REPLACEMENT METALLIC RETURN CONDUCTORS
MARINE ENVIRONMENTAL REPORT

MOYLE INTERCONNECTOR LIMITED

NON TECHNICAL SUMMARY
December 2014

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Intertek Energy & Water Consultancy Services

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<tr>
<td>AIS</td>
<td>Automatic Identification System</td>
</tr>
<tr>
<td>ASSI</td>
<td>Area of Special Scientific Interest</td>
</tr>
<tr>
<td>CA</td>
<td>Crossing Agreement</td>
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<tr>
<td>DETI</td>
<td>Department of Enterprise, Trade and Investment</td>
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<td>DOENI</td>
<td>Department of the Environment Northern Ireland</td>
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<td>Environmental Management Plan</td>
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<td>Great Britain</td>
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<tr>
<td>HVDC</td>
<td>High Voltage Direct Current</td>
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<tr>
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<td>Integrated Return Conductor</td>
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<td>LV</td>
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<td>Mean High Water Mark</td>
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<td>Mean High Water Springs</td>
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<td>Marine Protected Area</td>
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<td>Oslo-Paris Convention</td>
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<td>Utility Regulator</td>
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<td>WSI</td>
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1 INTRODUCTION

1.1 OVERVIEW

The Moyle Interconnector is a 500 megawatt (MW) high voltage direct current (HVDC) electricity cable which links the electricity grids of Northern Ireland and Scotland. It consists of two separate cables, each of which transfers 250 MW in either direction (see Figure 1-1).

Owned and operated by Mutual Energy’s subsidiary Moyle Interconnector Limited (MIL) the Moyle Interconnector has been operational since 2002. However, four system faults have been experienced since 2010 due to a failure in the low voltage component of the system. As a result, the interconnector is currently running at half capacity.

MIL has investigated options for the restoration of the interconnector to full capacity and proposes to install two replacement metallic return conductors (MRC’s) parallel to the existing cables to address the issue. The proposed cable corridors which run from mean high water springs (MHWS) at Currarie Port in Ayrshire, Scotland to MHWS at Portmuck South, Islandmagee, in County Antrim, Northern Ireland are shown in Figure 1-2.

The Environmental Report to which this non-technical summary (NTS) relates provides an assessment of the installation of the replacement MRC cables, herein referred to as “the project”.

Figure 1-1: Moyle Interconnector Route
1.2 THE NEED FOR THE PROJECT

MIL makes available and sells capacity in the Moyle Interconnector link to electricity supply companies. For example, an Irish supply company can purchase its power in GB, book capacity on the Moyle Interconnector and transfer that same power to Northern Ireland through the Moyle asset - or indeed vice versa. Power tends to flow from the cheaper to the more expensive market, so the presence of the link helps to put downward pressure on prices within the more expensive market. Since commissioning, the Interconnector has made a major contribution to the drive for lower electricity prices in Northern Ireland, which has a history of high energy costs.

In addition to providing a conduit for commercial flow of power, the physical link also provides system security benefits. When the frequency of either the Northern Ireland or GB transmission electrical transmission networks falls, for instance when a power station “trips”, the Moyle Interconnector has the ability to inject power almost instantaneously, from one system to the other, in mutual support.

A recent study has estimated that the benefit that the Moyle Interconnector, at full reliable 500MW, capacity has been bringing to the combined markets of GB and Northern Ireland through both enhancing competition in markets and reducing the system running costs has been on average greater than £100m per annum.

Interconnectors between wholesale markets in geographically separate areas generally tend to support the increased development of renewable generation. Wind may be blowing in Northern Ireland but not in GB and vice versa. European Energy Policy seeks to increase the penetration of renewable sources of energy and the changes to meet this objective are expected to increase the value of the benefit of interconnection generally and thereby Moyle and more particularly the customers it benefits.

The System Operator for Northern Ireland (SONI) and Eirgrid, the electricity Transmission System Operators (TSOs) for Northern Ireland and Republic of Ireland (RoI) respectively, are required to submit an annual Generation Capacity Statement to their respective regulatory authorities. These statements outline the expected electricity demand and the level of generation capacity available over the next 10 years, together with an analysis of generation adequacy for a number of realistic scenarios.

The Utility Regulator (UR) and the Department of Enterprise, Trade and Investment (DETI) have joint responsibility for ensuring the security of supply for consumers in Northern Ireland, who both are required to ‘have regard to the need to secure that all reasonable demands for electricity are met’.

The 2013 Generation Capacity statement, published in January 2013, identified that while there is a considerable surplus of generation in the Republic of Ireland, current interconnector limitations restrict the amount of generation that can be transferred to Northern Ireland. This limitation results in the security of supply to Northern Ireland being at risk from 2016 and in deficit from 2021.

There are three compounding factors giving rise to the risk of security of supply in Northern Ireland from 2016, namely:-
1) The delay in delivering the planned second North-South Interconnector, for which a planning application was initially submitted in December 2009 and resubmitted in April 2013.

2) The requirement to comply with EU Emissions Directives from 2016, which is expected to result in the withdrawal of some generation capacity at Ballylumford and place restrictions on generation at the Kilroot plant.

3) A fault on the Moyle Interconnector whose capacity has been halved and is unlikely to be restored to full reliable capacity until 2017.

The 2013 Generation Capacity statement states that "it is imperative that the second North-South Interconnector is progressed and delivered and that the Moyle Interconnector is restored to full, reliable capacity as soon as possible. It is however unlikely that these interconnectors will be fully operational before the EU Emissions Directive takes effect. It may therefore be necessary to consider alternative short term solutions."

Two short term solutions were identified and considered at this time to address the risk to security of supply to consumers in Northern Ireland from 2016:-

1) Interim repair of the Moyle interconnector prior to 2016, and/or
2) The introduction of additional generating capacity in Northern Ireland by 2016.

On the first of these solutions, MIL did in fact examine a range of possible options for effecting a temporary solution, including an in situ seabed repair to the existing low voltage cable fault. While this engineering process did yield some positive results, it ultimately did not produce a satisfactory outcome. A decision was made, as of November 2014, to discontinue this work and focus fully on the cable replacement project, which provides a permanent solution.

On the second solution, there was no commercially driven planned market entry. Intervention was therefore required, and DETNI directed the Utility Regulator to invite tenders for back up capacity. This competition is currently underway.

The complete report is accessible at:

1.3 PROJECT DEVELOPMENT

The Moyle interconnector consists of two independent HVDC cables linking converter stations at Ballycronan, Islandmagee, in Northern Ireland to Auchencrosh, Ayrshire, in Scotland. Each circuit is rated at 250 MW with a total combined power transfer capability of 500 MW.

Each cable is of integrated earth return conductor (IRC) design which means there is an insulated high voltage conductor in the centre of the cable surrounded by an insulated return conductor (see Figure 1-3).
Within the period between September 2010 and June 2012 the integrated earth return conductor (IRC) insulation of the Moyle Interconnector cables failed four times causing significant duration link down times and expensive repairs.

The first three failures were repaired; the second and third in particular, being at 150 m and 25 m water depth respectively, were extremely costly (circa £15m each) and very time consuming (3 months). As such repair of the forth fault, occurring in June 2012, was not enacted immediately and remains current. The interconnector has therefore been operational at only half capacity since then. Investigations into the cause of the failures have raised concern about the integrity of the IRC insulation.

MIL has therefore considered a number of repair and replacement options to return the Moyle interconnector to full capacity and reliability.

The preferred option, offering the least projected project risk, is that of installing two replacement separated metallic return conductors (MRC’s) within separate 100 m wide installation corridors to the south of the existing north and south cables. The HV element of the existing cables will continue to operate as the HV element of the replacement cable system. An illustration of the existing and proposed Moyle Interconnector systems is provided in Figure 1-4 below.
### 1.3.1 Consideration of Alternatives

Moyle Interconnector Ltd has considered a number of repair options to return the interconnector to full capacity and reliability. The alternatives which have been considered include:

**Replacement bundled metallic return conductors** – the two replacement return conductors would be laid together side by side ‘bundled’ along the whole marine cable route from landfall to landfall. The advantage of this option is that it only requires one installation campaign along one burial route. However, if a fault occurs on either conductor, dual outage will be required to de-bury, separate and repair the conductor; cable failure from mechanical intervention is possible; a larger than optimum conductor size will be required.

**Replacement of complete cables system (HV & LV)** – this option was rejected because of the high cost of the HV conductor and associated insulation which have never suffered a fault and are considered to have a long remaining operating life.

**Using the sea as the return conductor path** – In this option, rather than circulating the electrical current through the high and low voltage conductors, the current is circulated through the high voltage conductor and “returned” through the sea. Several HVDC Interconnectors throughout the world operate in this mode. However in Moyle’s particular environs the true environmental impact operation in this mode, and indeed the possible impact on other third party assets such as the gas transmission pipeline, cannot be adequately assessed for it to be considered a prudent option and whilst it could have been an instant solution to the particular type of cable faults Moyle has been experiencing, it was discounted as an option at a very early stage.

**Emergency Fallback** - In the event of a further cable fault occurring in the currently fully functioning south LV conductor resulting in the failure of the...
Moyle interconnector, MIL have engineered and technically proven an emergency fallback option. This would involve using the integral HV conductors of both cables to serve the functions of one HV conductor and one LV conductor enabling the Moyle interconnector to remain operational at half capacity. Should this be required MIL has agreed to notify Northern Ireland and Scotland Regulators as soon as practicable after its implementation. No consenting or other requirements apply.

**Bi-pole Option with Metallic Return (short term option)** - In the interim (until delivery of the preferred solution, possibly end 2017) consideration was given to changing the operational mode of the cables and redesigning the station control such that full capacity could be transferred through the two HV conductors and one remaining functional LV conductor. This option was referred to as the bi-pole option.

This option has been considered by the original manufacturer of the convertor station technology and could be engineered at a relatively low cost. The design is on the shelf but was not pursued further as a long term enduring solution because operation in this mode creates Electromagnetic Fields (EMF) which in shallow waters can create significant deviations to magnetic compasses. Unlike the proposed replacement cables option, in which similar compass deviation can be reduced by accurate placement of the replacement cables alongside the existing cables, with the bi-pole option there is no means of minimising the effect. Unmitigated, the compass deviation effect has the potential to introduce risks to mariners which were assessed and not considered to be reasonable. This option is therefore discounted as a long term solution but could be considered and employed, perhaps in conjunction with mobilising guard vessels, as a short term intervention if Northern Ireland required emergency power.

**Seabed Repair** – As all four faults have occurred in the return conductor insulation, there is the potential for further similar faults to occur in the future. The costs associated with carrying out any conventional future offshore repairs would be prohibitive and the interconnector would be out of service for several months at a time. Each conventional repair requires that the cable be cut on the seabed and lifted onto a vessel. Handling the cable in this way has the potential to cause further damage to the return conductor insulation. MIL therefore developed a pioneering approach to effect a underwater repair to faults with the cable *in situ* on the seabed. Such repairs were envisaged as a temporary, enabling full capacity of the interconnector to be restored in the intervening period before commissioning of the enduring solution.

The seabed repair was attempted in October 2014 and whilst this engineering process did yield some positive results, it ultimately did not produce a satisfactory outcome at the current fault location and a decision was taken in November 2014, to discontinue this work and focus fully on the cable replacement project, which provides a permanent solution.
1.4  **PROJECT DESCRIPTION**

1.4.1  **Description of the Marine Cable Route Corridors**

The proposed corridors for the replacement cables are shown in Figure 1-2 and incorporate the following:

- A landfall at approximately the Mean High Water Mark (MHWM) at Currarie Port, Ayrshire, Scotland
- Approximately 53 km per marine cable route (north and south). The replacement cables will be installed within a 100 m wide consented corridor to the south of the existing north cable and to the south of the existing south cable.
- A landfall at approximately MHWM at Portmuck South, Islandmagee, Northern Ireland.

The HV element of existing cables will remain functional and in their installed position but the integrated return conductors will become redundant as the replacement cables will take over that function.

1.4.2  **Pre-Installation Surveys**

Prior to marine cable installation, the appointed contractor will conduct a pre-installation route survey. This will be undertaken to provide information on the seabed to finalise the positioning of the marine cable route in areas of mobile sediments (e.g. areas of moving sand known as sand waves) and around reefs and to identify exactly the locations where there may be difficulties relating to engineering and/or safety hazards, such as other cables, wrecks and discarded articles on the seabed including unexploded military material such as explosives. Any changes to the proposed replacement cable routes will be developed to minimise environmental impacts within the proposed cable corridors and to provide the best cable protection by ensuring adequate burial.

1.4.3  **Installation**

MIL proposes to bury the replacement cables along their entire lengths apart from where burial is not possible for example at crossings with existing cables or pipelines, or where the seabed characteristics mean that burial is not possible. The exact details of the installation technique will be confirmed when the contract for installation is awarded. However, it is envisaged that the cables will be buried into the seabed either by a plough or jetting trenching machine deployed by the main laying vessel directly or by a support vessel ideally following closely behind to ensure cable protection is immediate.

The target burial depth is between 1 m to 1.5 m below the seabed. The replacement cables will be buried as a safety measure to avoid damage or failure resulting from marine hazards such as fishing trawling gear or shipping anchors snagging on the cable. At crossings with existing cables or pipelines and in areas where, due to seabed conditions burial is not possible, other cable protection methods will be employed such as installation of rock or concrete mattresses over the surface laid cable.
1.4.3.1 Vessels

During the marine cable installation process the following vessels may be required:

Nearshore - Cable Lay Barge: A shallow water cable lay barge may be required to lay and bury the cables at the nearshore areas of each landfall. The vessel will use anchors for positioning. Burial of the cables may take place simultaneously or a short time after the laying operation.

Offshore – Cable Lay Vessels: These will be dedicated vessels (see Figures 1-5 and 1-6) which will deposit the cables onto the seabed. Depending on the vessel capability the cable may also be buried by this vessel at the same time as it is laid or the cable may be buried later in a separate operation by another vessel. These vessels will use propellers or thrusters to maintain position.

A large cable vessel may carry up to 100-120 km of cable therefore it is likely that the north and south replacement cables, both approximately 53 km long, will be installed in one campaign. Cable installation operations are usually undertaken on a 24-hour basis to ensure minimal navigational impact on other users and to maximise efficient use of suitable weather conditions.

Figure 1-5: Example Cable Lay Vessel
Guard Vessels - In areas of high density shipping or fishing activity, the cable installation vessels will be accompanied by a guard vessel. The guard vessel will maintain surveillance around operations to ensure that other vessels keep clear of the area to avoid the threat of collision and to protect the cable prior to burial. Navigational warnings will be broadcast to warn approaching vessels of the operations and inform fishing vessels of the presence of the cable.

1.4.3.2 Burial Methods and Equipment

There are three types of equipment usually employed for installing cables into the seabed: ploughs, jet trenchers; and mechanical trenchers.

Ploughs:

Ploughing is used widely as the technology is relatively simple and, provided the geology, bathymetry and soil mechanics allow, can be used to minimise environmental impacts. Plough burial would be undertaken simultaneously with cable lay. There are a number of different types of plough that could be employed to ensure that the cable is buried, two that could be used for this project are:

Jetting Plough (Non-Displacement)

This uses a thin-bladed ploughshare, through which the cable is run; therefore, no open trench is created and minimal disturbance is caused to the seabed. The plough uses water jets to lubricate the blade, and subsequently requires less pull strength to bury cable to the same depth as a conventional share.

Traditional Plough (Non-Displacement)

This also uses a thin-bladed ploughshare, through which the cable is run; therefore, no open trench is created and minimal disturbance is caused to the seabed.

Should a trencher be selected for use, either or both of the following options could be employed. Trench burial would be undertaken post surface lay of the cable on the seabed. The trencher may be able to switch between the jet or chain cutting burial tools, dependent on the local sediment characteristics.
Trenchers:

Jet Trencher

High-pressure water jets are used to fluidise the seabed below the cable, resulting in the cable sinking to the desired burial depth. These may be deployed either onto a cable that had already been laid or directly as the cable is laid. Jet trenchers can be sled mounted (and vessel-towed), mounted on Remotely Operated Vehicles (ROVs) or mounted on self-propelled tracked vehicles. Jetting devices tend to be used where the seabed is relatively soft. They require high-power generation equipment on the lay or burial vessel. Jetting disrupts the sediment immediately along the cable route.

Mechanical Trencher (Chain Cutter)

These are used where the seabed is too hard for the other techniques. They are usually track-mounted and cut a trench through the harder sediment, with moving parts such as a chain mounted teeth.

Figure 1-7: Example Ploughs

Figure 1-8: Example Trenchers
1.4.3.3 Protection by Rock Installation

In areas where cable burial is not possible (e.g. at cable/pipeline crossings and areas of harder seabed) or where the cable was inadequately buried the cable will be protected by a covering of rock or concrete mattress armouring.

1.4.3.4 Cable/Pipeline Crossings

Each of the two replacement MRC cable routes will cross three existing Fibre Optic Cables (Sirius, Lanis and Hibernia,) a high pressure gas transmission pipeline (the Scotland to Northern Ireland natural gas transmission pipeline (SNIP) and two HVDC cables (Western Link) which are to be laid in 2015/16. The crossing of third party infrastructure is made with agreement of the owners following a negotiated formal Crossing Agreement (CA). The CA describes the rights and responsibilities of the parties and also the detailed physical design of the crossing.

1.4.3.5 Landfalls

The proposed landfall locations (i.e. where the cable passes from the subsea environment to onshore, via the intertidal) for the replacement cables are the same as those for the existing Moyle Interconnector at Currarie Port, Ayrshire and Portmuck South, Islandmagee. Engineering techniques for the landfall sites will not be finally confirmed until the detailed design stage but are expected to include the following:

The land cables will be connected with the marine cables in a transition jointing pit (TJP) buried in the ground above the high water mark. In all areas the cables will be buried below surface, i.e. into the beach.

Prior to marine operations, cable ducts will be installed at both landfalls from the TJP to the low water springs mark, by an open-cut trench method or using horizontal directional drilling (drilling underground horizontally). The design of the trench will be confirmed after the pre-installation survey has been completed and the final replacement cable route has been confirmed.

The replacement cables will then be floated ashore from the cable-lay vessel (floats will be attached to the cable to enable it to stay on the water surface, making it easier to pull). When the cable reaches the water’s edge, floats will be removed and it will be pulled into the duct and onwards to the TJP.
1.4.4 Installation Programme

An indicative programme of works for the project through to commissioning is presented below. The programme illustrates periods during which the various aspects of the project may take place with the earliest start date for the marine cable installation works indicated to be the middle of 2015. It should be noted that replacement cable installation works may be completed in less time than the overall periods shown if the conditions encountered during installation are favourable, i.e. good weather and burial progress.

Indicative Programme

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration (months)</th>
<th>2014 Q3</th>
<th>2014 Q4</th>
<th>2015 Q1</th>
<th>2015 Q2</th>
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<th>2015 Q4</th>
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1.4.5 Operation

Once installed the replacement cables do not require routine maintenance. The cables will be monitored for electrical integrity to provide early indication of any faults. Regular inspection surveys will be undertaken to monitor the buried depths of the cables. Following installation of the replacement cables the Moyle Interconnector will be fully operational at maximum capacity. Future repair requirements related to the current fault issue will permanently addressed. Repairs to the installed and protected cables should not be necessary except in the unlikely event that a cable is damaged by an external interaction e.g. by trawlers or ship’s anchors. Should this happen a repair will be carried out by a single repair vessel or an anchored barge for shallow waters repairs.

1.4.6 Emissions

During operation HVDC cables such as the proposed replacement cables emit small electric and magnetic fields which will cause a change in the detectable level of these fields in the immediate vicinity of the cables. Currently, electromagnetic fields (EMF) generated by the Moyle Interconnector cables are negligible due a cancellation effect from the integrated design of the system (High voltage and low voltage elements within the same cable). Installing the replacement cables will mean that the HV and LV elements are now separated for the majority of the route) which will mean with the exception of nearshore shallow areas, where the replacement cables will be laid close to the existing cables there will be no cancellation. The expected magnetic field to be generated is however predicted to be below natural background levels in close proximity (less than 4m) from the cables.

The replacement cables will operate at approximately 45°C. The cables will be buried to approximately 1 m depth, or, where this is not possible, protected by
rock armour (a pile of rocks/gravel) or mattressing (concrete sheets which overlay the cable).

When the cables are in operation there will be localised heating of the environment surrounding the cables (i.e. sediment for buried cable or water in the spaces of rock armouring or mattress protection). However, it has been shown that where cables are buried to 1 m or greater depth the increase in temperature in the sediments overlying the cable is insignificant. Similarly, where the cables are surface laid and protected by rock armour or mattressing, the heat is rapidly dissipated by the surrounding water and therefore the heating effect is negligible. Temperature increases in the upper sediments of the seabed over buried cables and in the outer layer of rock armouring are not expected to exceed 2°C.

The predominant noise generating activities associated with installation include those related to cable ploughing and trenching, mechanical chain cutter use on hard ground, rock placement and vessels using thrusters to maintain position. Laying of the replacement cables, together with related activities, including rock placement, are not expected to generate sound levels sufficient to cause physical harm to marine fauna.

1.4.7 Decommissioning

Cables in the UK territorial sea are installed on Crown land and therefore a lease is purchased for the expected lifetime of the cables. The proposed development has a theoretical design life of 30 years, although often this can be extended if necessary. Decommissioning of the subsea section of the cable will therefore be planned nearer to the end of the cable life.

Decommissioning may include recovery and/or dismantling of the cable although generally the current thinking is leaving them in place once out of service has less environmental impact than removing them. The decision as to whether to recover a cable or leave it in place will be taken at the appropriate time and in consultation with the relevant authorities.
2 ENVIRONMENTAL APPRAISAL

The installation of marine cables is not a form of development that is listed under Annex I or II of the Environmental Impact Assessment (EIA) Directive (as amended). Therefore, as defined under the Marine Works (EIA) Regulations 2007 (as amended) (Scotland) and the Marine Works (EIA) (Amendment) Regulations 2011 (Northern Ireland), the proposed development is not considered to constitute an “EIA” development. This has been confirmed by the respective Regulator’s in Scotland and Northern Ireland in their Screening Decisions.

However, MIL has chosen to undertake a Non-statutory Environmental Appraisal to the same standard as a Statutory EIA, the findings of which are presented in the full Environmental Report provided in support of the marine licence applications. This is to ensure that potential environmental effects are identified and assessed, and that appropriate mitigation measures are incorporated into the design, installation and operation of the proposed replacement cables.

2.1 SCOPING AND CONSULTATION

Consultation has been undertaken at key stages throughout the project in order to provide statutory and non-statutory consultees as well as local communities and other stakeholders with the opportunity to inform the development of the project and the final design and mitigation submitted as part of Marine Licence applications.

Scoping is a key stage early on in this process which is used to determine the content and extent of matters which should be covered in the environmental report. One of the main objectives of the scoping exercise is to ensure that the issues of greatest concern to various stakeholders receive appropriate consideration in the environmental appraisal. A scoping report which set out the approach to, and scope of, the non-statutory environmental appraisal of the proposed installation of the replacement cables, was issued to Marine Scotland and DOENI on 24th December 2014. They consulted their internal advisors on any particular concerns of the project. The scoping report was also circulated independently to other relevant stakeholders for their views on the project.

2.1.1 Statutory and Relevant Bodies Consultation

Consultation meetings were held with the principal statutory consultees, such as Department of Northern Ireland Marine Division, Northern Ireland Environment Agency, Department of Agriculture and Rural Development Fisheries Division in Northern Ireland and Marine Scotland Science, Scottish Natural Heritage and Historic Scotland in Scotland. A number of meetings were also held with the Maritime and Coastguard Agency to discuss potential compass deviation issues relating to ships’ compasses.

2.1.2 Local Interest Groups and Public Consultation

Recognising the importance of consultation with local stakeholders MIL has operated a policy of transparency and active consultation with all interested parties. Meetings have been held with fisheries organisations in Scotland and
Northern Ireland including the Scottish Fishermen’s Federation, Clyde Fishermen’s Association, Northern Ireland Lobster Fishermen’s Association, Anglo-North Irish Fish Producer’s Association and Northern Ireland Fish Producer’s Organisation,

In Scotland public consultation on marine cables projects is now a legal requirement under the Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013. A consultation event was therefore held at the King’s Arms Hotel, Ballantrae on the 04 September 2014 to introduce the project to the local community. Although, not a statutory requirement in Northern Ireland, an identical event was held in 2nd Islandmagee Presbyterian Church Hall, Islandmagee on the 03 September 2014.

2.2 ENVIRONMENTAL REPORT

The general headings of the topics and issues covered in the Environmental Report are as follows:

- **Protected Sites and Species**
- **Physical Environment**: bathymetry (water depth); geology, geomorphology and sedimentary features; metocean conditions (meteorology and oceanography) and; water and sediment quality.
- **Biological Environment**: intertidal and sub-tidal ecology; fish and shellfish; marine and coastal birds; marine mammals and reptiles.
- **Human Environment**: shipping and navigation; commercial fisheries; archaeology and cultural heritage; other maritime assets and marine stakeholders.
3 ENVIRONMENTAL APPRAISAL RESULTS

3.1 PROTECTED SITES AND SPECIES

The proposed replacement cable corridors pass directly through two protected sites, the Clyde Sea Sill (MPA) and Portmuck (ASSI). There are also a number of other protected sites which are either located adjacent to the project area or which have qualifying species for designation which may travel to within the predicted zone of influence of the project (see Figure 3-1).

Protected species with potential to be present include the fish species: angel shark; basking shark; common skate; Atlantic salmon; and river and sea lamprey. Bird species: red throated diver; manx shearwater; European storm petrel; Arctic tern; common tern; little tern; roseate tern; sandwich tern; and common guillemot. Several species of cetacean including, bottlenose dolphin, fin-whale, harbour porpoise, killer whale, long-finned pilot whale, minke whale, Risso’s dolphin, short-beaked common dolphin and white-beaked dolphin and two species of seal (harbour and grey seals). Leatherback turtle and loggerhead turtle are also occasional visitors to the region.

The birds of interest within Portmuck ASSI, The Gobbins ASSI, Larne Lough SPA, Ramsar and ASSI and the SPA planned colony extensions Larne Lough, Copeland Islands and Belfast Lough Open Water include: razorbill, common guillemot, black-legged kittiwake, roseate tern, common tern, Manx Shearwater and red throated divers.

There is a potential impact from disturbance to breeding seabirds, particularly in the nearshore region off Islandmagee. Vessels involved in installation activities will travel at a speed less than 14 knots to reduce physical disturbance and support vessels will be required to stay at least 200 m out from the eastern face of the Isle of Muck with another positioned at the north end of the island to keep boats away. In addition to this an ecological clerk of works (ECOW) will be present for any works undertaken within 1.5 km of the mainland shore of Northern Ireland with the power to stop activities if necessary to reduce physical disturbance. Therefore the effects on the integrity of protected sites for birds due to disturbance from the presence of cable installation vessels and plant will be minor and not significant.
Figure 3-1: Protected Areas potentially affected by the project in the vicinity of the proposed cable route corridors

Legend
- Proposed North Cable Corridor
- Proposed South Cable Corridor

Designated Sites
- SAC
- SPA
- MPA
- ASSI/SSSI
- Ramsar
- Annex I Habitat Sandbanks
- PAIH Rocky or Biogenic Reef
- Designated Seal Haul Out Site
- Territorial Sea Limit

NOTE: Not to be used for Navigation

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There are a number of protected sites for marine mammals adjacent to proposed cable corridors or which have qualifying species that may travel to within the zone of influence. These include Murlough SAC, South-East Islay Skerries SAC and Strangford Lough SAC which support qualifying numbers of harbour seals. The Maidens SAC supports qualifying numbers of grey seals and the Maidens ASSI is important for both grey and harbour seals. Skerries and Causeway SAC supports qualifying numbers of harbour porpoise.

The potential impacts to marine mammals include avoidance behaviour from noise during installation, disruption to navigation or orientation from the emission of electromagnetic fields during operation of the replacement cables, potential collision with vessels and effects from an accidental spill of fuel. However, noise levels associated with installation activity only occur in close vicinity to the cables and with mitigation measures in place including burial of cables to reduce the detectable distance of EMF, limiting vessel speed and oil spill contingency planning such impacts are considered to be minor and not significant. The potential impact of main concern is corkscrew injuries to seals from vessel thrusters or propellers, particularly for seals from the nearby Maidens SAC and ASSI. However, it is proposed to implement mitigation in consultation with DoE Marine Division and SNH, including consideration of seasonal restrictions during the seal breeding season to reduce this risk to acceptable levels.

The proposed cable corridors pass through the Clyde Sea Sill MPA which includes sand and coarse sediment communities. Potential effects to the integrity of this site from disturbance and loss of habitat will be limited to a small area of seabed incorporating the cable trench and footprint of the cable burial machine. Taking into account the proportion of habitat affected, and the ability of species to recover, effects on the integrity of the Clyde Sea Sill MPA are considered to be minor and not significant.

Additionally, two Annex I habitats were encountered along the routes, stony reef and bedrock reef. Areas of potential stony reef were found in the central section of the proposed cable corridors and also adjacent to Islandmagee, where increased epifaunal diversity is noted, especially in shallower areas. A small area of shore-fringing bedrock reef was found on the Scottish side. Pre-installation surveys will investigate reef quality in these areas and where possible impacts will be reduced by routing the cables to avoid the best examples of reef.

Further aspects of protected sites (including geology) and species are summarised in the following sections.

### 3.2 Physical Environment

#### 3.2.1 Bathymetry

The Irish Sea is encircled by the land masses of the United Kingdom and Ireland. It is generally formed of platforms, typically shallower than 60 m, within which are enclosed deep areas with water depths up to approximately 140 m. The western region of the Irish Sea is dominated by a series of troughs, which run north to south through the western side from the North Channel in the north continuing through the Western Trough to the St Georges Channel in the south. Water depths of up to 320 m are present in the deepest section of these channels located in Beaufort’s Dyke within the North Channel. To the northeast
of the North Channel lies the Firth of Clyde where the water depths decrease steadily over a rising seabed shoreward from around 100 m. No significant impacts to bathymetry are anticipated as the cables will be buried into the seabed and any cable protection that is required will be engineered with a shallow profile.

3.2.2 Seabed sediments, Geology, Geomorphology and Seabed Features

Sediments along the section of the proposed cable corridors from the landfall at Currarie Port, Ayrshire up to the mouth of the Firth of Clyde typically consist of cobbles and coarse sediment near to shore and grade from sands to fine sands and muds moving away from the shore. Within the Clyde Sea Sill sediment is typically mixed comprising pebbles, shell, gravel and sand. Further offshore into the North Channel sediments comprise cobbles, pebbles, boulders and gravel. On approach to the landfall at Portmuck South, Islandmagee the sediments consist of sands with coarser sediments and cobbles and boulders in the near shore waters.

Seabed features along the proposed cable corridors include outcropping bedrock, boulder fields, sand/pebble bedforms and overlaid ripples and trawl scars. Seabed features such as megaripples and sandwaves found along a number of sections of the proposed cable corridors are indicative of mobile sediment processes.

There are two protected sites designated for the presence of geomorphological and geological features along the proposed cable corridors: Clyde Sea Sill MPA which contains highly mobile sediments resulting in the geomorphological features sandbank ridges, ribbons and sandwave fields; and Portmuck ASSI which includes a geomorphological designating feature, a tombolo (a bar that extends outward from the shore, connecting with an island) between Isle of Muck and the mainland) and geological designating features, the best exposure of the Cretaceous Hibernian formation in Northern Ireland, the only occurrence of sodalite in Ireland and the rare mineral gobbinsite.

Direct physical effects on seabed sediments resulting from replacement cable burial and rock placement, and effects resulting from pre-sweep dredging have been appraised. The main potential impacts of concern are from disturbance or destruction of seabed morphology features in particular in the Clyde Sea Sill MPA and Portmuck ASSI.

It is unlikely that there will be an extensive requirement for pre-sweep dredging. In areas where pre-sweeping is required, natural processes can be expected to return the seabed to its previous condition within a number of months. This therefore represents a minor effect and is considered to be not significant.

Disturbance or destruction of seabed morphology and features within the Clyde Sea Sill MPA and Portmuck ASSI will be confined to a small percentage of the overall designated sites. Therefore it is unlikely that the wider physical integrity of the protected sites is at risk. The tombolo feature is located 50 m to the north of the cable route and will not be impacted.
3.2.3 Water and Sediment Quality

Water and sediment quality in the Irish Sea and North Channel is the result of a combination of the source and transport mechanisms for various chemical elements. Locally in Northern Ireland, the Larne Lough North water body which includes the Port of Larne is heavily modified due to its use as a functioning port and harbour. South of the Scottish landfall Loch Ryan is designated as a Shellfish Water by the Scottish Government.

The coastal sections of the proposed cable corridors are influenced by human activity, including farming and runoff. In addition, Beaufort’s Dyke was used as an ordnance disposal ground over a 40 year period.

Elevated concentrations of radioactivity are also present in the Irish Sea, compared with other UK waters, as a result of discharges from Sellafield and other nuclear installations.

Disturbance of seabed surface and sub-surface sediments will be restricted to within the small area of the cable installation footprint and sediment transport will be relatively localised and short term.

A pre-installation unexploded ordnance survey will be undertaken and the presence of a registered explosives and ordnance specialist during installation will reduce the likelihood of any munitions disturbance.

Routine discharges from vessels are an unavoidable part of installation activities. The possibility of an unplanned fuel release from a vessel and the resultant effect on local water quality and potential for contamination of seabed sediments is also recognised. However, employment of legal compliance measures including proper waste management and adherence to Prevention of Pollution Standards and Oil Spill Contingency Planning will aim to contain and reduce the effects of any discharge or spill.

3.3 BIOLOGICAL ENVIRONMENT

3.3.1 Benthic and Intertidal Ecology

The seabed habitats found along the majority of the proposed cable corridors comprise coarse sediments. Patches of cobble and small boulders are also frequently encountered, often mixed between coarse sands and shells. Finer sedimentary areas cover notable sections of the eastern side of the cable corridors, with sediments classified as muddy sand or sandy mud. These areas include the location of Norway Lobster (*Nephrops*) grounds.

The proposed cable corridors pass through one protected site important for benthic habitats, the Clyde Sea Sill MPA. This site is important for its coarse sediment communities. Additionally, two Annex I habitats were encountered along the routes, stony reef and bedrock reef. Areas of potential stony reef were identified in the central section of the cable route and also found adjacent to Islandmagee, where increased epifaunal diversity is noted, especially in shallower areas. A small area of shore-fringing bedrock reef was found on the Scottish side.

Potential impacts on benthic communities and species during installation are: the direct loss of benthic species and habitat; smothering from displaced...
sediment; impacts from suspended sediment dispersion and deposition; and smothering from cable protection measures. Potential impacts during operation are: habitat change due to introduction of new substrate; impacts to benthic species from electromagnetic fields produced by the operating cables and heating effects to surrounding sediment and seawater.

With the implementation of measures to mitigate these impacts, including minimisation of the marine cable installation footprint, cable burial to reduce EMF levels and heating effects, positioning the replacement cables as close as practicable to the existing cables in shallow waters to maximise EMF cancellation effect, and pre-installation survey and micro-routing to avoid the best examples of potential Annex I reef habitat impacts to benthic and intertidal ecology have been assessed as minor and not significant.

3.3.2 Fish and Shellfish

There are a wide number of fish which could be present within and adjacent to the proposed cable corridors. The majority of these species are demersal (bottom dwelling) e.g. cod, hake, sole whiting with others such as herring and mackerel pelagic (open sea dwelling). The term diadromous is used to describe fish species that migrate between rivers (fresh) and the sea (salt water). Diadromous fish likely to be within the project area include the Atlantic salmon, European eel and sea trout as well as river and sea lamprey.

The proposed cable corridors pass through the spawning grounds of eight species: Atlantic herring, Atlantic mackerel, cod, ling, plaice, Norway lobster, sprat and whiting. Atlantic herring and Norway lobster are the only demersal (lay their eggs on the seabed) spawning species. Norway lobster is the only species listed to use the area as nursery grounds which have demersal juveniles.

The term elasmobranch encompasses sharks, rays and skates and around 48 species are known to occur within UK waters. As many as 21 species could be present within and adjacent to the proposed cable corridors. Rays and skates are among the most common bottom dwelling fish. The most common to the region are the cuckoo ray, thornback ray, spotted ray and blonde ray. The nursehound is a shark common throughout coastal and shelf waters in Scotland and reported in Northern Ireland. The basking shark is also present along the coast of Scotland and Northern Ireland and undertakes seasonal migrations through the North Channel.

There are as many as 21 species of commercial shellfish that could be present within and adjacent to the proposed cable corridors. They will be most common in shallower waters close to the landfall sites, although crabs, Norway lobster, queen scallops, rugose squat lobster, scallops and whelks can be found further offshore.

Protected species which could use the area include Atlantic salmon, sea and river lamprey which are all listed on Annex II of the EC Habitats Directive. Other species which are likely to be present and are on the UK Biodiversity Action Plan (BAP) list as priority species for conservation include: Angel shark, basking shark, common skate, Atlantic halibut, whiting, European hake, ling, herring, cod, sole and plaice.

Potential impacts to fish and shellfish include the removal of habitat important for fish spawning, removal of habitat, suspended sediment and deposition...
effects on spawning and nursery areas, reduced feeding success of visual species, smothering of bottom dwelling species, routine vessel discharges, accidental spill of oil fuels, marine noise, collision of vessels with basking sharks and EMF and heating effects from the operation of the marine cables.

The area of habitat removed or disturbed under the cable installation footprint in comparison to the total available habitat in the North Channel and Firth of Clyde will be very small, and in addition the spawning and nursery areas identified within the vicinity of the proposed cable corridors are extensive, covering a large area within the region. Effects to fish and shellfish due to the removal of habitat and displacement of sediment are considered to be not significant.

There is potential for a permanent loss of spawning ground habitat for Nephrops and herring should rock protection be required in these areas. The preferred option is however for burial of the cables where possible and only in harder seabed conditions will rock protection be required. Burial of the cables should be achievable in the soft mud Nephrops grounds and can also hopefully be avoided in the lower quality herring spawning ground that the cable corridors pass through offshore of Scotland.

The presence of installation and other vessels associated with cable laying/maintenance and survey activity will only marginally increase the level of wider vessel activity expected in the vicinity of the proposed marine cable route corridor. Therefore the risk of collisions with basking sharks will only be marginally increased and is considered to be not significant.

Cable installation will generate marine noise from a number of sources, the most significant of which is that generated by dynamic positioning vessels. Mobile species which are displaced due to noise generated by cable laying activity would be expected to return to the area once cable laying operations have ended. Effects from noise are considered to be not significant.

The heat generated from the proposed marine cables will be rapidly dissipated into the surrounding marine environment, so that there will be no noticeable heating effects except in very close proximity to the cable. The marine organisms likely to be found along the cable corridors are naturally adapted to dealing with a range of temperatures including and extending beyond the temperature changes generated by the operation of the marine cables. Effects from heating effects are considered to be not significant.

Potential impacts upon the navigation and physiology of fish and shellfish species from magnetic fields cannot be ruled out. Effects would be limited to within close proximity of the cables, some are expected to be temporary and pelagic fish, in general, are thought likely to be largely unaffected. The zone of influence of the effects can be limited by burying the cables to reduce EMF levels at the seabed and maximising the EMF cancellation effect in shallow waters by laying the cables as close to the existing cables as possible in inshore areas. With these measures in place only very minor and brief effects upon navigation are expected in very close proximity to the cables, if at all.

The potential for avoidance behaviour to be elicited in demersal elasmobranch species detecting electric fields can also largely be negated by ensuring burial of the cables by laying the cables as close to the existing cables as possible in inshore areas. Confusion effects may still occur for individual sharks and rays that encounter the cables, and although the ecological significance is uncertain,
this will only be within very close proximity to the cables and not at a population level due to the limited zone of influence.

### 3.3.3 Marine and Coastal Birds

South west Scotland and Northern Ireland are known to support large numbers of nationally and internationally important seabird populations. In particular the Antrim coast and Firth of Clyde are important for breeding seabird colonies, as reflected in the designation of several cliff and island colonies as protected sites (e.g. Rathlin Island, Copeland Islands and Ailsa Craig Special Protected Areas (SPA)). It is also recognised that the marine areas used by seabirds for feeding, resting and travelling are as important as the colonies themselves.

In general the Scottish end of the proposed cable corridors appears to be of less importance to marine birds with the area of greatest importance being the inshore area off Islandmagee during the breeding season. The proposed cable corridors pass through two protected sites: the Clyde Sea Sill MPA located between the Mull of Kintyre and the Rhins of Galloway off Scotland and Portmuck ASSI located along the coastline of Islandmagee and the Isle of Muck.

A protected feature of the Clyde Sea Sill MPA is the presence of a breeding black guillemot population which is located at the northern end of the MPA over 31 km from the proposed north cable corridor. Modelling and survey data suggests the majority of foraging occurs within 2 km of the coastline where they nest therefore they are unlikely to be present within and immediately adjacent to the cable corridors.

The proposed Portmuck South landfall lies within Portmuck ASSI. The importance of this ASSI to birds specifically relates to the seabird colony on the eastern cliffs of the Isle of Muck a distance of 150 m to the north of the landfall. In the summer the Isle of Muck supports more than 2,500 breeding seabirds including razorbill, common guillemot, black-legged kittiwake, northern fulmar and black guillemot.

Other protected sites close to the Portmuck South landfall include the Gobbins ASSI, located 410 m to the south of landfall and designated for its breeding colony of seabirds, including black-legged kittiwakes, razorbills and Atlantic puffins and Larne Lough SPA, Ramsar and ASSI (3 km south-west of landfall) which supports roseate tern and common tern.

In addition to these designated sites there are three planned SPA colony extensions which if designated will protect sea areas used by SPA species of birds. They include, Larne Lough SPA planned extension, Copeland Islands SPA planned Extension and Belfast Lough Open Water SPA planned extension. These proposed sites are important for foraging tern species, evening rafting (birds assembling in flocks or ‘rafts’) Manx Shearwater, and non-breeding red-throated diver respectively.

Potential impacts to marine birds include disturbance due to the presence of construction vessels and installation plant, depletion of food resources and accidental oil or chemical spills from installation vessels.

The main potential impact is disturbance to breeding seabirds, in the nearshore region off Islandmagee. Seabirds from the Portmuck ASSI (specifically Muck Island) and the Gobbins ASSI are most sensitive to disturbance early on in the
breeding season (May-July) when there are the highest densities of birds in the area. During this period they feed and gather in waters close to the breeding colonies and may be present in aggregations on the water surface within the project area.

To reduce this physical disturbance vessels involved in installation activities will travel at a speed less than 14 knots and support vessels will be required to stay at least 200 m out from the eastern face of the Isle of Muck with another positioned at the north end of the isle to keep boats away. In addition to this an ecological clerk of works (ECOW) will be present for any works undertaken within 1.5 km of the mainland shore of Northern Ireland with the power to stop activities if necessary to reduce physical disturbance. Therefore the effects on birds due to disturbance from the presence of cable installation vessels and plant will be minor and not significant.

In the unlikely event of an unplanned release of hydrocarbon (diesel) fuel from construction vessels, the feathers of seabirds landing on the water may become contaminated with hydrocarbons, which in turn may be ingested. Seabird vulnerability to oil pollution is considered to be high during the summer months when the planned installation works are likely to take place. However, large spills as a result of total loss of containment of the fuel tank are very rare. Control measures and oil spill contingency plans will be in place and adhered to under MARPOL and a Shipboard Oil Pollution Emergency Plan (SOPEP) will be in place on each vessel which details the procedure and response required in the unlikely event of a hydrocarbon release. This will ensure there is a timely and effective response which will minimise any adverse impacts on the environment and birds in particular. Therefore this impact has been assessed as minor and not significant.

3.3.4 Marine Mammals and Reptiles

Five cetacean species are commonly found in the region surrounding the proposed cable corridors: harbour porpoise, bottlenose dolphin, short-beaked dolphin, Risso’s dolphin and minke whales. Grey seal and common (harbour) seal are also likely to be present. Additionally two reptile species may be present: the leatherback turtle, occasionally seen off the coast of Northern Ireland and north-west Scotland between July and September and the loggerhead turtle potentially present in low numbers throughout the year.

There are two SACs and one candidate SAC adjacent to the proposed cable corridors which list seals as a primary of qualifying feature for designation: The Maidens cSAC, South-east Islay Skerries SAC and Strangford Lough SAC. There are also several designated seal haul-out sites within the vicinity of the proposed cable corridors. The closest are Sanda and Sheep Island (32 km to the north) and South of Pladda Skerries (41 km to the northeast).

In recent years a number of grey and common (harbour) seals have been found with fatal ‘corkscrew’ injuries characterised by a deep laceration that starts at the head and spirals around the seals body. It is believed the injuries are sustained by impact with a ships’ ducted propeller, or some types of thrusters, which can be found on a range of vessels. To minimise risk of injury to seals the project will follow advice from the Statutory Nature Conservation Agencies which sets out recommendations for mitigation within certain distances from SACs designated for seals. The Maidens SAC falls within the distance where mitigation including avoidance of the breeding season may be required.
Other potential impacts to marine mammals and turtles include the risk of collision with installation or maintenance and survey vessels, disturbance through the physical presence of vessels, disturbance or injury to marine mammals from subsea noise generated during installation, smothering or potential toxic effects from accidental hydrocarbon or chemical spill from installation or maintenance/survey vessels and interference with cetaceans and marine turtles from the magnetic fields generated by the proposed cables during operation.

Due to the low likelihood of high speed collisions with marine mammals and turtles this impact is considered to be minor and not significant.

Due to the low frequency and short duration of noise emitted during installation the effect of disturbance or injury from subsea noise generated during installation is considered to be minor and not significant.

The low likelihood of a pollution incident occurring, in combination with appropriate spill control measures, has resulted in this impact being assessed as minor and not significant.

Considering marine mammals are predominantly pelagic with migrations strongly linked to surface waters for breathing, species are only likely to encounter the effects for EMF should they dive near to the seabed or venture into shallow waters. Owing to the rapid attenuation of the EMF with distance from the cables, combined with lack of evidence of effects upon cetaceans, it is expected these mammals will be largely unaffected by emission of magnetic fields from the replacement cables. The same is expected for marine turtles for similar reasons.

### HUMAN ENVIRONMENT

#### 3.4.1 Shipping and Navigation

A study corridor 10 nm wide was defined for the purposes of undertaking a Navigation Risk Assessment. Baseline data were collated along the proposed replacement cable routes to identify navigational features and shipping routes and densities. Larger vessels are required to have tracking systems fitted known as Automatic Information Systems (AIS). A total of three months of AIS data was used to assess the shipping activity in the vicinity of the proposed cable corridors. The AIS data was also used to assess the risk to shipping from dragged or emergency anchoring. Six weeks of summer and six weeks of winter were chosen to account for seasonal changes in shipping within the analysis.

Analysis of the data indicates that the proposed cable corridors are not notably busy for shipping. During summer there was an average of 30 unique vessels per day passing through the vicinity of the proposed cable corridors, with 40 vessels recorded on the busiest day. The most common vessel type was cargo vessels (40% of all shipping), followed by passenger vessels (18% of all shipping). In terms of length, 45% of vessels were less than 90 m in length and 17% were greater than 200 m.

An overview of shipping densities in the summer and winter data periods is provided below in Figure 3-2.
Overall the highest density of shipping passing over and adjacent to the proposed cable corridors is along the regular passenger routes between Larne and Cairnryan, Belfast and Cairnryan and a summer crossing between Larne and Troon.

**Figure 3-2: Shipping density and vessel type distribution (Summer 2013)**

Source: Anatec (2014)

Commercial routes used by tanker and cargo vessels were recorded crossing the proposed cable corridors in the western section of the route. A higher level of fishing activity was also noted in the north east section of the route.

There are two charted anchorages within the study area: at the West Maiden rock formation approximately 7.4 km to the east of the Northern Irish coast and 9.3 km north of Portmuck South landfall; and near to the mouth of Loch Ryan 3.1 km south of the southern cable route. During the AIS survey period only one vessel was seen to be anchoring within the study area in a position that could lead to cable interaction. The low level of anchoring activity seen within the vicinity of the proposed cable corridors is likely to be due to their location in the North Channel which is frequented by commercial shipping. It is also noted that the two existing Moyle Interconnector cables are currently charted on the Admiralty charts, and this will discourage vessels from anchoring nearby.

The largest port within the vicinity is the Port of Larne which is a busy commercial port equipped with a ferry terminal. The main ferry routes from Larne travel to Cairnryan and Troon on the west coast of Scotland.

The most significant recreational activity in the study area is recreational boating which takes place off the coast of Northern Ireland and Scotland. A review of recreational vessel tracks from the shipping analysis shows that the majority of recreational activity over the cable corridors occurs nearer to the Northern Ireland landfall. Vessels associated with Loch Ryan were also seen in the area at the mouth of the loch. Due to their small size, recreational vessels tend to remain close to the coast in water depths of less than 50 m.

Potential impacts during the installation phase include; disruption or displacement of shipping activity through the presence of installation vessels; a risk of collision between installation and other vessels; and a risk of accidental anchoring on unburied sections of cable. The potential effects during the operational phase include; disruption of vessel anchoring; anchor dragging and...
snagging the cable; compass deviation on ships navigating with magnetic compasses; disruption to shipping activity from the presence of maintenance, repair or survey vessels and a risk of collision between maintenance/repair/survey vessels and other vessels.

Due to the low risk of accidental events occurring and the commitment to effective mitigation measures including the use of guard vessels to communicate with third party vessels and warn them to stay clear of exposed sections of cable, good communication through Notices to Mariners and liaison with navigational stakeholders and Port Authorities the potential impacts relating to disruption and accidental collision and cable snagging are considered to be minor or negligible and not significant.

Magnetic anomalies caused by the operation of the replacement cables have potential to pose a risk only to vessels using a fluxgate controlled autopilot under sail in shallow water. The potential risk stems from a sudden and unexpected course change by the autopilot in response to magnetic anomalies induced by electric currents in the cable.

Risk to safe navigation associated with position fixing is negligible.

Vessels taking a nearshore passage are extremely unlikely to transit the cable at less than 10 m water depth. At the Northern Ireland end, any which do will be piloting through a course change to avoid the Isle of Muck and are far less likely to be vulnerable to an unexpected autopilot course deviation.

At water depths between 10 m and 22 m it is proposed that the replacement cables are laid close enough to the existing cables to illicit an EMF cancellation effect and limit compass deviation to less than 20°. At water depths shallower than 10 m, it is proposed that the replacement cables are laid as close as reasonably practicable to the existing cables but without disturbance to the existing cable protection.

A post-installation compass deviation survey will be undertaken and the results passed to UKHO for consideration of marking of any magnetic anomalies on charts. If required a cardinal mark (a buoy or other floating or fixed structure) will be placed in the sea to the east of any magnetic anomaly at Portmuck South to indicate the position of a hazard and the direction of safe water.

3.4.1.1 Commercial Fishing

Commercial fisheries operating along the proposed cable corridors have been established by undertaking desk top reviews of published information and through consultation with relevant bodies. The routes pass through important commercial fishing areas, particularly in the Firth of Clyde and off the Northern Ireland coast. Overall shellfish form the most important component of commercial fish landings in the area, both in terms of volume and value.

The most important commercial species along the proposed cable route corridors are Nephrops (Norway Lobster) and scallops. Nephrops are primarily caught using demersal (bottom) trawlers and pots, scallops are primarily caught by dredging but are also handpicked by scallop divers. Other high value species include cod, herring, lobster and hake.

Fishing techniques undertaken within the vicinity of the proposed cable route corridors include: potting, dredging, trawling and diving. Overall demersal
trawlers account for the majority of all fishing activities in the area (69%). Fishing density along the proposed corridors is shown in Figure 3-3 below.

Fishing activity in the vicinity of the proposed cable corridors constitutes 9% of the overall vessel activity in the summer and 19% in the winter. Trawlers from around the UK land into the following ports within the vicinity of the proposed cable corridors: Campbeltown and Stranraer in Scotland and seven Northern Irish ports the closest of which is Bangor.

Landings by pots are reported into four Scottish ports (Ballantrae, Campbeltown, Machrihanish and Portpatrick) and ten Northern Irish ports within the vicinity of the proposed cable corridors, of which three are considered to directly utilise the area closest to the cable corridors (Ballylumford, Larne and Islandmagee).

There is one aquaculture fishery located within the boundaries of Loch Ryan, a wild native oyster fishery which is 13 km south of the proposed south cable route corridor.

**Figure 3-3: Fishing density along the proposed cable corridors**

Potential impacts during installation include the displacement of vessels using mobile gear until post-lay burial assessments are completed, the displacement of vessels using static gear from the mobile exclusion zone around installation vessels, snagging risk of fishing trawlers and dredgers on sections of cable that may remain unprotected on the seabed for a period following installation or on cable protection rock berms or mattresses, destruction of habitat/fishing grounds within the footprint of the installation activities.

Potential impacts during operation include the displacement of fishing vessels using mobile gear, the safety risk of an exposed cable on the seabed, cable protection at crossings obstructing mobile gear and disruption to fishing activity during repairs and maintenance.
The risk of fishing vessels snagging equipment or gear on sections of cables temporarily left on the seabed prior to burial will be mitigated through exclusion of shipping vessels from within 500 m of installation operations, the use of guard vessels (with potential for using local fishing vessels as guard vessels), employment of a Fisheries Liaison Officer and provision of regular updates to the fishing community on the location of cable exclusion zones to ensure that fishing does not occur over any sections of exposed cable.

The risk of fishing vessels snagging equipment or gear on seabed obstructions created by installation of the cables, including sediment berms, trenches and anchor mounds will be reduced by having them removed or made safe for towed fishing gear.

The risk of fishing vessels snagging equipment or gear on an exposed section of a buried cable or on cable protection (rock or mattresses) will be reduced through the preparation of a cable burial plan for consultation with the fishing industry and regular post-installation inspection surveys. Cable protection will be designed to have a low profile to enable fishing gear to trawl over it and rock will be of the correct grade for the type of fishing activity. If required post cable lay ‘over-trawlability’ trials in areas of rock protection will be undertaken in consultation with the fishing industry.

### 3.4.2 Archaeology and Cultural Heritage

A desk study and archaeological assessment of existing data have been carried out in order to identify potential archaeology and cultural heritage assets that may be affected by the proposed cable route corridors and establish their current condition. This work also provided information upon which to base the assessment of archaeological potential.

For the purposes of the assessment a cable study corridor has been assessed that extends 1 km either side of the existing Moyle Interconnector cables and a Wider Study Area (WSA) with a 5 km buffer to inform the archaeological potential of the area.

At the Currairie Port landfall there is little potential for the presence of intertidal archaeological deposits, particularly given the rocky nature of this steep imposing coastline. There are few archaeological remains in the onshore area suggesting there is little potential either archaeologically (for archaeological artefacts) or palaeo-environmentally (past environmental history).

At Portmuck South landfall there is the potential for previously terrestrial (land) deposits from the early Mesolithic (archaeological period of time of past cultures approximately 9,000 – 4,000BC) to be submerged in the offshore area.

The desk based study established there are no designated wrecks or other cultural heritage assets with legal designations within the cable study corridors or in the wider study area.

There are seventeen recorded wrecks and obstructions within the cable study corridor, nine of which are known and eight that are unidentified; nine of the seventeen are live sites in that their location on the seabed has been confirmed. Of the nine known wrecks, two date from the nineteenth century, four are casualties of the First World War (WW1), one dates from the inter-war years, there is an aircraft from World War Two (WW2) and one modern recent
wreck. The dates of the remaining six wrecks and two obstructions are unknown.

Within the wider study area there are a total of 46 recorded wrecks and obstructions; 25 known wrecks, 21 of which are live; nine unidentified wrecks, eight of which are live and 12 recorded obstruction (including a bronze cannon) nine of which are live.

An assessment of the inter-tidal zones in the vicinity of the proposed landfall locations at Currarie Port, Ayrshire in Scotland and at Portmuck South, Islandmagee in Northern Ireland has shown that there are no recorded cultural heritage assets in the vicinity of either location.

Analysis of existing geophysical survey data identified 36 potential targets (possible cultural heritage assets) along the length of the proposed cable corridors, seven of which are considered to have high potential and two appear to bear the hallmarks of wreck sites. Five sites are considered of medium potential and the remaining 23 are graded as low potential.

The results of the assessment suggests that the distribution of wrecks in the vicinity of the proposed cable corridors is fairly sparse so there is ample opportunity to micro-site the replacement cables around any significant unexpected features that come to light after the pre-installation geophysical survey has been conducted.

The installation of the proposed replacement cables may have impacts upon cultural heritage assets, both in the intertidal area and offshore. Potential impacts during installation include damage/destruction to cultural heritage assets during pre-sweeping, debris clearance, trenching and cable protection activities; exposure/burial of cultural heritage assets as a result of activities which disturb sediments and contamination of foreshore/intertidal sites from a diesel or chemical spill from a construction vessel.

Mitigation of potential effects offshore will involve the implementation of a project-specific Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD), the content of which will be agreed with the appropriate regulators.

Installation impacts will be mitigated as far as possible through the establishment of archaeological exclusion zones and careful routeing of the cable around features of interest.

### 3.4.3 Other Maritime Assets and Stakeholders

#### 3.4.3.1 MOD Areas

The proposed cable corridors are located almost entirely within an area designated as a MOD Practice and Exercise Area (PEXA). These areas are used extensively by the Royal Navy.

Disruption or displacement of MoD vessels may occur as a result of the mobile 500m exclusion zone around the construction vessels. However, approval will be sought from the MOD prior to any installation, repair or maintenance activity and with control measures in place such as notice given to shipping in the area, and a method statement and risk assessment prepared and approved by
nearby ports and harbours prior to undertaking the works, the potential impacts have been assessed as not significant.

### 3.4.3.2 Disposal Sites

There are no active disposal sites located within the proposed cable corridors.

### 3.4.3.3 Cables and Pipelines

The proposed cable corridors cross one gas pipeline, three telecommunication cables and one power cable. They also run parallel to a forth telecommunication cable. MIL is in the process of negotiating formal Crossing Agreements with cable and pipeline owners. The Crossing Agreement will describe the rights and responsibilities of the parties and also the detailed physical design of the crossing. Crossing design will be in line with industry standard criteria procedures and techniques agreed with the cable and pipeline owners.

### 3.4.3.4 Tourism and Recreation

The proposed cable corridors are located in an area which is also popular for a variety of tourism and recreation activity. Currarie Port is a tranquil secluded bay with a steep shingle beach which can be accessed by coastal walkers using the Ayrshire Coastal path which passes close to the landfall.

Portmuck South is a picturesque harbour popular with visitors and Islandmagee more generally offers a wide range of activities for visitors including horse riding, walking and bird watching. The Gobbins cliff path is to be restored and is scheduled to open in 2014 and boat trips are also available during the bird nesting season (May and June to Gobbins cliffs).

A range of marine leisure activities in the wider region including sailing, sea angling, scuba diving and sea kayaking,

The impacts recreational users of the nearshore and landfall areas such as canoeists, divers and sea anglers will be temporary and localised and is not expected to result in significant disruption.

Installation of the replacement cables at the landfall sites at Currarie Port and Portmuck South will be undertaken by trenching across the respective beaches. Mechanical diggers will be used to construct a trench from low to high water. This has the potential to impact local users of the beach areas at both landfalls through displacement and restricted access to beaches. As Port Currarie is a secluded beach the risk of impact is unlikely to be significant, however there may still be temporary displacement of recreational access to the bay and beach and visual impacts to walkers of the Ayrshire Coastal Path. Experiential impacts through noise or light pollution and associated landscape impacts due to the nearshore and intertidal works will be temporary and localised and not expected to result in significant disruption or distraction to recreational activity.
3.5 **Cumulative Impacts**

Cumulative impacts are those that may result from the combined or incremental effects of the past, present or future activities. While a single activity may itself result in an insignificant impact, it may when combined with other impacts in the same geographical area, and occurring at the same time, result in a cumulative impact that is significant.

Other marine activities that already occur or are planned within and adjacent to the project area that could have cumulative impacts include existing shipping and commercial fishing, other existing and proposed cables and pipelines such as the Western Link marine cable, renewable energy developments and planned energy storage project at Islandmagee. Any cumulative effects on the physical, biological and human environment are however expected to minor or negligible and not significant.
4 SUMMARY AND CONCLUSIONS

The Environmental Report provides a comprehensive assessment of the potential impacts of the installation and operation of the proposed replacement cables and sets out proposed mitigation measures to avoid or reduce the level of impact to an acceptable level.

The package of migration measures will form the basis of an Environmental Management Plan (EMP) to be implemented in the installation and operation of the replacement cables.

Following the environmental appraisal of the residual effects on the physical, protected, biological and human environments, the following can be concluded.

- The main impacts associated with the project are predicted to be the minor temporary disturbance to the seabed during the installation, with the resultant minor effects on benthic and intertidal communities and fish species.

- The presence of the cable installation vessels will cause a temporary disturbance to fishing and shipping activity in the vicinity of replacement cable installations. The use of cable protection measures will be minimised by burial where possible and rock installation or concrete mattressing will be designed to be overtrawlable. A cable burial plan will be produced by the Contractor outlining proposed method statements and cable protection requirements for approval by the Regulator/s and discussion with fisheries stakeholders to reduce/avoid disruption to fisheries interests as much as possible. If required provision will be made for post cable lay fishing trials, using appropriately modified and tested fishing gear, over areas of cable protection in consultation with Fisheries Organisations. Effective channels of communication will be established and maintained between the appointed Contractor and commercial fishing interests. This will include the appointment of a Fisheries Liaison Officer (FLO).

- A minor, localised, but long-term effect from electromagnetic fields will be caused during operation of the replacement cables. This will cause a minor effect on the magnetic compasses of ships, fishing boats and recreational vessels as they pass directly over the marine cables, but will not interfere with navigational safety. Whilst certain fish and mammal species are sensitive to electromagnetic fields no impact to prey location, navigation or migration patterns are expected with the possible exception of localised avoidance behaviour to be demonstrated in bottom dwelling species such as skates and rays in close vicinity to the cable.

- It is also concluded that there will be no significant cumulative environmental impacts with other existing and proposed marine developments during both the installation and operation of the replacement cables. Nearshore and landfall installation works and the construction of onshore elements of the cables may have short-term and minor cumulative impacts on recreation and tourism.

- Any impacts from decommissioning activities (cable removal) will be broadly similar to those during installation. The appropriate method of cable decommissioning will be considered towards the end of the
replacement cables life. This will consider hazards presented by leaving the cables in situ and potential disturbances if removed entirely. The effects of removal are predicted to be minor and temporary in nature, and will be considered thoroughly at the time of removal.