BUTE CUMBRAE CABLE INSTALLATION ENVIRONMENTAL SUPPORTING INFORMATION

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Revision	Date	Issued by	Approved by	Amendments
1.0	29/08/2018	Michael Moore	Andrew Kinninmonth	
2.0	19/09/2018	Martin Black	Andrew Kinninmonth	Client comments
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Abbreviations

Abbreviation	Definition
BMC	Briggs Marine Contractors – Principal Contractor
CFA	Clyde Fisherman's Association
CFE	Controlled Flow Excavation
CIRIA	Construction Industry Research and Information Association
CLV	Cable Lay Vessel
CMID	Common Marine Inspection Document
CMPP	Clyde Marine Planning Partnership
CMR	Clyde Marine Region
CMRA	Clyde Marine Region Assessment
DDV	Drop Down Video
DSV	Dive Support Vessel
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EMF	Electromagnetic fields
EPS	European Protected Species
FIR	Fishing Industry Representative
FLMAP	Fisheries Liaison and Mitigation Action Plan
HVAC	High Voltage Alternating Current
INNMS	Invasive Non-Native Marine Species
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effects
MARPOL	Marine Pollution
MBES	Multibeam Echosounder
MCA	Marine Consultation Area
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
MMO	Marine Mammal Observer
MMPP	Marine Mammal Protection Plan
MPA	Marine Protected Area
NMP	National Marine Plan
NTM	Notice to Mariners
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic
PAC	Pre-Application Consultation
PAM	Passive Acoustic Monitor
PMF	Priority Marine Feature
PLGR	Pre-Lay Grapnel Run
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SEPA	Scottish Environmental Protection Agency

SFF	Scottish Fishermen's Federation
SHEPD	Scottish Hydro Electric Power Distribution
SNH	Scottish National Heritage
SOPEP	Shipboard Oil Pollution Emergency Plan
SPA	Special Protection Area
SPP	Scottish Planning Policy
SSEN	Scottish & Southern Energy Networks - Client and Principle Designer
SSS	Sidescan Sonar
SSSI	Site of Special Scientific Interest
TJB	Transition Joint Bay
UKBAP	United Kingdom Biodiversity Action Plan
UKHO	United Kingdom Hydrographic Office
UNCLOS	The United Nations Convention on the Law of the Sea
UNESCO	The United Nations Educational, Scientific and Cultural Organisation
UXO	Unexploded Ordnance
WFD	Water Framework Directive

1 INTRODUCTION

1.1 Introduction

Briggs Marine Contractors (BMC) have been contracted by Scottish Hydro Electric Power Distribution (SHEPD) to survey, design and install and new cable between the islands of Bute and Great Cumbrae on the west coast of Scotland. Cumbrae is normally fed by two HVAC 11kV submarine cables from the Isle of Bute within the Clyde Estuary. Historically there were three submarine cables, but this was rationalised following the failure of the southern cable.

On the 26th February 2017, on Figure 1 the Centre cable (ID 30) faulted leaving the island of Cumbrae supplied solely by the North cable (ID 77). Following cable failure and after fault testing, an ROV inspection was carried out to determine the cause of the fault and overall health of the cable. No point of failure or physical evidence was found during the cable inspection. As the cable had previously faulted and repaired in 2014, the cause of the failure was concluded to be electrical related and attributed to the age of the circuit.

The remaining operational cable was installed in 1980 at a length of 4.62km and a maximum depth of approximately 100m. As this cable has exceeded SHEPD's life expectancy, a decision was made to install a new cable.

Following assessment of the existing and alternative landing points by SSEN, the decision was made to relocate the replacement cable route further north. The proposed new landing points are Kerrylamont Bay on Bute and Bell Bay on Cumbrae.

The operations site is located as below:

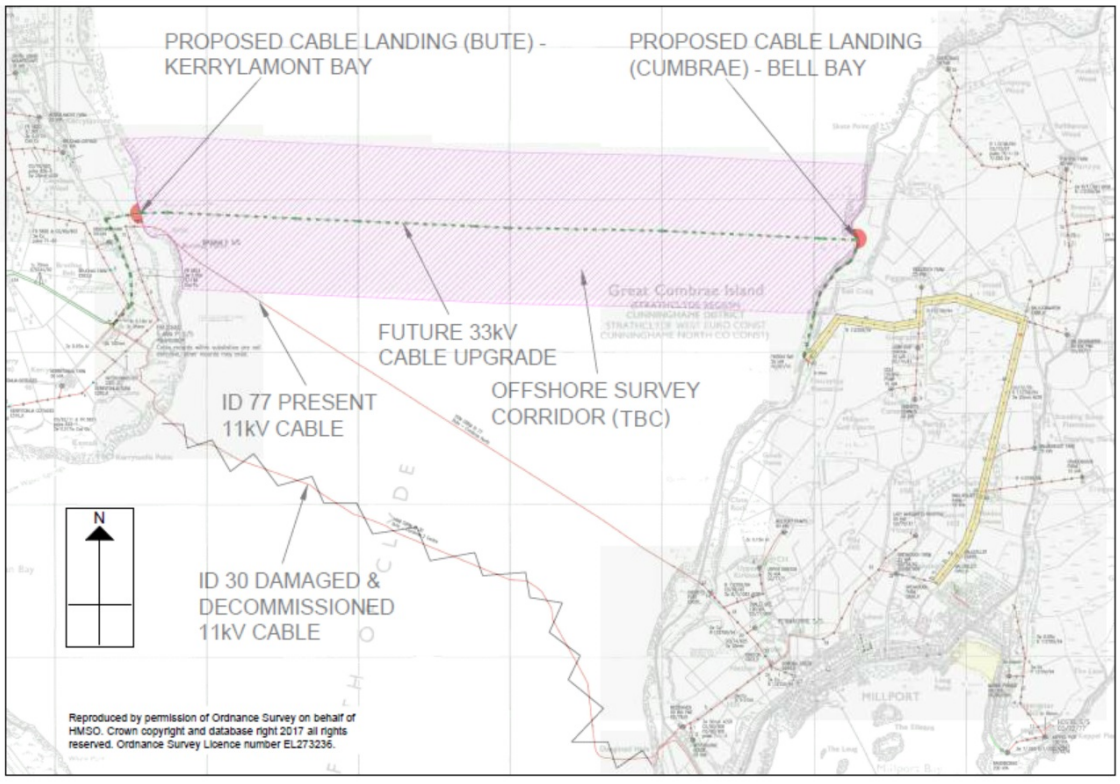


Figure 1- Location of Proposed Cable Route

BMC will be responsible for carrying out the works associated with the submarine cable installation works between the TJB locations on both landfalls. This includes a desk top study, route survey and design, cable installation and cable protection. BMC have assisted in preparing the applications for marine licences and SHEPD are responsible for submittal to Marine Scotland.

On both Bute and Cumbrae, inshore of the TJP locations, there shall be underground cabling works along with overhead line upgrades and removal of wooden poles to connect the new cable to the existing network. These works inshore of the TJP locations will be the responsibility of SHEPD. In line with Part 4 of the Marine (Scotland) Act 2010, SHEPD will submit a Marine Licence application for the replacement of the cable. This document is a reference for that application.

1.2 Marine Surveys

BMC undertook hydrographic surveys along the proposed cable corridor in August/ September 2018. The surveyed corridor was chosen based on landfall sites identified by SHEPD. The extent of the surveyed corridor was decided taking into consideration the survey cost, impact on environmental species from the survey equipment and disruption to sea users from the survey works. The survey programmed was designed to inform the following parameters:

- Seabed conditions (e.g. sand, rock, mud) to optimise the proposed cable route (avoidance of rock outcrops, etc.)
- 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, UXO etc.
- Areas of potential biological and ecological importance (such as biogenic and rocky reefs, priority marine features etc).

The following marine surveys were undertaken:

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

Drop-down video and imagery surveys were undertaken to better understand the range of potential habitats and their geographic spread. The methodology in relation to the surveys was developed through discussion with SNH. The survey outputs from the drop-down video surveys will be shared to evidence the habitats and features present along and near the proposed cable.

Figure 2: Overview of the Shore at Bell Bay, Cumbrae

Figure 3: Overview of the Shore at Kerrylamont Bay, Bute

1.3 Submarine Cable Installation

A new distribution submarine electricity cable is proposed to be laid on the seabed between the Bute and Cumbrae coasts. The new cable will be laid along the route corridor utilising the best route for cable integrity over the life of cable and to account for environmental and archaeological considerations. The new cable will have an outer diameter of 127 mm and will be installed from a Cable Lay Vessel (CLV). It will be installed within a defined corridor, to allow for any unforeseen difficulties that may arise during installation, to enable more scope for in-situ micro-routing during installation and to avoid potential sensitive environmental habitats or marine archaeology.

Before cable laying operations commence, it will be necessary to ensure that the route is free from obstructions such as discarded fishing gear and out of service cables. A suitably equipped vessel will complete a pre-lay grapnel run (PLGR) to remove such debris to ensure the safety of the installation team, the new subsea cable and other sea users.

During cable lay activities additional smaller support vessels will be required at each of the shallower shore locations; this is likely to be a multicat/DSV. This may require an anchoring system to be laid out prior to and during works in the nearshore region. In this instance, an anchor handling vessel would be required to lay out the anchors. A guard vessel is also likely to be used during the cable lay operations to ensure other vessels remain outside the area of operations, to reduce collision risk.

Initially, the proposed submarine cable will be surface laid on the seabed across the length of the route. BMC plan to bury the cable along the entirety of the cable route utilising a controlled flow excavation technique to protect the cable from anchor strikes and any other third-party damage.

1.4 Intertidal Zone

New shore end landfall locations have been selected by SHEPD for the cable replacement. 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 4.

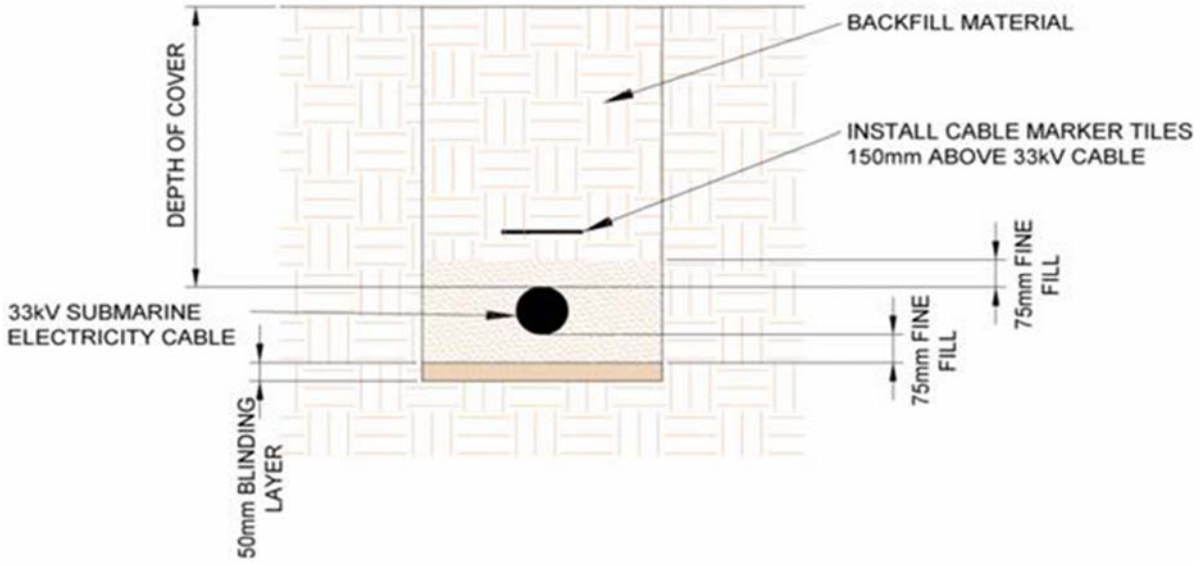


Figure 4: Typical open cut trench cross-section inshore of MLWS.

At the Cumbrae landfall, the marine cable will be installed by an open cut trench method above the MLWS limit. The marine cable will be installed within a ducted conduit through the nearby road. To complete the shore end installation works there will be some underground cabling from the transition joint location with the marine cable.

The trench will be excavated using a terrestrial-based mechanical excavator during low spring tide. 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 1 m wide. The target depth of the trench will be 1.25 m. Temporary trench shoring may be required to prevent collapse of the trench wall. The footprint of the excavator may be up to 5 m, and a working width, including for the temporary storage of removed material, would be in the order of 10 m.

On completion of jointing and cabling works, spoil material will be backfilled into the trenches and the shore will be reinstated; grassed areas will be left to re-seed naturally.

1.5 Vessels

For the cable laying activities, a standard cable lay vessel will be used. An additional smaller support vessel is likely to be required at each of the shallower shore locations; this is likely to be a multicat / DSV. This may require deployment of an anchor spread, such as a four-point anchor system or spud legs, prior to and during the works in the nearshore region. An anchor handling vessel will be required to lay out the anchors, which would be within a radius of 100 m from the DSV. Where there is sensitive habitat close to shore, the anchor pattern would be designed so that it targets areas where sensitivity is reduced, thereby minimising the potential impact. A guard vessel is also likely to be used during the cable lay operations to ensure other vessels remain outside the area of operations, thereby reducing collision risk. Finally, an anchor handling tug, likely to be DP vessel Kingdom of Fife, will perform the PLGR 1-3 weeks in advance of the cable installation.

2 MARINE CONSENT

2.1 Marine Licence

Under Part 4 of the Marine (Scotland) Act 2010, a Marine Licence is required for the installation and operation of submarine cables in Scottish waters. However, submarine cables do not require a formal Environmental Impact Assessment (EIA) as they are not listed on either Schedule 1 or Schedule 2 of the Marine Works (Environmental Impact Assessment) Regulations 2017.

Although a formal EIA is not required for submarine cables, Marine Scotland advises, in their Guidance for Marine Licence Applicant Version 2 June 2015 (Marine Scotland, 2015) that "applicants for marine licences for submarine cables should consider the scale and nature of their projects and give consideration to the need for a proportionate environmental assessment".

For larger projects, where there is potential for the subsea cable to impact key environmental receptors, it is recommended by Marine Scotland (Marine Scotland, 2015) that an assessment of potential impacts on these receptors is carried out. Results from this assessment along with other relevant information about the Project are provided to support the Marine Licence application.

The aim of this report is to provide sufficient environmental information to support the Marine Licence application, by identifying the environmental receptors in the area and undertaking an assessment of the potential impacts to those that are considered particularly sensitive to the proposed works.

2.2 Scottish National Marine Plan

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. Sectoral policies are also outlined in the Plan where a particular industry brings with it issues beyond those set out in the general policies. For the Project, the policies covering sea fisheries and submarine electricity cables are of particular relevance.

2.3 General Planning

The general planning policies of particular relevance to the Project include:

- General planning - There is a presumption in favour of sustainable development and use of the marine environment when consistent with the policies and objectives of the Plan;
- Economic benefit - Sustainable development and use which provides economic benefit to Scottish communities is encouraged when consistent with the objectives and policies of this Plan;
- Co-existence - Proposals which enable coexistence with other development sectors and activities within the Scottish marine area are encouraged in planning and decision-making processes, when consistent with policies and objectives of this Plan;
- Climate change - Marine planners and decision makers must act in the way best calculated to mitigate, and adapt to, climate change;
- Natural heritage - Development and use of the marine environment must:
    - Comply with legal requirements for protected areas and protected species;
    - Not result in significant impact on the national status of Priority Marine Features (PMF); and
    - Protect and, where appropriate, enhance the health of the marine area.

- Noise: Development and use in the marine environment should avoid significant adverse effects of manmade noise and vibration, especially on species sensitive to such effects;
- Engagement: Early and effective engagement should be undertaken with the general public and interested stakeholders to facilitate planning and consenting processes; and
- Cumulative impacts: Cumulative impacts affecting the ecosystem of the Marine Plan area should be addressed in decision-making and Plan implementation.

2.4 Sea Fisheries

With respect to sea fisheries, the NMP sets out a number of policies. Those that are relevant to the Project include:

'Fisheries 1': Taking account of the EU's Common Fisheries Policy, Habitats Directive, Birds Directive and Marine Strategy Framework Directive, marine planners and decision makers should aim to ensure:

- Existing fishing opportunities and activities are safeguarded wherever possible;
- Protection for vulnerable stocks (in particular for juvenile and spawning stocks through continuation of sea area closures where appropriate);
- That other sectors take into account the need to protect fish stocks and sustain healthy fisheries for both economic and conservation reasons; and
- Mechanisms for managing conflicts between fishermen and/or between the fishing sector and other users of the marine environment.

'Fisheries 2': The following key factors should be taken into account when deciding on uses of the marine environment and the potential impact on fishing:

- The cultural and economic importance of fishing, in particular to vulnerable coastal communities;
- The potential impact (positive and negative) of marine developments on the sustainability of fish and shellfish stocks and resultant fishing opportunities in any given area;
- The environmental impact on fishing grounds (such as nursery, spawning areas), commercially fished species, habitats and species more generally; and
- The potential effect of displacement on: fish stocks; the wider environment; use of fuel; socio-economic costs to fishers and their communities and other marine users.

'Fisheries 3': Where existing fishing opportunities or activity cannot be safeguarded, a Fisheries Management and Mitigation Strategy should be prepared by the proposer of development or use, involving full engagement with local fishing interests (and other interests as appropriate) in the development of the Strategy. All efforts should be made to agree the Strategy with those interests. Those interests should also undertake to engage with the proposer and provide transparent and accurate information and data to help complete the Strategy. The Strategy should be drawn up as part of the discharge of conditions of permissions granted.

The content of the Strategy should be relevant to the particular circumstances and could include:

- An assessment of the potential impact of the development or use on the affected fishery or fisheries, both in socio-economic terms and in terms of environmental sustainability;
- A recognition that the disruption to existing fishing opportunities/activity should be minimised as far as possible;

- Reasonable measures to mitigate any constraints which the proposed development or use may place on existing or proposed fishing activity; and
- Reasonable measures to mitigate any potential impacts on sustainability of fish stocks (e.g. impacts on spawning grounds or areas of fish or shellfish abundance) and any socioeconomic impacts.

2.5 Submarine Cables

With respect to submarine cables, the NMP sets out a number of key objectives. Those that are relevant to the Project include:

- Protect submarine cables whilst achieving successful seabed user co-existence;
- Achieve the highest possible quality and safety standards and reduce risks to all seabed users and the marine environment; and
- Support the generation, distribution and optimisation of electricity from traditional and renewable sources to Scotland, UK and beyond.

There are three marine planning policies laid out in the NMP that are relevant to the project:

'Cables 1': Cable and network owners should engage with decision makers at the early planning stage to notify of any intention to lay, repair or replace cables before routes are selected and agreed. When making proposals, cable and network owners and marine users should evidence that they have taken a joined-up approach to development and activity to minimise impacts, where possible, on the marine historic and natural environment, the assets, infrastructures and other users. Appropriate and proportionate environmental consideration and risk assessments should be provided which may include cable protection measures and mitigation plans. Any deposit, removal or dredging carried out for the purpose of executing emergency inspection or repair works to any cable is exempt from the marine licensing regime with approval by Scottish Ministers. However, cable replacement requires a marine license. Marine Licensing Guidance should be followed when considering any cable development and activity.

'Cables 2': The following factors will be taken into account on a case by case basis when reaching decisions regarding submarine cable development and activities:

- Cables should be suitably routed to provide sufficient requirements for installation and cable protection;
- New cables should implement methods to minimise impacts on the environment, seabed and other users, where operationally possible and in accordance with relevant industry practice;
- Cables should be buried to maximise protection where there are safety or seabed stability risks and to reduce conflict with other marine users and to protect the assets and infrastructure;
- Where burial is demonstrated not to be feasible, cables may be suitably protected through recognized and approved measures (such as rock or mattress placement or cable armoring) where practicable and cost-effective and as risk assessments direct; and
- Consideration of the need to reinstate the seabed, undertake post-lay surveys and monitoring and carry out remedial action where required.

'Cables 4': When selecting locations for land-fall of power and telecommunications equipment and cabling, developers and decision makers should consider the policies pertaining to flooding and coastal protection in Chapter 4 (of the NMP) and align with those in Scottish Planning Policy and Local Development Plans.

2.6 Clyde Marine Spatial Plan

The Clyde Marine Planning Partnership (CMPP) is the regional planning partnership working to create a Regional Marine Plan for the Clyde. The CMPP is made up of a range of stakeholders from around the Clyde Marine Region (CMR). The CMPP have drafted the Clyde Marine Region Assessment (CMRA) (2017), that provides a comprehensive assessment of the issues relevant to marine planning within the greater Clyde area.

The CMRA is based on Scottish Ministers' commitment to making marine management more efficient, inclusive and accessible. Areas of constraint and/or opportunities for development have been identified in order to reduce potential conflicts between marine activities and encourage co-existence between multiple users. The CMRA aims at providing an approach to the management of the sea around the Clyde; facilitating an integrated and better-informed decision- making process regarding the future distribution of activities and resources; and enabling the long- term protection and use of the marine environment.

The document provides several assessments of the current condition of the region including:

- Physical and environmental characteristics
    - Climate change
    - Seabed and coastal geology
    - Water circulation
    - Seascape
- Clean and Safe Environment
    - Water Framework Directive
    - Hazardous substances
    - Microbiological substances
    - Eutrophication
    - Oil and Chemical spills
    - Dissolved oxygen
    - Marine litter
    - Noise
- Healthy and Biologically Diverse
    - Intertidal rock and sediments
    - Subtidal rock
    - Fish
    - Cetaceans
    - Sharks, skates and rays
    - Seals
    - Seabirds and water birds
    - Protected Areas
    - Marine Non-Native species
- Economic Pressures and Impacts
    - Sea Fisheries
    - Aquaculture
    - Recreation
    - Defence
    - Cultural Heritage
    - Subsea Infrastructure
    - Shipping and Transport
    - Waste water treatment
    - Marine Management

2.7 Stakeholder Consultation

SHEPD have undertaken several stakeholder engagement events in advance of the cable installation. This allowed for interested parties to comment on the cable replacement process including SHEPD customers, sea users and statutory consultees. The timing and content of these consultations are summarised in Table 1.

Table 1: Consultation Events

Date	Organisation	Consultation
23-05-18	Legitimate sea users, SHEPD customers, public sector and non-governmental organisations	Open Door PAC Event, Millport Library- Great Cumbrae, KA28 0DG
24-05-18	Legitimate sea users, SHEPD customers, public sector and non-governmental organisations	Open Door PAC Event, MOAT Community Centre, Bute, PA20 0EP
12-06-18	Peel Ports	Inform of project details prior to submission of applications
18-06-18	Scottish Natural Heritage	Inform of project details prior to submission of applications
22-06-18	Argyll & Bute Council	Inform of project details prior to submission of applications
16-07-18	Clyde Fisherman's Association (CFA)	Inform of project details prior to submission of applications

2.8 Environmental Assessment Scope

The following sections of this environmental supporting information document provide information on:

- The identification of potential impacts on protected sites and key receptors associated with those sites;
- The identification of potential impacts on other key receptors and an assessment of the potential for those impacts to be significant; and
- Mitigation measures that will be implemented to avoid or minimise any potential impacts (these include mitigation measures that are inherent to the Project design).

The proposed cable installation works are temporary in nature and will be short term. The installation has a small seabed footprint; however, the following environmental receptors have been identified for assessment:

- Protected sites and species associated with those sites;
- Physical environment;
- Benthic and intertidal ecology; and
- Other species, including mammals, fish, shorebirds and otters.

Fisheries and other legitimate sea users are considered in the FLMAP and are not discussed further in this document.

Table 2: General Marine Environmental Guidance Document List

Title of Document	Author/Publisher	Date Published
Marine Biosecurity Planning	SNH	2014
Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) Recommendations For Fisheries Liaison – Best practise guidance for offshore renewable developers	BERR – Department for Business Enterprise and Regulatory Reform	2008
Review of cabling techniques and environmental effects applicable to the offshore wind farm industry	BERR – Department for Business Enterprise and Regulatory Reform	2008
Background Document on potential problems associated with power cables other than those for oil and gas activities	OSPAR Commission	2008
Assessment of the environmental impacts of cables	OSPAR Commission	2009
Alien invasive species and the oil and gas industry - Guidance for prevention and management	The global oil and gas industry association for environmental and social issues	2010
Environmental good practice - working on coastal and marine construction sites (C594)	CIRIA	2003
Culvert Design and Operation Guide (RP901)	CIRIA	2010
Coastal and marine environmental site guide (C584)	CIRIA	2003
Environmental Good Practice	CIRIA	2005
Marine Mammal Observer (MMO) Protocol	Marine Scotland	2011
Marine Benthic Sampling and Instrument Deployment Projects in the Territorial Sea and UK Controlled Waters Adjacent to Scotland -Marine (Scotland) Act 2010 - Marine and Coastal Access Act 2009	Marine Scotland	2010
Marine Renewable Energy Projects in the Territorial Sea and UK Controlled Waters Adjacent to Scotland - Marine (Scotland) Act 2010	Marine Scotland	2010
Marine Construction Projects in the Territorial Sea and UK Controlled Waters Adjacent to Scotland – Marine (Scotland) Act 2010	Marine Scotland	2010
Marine licensing guidance 5 - Wildlife licence guidance	Marine Management Organisation	2011
Marine licensing guidance 8 - Environmental impact assessment	Marine Management Organisation	2011
Marine licensing guidance 2 - Construction (including renewables) and removals	Marine Management Organisation	2011
Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal	Institute of Ecology and Environmental Management	2010

European Protected Species, Development Sites and the Planning System – Interim guidance for local authorities on licensing arrangements	SEERAD	October 2001
Forests and Water Guidelines	Forestry Commission	2011
Pollution Prevention Guidelines PPG 1-8, 14, 18, 21,22,	NetRegs	Variety
SEPA Good Practice Guide – Temporary construction methods	SEPA	2009
WAT-SG-31: SEPA Special Requirements for Civil Engineering Contracts for the Prevention of Pollution V2	SEPA	2006
SEPA Is it Waste – Guidance Document	SEPA	2006
The Water Environment (Controlled Activities)(Scotland) Regulations 2011 A practical Guide.	SEPA	2011
Otters and Development Scottish Wildlife Series	SNH	2008
Marine non-native species	SNH	2012
Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives	Scottish Government	2000
Biosecurity Guidance	Scottish Government	2011
Best Practise – Dealing with marine non-native species	The Green Blue	2012
Standard and Guidance for archaeological watching brief	IFA	2001

3 ECOLOGICAL PROTECTED SITES

3.1 Environmental Assessment Scope

This section of the report provides detail on the protected sites and their qualifying features in the vicinity of the Project, as well as the relevant legislation applicable to each site, and the relevant consultation advice that has been provided to SHEPD by key stakeholders.

It then assesses the potential impacts on the sites that could be impacted from the proposed activities and discusses the mitigation and management measures that will be undertaken in order to ensure impacts are avoided or minimised and provides a conclusion of the significance of potential impacts.

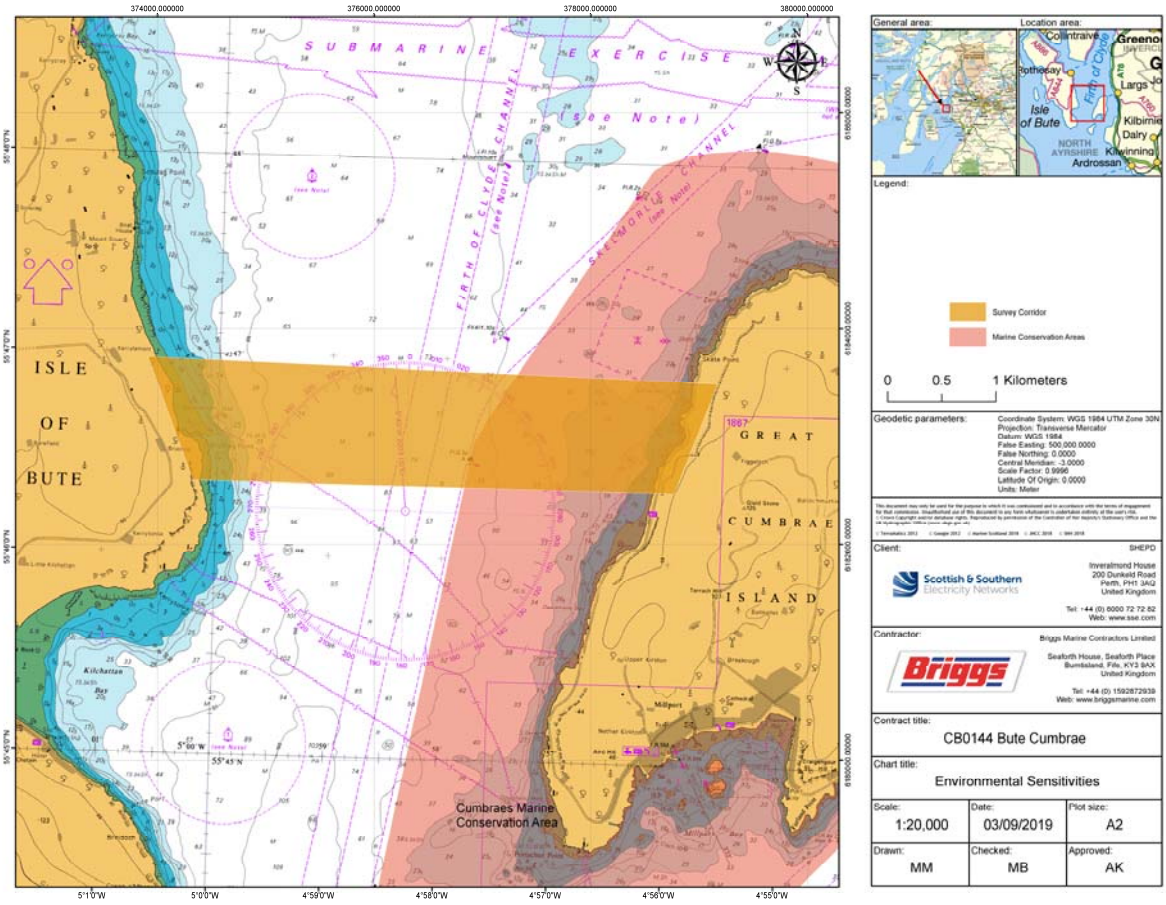


Figure 5: Environmental Designations

3.2 Sites of International Importance

Designation	
Special Area of Conservation (SAC)	Areas considered to be important for certain habitats and non-bird species of interest in a European context. One of the main mechanisms by which the EC Habitats and Species Directive 1992 will be implemented.
Special Protection Area (SPA)	Sites designated by the UK Government to protect certain rare or vulnerable species and regularly occurring migratory species of birds.
Site of Special Scientific Interest (SSSI)	Sites of Special Scientific Interest (SSSIs) are those areas of land and water that best represent natural heritage in terms of their: • flora – i.e. plants • fauna – i.e. animals • geology – i.e. rocks • geomorphology – i.e. landforms • a mixture of these natural features
Marine Protected Area (MPA)	Thirty Marine Protected Areas (MPAs) were designated in Scotland's seas on 24 July 2014; 17 of these MPAs fall under the Marine (Scotland) Act 2010 in inshore waters.
Marine Consultation Area (MCA)	Marine Consultation Areas are identified by Scottish Natural Heritage as deserving particular distinction in respect of the quality and sensitivity of the marine environment within them. Their selection encourages coastal communities and management bodies to be aware of marine conservation issues in the area.
RAMSAR	A Ramsar Site is a wetland site designated of international importance under the Ramsar Convention. The Convention on Wetlands, known as the Ramsar Convention, is an intergovernmental environmental treaty established in 1971 by UNESCO, and coming into force in 1975.
Natural Nature Reserves	National Nature Reserves (NNRs) are areas of land set aside for nature. As in other countries, the accolade is given to Scotland's best wildlife sites, to promote their conservation and enjoyment. Most reserves contain nationally or internationally important habitats and species, so the wildlife is managed very carefully. Visitor facilities are designed and managed to ensure that people can enjoy NNRs without harming or disturbing the wildlife that lives there.

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 and species in particular epibenthic ophiuroids. This covers 2,823 ha. 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.

3.3 Potential Impacts

Table 3: Potential impacts on protected sites

Environmental Receptor	Potential Impacts	Mitigation
Marine Mammals	Risk from accidental pollution e.g. from oil seepage, hydraulic fluid release, vessel fuel release	• Marine (vessel) activities will be temporary; • Potential for accidental release of pollutants is very low; • Vessel SOPEP details procedures and description of actions to be taken in the event of an oil pollution incident; • Operating instructions in place for all hazardous substances including hydraulic oil.
Benthic Ecology	Displacement of sediment and loss of habitat during PLGR, cable burial works (subsea) and trench reinstatement onshore	• Shore end sediment will be reinstated within the trench for cable burial.
Waterfowl	Vessel presence and noise (offshore) and presence of heavy machinery and vehicles at landfall. Accidental fuel release.	• Marine (vessel) activities will be temporary; • Potential for accidental release of pollutants is very low; • Vessel SOPEP details procedures and description of actions to be taken in the event of an oil pollution incident; • Operating instructions in place for all hazardous substances including hydraulic oil.

4 PHYSICAL ENVIRONMENT

This section of the report provides detail on the physical environment in the vicinity of the Project, as well as the relevant legislation applicable to each site, and the relevant consultation advice that has been provided to SHEPD by key stakeholders.

It then assesses the potential impacts on the sites that could be impacted from the proposed activities and discusses the mitigation and management measures that will be undertaken in order to ensure impacts are avoided or minimised and provides a conclusion of the significance of potential impacts.

4.1 EU Legislation

The EU Marine Strategy Framework Directive 2008/56/EC (MSFD) was formally adopted in July 2008 and was transposed into UK Legislation under the Marine Strategy Regulations 2010 on 15th July 2010. The Directive is the environmental pillar of the Integrated European Maritime Policy which focuses on the development of a coherent, co-ordinated and integrated approach to the management of the marine environment through marine planning. The MSFD constitutes a vital environmental component of the European Union's future maritime policy and is designed to achieve full economic potential of oceans and seas in harmony with the marine environment (MSFD, 2015). An updated Marine Strategy Part One will be published in 2018 following a public consultation in 2017.

The main requirement of the MSFD is for Member States to prepare national strategies, including marine spatial plans, to manage their seas to achieve Good Environmental Status (GES) by 2020 at the latest. The key requirements of the Directive are to undertake an assessment of the current state of UK seas, and a detailed description of what GES means for UK waters, with a set of associated targets and indicators (Scottish Government, 2016).

In December 2012, the UK Marine Strategy Part 1 was published. This included an assessment of UK marine waters; proposals on defining Good Environmental Status (GES) and developing targets and indicators for achieving and monitoring GES. Provisions for Scotland to work with other UK administrations towards achieving GES are set out under the MSFD (DEFRA, 2012).
In July 2014, Part two of the Marine Strategy was published by the UK government to establish and implement coordinated monitoring programmes for the ongoing assessment of the environmental status of marine waters around the UK (DEFRA, 2014).

Part 3 of the Marine Strategy was published in December 2015. It sets out a programme of measures to enable the achievement of GES (DEFRA, 2015).

4.2 Consultation

SHEPD has undertaken consultation with statutory and non-statutory bodies. It was raised during the public consultation that the sands of Bell Bay are known to shift with the weather. Following assessment of the existing and alternative cable landing points, the decision was made utilise Bell Bay due to the rocky coastline and difficulty burying the cable at other 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.

4.3 Physical Environment

The hydrography of the area is complex and is largely driven by its bathymetry. Salinity and temperature distributions described by Craig (1959) and Dooley (1979) point to a front on the Great Plateau which separates the tidally mixed waters of the North Channel from the stratified waters and weak tidal currents of the Clyde.

The maximum velocity of the tidal currents in the Clyde is generally less than 0.5 m/s and within the sea lochs they are even weaker attaining about 0.2 m/s. The bathymetry controls the balance of processes at any particular depth. At the surface there is free connection throughout and movement is dominated by pressure gradients set up by tide, wind and freshwater outflows. In the deeper waters below the sills, dense water settles, flows are blocked and are dominated by oscillatory internal movements; bottom water stagnation, some oxygen depletion and nutrient build-up can occur within the lower levels of the sea lochs. However, the importance of the deep water is sometimes overemphasised, by area only 20% lies below 70 m and 6% below 100 m (Marine Scotland, 2012).

The basin also receives large inputs (60-700 m^3/s) of freshwater from the River Clyde and other river sources which enter mainly through the north of the region (Poodle, 1986). The freshwater inflow produces a typical fjordic regime with the salinity of the outflow surface water reduced by up to 1.5 relative to the inflow over the sill. The effect of this surface water tends to maintain a stable stratification which is not seriously eroded by tidal stirring on account of the generally weak tidal flows (Simpson and Rippeth, 1993).

The temperature of the Clyde Sea, compared to the North Channel, is warmer in the summer and colder in the winter. The shallow waters of the lochs and estuaries experience much greater temperature fluctuations, surface ice forms at the heads of some lochs in the winter and a thermocline is established during the summer (Connor, 1991). Mean surface temperature and salinity vary quite considerably (depending on the season) from 6-14°C and from <30-34.75 respectively (Marine Scotland, 2012).

Figure 6 shows the Average annual cycles in the Clyde Sea of temperature (ºC), salinity and density (σT kg/m^3) (Marine Scotland, 2012). Red lines indicate surface variables with blue representing seabed variables.

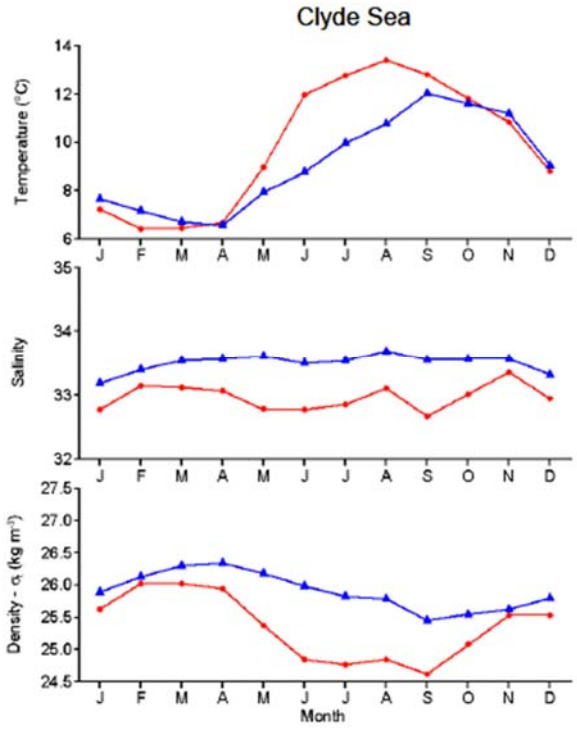


Figure 6: Average annual cycles

4.4 Potential Impacts

Table 4: Potential impacts on physical environment

Environmental Receptor	Potential Impacts	Mitigation
Bathymetry and hydrology	No potential impacts	• N/A
Water Quality	Increased suspended sediment in the water column over the short period of the underwater activities resulting from PLGR and cable installation activities where trenching may occur in the intertidal areas. Risk from accidental pollution e.g. from oil seepage, hydraulic fluid release, vessel fuel release.	No potential for significant impacts on water quality, due to: • PLGR and cable burial activities will be temporary (< 1 week) and any increase in suspended sediments will quickly revert back to background levels; and • All cable landfall works undertaken in line with standard best practice and general environmental management plans provided by SHEPD.

5 BENTHIC AND INTERTIDAL ECOLOGY

5.1 Introduction

This section of the report provides detail on the benthic and intertidal habitats in the vicinity of the Project, as well as the relevant legislation and policy guidance. It then assesses the potential impacts on benthic and intertidal ecology and the management and mitigation measures that will be undertaken in order to ensure impacts are minimised.

5.2 Legislation and Policy Context

With respect to benthic and intertidal ecology, in order to identify potential constraints to routing a subsea cable and identifying potential landfall locations, it is necessary to identify potential habitats and species of conservation importance that could potentially be present in the Project study area and along potential subsea cable route corridors.
There are several different statutes and guidance that are relevant in this regard. These include:

- European Habitats Directive (Directive 92/43/EEC);
- The Habitats (Scotland) Regulations 1994 (as amended) which implements species protection requirements of the Habitats Directive in Scotland, on land and in inshore waters (within 12 nm);
- The Convention for the Protection of the Marine Environment of the North East Atlantic (known as the OSPAR Convention);
- Marine (Scotland) Act 2010 and Marine and Coastal Access Act (2009); and
- UK Post-2010 Biodiversity Framework (July 2012) – this supersedes the UK Biodiversity Action Plan (UKBAP) which was the UK Governments Response to the Convention on Biological Diversity (CBD), which the UK signed up to in 1992 in Rio de Janeiro.

5.3 European Habitats Directive

The European Habitats Directive lists 15 marine and coastal habitats and eight marine species in Annexes I and II respectively. To meet the requirements outlined in Article 3 of the European Habitats Directive, SACs have been designated in UK waters to contribute to the European network of important high-quality conservation sites that will make a significant contribution to conserving these species and habitats. There are no records of marine and coastal habitats as listed in Annex I of the Directive within the Project area.

5.4 Marine (Scotland) Act 2010

On behalf of the Scottish Government; JNCC, SNH and Marine Scotland have together developed recommended lists of PMFs in Scotland's seas (Tyler-Walters et al., 2016). The list of PMFs has not been developed in accordance with any specific legislation, agreement or convention; it was developed to guide policy decisions regarding the conservation of Scotland's seas, through the identification of priority species and habitats.

The list of recommended PMFs in Scotland's offshore waters was adopted in 2014 and contains 81 habitats and species considered to be of conservation importance (Tyler-Walters et al., 2016). Howson et al. (2012) have also developed an equivalent list for Scotland's territorial waters which comprises 56 PMFs, including eight habitats and species groups, 11 individual habitats and 37 individual species.

5.5 Biodiversity Action Plan (BAP)

The UK Biodiversity Action Plan (UKBAP) was launched in 1994 as a means of meeting the UK's obligations under the Biodiversity Convention (signed by the UK and over a hundred other countries at the Rio Earth Summit in 1992) to "develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity". The stated goal of the UK BAP is to "conserve and enhance biological diversity within the UK, and to contribute to the conservation of global diversity through all appropriate mechanisms".

UK BAP priority species were those identified as being the most threatened and requiring conservation action under the UK BAP. As a result of devolution, and new country-level and international drivers and requirements, much of the work previously carried out by the UK BAP is now focused at a country-level rather than a UK-level, and in July 2012 the UK BAP was succeeded by the UK Post-2010 Biodiversity Framework[6]. The UK list of priority species, however, remains an important reference source and has been used to help draw up statutory lists of priorities in Scotland.

5.6 Benthic and Intertidal Ecology

This section presents detail on the benthic subtidal and intertidal habitats present within the cable route corridor, with information on the relevant legislation and policy guidance presented for context. Potential impacts of the proposed cable development on benthic and intertidal habitats are discussed along with proposed management and mitigation measures to minimise such impacts. This is based on published resources[1-5] and on data collected during a dedicated drop-down video survey conducted along proposed cable route by Ocean Ecology Limited in August 2018.

5.6.1 Subtidal Area

Broad-scale seabed habitats were initially identified through the EMODnet Seabed Habitats Map Viewer1, of which a number are thought to occur below mean low water in the general vicinity of the proposed cable route. The majority of the route corridor is thought to be dominated by sublittoral mud (EUNIS A5.3), while inshore areas close to the coast of both Bute and Great Cumbrae are thought to comprise areas of high and low energy infralittoral and circalittoral rock (EUNIS A4.1, A4.3, A3.1 A3.3). The available data therefore indicates that the majority of the cable route area was characterised by soft sediment habitats in the deeper areas of the route, while shallower inshore areas are characterised by bedrock and hard substrata.

Detailed interpretation of the data collected during the targeted drop-down video survey allowed for mapping of the subtidal habitats within the area at a higher confidence and at a greater spatial resolution but generally corroborated the existing EMODnet mapping. The data indicates that the cable route corridor is characterised by four separate EUNIS Level 5 biotopes as described below.

5.6.2 A3.3 Atlantic and Mediterranean low energy infralittoral rock

Areas of this habitat occur at the eastern and western ends of the cable route corridor, in the shallower inshore areas. This habitat is comprised of bedrock, boulders and cobbles in the infralittoral shallow subtidal zone, and typically support communities of seaweed and kelp. The upper limit is defined by the top of the kelp zone and the lower by the lower limit of kelp or dense seaweed growth. Communities associated with these habitats generally include the kelp *Laminaria hyperborea* and *Laminaria saccharina*, which together with other associated seaweeds, generally silt-tolerant and filamentous species, can form dense and productive forests that support high levels of biodiversity. In areas of high turbidity kelp may be replaced by animal-dominated communities such as beds of *Mytilus edulis* (MarLIN, 2018). Kelp beds are a Scottish PMF (Tyler-Walters et al., 2016) and are a listed UK BAP habitat, although are not listed as Annex I or OSPAR habitats

5.6.3 A5.354 Virgularia mirabilis and Ophiura spp. with Pecten maximus on circalittoral sandy or shelly mud

This habitat is one of the dominant biotopes within the project area and occupies much of the sloping areas of the proposed cable route (Figure 7). Such area where fine sediments dominate support the sea pen *Virgularia mirabilis* and *Ophiura* spp., with the presence of these epifauna being the defining characteristics of the biotope. The presence of these species is strongly determined by the physical characteristics of a site rather than any interspecific factors however both species do not necessarily need to be present as is the case in the areas along the proposed cable route (*V. mirabilis* absent). A variety of other species may occur and the faunal assemblage and community structure at a particular site is often defined by the sediment composition. *V. mirabilis*, *Ophiura albida* and *Ophiura ophiura* are often present in moderate numbers while the scallop *Pecten maximus* usually occurs in relatively low numbers. Various crab species and the burrowing anemone *Cerianthus lloydi* are often associated with sea pens and other brittle stars (*Amphiura* spp.) are often recorded. The infauna of this biotope is dominated by various polychaetes, nemerteans and small bivalves (MarLIN, 2018).

5.6.4 A5.361 Seapens and burrowing megafauna in circalittoral fine mud

This biotope was observed in the western extent of the proposed cable route corridor, adjacent to areas of infralittoral rock that occur at shallower depths (Figure 7). This biotope is similar to A5.354 described above, although with relatively less coarse sediment content, namely sand and shell fragments, and a different faunal community. These areas of finer mud occur in sheltered areas up to relatively shallow (> 15m) depths and may support burrowing megafauna that create numerous burrows and mounds, a notable feature of the biotope that is not observed in areas characterised as A5.354. In this biotope the seapen *V. mirabilis* is also commonly present along with *Pennatula phosphorea* although no seapens were observed in the seabed imagery. Burrowing fauna often include the crustacean *Nephrops norvegicus* that feeds on various infauna and epifaunal species, and *Cerianthus lloydi*, (both being present in the seabed imagery) along with various scavenging fauna such as *Ophiura* spp., *Asterias rubens, Pagarus bernhardus* and *Liocarcinus depurator*. The infauna of this biotope is usually dominated by various polychaete worms, small bivalves and occasional echinoderms. 'Burrowed mud' is a listed Scottish PMF and is a listed UK BAP habitat.

5.6.5 A5.37x Seapens and burrowing megafauna in deep circalittoral fine mud

While the areas described above allowed an exact match with the observed habitats and species and EUNIS Level 3 biotope codes, the deepest area across the central part of the proposed cable route corridor could not be matched exactly with EUNIS biotopes as the observed faunal community and physical conditions did not match. While the faunal community observed included the presence of burrowing megafauna and is therefore characteristic of A5.361 'Seapens and burrowing megafauna in circalittoral fine mud', as described above, the depths at which this biotope was recorded (> 61.5 - 84.7 m) indicate that the biological zone of these habitat would be better described as 'deep circalittoral' rather than 'circalittoral'. Therefore, consistent with the guidelines provided by Parry (2015), the appropriate parent biotope at Level 4 has been assigned, with an indication that the Level 5 biotope is unknown. This biotope is therefore described as A5.37*x* 'Seapens and burrowing megafauna in *deep* circalittoral fine mud' and largely aligns with the description provided in Section 5.6.4, with the caveat that the biotope was observed at greater depths than the nearest existing Level 5 biotope.

5.6.6 Intertidal Habitats

Intertidal habitats within the proposed cable route were surveyed by Environmental Resources Management (ERM) on 25th and 26th July 2018 and a detailed description of the biotopes recorded and their spatial extent within the cable route is provided in ERM's survey report (ERM, 2018). The intertidal areas within the proposed route include an area to the north of Kerrylamont Bay on the Isle of Bute and Bell Bay on the Isle of Cumbrae. The intertidal habitats and biotopes recorded at each are discussed briefly below.

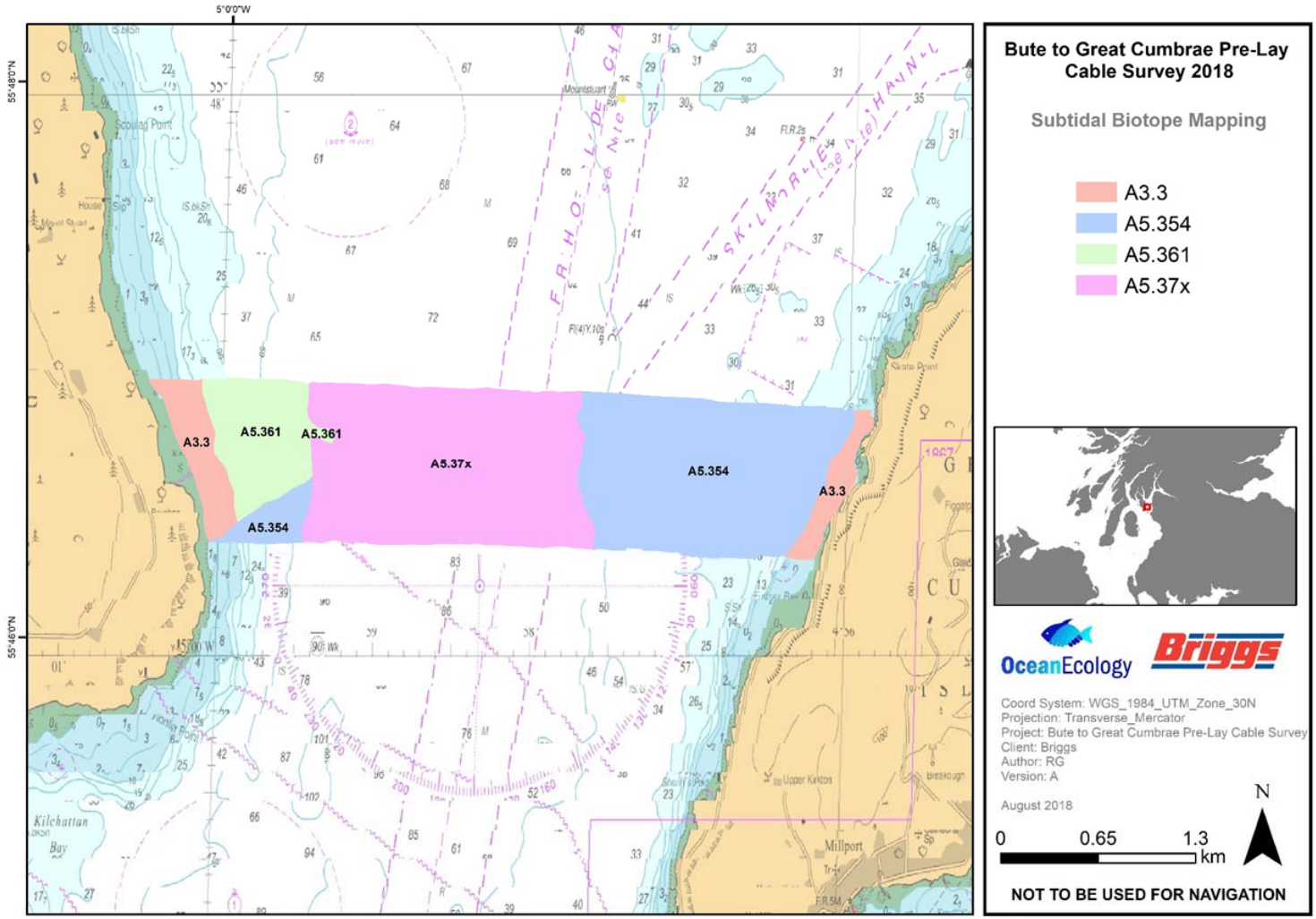
5.6.7 Kerrylamont Bay, Bute

The habitats observed at Kerrylamont Bay appear typical of low-lying shores of hard substrate, mostly comprising areas of intertidal rock, coarse and mixed sediments and shingle. Fucoid and other algae species

dominate large areas of the intertidal along with mussels and barnacles, while lower down the shore areas of sand occur that support tube dwelling polychaetes *Lanice conchilega* and *Arenicola marina*. Spraints observed in areas of shingle at the top of the shore indicate the presence of otters *Lutra lutra*. Individual biotopes observed across the intertidal at Kerrylamnot Bay are presented in Figure 7. 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 biotope in any area.

5.6.8 Bell Bay, Cumbrae

At Bell Bay the predominant substrate is sand, which supports little fauna in the upper shore although at lower elevations the polychaete *Scololepis* spp. and burrowing amphipods including *Orchestia* spp. were observed. Orache or *Atriplex* spp. is present on the barren sands at the upper shore. Fucoid algae and areas of *Porphyra* spp. and the gutweed *Enteromorpha intestinalis* are limited to areas of boulder on the lower shore, with the majority occurring on large areas of bedrock at the northern and southern ends of the bay outside of the survey area. In the supralittoral lichens and algae dominate, along with plant species such as *Armeria maritima*, *Plantago maritima*, *Tripleurospermum maritimum* and *Festuca rubra*. Otter spraints were also recorded at Bell Bay. The intertidal biotopes recorded at Bell Bay are presented in Figure 7.



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 7: EUNIS Biotopes identified across the proposed cable route corridor.

Table 5: Biotopes and species recorded across the intertidal at Kerrylamont Bay on the Isle of Bute in July 2018, including a description of their location on the shore and the relevant JNCC and EUNIS biotope codes. Adapted from ERM (2018).

Life Form	JNCC Biotope Code	EUNIS Biotope	Description	Location	Species Present
Shingle	LS.LCS.Sh.BarSh	A2.111	Barren littoral shingle	Upper shore below strandline vegetation	Amphipoda
	LS.LSa.St.Tal	A2.211	Talitrids on the upper shore and shingle	Small diffuse patches overlying the barren rock/ shingle biotope	Talitrid amphipods
Lichens and Algae	LR.FLR.Lic.Ver.Ver	B3.113	*Verrucaria maura* on littoral fringe rock	Upper shore rocks above the *F. spiralis* biotope and below a band of barren rock	*Verrucaria maura*, *Littorina saxatilis*, amphipoda
	LR.LLR.F.Fspi.X	A1.3122	*Fucus spiralis* on full salinity upper eulittoral mixed substrata	Upper shore below the *Verrucaria maura* biotope	*Fucus spiralis, Semibalanus* balanoides, *Littorina littorea, Littorina saxatilis, Littorina obtusata,* Gammaridae*, Carcinus maenas*
	LR.LLR.F.Fves.X	A1.3132	*Fucus vesiculosus* on mid eulittoral mixed substrata	Upper to middle shore in the north of the survey area	*Fucus vesiculosus, Semibalanus balanoides, Patella vulgata, Actinia equina, Nucella lapillus, Littorina littorea, Littorina saxatilis, Littorina obtusata, Gibbula umbilicalis*
Mussels and Barnacles	LR.HLR.MusB.Sem.LitX	A1.1133	*Semibalanus balanoides* and *Littorina* spp. on exposed to moderately exposed eulittoral boulder and cobbles	Predominant mid-shore biotope	*Semibalanus balanoides, Littorina littorea, Littorina saxatilis, Nucella lapillus, Patella* spp*, Actinia equina, Mytilis edulis, Chondrus crispus, Carcinus maenas, Hediste diversicolor Arenicola marina, Lanice conchiglea, Pagurus bernhardus, Echinus esculentus*
Sand	LS.LSa.FiSa.Po	A2.231	Polychaetes in littoral fine sand	Merging with mussel and barnacle biotope and becoming more predominant seaward	Various polychaete species, *Arenicola marina, Lanice conchiglea*

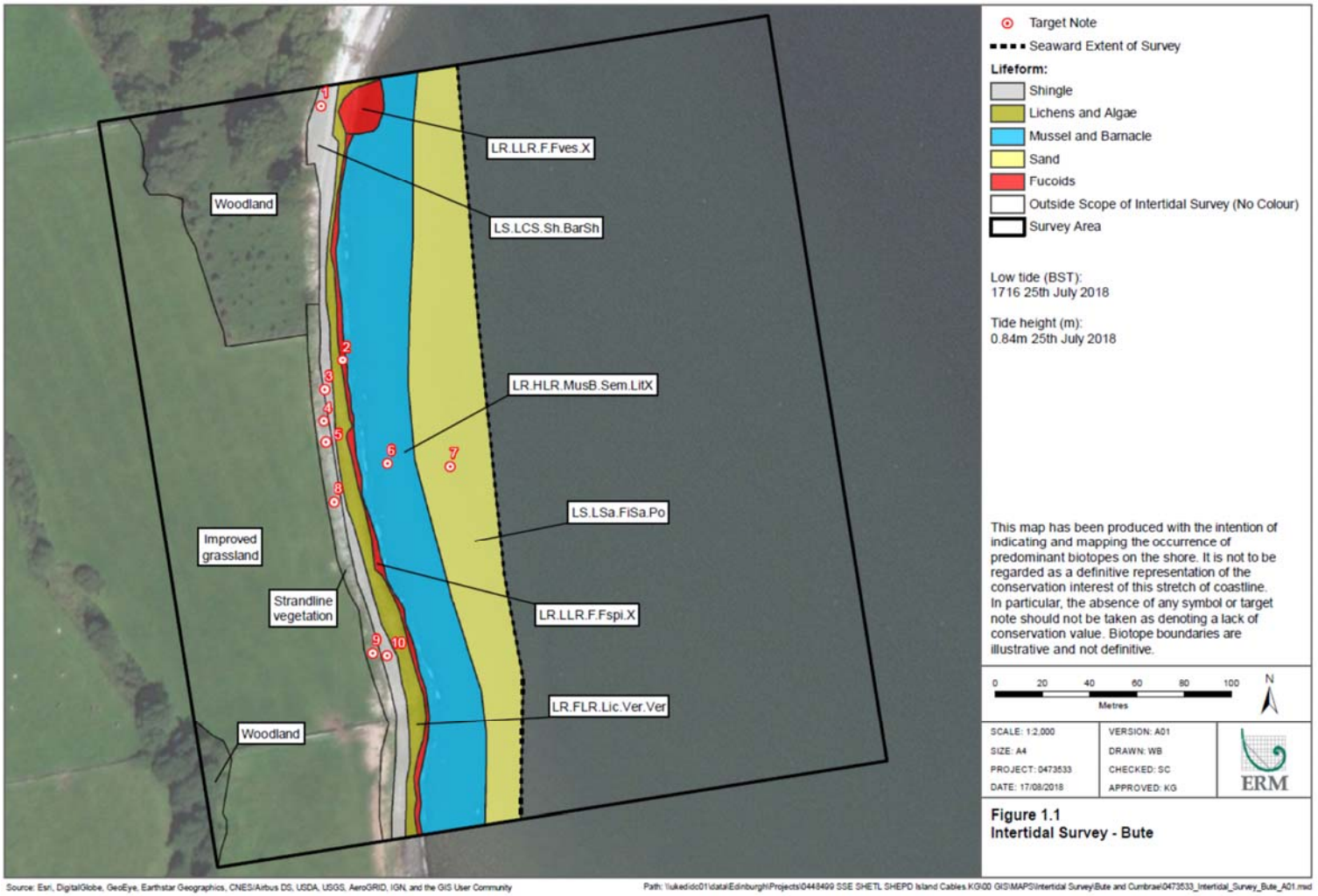


Figure 8 : Bute Intertidal Biotope Map

Table 6: Biotopes and species recorded across the intertidal at Bell Bay on the Isle of Cumbrae in July 2018, including a description of their location on the shore and the relevant JNCC and EUNIS biotope codes. Adapted from ERM (2018).

Life Form	JNCC Biotope Code	EUNIS Biotope	Description	Location	Species Present
Lichens and Algae	LR.FLR.Lic.YG	B3.111	Yellow and grey lichens on supralittoral rock	Supralittoral bedrock outcrops in the south of the survey area	*Xanthoria parietina, Lecanora atra, Armeria maritima, Plantago maritima, Tripleurospermum maritimum, Festuca rubra*
Fucoids	LR.LLR.F.Fspi.FS	A1.3121	*Fucus spiralis* on full salinity moderately exposed to very sheltered upper eulittoral rock	Isolated boulders overlying lower shore sand biotope	*Fucus spiralis, Semibalanus balanoides, Balanis crenatus, Patella vulgata, Actinia equina, Nucella lapillus, Littorina obtusata, Littorina saxatilis, Littorina littorea*
	LR.MLR.BF.Fser	A1.214	*Fucus serratus* on moderately exposed lower eulittoral rock	Isolated boulder overlying lower shore sand biotope	*Fucus serratus, Semibalanus balanoides, Balanis crenatus, Patella vulgata, Actinia equina, Nucella lapillus, Littorina obtusata, Littorina saxatilis, Littorina littorea, Enteromorpha intestinalis*
	LR.FLR.Eph.EntPor	A1.452	*Porphyra purpurea* and *Enteromorpha* spp on sand-scoured mid or lower eulittoral rock	Isolated boulder overlying lower shore sand biotope	*Porphyra* sp, *Enteromorpha intestinalis*
Sand	LS.LSa.MoSa.BarSa	A2.221	Barren littoral coarse sand	Upper shore above the strandline	None
	LS.LSa.St.Tal	A2.211	Talitrids on the upper shore and strandline	Continuous band overlying the barren sand biotope	Talitrid amphipods
	LS.LSa.MoSa.AmSco.Sco	A2.2231	*Scolelepis* spp on littoral mobile sand	Lower shore	*Scolelpis* spp, *Arenicola marina*

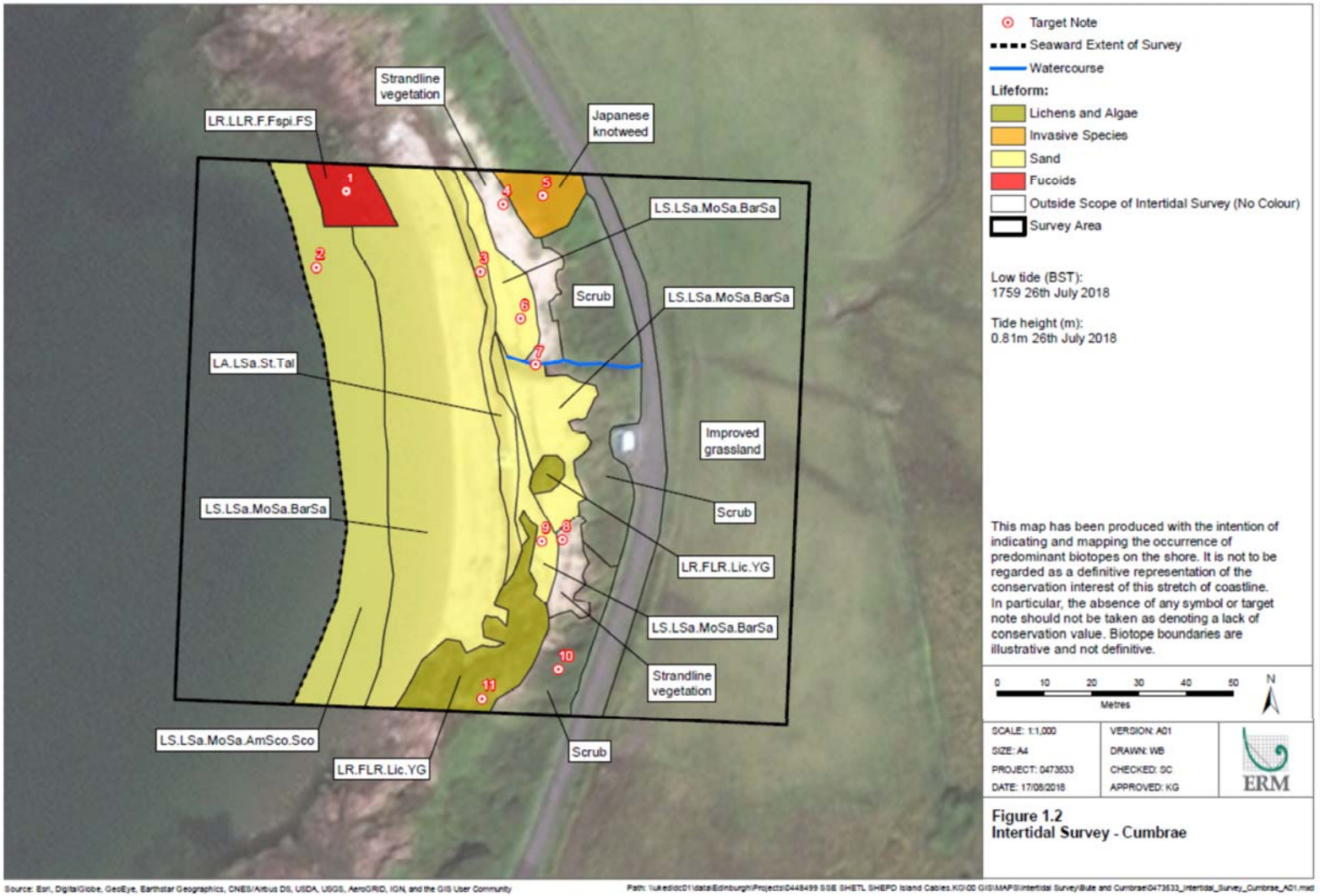


Figure 9 : Cumbrae Intertidal Biotope map

5.7 Cable Installation

Cable installation will involve laying the cable on the seabed with post-trenching undertaken by a Controlled Flow Excavator (CFE) and PLGR carried out in advance of the installation. Burial will be attempted across the whole cable route to avoid the need for concrete mattressing. The trench will be allowed to backfill naturally. In shallow areas, trenching will be carried out by a diver operated dredge system. An excavator will be utilised to dig shore end trenches for cable burial and transition joint bay (TJB). A dive vessel at anchor or secured with spud legs will be used to assist with cable burial in inshore areas. Note that the PLGR footprint on the seabed will be smaller than that of CFE.

Cable installation and associated activities have the potential to impact upon the subtidal habitats and associated species through a number of pathways. The most pertinent are likely to be physical abrasion during excavation of the seabed and smothering due to associated increases in suspended sediment loads while the vessel is at anchor. Potential impacts are discussed in this section and the likely magnitude of each on each biotope are presented in

Table 7. To expedite the assessment process, intertidal ecological receptors were assessed together rather than separately, as biotopes in these areas were recorded at a relatively fine scale.

5.8 Direct loss and damage to habitats and species

During cable installation there is a high likelihood of loss or damage to the benthic habitats and the biotopes identified in the previous section. Trench excavation, PLGR and the use of spud legs/vessel anchorage has high potential to remove, dislodge or displace flora and fauna as well as causing direct mortality through physical abrasion and disturbance. Within the cable route corridor and in the immediate footprint of cable installation this is highly likely/unavoidable. With regards to impact severity, the footprint of the development is anticipated to be relatively small (1 m width/depth). Furthermore, the anticipated densities of the species most sensitive to this kind of disturbance (e.g. *V. mirabilis*, *P. phosphorea*, *C. lloydi*) are low, and generally show a degree of resilience and medium recoverability to such impacts (MarLIN, 2018). The severity of this impact is therefore considered to be 'low'.

5.9 Toxic and non-toxic contamination

Installation of the cable along the proposed route will increase suspended sediment levels and turbidity in the local environment through physical disturbance of the seabed, with subsequent deposition of disturbed sediments. This may cause smothering to the habitats and species identified in the previous section, which can interfere with filter feeding, photosynthesis and respiration. Toxic contamination may also occur through release and dispersal of contaminants within sediments during cable installation. Toxic contamination may also occur through spillages of fluids, fuel or other materials during cable installation and routeing. The likelihood of this impact is considered to be low, given that the area is not known to be contaminated, and given the relatively small footprint of the trench to be excavated during installation.

5.10 Non-native species introductions

Although unlikely, fouling organisms on vessels involved in cable installation and routeing or the release of ballast water discharges has the potential to introduce non-native or invasive species to the local environment. To minimise any risk of introduction, ballast waters are treated prior to discharge. Non-native introductions can have significant negative impacts on local ecosystems and despite a low likelihood, severity is considered high.

Table 7: Potential impacts on subtidal and intertidal ecological receptors associated with cable installation.

Habitat	Biotope Receptor	Potential Impact	Likelihood	Severity/ Sensitivity	Impact
Subtidal	A3.3	Direct loss and damage to benthic habitats and species	High	Low	Low
		Toxic and non-toxic contamination	Unlikely	Low	Negligible
		Non-native species introductions	Highly Unlikely	High	Negligible
	A5.361	Direct loss and damage to benthic habitats and species	High	Low	Low
		Toxic and non-toxic contamination	Unlikely	Low	Negligible
		Non-native species introductions	Highly Unlikely	High	Negligible
	A5.354	Direct loss and damage to benthic habitats and species	High	Low	Low
		Toxic and non-toxic contamination	Unlikely	Low	Negligible
		Non-native species introductions	Highly Unlikely	High	Negligible
	A5.37*x*	Direct loss and damage to benthic habitats and species	High	Low	Low
		Toxic and non-toxic contamination	Unlikely	Low	Negligible
		Non-native species introductions	Highly Unlikely	High	Negligible
Intertidal	A1 / A2	Direct loss and damage to benthic habitats and species	High	Low	Low
		Toxic and non-toxic contamination	Unlikely	Low	Negligible
		Non-native species introductions	Highly Unlikely	High	Negligible

5.11 Potential Impacts During Operations and Maintenance

As the cable is intended to be buried along the entire route, the reduced likelihood for movement of the cable means potential impacts on benthic habitats during cable operation are highly unlikely. The only source of potential impact would be if the cable fails and needs to be repaired; a repair operation could potentially disturb protected habitats in the area as sections of the cable (or the whole cable) may need to be replaced. However, given that the cable will have a design life of more than 30 years, the likelihood that maintenance / repair works will be required is very low.

Electromagnetic fields (EMF) emitted by submarine cables during operation could potentially affect elasmobranch species (sharks and rays) which possess specialised electroreceptors and are able to detect induced voltage gradients associated with water movements and geomagnetic emissions. However, it should be noted that EMF is already present due to the existing cable and therefore the replacement cable will not introduce any increase in EMF. Additionally, the EMFs decrease with distance from the cable and effects become negligible within a few metres. Therefore, no impacts are expected on EMF sensitive species.

5.12 Impact, Management and Mitigation Summary

Based on the subtidal and intertidal biotopes identified within the proposed cable route, the potential impacts associated with cable installation and operation are summarised in, along with suggested management and mitigation of the relevant impacts. While the magnitude of the impact through direct loss and damage during cable installation has been calculated as 'Low', due to the relatively small area of impact and the sensitivity and resilience of the biotopes identified throughout the cable route, no significant impact is predicted, and the suggested management and mitigation measures presented in Table 8 are generally with regards to implementing best practice during cable installation.

Table 8: Potential impacts on benthic and intertidal ecology

Environmental Receptor	Potential Impacts	Mitigation
Subtidal Ecology	Direct loss and damage to benthic habitats and species by PLGR, cable installation, burial and vessel anchoring	• Consider use of midline buoys to minimise chain drag on seabed; • Minimise anchor moves where possible; • Undertake PLGR and cable installation in line with existing best practice guidelines (https://www.iscpc.org/publications/recommendations/).
	Toxic and non-toxic contamination	N/A
	Non-native species introductions	N/A
Intertidal Ecology	Direct loss and damage to benthic habitats and species	• Consider use of midline buoys to minimise chain drag on seabed; • Minimise anchor moves where possible; • Undertake cable installation in line with existing best practice guidelines.
	Toxic and non-toxic contamination	N/A
	Non-native species introductions	N/A

6 MARINE MAMMALS FISH AND OTTERS

This section of the report provides detail on marine mammals, fish, birds and otters in the vicinity of the Project, as well as the relevant legislation and policy guidance. It then assesses the potential impacts on these and the management and mitigation measures that will be undertaken in order to ensure impacts are minimised.

6.1 Legislation and Policy Context

With respect to marine mammals, otters, birds and fish, in order to identify potential constraints to routing a subsea cable and identifying potential landfall locations, it is necessary to identify potential habitats and species of conservation importance that could potentially be present in the Project study area and along potential subsea cable route corridors.

There are a number of different statutes and guidance that are relevant in this regard. These include:

- European Habitats Directive (Directive 92/43/EEC);
- European Birds Directive (Directive 2009/147/EC)
- The Habitats (Scotland) Regulations 1994 (as amended) which implements species protection requirements of the Habitats Directive in Scotland, on land and in inshore waters (within 12 nm);
- Wildlife and Countryside Act 1981 (as amended)
- The Convention for the Protection of the Marine Environment of the North East Atlantic (known as the OSPAR Convention);
- Marine (Scotland) Act 2010 and Marine and Coastal Access Act (2009); and
- UK Post-2010 Biodiversity Framework (July 2012) – this supersedes the UK Biodiversity Action Plan (UKBAP) which was the UK Governments Response to the Convention on Biological Diversity (CBD), which the UK signed up to in 1992 in Rio de Janeiro.
- Marine Strategy Framework Directive, 2008;
- Bern Convention 1979, The Convention on the Conservation of European Wildlife and Natural Habitats 1979.
- ASCOBANS, Convention for Migratory Species of Wild Animals (CMS) Conservation of Small Cetaceans of the Baltic, north-east Atlantic, Irish and North seas, 1994;

6.2 Cetaceans

6.2.1 Overview

All species of cetacean (whale, dolphin, porpoise) occurring in UK waters are listed in Annex IV (species of community interest in need of strict protection) of the Habitats Directive as European Protected Species (EPS) and fully protected in Scottish territorial waters (out to 12 nautical miles) under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

Bottlenose dolphin and harbour porpoise are also listed on Annex II of the Habitats Directive and thus require the designation of Special Areas of Conservation (SAC). Twenty-three species of cetacean have been recorded in Scottish waters over the last 25 years. Of these, 11 are regularly sighted, the remaining 12 are considered to be vagrants or rare visitors (Scottish Government, 2011).

The most sighted cetaceans in the south-west of Scotland (Block G) during the SCANS III survey for Small Cetaceans in European Atlantic waters and the North Sea, were harbour porpoise (*Phocoena phocoena*), minke whale (*Balaenoptera acutorostrata*) and bottlenose dolphin (*Tursiops truncatus*) (Hammond *et al*. 2017).

Other species regularly recorded in the area include killer whale (*Orcinus orca*), humpback whale (*Megaptera novaeangliae*), short-beaked common dolphin (*Delphinus delphis*) (Clyde Marine Mammals Project, 2016 & 2017; HWDT, 2018).

Risso's dolphin (*Grampus griseus*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), White-beaked dolphin (*Lagenorhynchus albirostris*) are recorded in the wider waters of Scotland.

The general distribution of the most common species in the UK is as follows:

- **Harbour porpoise (*Phocoena phocoena)***

Harbour porpoise is widespread throughout the cold and temperate seas of Europe, including the North Sea, the Skagerrak, Kattegat, Irish Sea, the seas west of Ireland and Scotland, northwards to Orkney and Shetland and off the coasts of Norway. There appears to be locally high densities of porpoises, such as off south-west Ireland and south-west Wales, and off the west coast of Scotland (Reid *et al*. 2003).

While seasonal movements are difficult to conclude, as sightings are made at all times of the year, seasonal peaks can be made in coastal localities (Evans *et al*. 2003). For example, in Scotland a peak in sightings occurs during July and August and has often been associated with the distribution of prey, utilisation of sheltered waters during calving season, lactation and/or seasonal migration (Weir *et al*. 2007). Learmonth et al. (2014) found conception in harbour porpoise occurred mainly in July and August, gestation lasted 10–11 months, with calving mainly between May and July. Lactating females were recorded during June to November.

Harbour porpoise is the most numerous marine mammals in north-western European shelf waters (Reid *et al.* 2003). Within the ICES Assessment Unit 'West Scotland' an estimated abundance of 24,370 (95% CI: 15,074 -37,858) and a density of 0.21 (animals/km^2) was made for harbour porpoise (Hammond *et al*. 2017).

Harbour porpoise occurs on the IUCN Red List for Threatened Species and is listed in Annex II & IV of the Habitats Directive and is also listed as a Scottish Priority Marine Feature (PMF) (JNCC, 2012). Harbour porpoise are a primary feature of The Inner Hebrides and the Minches cSAC and SCI.

- **Minke whale (*Balaenoptera acutorostrata)***

The minke whale is found in all major oceans of the world from tropical to polar seas. They are distributed off western coasts of Britain and Ireland in continental shelf waters (200 m or less), and throughout the north-western and central North Sea (Reid *et al*. 2003).

They are mainly present in Scottish waters in the summer months with numbers greatest in the Minches and Sea of Hebrides. Peak numbers of sightings and of individuals occur in June to September, with August or September tending to be the peak months, with smaller numbers between November and April (Evans *et al*. 2003). They are thought to undergo an annual cycle which includes feeding migrations in summer to higher latitudes and an assumed winter stay in warmer waters where mating and calving take place (Bothun *et.al*. 2009).

Minke whale is listed in Annex IV of the Habitats Directive and is also a Scottish PMF (JNCC, 2012) and a feature of the Sea of Hebrides Nature Conservation Marine Protected Area (pNC-MPA). South and west of the Hebrides, the Sea of Hebrides and the Moray Firth are identified areas of interest for minke whale (Paxton *et al*. 2014).

- **Bottlenose dolphin (*Tursiops truncates)***

The bottlenose dolphin has a worldwide distribution in tropical and temperate seas of both the southern and northern hemispheres. Distributed along the Atlantic seaboard of Europe, bottlenose dolphins are locally common near-shore, within 10 km land. They can also occur offshore, often in association with other cetaceans. Most offshore animals probably represent a separate population, although some inshore dolphins may move offshore during the winter months (Reid, *et al*. 2003). They occur in near-shore in Scottish waters

and the greatest numbers have been observed between July and October, but are present all year long (Seawatch Foundation, undated).

While localised residency has been shown by certain communities in Ireland, the UK and other European countries, individuals and groups may also make large scale movements spanning hundreds of kilometres. There are two main areas of UK territorial waters where there are semi-resident groups of bottlenose dolphin: Cardigan Bay and the Moray Firth. Bottlenose dolphin is listed in Annex II & IV of the Habitats Directive and is also listed as a PMF (JNCC, 2012).

- **Killer whale (*Orcinus orca)***

Killer whales often called 'orca', are distributed worldwide in both the southern and northern hemisphere however their greatest abundance is in colder waters at higher latitudes. They are widely distributed in the deep North Atlantic and in coastal northern European waters, particularly around Iceland, the Faroe Islands and western Norway (Reid *et al*. 2003).

Killer whales are sighted in all months of the year in UK waters, however most near-shore sightings have been between April and October. Killer whales are suggested to be most concentrated along the continental slope of north Shetland between November and March (Pollock *et al.* 2000) and are also sighted around the Northern Islands and Outer Hebrides at the same time of year (Reid *et al*. 2003).

Two pods of killer whale are found within Scottish waters, the Western Coast Community (a population size of ~8 individuals), which are deemed to be resident to Scotland, although their coverage can span hundreds of kilometres. The second group is the Northern Isles Community which move between Scotland and Iceland (HWDT, 2018b). Killer whale is listed in Annex IV of the Habitats Directive and is also listed as a PMF (JNCC, 2012).

- **Humpback whale (*Megaptera novaeangliae)***

The humpback whale occurs globally in tropical, temperate and polar seas of the northern and southern hemispheres. It favours waters over and along the edges of continental shelves, and around oceanic islands. Most sightings have been made between May and September, which is when small numbers have also been seen off the continental shelf west and north of Scotland. Individual whales commonly move between cold, high latitude feeding grounds in summer and tropical waters in winter during which calving, and mating occurs (Reid *et al*. 2003). Humpback whale is listed in Annex IV of the Habitats Directive.

- **Short-beaked common dolphin (*Delphinus delphis)***

Short-beaked common dolphin is found throughout the world's oceans, its distribution extending from very deep ocean habitats to shallow coastal bays. The short-beaked common dolphin is the most numerous offshore cetacean species in the temperate north-east Atlantic. It has frequently been seen in the Sea of Hebrides in summer months (Reid *et al*. 2003). Short-beaked common dolphin is listed in Annex IV of the Habitats Directive and is also listed as a PMF (JNCC, 2012).

- **Risso's dolphin (*Grampus griseus)***

Risso's dolphins are widely distributed throughout tropical and temperate regions. They show a preference for deep offshore waters but will inhabit coastal areas around oceanic islands and narrow continental shelves (Gaspari *et al*. 2006). Around the UK they are most common off the Western Isles in Scotland (Reid *et al*. 2003).

There appears to be some seasonal trends, with sightings been made more frequently offshore near the continental shelf edge in winter months, and more coastal sightings been made during summer months. The

highest sightings rates in the Minch were between May and September. Risso's dolphin is listed in Annex IV of the Habitats Directive and is also listed as a PMF (JNCC, 2012).

- **Atlantic white-sided dolphin (*Lagenorhynchus acutus)***

The Atlantic white-sided dolphin is confined to temperate and sub-Arctic seas of the North Atlantic (Reid *et al*. 2003). In the British Isles Atlantic white-sided dolphin is most abundant along the shelf edge and in deeper waters of 1,000 m, especially in the north-west (Pollock *et al.* 2000). Little is known about seasonal movements. They are found in waters around the north of Scotland throughout the year and enter the North Sea in the summer (Reid *et al.* 2003; Evans *et al*. 2003). Sightings of Atlantic white-sided dolphins were recorded further south, west of the Kintyre peninsula in March 2018 (HWDT, 2018a). Atlantic white-sided dolphin is listed in Annex IV of the Habitats Directive and is also listed as a PMF (JNCC, 2012).

- **White-beaked dolphin (*Lagenorhynchus albirostris)***

White-beaked dolphin inhabits cold temperate and sub-Arctic waters and is distributed throughout the North Sea and shelf waters of the North Atlantic. It is the second most frequently reported cetacean around the UK (Evans, 1992) They are sighted around British Isles throughout the year, with an increase in inshore frequencies during the summer (Canning *et al*. 2008). Pollock *et al*. (2000) found widespread distribution between May to October, with high abundance in the northern area of the Minch. White-beaked dolphin is listed in Annex IV of the Habitats Directive and is also listed as a PMF (JNCC, 2012).

6.2.2 Project Area

The following sections provide a summary of the most common species in the Project area;

- **Harbour porpoise (*Phocoena phocoena)***

Harbour porpoise *Phocoena phocoena* is the most abundant species in the Clyde and the British Isles. SCANS-III data for harbour porpoise estimate an abundance of 5,087 (95% CI: 1,701 - 10,386) and a density of 0.336 (animals/km^2) in the south-west of Scotland (Hammond *et al.,* 2017). Reid *et al*. (2003) reports that the Clyde has a harbour porpoise density of 1-10 (individuals/h) in March, May, July, August and September. The NMPi (2018) gives more spatially detailed data which show that the cable routes in the Clyde have a harbour porpoise relative abundance of 0.00-0.03 (animals/h).

During the Bute to Cumbrae and Arran to Carradale pre-lay cable survey, 25 sightings of harbour porpoise were observed. Twenty-four percent of these sightings included a juvenile. There was one sighting of an adult and a juvenile during the Arran to Carradale survey, and five sightings of an adult(s) and a juvenile during the Bute to Cumbrae survey. Group sizes ranged from 2-4 individuals (Ocean Ecology, 2018), suggesting the Firth of Clyde could be an area of preferred habitat of sheltered waters during calving season, lactation and/or seasonal migration (Weir *et al*. 2007).

- **Minke whale (*Balaenoptera acutorostrata)***

Opportunistic sightings of minke whale are often reported in the Clyde area to NGOs and sighting databases. SCANS-III data (Hammond *et al*. 2017) estimate Minke whale to have an abundance of 410 (95% CI: 0-1,259) and a density of 0.027 (animals/km^2) in the south-west of Scotland. Reid *et al*. (2003) reported Minke whale to be present in densities of 0.01-1 individuals/h in August and October and the NMPi indicates that Minke whale has a relative abundance of 0.00-0.005 animals/h in the waters just to the south of the Firth of Clyde (NMPi, 2018).
During the Bute to Cumbrae and Arran to Carradale pre-lay cable survey, one minke sighting was observed in the Firth of Clyde (Ocean Ecology, 2018).

- **Bottlenose dolphin (*Tursiops truncates)***

Bottlenose dolphin have been reported in the Clyde on numerous occasions during 2016 and 2017 (Clyde Marine Mammals Project, 2016 & 2017), although no obvious trends during which months is evident from the opportunistic sightings.

SCANS-III data (Hammond *et al*., 2017) estimate bottlenose dolphin to have an abundance of 1,824 (95% CI: 0-4,474) and a density of 0.121 (animals/km^2) in the south-west of Scotland.

- **Killer whale (*Orcinus orca)***

The Clyde Marine Mammal Project reported two sightings of killer whale in the Clyde area during July and November 2016 (Clyde Marine Mammal Project, 2016) and one further sighting in April 2018 (HWDT, 2018). It is thought that the 2018 sighting belonged to the Northern Isles Community that moves between Iceland and Scotland (HWDT, 2018).

- **Humpback whale (*Megaptera novaeangliae)***

The Clyde Marine Mammal Project reported that there were 21 sightings of humpback whale in the Clyde area during 2016 and 5 sightings in 2017 (Clyde Marine Mammal Project, 2017). One sighting was reported in 2018 (HWDT, 2018a). Most sightings have been made between May and September (Reid *et al*. 2003).

- **Short-beaked common dolphin (*Delphinus delphis)***

Ryan *et al*. (2017) reports 13 sightings, between 2011 to 2015, of a solitary individual (identified by nicks on its dorsal fin) within Lough Fyne and adjacent sea lochs around the Clyde. The individual has been associated with an individual harbour porpoise (also identified by photo-ID) in the area. Neither short- nor long-term associations between common dolphins and harbour porpoises have been previously documented. Two sightings of one individual common dolphin was observed in 2018 off Great Cumbrae (HWDT, 2018a).
Common dolphin in the Clyde area is reported to have a density of 1-10 (individuals/h) in March (Reid *et al.* 2003), and NMPi indicates the short-beaked common dolphin has a relative abundance of 0.000-0.381 (animals/h) (NMPi, 2018).

6.2.3 Summary

There is potential for a number of cetacean species to be present in the vicinity of the cable route based on the available information, however, the areas in which the activities will take place generally exhibit low cetacean species densities. Harbour porpoise (*Phocoena phocoena*) is the most abundant and exhibits the greatest density of any species in the Clyde, with seasonal peaks during summer months, which has often been associated with the distribution of prey, utilization of sheltered waters during calving season, lactation and/or seasonal migration (Hammond et al. 2017; Weir et al. 2007; Ocean Ecology, 2018).

Table 9: Summarises of potential impacts on each receptor from the Project.

Environmental receptor	Potential impacts	Management and mitigation and overall impact significance
Cetaceans and pinnipeds	Cetaceans and pinnipeds could potentially be present in the Project area and experience short term physical disturbance / displacement due to vessel presence and noise .	No potential for significant impacts on cetaceans (and pinnipeds), due to • Marine (vessel) activities will only last approximately 14 days; • Operations to occur outside of the harbour seal pupping season (June-July); • Operations will not occur within recognised seal haul outs (grey seal and harbour seal); • Operations to occur outside of harbour porpoise conception / calving season (May-Aug); and • Implementation of a Marine Mammal Protection Plan (MMPP), incorporating the EPS management plan (to support the EPS Licence). Although no significant impacts are predicted, there is the potential for disturbance to protected cetacean species and therefore an EPS Licence will be applied for.
Otters	Otters could be present in the area of the landfall works and be disturbed during excavation works at the intertidal areas, or when swimming within the vicinity of the vessels deployed for cable installation works.	No potential for significant impacts on otters, due to: • Limited duration of cable installation activities; • In the event that potential impacts on otters at the cable landfall cannot be avoided, any disturbance will require a European Protected Species (EPS) licence and specific mitigation implemented in order to minimise impacts.

A Marine Mammal Protection Plan will be implemented to mitigate any potential impacts on cetaceans and pinnipeds, although no Likely Significant Effects (LSE) are anticipated. As there is the potential for disturbance to protected cetacean species an EPS Licence will be applied for. The Clyde is potentially used during calving season, lactation and/or seasonal migration for harbour porpoise during May-August. A number of cetacean species occur within the area throughout the year, with higher seasonal peaks generally during the summer months. Grey and harbour seals are found though-out the waters of the Clyde and haul-out on many islands and coastlines.

6.3 Pinnipeds

Although not afforded the strict protection of European Protected Species (EPS) through the Habitats Directive, pinniped species (seals) occurring in UK waters are listed in Annex V (and hence Schedule 3 of the Habitats Regulations) such that they are defined as species of community interest and taking in the wild may thus be subject to management measures. Grey and harbour seals are also listed in Annex II of the Habitats Directive (and therefore Schedule 2 of the Habitats Regulations) as requiring protection through the designation of SACs and are protected at 194 haul-out sites around Scotland under Part 6 of the Marine (Scotland) Act 2010. In addition, they are also listed as Scottish PMF.

6.3.1 Grey or Atlantic Seal

Grey seal is the rarer of the two seal species, its world population is estimated at just 350,000 to 400,000 individuals (SNH, 2017). About 36 % of all grey seals breed in UK waters and about 90% of this number breed off Scotland (Duck, 2010).

Grey seals come ashore on remote islands, sandbanks and coastlines to give birth to their pups. The pupping season in the north and west Scotland occurs mainly between September – late November (months vary with different populations around the UK) and pups are born ashore and nursed for a period of about 2-3 weeks. Mating also takes place at breeding sites or in the water nearby. Moulting takes place between December and April. Foraging can take place 100 km to several hundred kilometres offshore (SCOS, 2017). Individual mature grey seals of both sexes usually show high site fidelity and may return to within 10–100 m of individual breeding locations (Pomeroy et al. 2000).

During the Bute to Cumbrae pre-lay cable survey one sighting of grey seal was observed. During the Arran to Carradale pre-lay survey nine sightings were observed (Ocean Ecology, 2018). SMRU summer counts per 10 km square of seals in the period 2011-2015 recorded 18 grey seals hauled-out on the south-west coast of the Island of Great Cumbrae. Higher counts were observed off the south of the Kintyre peninsula (NMPi, 2018).

6.3.2 Common or Harbour Seal

Harbour seal, often called ‘common seal’ is the smaller of two species of true seal (Phocidae) that commonly breed around the coasts of Britain. There are approximately 83,000 harbour seals in Europe. About 30% of this population is found in UK waters, and 80% of these in Scottish waters (Duck, 2010). They are distributed around the west coast of Scotland and throughout the Hebrides and Northern Isles. Harbour seals come ashore in sheltered waters typically on sandbanks and in estuaries, but also in rocky areas. They give birth to their pups in June and July and moult in August. Foraging takes place 40-50 km around their haul-out sites (SCOS, 2017).

A nationwide survey by SCOS (2017) counted a total of 1,200 harbour seals compared with 923 counted in 2007 and 2009 in the Southwest Scotland Seal Management Area. SMRU summer counts per 10 km square of seals in the period 2011-2015 recorded 77 harbour seals hauled-out on the south-west coast of the island of Great Cumbrae (NMPi, 2018). Higher counts were observed on the Isle of Arran and surrounding waters. During Bute to Cumbrae pre-lay cable survey one sighting of harbour seals (four individuals) were observed hauled out at low tide on the island of Bute. A further four sightings of unidentified species of pinniped were observed within the cable survey corridor. During the Arran to Carradale pre-lay cable survey two sightings of harbour seal were observed (Ocean Ecology, 2018).

6.3.3 Summary

It is likely that harbour (Phoca vitulina) and grey seal (Halichoerus grypus) could be encountered during operations. No SAC’s or designated haul-out sites are within the direct vicinity of the cable corridor, however both species of seal have been recorded hauled out on the island of Great Cumbrae and within the surrounding areas (NMPi, 2018; Ocean Ecology,2018). Harbour seals are most sensitive to impact during the pupping and

moulting season which occurs between June to early July. The pupping season for grey seals is September – late November. Moulting takes place between December and April (SCOS, 2017).

6.4 Otters

Otters favour low peat-covered coastlines with a good freshwater supply and shallow, seaweed rich waters offshore. Otter is a Scottish PMF and listed on Annex II of the Habitats Directive. Otter (Lutra lutra) spraints were found on bedrock outcrops at both shore ends during intertidal Phase 1 surveys undertaken by ERM on behalf of BMC (ERM, 2018).

However, several mitigation measures are proposed to avoid otter holts. The proposed cable routes between Bute and Cumbrae remain flexible in the design route such that the working corridor allows for micro-routing and avoidance of known holt locations. Sightings of otter have been observed twice in Millport bay, south of Great Cumbrae island in 2017 (February and April) (Clyde Marine Mammal Project, 2017).

An Ecological Clerk of Works (ECoW) would most likely be present on site to ensure that buffer areas are enforced and check any new otter activity. If there are any activities close to areas of high otter density, as found during the SAT survey at the cable landfalls, a Marine Mammal Observer (MMO) will also monitor for the presence of otters in the water and delay the start of the activities if any are observed within 100 m of the vessels.

6.5 Ornithology

The proposed development site affects both the terrestrial and marine environments, and thus the birds nesting and feeding within either habitat. Rare and vulnerable birds are listed under Annex I of the European Birds Directive (79/409/EEC) and are afforded protected through the designation of Special Protection Areas (SPAs). No significant breeding or migratory colonies are thought to be affected by this project and there are no environmental designations for seabirds within the scope of this report.

The wider Clyde area is frequented by relatively high numbers of waders and wildfoul in the winter and spring. Notable species include the UKBAP priority species Herring Gull (Larus argentatus) and Common Scoter (Melanitta nigra) (Defra, 2013; JNCC, 2007); and IUCN Redlist 2013.2 species Curlew (status: near threatened) and Long-tailed Duck (status: vulnerable) (IUCN, 2013). Outside of the breeding season the wider area hosts significant numbers of Divers (Gavia immer, Gavia arctica & Gavia stellata), Ringed Plover (Charadrius hiaticula), Greenland White-fronted Geese (Anser albifrons flavirostris) and Slavonian Grebes (Podiceps auritus). Kintyre also supports good numbers of Eiders (Somateria mollissima), Red-breasted Mergansers (Mergus serrator), auks (Alcidae) and Goldeneyes (Bucephala clangula).

Table 10: Seasonal Seabird distribution in Scotland

Protected seabird species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Arctic Tern												
Common guillemot								M M	M	M		
Kittiwake												
Arctic Skua												
Fulmar												
Great skua												
Red-throated diver									M	M	M	M
Razorbill								M	M	M	M	
European shag												
Slavonian grebe												
Common eider							M	M	M			
Long-tailed duck												
Velvet scoter												
Red-breasted merganser								M M	M			
Black-headed gull												
Great black-backed gull												
Black guillemot								M	M	M	M	
Common gull												
Lesser black-backed gull												
Cormorant												
Puffin		M	M									
Black-headed gull												
Northern gannet												
Common tern												
Lech's storm petrel												

Key:

Black = breeding season
White = not present in significant numbers
Dark blue = breeding site attendance
M = flightless moult period
Light blue = non-breeding period

6.6 Potential effects to seabirds during operations

Table 11: Installation effects on seabirds

Effect	Explanation
Collision risk	Collision can typically occur in two situations – flying birds colliding with the surface structures of ships or ships colliding with birds rafting on the surface. The risk is likely to be low for all species. Cable laying vessels are likely to be either stationary or travelling considerably slower than commercial shipping vessels whilst involved in construction activities, and therefore the collision risk during construction is likely to be lower than that posed by commercial shipping activity.
Physical disturbance	The likely response of birds to disturbance impacts would be to avoid the immediate area during construction, which has implications of foraging and breeding success, stress on individuals and energy budgets. However, there is no quantified data from which to determine estimated magnitude of impact.
Marine noise	It is not possible to assess the likelihood, or magnitude of noise impacts on seabirds underwater. Whilst it is evident from bird behaviour on land that they have acute hearing, little is known about their sensitivity to underwater noise and the importance of hearing underwater in birds. It is therefore not possible to make any estimates about the potential significance of this impact.
Increased turbidity	Given the small area of contact between the cable and the sea floor and the high energy environments where the cable will be installed, this impact is considered likely to be of negligible potential significance
Contamination	The potential for leakage of diesel or hydraulic fluids through accidental storm or collision damage, or vessel fuel and/ or cargo through collision damage could present an impact of major significance if it occurred. It is considered, however, that there is a very low likelihood of such a leakage occurring and hence the residual significance of this impact is considered to be minor. The residual significance assumes that an appropriate design is used in order to minimize the risk of diesel or hydraulic fluid leaks occurring, and that shipping lanes and other areas of high potential collision risk are avoided.
Creation of resting and breeding habitat	There is a potentially positive impact associated with increasing the area available for seabirds, such as providing perches for birds to use for resting and to forage from. However, there may also be adverse impacts associated with changes to the population dynamics, and competitive interactions between different species. It is therefore not possible to make an estimate as to the potential significance of this impact.

(adapted from Scottish Marine SEA, 2007)

Table 12: Possible mitigation measures

Effect/ Impact	Seabird Mitigation Measure
Physical disturbance	Avoid sensitive sites/ species Avoid installation during sensitive seasons
Increased turbidity	Use cable installation methods that minimise sediment re-suspension Carry out work in appropriate tidal conditions to minimise effect
Collision risk	Design for minimal impact Avoid particularly sensitive areas – e.g. migration routes, feeding, breeding areas Do not undertake installation activities at night when birds are more vulnerable to collisions.
Underwater Noise	Avoid installation during sensitive periods

6.7 Fish and Shellfish

The area to the south of Kintyre is a prominent fishing ground for shellfish, thornback ray and mackerel. Fishing operations around Cumbrae are expected to be both recreational fishing and low volume commercial catches. The area borders two ICES rectangles 40E4 and 40E5. The fishing effort information below has been provided by Marine Scotland through the annual ICES reporting.

Table 13: Fishing effort in the UK over 10 m vessels in ICES rectangle 40E4 by gear type

Gear Type	2017 Effort (days)	2016 Effort (days)	2015 Effort (days)
Dredges	789	1203	940
Traps	1158	958	800
Trawls	2809	3100	3533
Misc	230	N/A	N/A

Table 14: Fishing effort in the UK over 10 m vessels in ICES rectangle 40E4 by month

Month	2017 Effort (days)	2016 Effort (days)	2015 Effort (days)
January	426	363	323
February	392	477	444
March	534	490	469
April	361	370	570
May	410	374	412
June	430	454	486
July	459	469	526
August	433	495	510
September	481	424	457
October	373	543	433
November	446	548	423
December	292	357	321

Table 15: Fishing effort in the UK over 10 m vessels in ICES rectangle 40E5 by gear type

Gear Type	2017 Effort (days)	2016 Effort (days)	2015 Effort (days)
Dredges	8	N/A	N/A
Traps	N/A	N/A	N/A
Trawls	1002	1612	1622

Table 16: Fishing effort in the UK over 10 m vessels in ICES rectangle 40E5 by month

Month	2017 Effort (days)	2016 Effort (days)	2015 Effort (days)
January	74	80	87
February	95	146	125
March	106	150	135
April	63	156	159
May	92	150	167
June	100	102	140
July	93	89	141
August	112	91	129
September	148	124	123
October	91	226	231
November	87	219	135
December	61	103	77

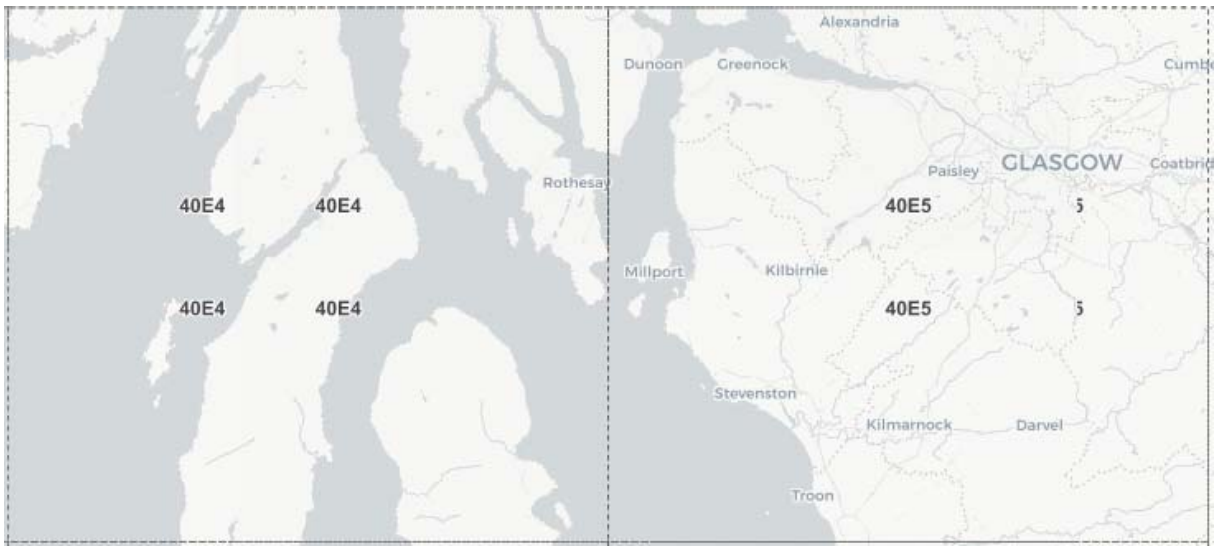


Figure 10: ICES Rectangles Overview

Table 17: Quantity and value of landings by UK vessels into the UK and abroad, and foreign vessels into the UK in 2017 in ICES rectangle 40E4.

Species	Value (£)	Quantity (tonnes)
Ballan Wrasse	27,099	N/A
Brown Shrimps	8,267	N/A
Crabs (C.P.Mixed Sexes)	342,814	208
Crabs - Velvet (Swim)	292,107	99
Crawfish	760	N/A
Green Crab	1,410	2
Haddock	22	N/A
Lobster - Squat	719	N/A
Lobsters	265,105	19
Mackerel	137	N/A
Monks or Anglers	45	N/A
Nephrops (Norway Lobster)	5,776,157	1,696
Queen Scallops	6,665	6
Razor Clam	555,212	102
Scallops	1,185,885	436
Skates and Rays	41	N/A
Spotted Ray	47	N/A
Turbot	110	N/A
Whelks	117,474	111
Witch	2	N/A

Table 18: Quantity and value of landings by UK vessels into the UK and abroad, and foreign vessels into the UK in 2017 in ICES rectangle 40E5.

Species	Value (£)	Quantity (tonnes)
Brill	83	N/A
Brown Shrimps	13,290	N/A
Cod	55	N/A
Crabs (C.P.Mixed Sexes)	15,359	9
Crabs - Velvet (Swim)	5,759	2
Haddock	34	N/A
Hake	7	N/A
Lemon Sole	5	N/A
Lobsters	34,268	2
Mackerel	105	N/A
Monks or Anglers	85	N/A
Nephrops (Norway Lobster)	1,941,282	654
Plaice	3	N/A
Razor Clam	380,437	61
Scallops	18,071	7
Skates and Rays	20	N/A
Squid	7	N/A
Thornback Ray	100	N/A
Turbot	72	N/A
Whelks	90,133	88
Witch	1	N/A

6.8 Fish Ecology

Most fish species are highly mobile and it is therefore highly unlikely that cable installation activities and cable presence would have any impact on the majority of fish species. It is only those species that are either directly dependent upon the seabed environment for important life-stages (e.g. spawning) or are considered to be sensitive to noise generated during cable installation or from electromagnetic fields (EMF) emitted from the installed cable that could potentially be impacted by the Project and are considered further here.

6.8.1 Spawning Grounds and Nursery Area

Spawning areas for most species are not rigidly fixed and fish may spawn either earlier or later from year to year. In addition, mapped spawning areas represent the widest known distribution given current knowledge and should not be seen as rigid unchanging descriptions of presence and absence (Coull et al., 1998). Whilst most species spawn into the water column of moving water masses over extensive areas, benthic spawners have very specific habitat requirements, and as a consequence their spawning grounds are relatively limited and potentially vulnerable to seabed disturbance and change.

In the UK, Cefas, via Ellis et al. (2012) has published data on the predicted distribution of spawning sites for these species. This data updates the original Coull et al. (1998) data on spawning grounds with additional information obtained from ichthyoplankton surveys (surveys to identify the distribution of the planktonic stages of fish eggs) and from fisheries independent groundfish trawl surveys. Table 19 outlines the project specific fish species likely to be impacted by the cable installation works.

Table 19: Fisheries sensitivities within the Project area (Coull et al., 1998 and Ellis et al., 2012)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Cod											
N	N	N	N	N	N	N	N	N	N	N	N
Spurdog											
N	N	N	N	N	N	N	N	N	N	N	N
Herring											
N	N	N	N	N	N	N	N	N	N	N	N
European Hake											
N	N	N	N	N	N	N	N	N	N	N	N
Mackerel											
N	N	N	N	N	N	N	N	N	N	N	N
Anglerfish											
N	N	N	N	N	N	N	N	N	N	N	N
Sandeel											
N	N	N	N	N	N	N	N	N	N	N	N
Common Skate											
N	N	N	N	N	N	N	N	N	N	N	N
Whiting											
N	N	N	N	N	N	N	N	N	N	N	N
Key:			N = Nursery			Spawning			Peak Spawning		

Of the species identified, some are Priority Marine Species. (Ellis, (2012), Marine Scotland, (2018)).

Table 20: BAP Fish Species (Coull et al., 1998 and Ellis et al., 2012)

Species	Nursery Intensity	BAP Priority Species	IUCN Global Red list status
Cod	High	✓	Vulnerable
Spurdog	High		
Herring	High	✓	
European Hake	Low		
Mackerel	Low	✓	
Anglerfish	Low	✓	
Sandeel	Low	✓	
Whiting	High	✓	
Common Skate	Low	✓	Critically Endangered

6.8.2 Noise-sensitive species

The ability of fish to detect sound depends on whether or not they have a swim bladder and whether the swim bladder is located near to the fish's ear. Hawkins and Popper (2014) have divided fishes into several different categories based on the structures associated with hearing. The functional groups include:

- Low sensitivity to noise - fish without a swim bladder (these can only detect kinetic energy – e.g., sharks, common skate complex, mackerel, whiting);
- Medium sensitivity to noise - fish with a swim bladder that is far from the ear and thus not likely to contribute to pressure reception, so the fish are primarily kinetic detectors (e.g., salmon, sea trout) and eggs and larvae that are less mobile than adult fish and therefore not able to readily move away from the noise source; and
- High sensitivity to noise - fish where the swim bladder or other air bubble is close to the ear and enables sound pressure to be detected, broadening the hearing range and increasing hearing sensitivity (e.g., herring, sprat, cod).

7 MARINE ARCHAEOLOGY

7.1 Introduction

Marine cultural heritage in general is considered to encompass submerged landscapes, along with all evidence of human exploitation of maritime resources such as shipwrecks, aircraft wrecks, shipyards, piers, fish traps, anchor sites etc.

Historic Scotland is responsible for nationally important onshore Scheduled Ancient Monuments and for the preservation of the marine archaeological resource out to the 12NM. They will be consulted to obtain detailed information on the archaeological resource of the area, as will local archaeological societies for information on the regionally important archaeology on shore when the proposed grid landing point, on-land cable routes and substation infrastructure is established. Under the Protection of Wrecks Act 1973 and Protection of Military Remains Act, 1986, designated wrecks and surrounding seabed must be preserved.

7.2 Wrecks

Section 1 of The Protection of Wrecks Act 1973, provides protection for designated wrecks deemed to have important archaeological, historical, or artistic value. Around the coasts of the UK, there are 56 wrecks which are classified under this section of the Act. Each wreck is designated an exclusion zone and it is an offence to carry out any diving or salvage operations, tamper with, damage or remove any parts of the vessel. In Scotland, the responsibility of the administration of this act lies with Historic Scotland.

The Protection of Military Remains Act 1986 was drafted to protect the sanctity of vessels and aircraft which act as military marine graves. Under this act, all military aircraft lost during service are automatically protected, which may be of concern if discovered during the proposed works.

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

The following wrecks have been identified close to the project work site:

Table 21: Shipwrecks

UKHO Identifier	Depth (m)	Position (WGS84)	Comments
004177	79	55.78063, -4.97963	Apparently old and dispersed. Stands 2mtrs above seabed in gen depth 81mtrs. No hazard to surface or submarine navigation.
004092	94	55.76705, -4.98917	HM Trawler ARSENAL exploded and sank following collision with the Polish destroyer BURZA.
004095	26.5	55.78827, -4.94395	The steamship BEAGLE sank following collision with SS NAPOLI.

Source: Canmore (2018).

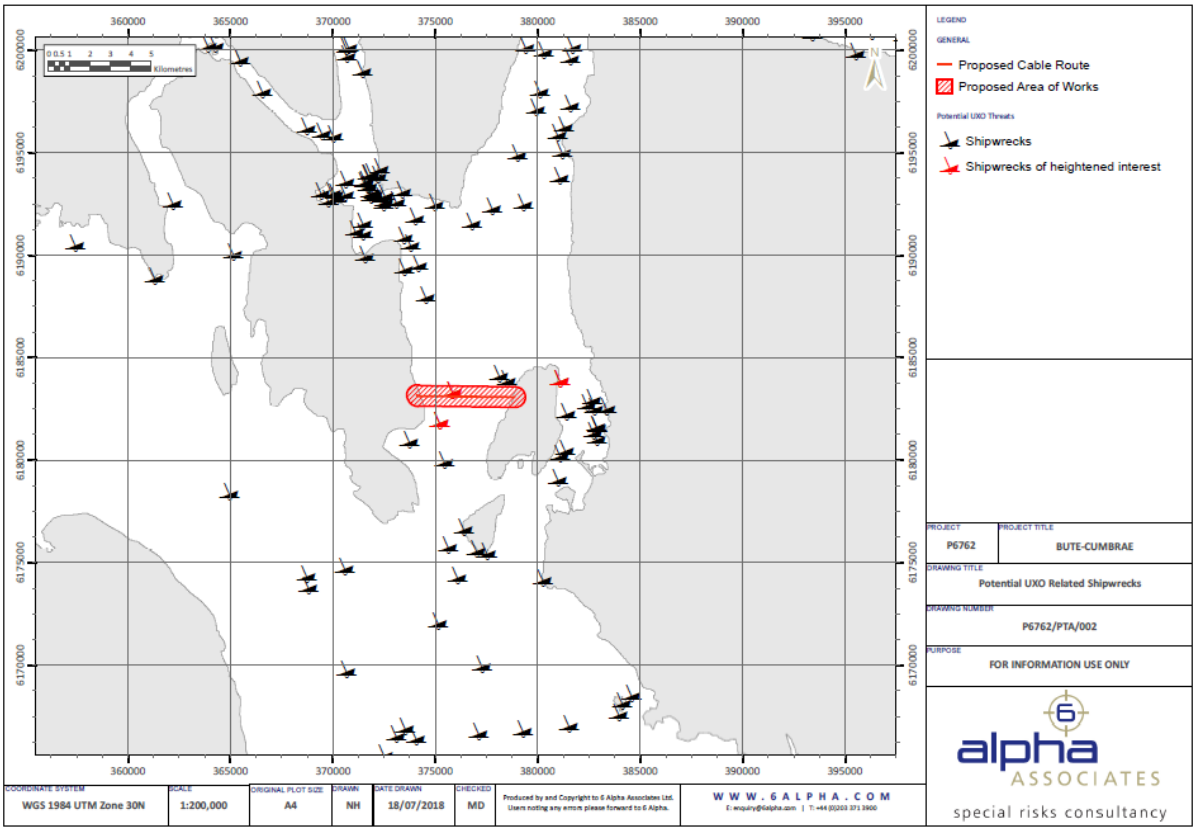


Figure 11: Shipwreck Locations

7.3 Unexploded Ordnance (UXO)

There are no known munitions dumping sites located within 10,000m of the site.

The Site is not situated within any recorded WWI or WWII mine fields, however anecdotal evidence has documented fishermen snagging a sea mine in a net near Cumbrae.
In addition, the site is situated within a modern Navy training area which is used for air, ship and submarine exercises. A historic coastal military practice area is located approx. 10km south. These were known to use live anti-aircraft artillery for active and training purposes. These emplacements had an effective range of 20,000m and although these areas do not encompass the cable route, there remains potential for UXO to have migrated onto site over time.

The site coincides with several documented WWII convoy routes hailing out of Glasgow and the Firth of Clyde but there is no documentation of any WWI or WWII naval engagements occurring within the vicinity of the Site.

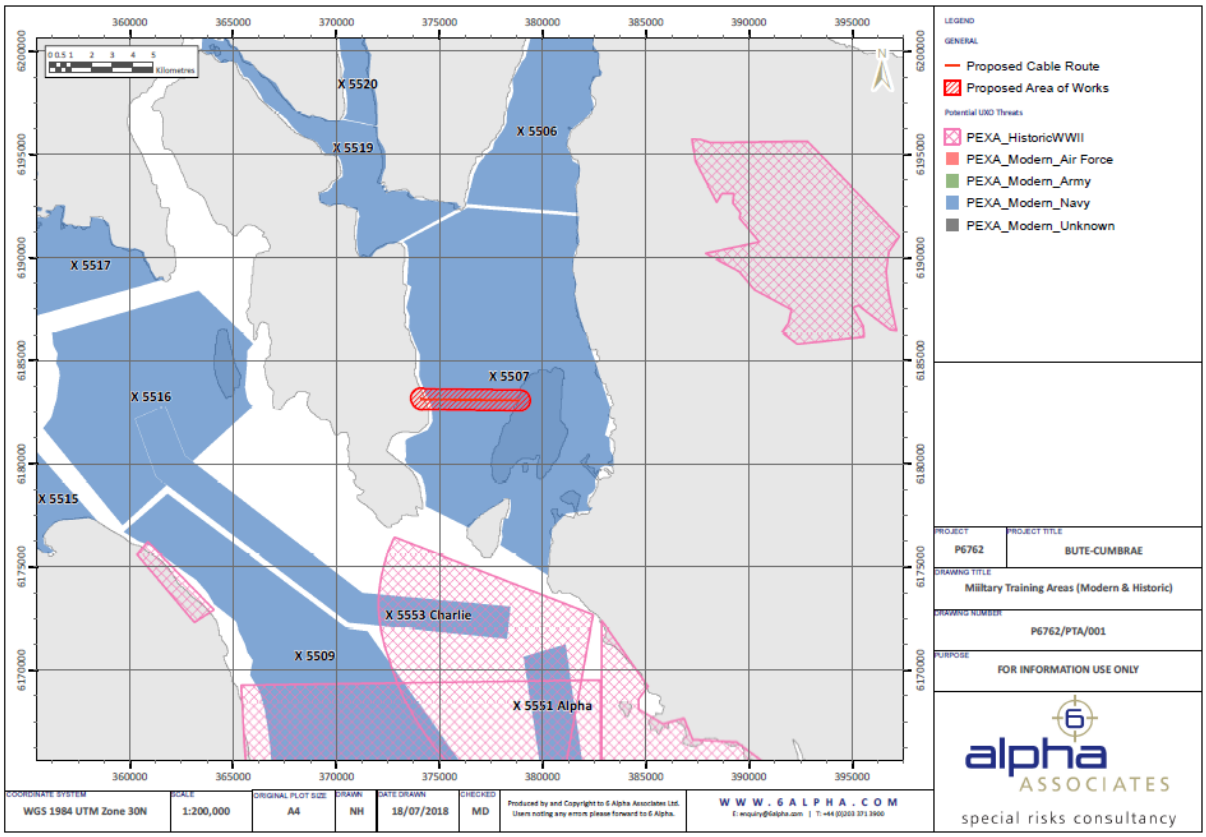


Figure 12: Military Training Locations

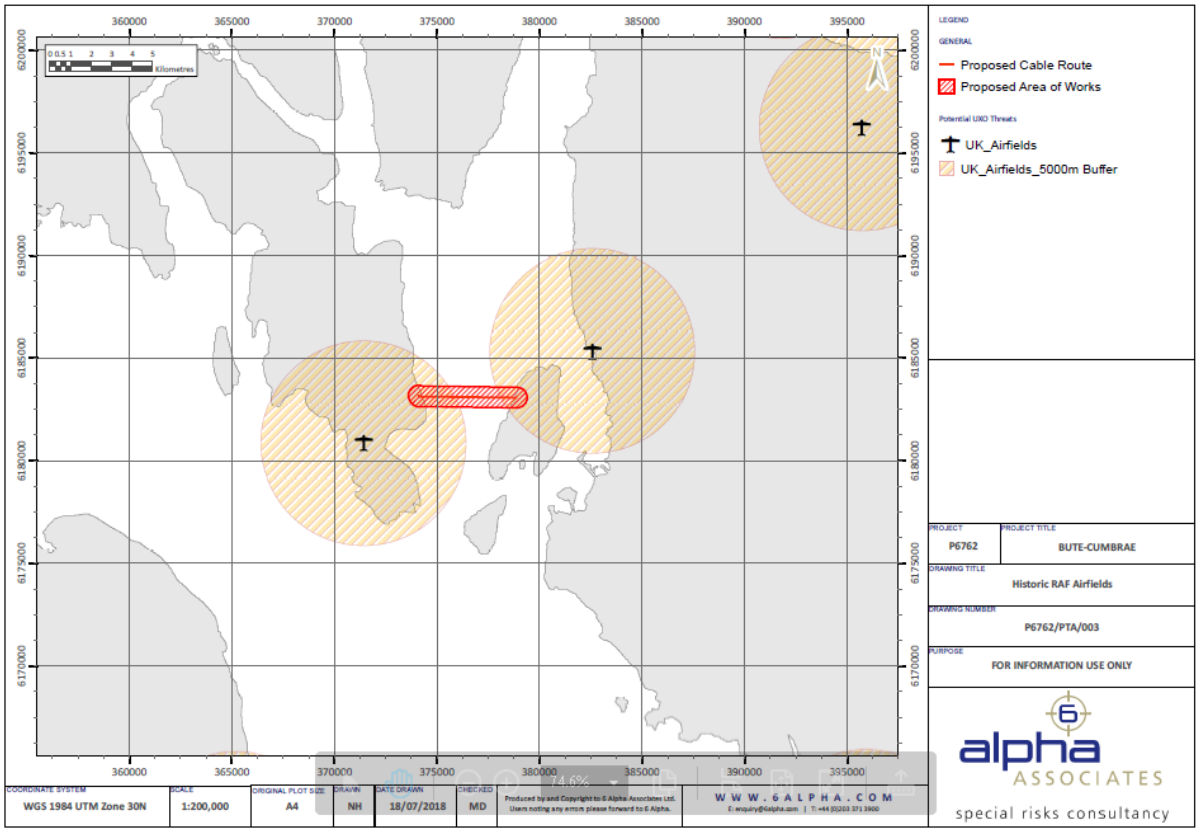


Figure 13: Historic RAF Airfield Locations

7.4 Mitigation

In general terms, it is preferable to manage the presence of cultural heritage sites by locating construction footprints and routing the cable to avoid them. However, where this is not possible various strategies can be put in place, although few are required for this development due to the lack of identified maritime heritage. The mitigation and management measures outlined below will result in the avoidance, reduction or offsetting of any short-term potential impacts on cultural heritage by the Project.

In order to manage the potential for impacting unknown heritage, a reporting protocol will be instigated for the discovery of previously unknown marine cultural material during development. The reporting protocol produced by Wessex Archaeology (2014)[7] for the Crown Estate will be sufficient.

Unknown cultural material could come from the presence of wrecks of uncertain location and the potential for submerged landscape material, although this a low risk. However, should any cultural heritage sites be reported during the course of the Project, it is recommended that they are investigated by a qualified marine archaeologist as their potential for retaining cultural heritage information could be high.

The reduction of potential impacts by the work conducted during the design and development of the Project, after the geophysical survey review, combined with instigating a reporting protocol for the accidental discovery of cultural remains are likely to result in impacts of negligible significance on the marine historic environment.

Table 22: Residual impacts on archaeological receptors

Receptor	Sensitivity	Potential Impact	Likelihood	Management / Mitigation	Residual Impact
Known marine heritage assets	Negligible	Direct: vessel activities, seabed preparation, post-lay jetting, rock filter bag placement, PLGR	None	DBA has identified none present	None
Shipwrecks with unknown locations	Negligible	Direct: vessel activities, seabed preparation, post-lay jetting, rock filter bag placement, PLGR. Indirect: cable movement, scour.	Low	Geophysical and DDV surveys to be reviewed and results used to inform project design and management / mitigation strategy.. Reporting protocol for accidental discoveries. Use of rock filter bags to prevent cable movement and scour.	Negligible
Aircraft with unknown locations. Aircraft legally protected and must not be disturbed, even accidentally.	High	Direct: vessel activities, seabed preparation, post-lay jetting, rock filter bag placement, PLGR. Indirect: cable movement, scour.	Negligible	Geophysical and DDV surveys to be reviewed and results used to inform project design and management / mitigation strategy. Reporting protocol for accidental discoveries. Avoidance. Use of rock filter bags to prevent cable movement and scour.	Low
UXO	High	Direct: vessel activities, seabed preparation, post-lay jetting, rock filter bag placement, PLGR. Indirect: cable movement, scour.	Negligible	None identified by DBA. Geophysical surveys to be reviewed and results used to inform project design and management / mitigation strategy. Reporting protocol for accidental discoveries. Use of rock filter bags to prevent cable movement and scour.	Negligible
Unknown submerged deposits	Low-High	Direct: vessel activities, seabed preparation, post-lay jetting, rock filter bag placement, PLGR. Indirect: cable movement, scour.	Low	Geophysical surveys to be reviewed and results used to inform project design and management / mitigation strategy. Reporting protocol for accidental discoveries. Use of rock filter bags to prevent cable movement and scour.	Negligible
Unknown cultural material	Low-High	Direct: vessel activities, seabed preparation, post-lay jetting, rock filter bag placement, PLGR. Indirect: cable movement, scour.	Low	Geophysical surveys to be reviewed and results used to inform project design and management / mitigation strategy. Reporting protocol for accidental discoveries. Use of rock filter bags to prevent cable movement and scour.	Negligible

8 IMPACTS AND SPECIFIC COMMITMENTS

8.1 Physical Presence

The physical presence of the project vessels and the subsea infrastructure has the potential to be a navigational hazard, to restrict fishing operations in the area and/or to cause disturbance to wildlife. However, taking account of the mitigation measures in the project planning phase, which include early consultation with the Scottish Fisheries Federation (SFF) for all operations, notification to other users of the sea regarding the development's activities through a Notice to Mariners (NTM) and notification to the Hydrographic Office, the impact is assessed to be low.

8.2 Emissions to Air

Gaseous emissions can contribute to global atmospheric concentrations of greenhouse gases, regional acid loads and ozone depletion. Quantities of the main greenhouse gases, carbon dioxide, methane and nitrous oxide will be produced during the installation phase by project vessels. Mitigation measures include optimisation of vessel use, review of vessel Common Marine Inspection Documents (CMID) as part of vessel assurance and compliance with UK legislation. Taking these measures into consideration, the overall impact from short-term emissions to air is assessed to be low during installation.

8.3 Discharges to sea

There are no planned discharged to sea during this project. All project vessels will be fully equipped with appropriate oil spill response equipment as per their class designation and best practice.

8.4 Seabed Disturbance

Several activities will be carried out during the proposed project that have the potential to impact on the seabed and its communities.

The dive support vessel (DSV) will be positioned using either its spud legs or using a 4-point mooring spread. Therefore, the seabed area directly beneath these points will be impacted. The cable will be surface laid and then post-trenched with a controlled flow excavator to minimise the seabed area affected by the burial option. PLGR will be conducted 1-3 weeks prior to the cable installation to clear the route of debris. The grapnel train selected will be selected to be <1m wide and have 0.5m seabed penetration; a smaller impact than the chosen burial technique.

8.5 Underwater Noise

Many marine organisms use sound for navigation, communication and prey detection. Therefore, the introduction of man-made sources of underwater noise has the potential to impact marine animals if it interferes with their ability to receive and use sound. Types of impact include temporary avoidance or behavioural changes, the masking of biological sounds, auditory and other injuries.

Construction work is likely to have the most impact on marine mammals, but this will be localised and temporary, particularly with respect to seals and their haul out sites, during pupping and moulting. Common seals have to spend a great deal of time on shore during moulting, which occurs shortly after breeding generally from February to June. Sensitive periods of the year should be avoided as this onshore time is important to their life cycle and they can be disturbed when there is substantial human presence. Potential impacts could result from noise and vibration disturbance particularly that generated during the installation phase. Many species of marine mammal use sound for detection of prey, communication and orientation. An increase in

underwater sound levels can mask the biological acoustic clicks used for hunting and social activity and may even contribute to stranding and mortality.

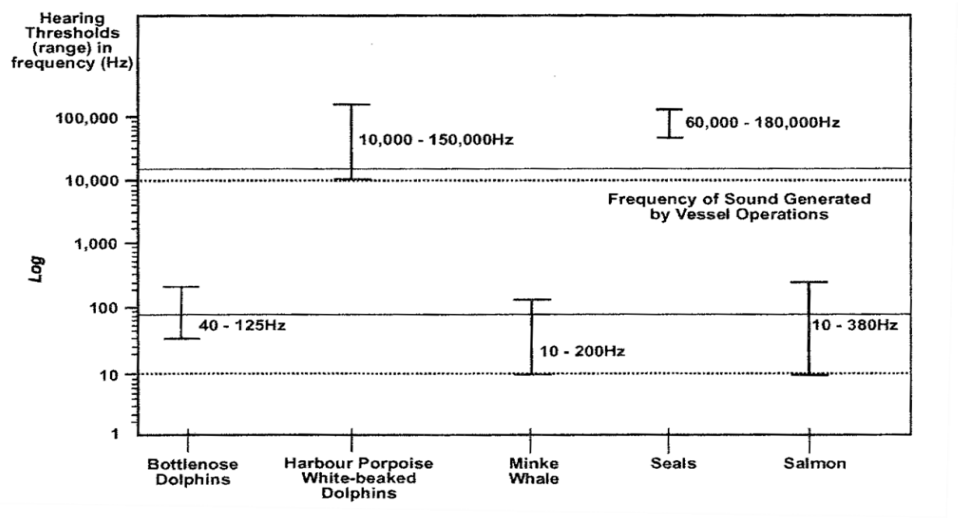


Figure 14: Frequency ranges of various marine mammals to expected frequencies ranges during vessel operations. Richardson et al. 1995

Table 23: Examples of underwater noise levels produced by different types of vessel.

Source	Source levels of underwater noise (dB re1µPa at 1m)*
Median Ambient Level	80 – 100
Tug/ Barge	140 – 170
Supply/ Support Vessel	170 – 180
Drillship	150 – 180
Tanker	170 – 180
Super tanker	185 - 200
Key: dB re 1µPa at 1m – unit of Sound Pressure Levels measured at a 1 m range from source * - Most data taken from 1/3 octave band centre frequencies (50-2,000Hz)	

Source: Richardson et al., 1995

Short-term installation and cabling works may cause some stress, especially in breeding times to marine mammals. Usually male seals use airborne calls to compete for females and territory, whilst females and their pups call in air and water to maintain contact. Underwater calls are also usually used to co-ordinate mating. However, seals may be able to habituate to low level background noise and sounds that become familiar to them. Evidence from recent submarine cable installations has shown cetaceans and marine mammals to remain in the vicinity of cable lay vessels and are not stressed by the operations if breeding times are avoided (Tricas et al, 2011). In general, the route does not impact directly upon any haul out or breeding sites.

Cetaceans could be impacted by the magnetic field processed by the power cables. This could influence their navigation. Within the literature, there is little circumstantial evidence linking migration impacts to power cables. Cetaceans rely heavily on sound for many functions necessary for survival and are therefore likely to be affected by any abnormally high noise levels. Some species of Cetacean also rely on echolocation by sound waves for navigation and social interaction and this could also be potentially disrupted by additional underwater noise. Some species are more sensitive than others to different noise levels and have different adaptations to

cope with extensive ambient sound. The low noise levels created by this cable installation will not create any noise above the levels of vessels already operating within the area therefore the impact during the installation period is expected to be low. The temporal period of the cable installation is also short and is therefore unlikely to have any long-term impacts on cetacean species.

There could also be by physical intrusion and interruption of known migration routes, particularly in routes two and three, which run parallel to the shore. The potential for collision between large mobile organisms and deployment vessels is difficult to predict. Historically marine mammal entanglements have been a cause of submarine cable failure but with modern survey methods and installation procedures the avoidance of large suspensions is now easily achieved. The initial observations of the available bathymetric data along the proposed route show a low likelihood of such suspensions. The risks associated with collision with the catenary are low as the cable is installed over a short period of time.

Mitigation should include minimisation of impact to marine mammal habitats, particularly those adjacent to sensitive areas. Although the route avoids population centres an assessment of key times for installing the cable will be carried out. The surrounding waters are also an important corridor for species of migrating marine mammals that summer, forage or pass through this area on route to developmental; nursery or feeding grounds. Marine mammals require different habitats during breeding, feeding and migration and therefore it is important to ensure that any adverse environmental effects on these animals and their habitats are avoided or reduced. The construction and operation of new submarine cables have the potential to result in habitat/water quality degradation and increase in marine traffic causing an increase in noise levels. These have, in turn, the potential to cause changes in mammal habitat use or physical harm to marine mammals. The potential effects to marine mammals can be grouped into two key issues: direct mortality; and decreased habitat quality. There are several construction activities that may affect marine mammals. Deployment of the new submarine cables will incorporate vessel operation (potential acoustic effects). Proposed cable operational activities that are likely to interact with marine mammals include the maintenance, deployment or repair of the cable, which may produce vessel-related effects. Perceived, though unsubstantiated, potential environmental effects are biological implications of EMF generated by operation of high voltage submarine cables on marine mammals is also a consideration.

Although the sound from the proposed cable installation and survey activities does have the potential to cause disturbance to marine mammals it is not expected to have a significant impact on any cetacean or fish species. Marine Mammal Observers (MMOs) will be utilised where underwater acoustic positioning is being used. Taking this into account the risk from underwater noise associated with the project is assessed to be low.

8.6 Waste

Waste may be generated during the installation phase or PLGR. BMC is committed to managing wastes in accordance with the principles of the waste management hierarchy, i.e. reduce, reuse, recycle. With the application of control measures the impact of waste production will be minimised and the overall risk is considered low.

8.7 Military Activities

The Ministry of Defence (MOD) will be consulted as part of the Marine (Scotland) Act 2010 consent application process on the cable route. The cable route is not expected to have any impact upon MOD activity during its operational phase. During installation the appropriate ‘Notice to Mariners’ will be required to be issued to ensure vessel safety and co-ordination with the MOD in the event of any activities.

8.8 Hydrocarbon Exploitation

The likelihood of exploration activities in the project is unlikely due to the proximity to shore and unfavourable geological conditions for hydrocarbon formation.

8.9 Dumping and Dredging

Desktop enquiries show that there are no known dumping or dredging activities which would affect the proposed cable routes.

9 REFERENCES

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