Cross Shannon 400 kV Cable Project

Screening Statement for Appropriate Assessment and Natura Impact Statement

Produced by

AQUAFACT International Services Ltd

On behalf of

Mott MacDonald

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AQUAFACT

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1. Introduction

This Screening Statement for Appropriate Assessment and Natura Impact Statement (Screening Statement for AA and NIS) has been prepared by AQUAFACT International Services Ltd. (AQUAFACT) to accompany an EirGrid plc (EirGrid) application for statutory approval to An Bord Pleanála (ABP) and a foreshore licence application to the Department of Housing, Planning and Local Government (DHPLG) for the Cross Shannon 400 kV Cable Project (EirGrid Capital Project Reference: 0970). The line boundary of the proposed development site is shown in red in Figure 1.1.

The NIS was compiled by Dr. James Forde. James is a senior biologist with over fourteen years' experience in marine research and environmental consultancy. James has a Ph.D. in Marine Ecology and is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). James has an extensive understanding of marine ecology and a full appreciation of the objectives and mechanisms of national and international environmental legislation and policy. James' research has focused on techniques used to assess ecological impacts under European environmental legislation including the Habitats Directive (HD) and the Water Framework Directive (WFD). James' core work has focused on the implementation of European legislation including the Marine Strategy Framework Directive (MSFD), the WFD, the HD and the EIA Directive.

James has managed numerous projects that assessed environmental impacts at Special Areas of Conservation (SAC) and Special Protection Areas (SPAs) around the Irish coast. James has undertaken and prepared assessment reports to support planning applications for a wide range of coastal developments including a pier enhancement projects and coastal defence installations. James has also provided technical expertise on the EIA and AA for an offshore wind farm developments in the Irish Sea.

James has managed the delivery of regulatory support and the preparation of environmental assessments for oil and gas companies making applications to the Petroleum Affairs Division (PAD) of the Department of Communications, Climate Action and Environment (DCCAE) for approval to undertake seismic surveys, site surveys, geochemistry coring surveys and drilling operations. The environmental assessments prepared for the above projects include Stage I Screening for AA, Stage II NIS, EIA screenings, EIARs ERA reports.

1.1. Overview of the Proposed Development

The Cross Shannon 400 kV Cable Project involves the laying of a new 400 kV cable across the Shannon Estuary (in the seabed) between the Moneypoint 400 kV Electricity Substation in the townland of Carrowdotia South County Clare and Kilpaddoge 220/110 kV Electricity Substation in the townland of Kilpaddoge County Kerry. The connection at Moneypoint will be at the existing substation on ESB lands. The connection at Kilpaddoge requires an extension of 5,500m^2 to the existing substation on ESB lands.

The line boundary of the proposed development site partially overlaps the Lower River Shannon Special Area of Conservation (SAC) (Site code 002165) (NPWS 2012[1], 2013[2]) and the River Shannon and River Fergus Estuaries Special Protection Area (SPA) (Site code 004077) (NPWS 2012[3], 2015[4]); the proposed development site relative to the SAC and SPA is shown in

Figure 1.2 and Figure 1.3 respectively.

1.2. Requirement for Appropriate Assessment

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (commonly known as the Habitats Directive) is European Community legislation regarding nature conservation established to ensure biodiversity is conserved through the conservation of natural habitats and wild fauna and flora in Europe.

The requirements for "Appropriate Assessment" (AA) are set out in Article 6 of the Habitats Directive. According to the Habitats Directive, an AA is required of the implications for the European site concerned of any plan or project not directly connected with or necessary to the management of that site but likely to have a significant effect thereon, either individually or in combination with any other plans or projects prior to its approval, and to take into account the cumulative effects which result from the combination of that plan or project with other plans or projects (in-combination effects) in view of the European site's conservation objectives. European Sites include Special Areas of

[1] NPWS 2012 Conservation Objectives Series. Lower River Shannon SAC Site Code: 002165. https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002165.pdf
[2] NPWS 2013 Site Synopsis. Lower River Shannon SAC Site Code: 002165. https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY002165.pdf
[3] NPWS 2012 Conservation Objectives Series. River Shannon and River Fergus Estuaries Special Protection Area Site Code: 004077. https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004077.pdf
[4] NPWS 2015 Site Synopsis. River Shannon and River Fergus Estuaries Special Protection Area Site Code: 004077. https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004077.pdf

Conservation (SAC) designated under the Habitats Directive, Special Protection Areas (SPA) designated under Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the Birds Directive) and candidate SACs (cSACs) or proposed SPAs (pSPAs), all of which are afforded the same level of protection as fully adopted sites.

The purpose of the screening stage is to determine, on the basis of a preliminary assessment and objective criteria, whether a plan or project, alone and in-combination with other plans or projects, could have significant effects on a Natura 2000 site in view of the site's conservation objectives. There is no necessity to establish such an effect; it is merely necessary for the competent authority to determine that there may be such an effect. The need to apply the precautionary principle in making any key decisions in relation to the tests of AA has been confirmed by the case law of the Court of Justice of the European Union (CJEU). Plans or projects that have no appreciable effect on a European site may be excluded.

This Screening Statement for AA and NIS has been prepared to inform the AA determination of the competent authorities.

1.3. Structure of this Report

The content of this report is as follows:

- Section 2: Screening for Appropriate Assessment
    - Section 2.1 Management of the European site(s)
    - Section 2.2 Description of the Proposed Development
    - Section 2.3 Characteristics of the European site(s)
    - Section 2.4 Screening Outcome
- Section 3: Natura Impact Statement
    - Section 3.1 Summary of Screening Outcome
    - Section 3.2 Description of the Proposed Development
    - Section 3.3 Description of Receiving Environment
    - Section 3.4 Impact Prediction
    - Section 3.5 Potential for Adverse Effects on Site Integrity
    - Section 3.6 Mitigation
    - Section 3.7 Outcomes

1.4. Guidance

This report has been prepared in accordance with the following guidance:

- EC (2018) Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive 92/43/EEC Commission Notice (2018);
- DEHLG (2009) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (Revised 2010);
- EC (2001) Managing Natura 2000 Sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC; and
- Department of Arts, Heritage and the Gaeltacht – National Parks and Wildlife Service DAHG - NPWS (2012) Marine Natura Impact Statements in Ireland Special Areas of Conservation, A Working Document.

This assessment includes a desk-based review of available records of protected species and habitats including the following sources:

- Conservation Status Assessment Reports, Backing Documents and Maps prepared to inform national reporting[5] required under Article 17 of the Habitats Directive;
- Site Synopsis, Conservation Objective Reports and Natura 2000 Forms available from NPWS;
- Published and unpublished NPWS reports on protected habitats and species including Irish Wildlife Manual reports, Species Action Plans, and Conservation Management Plans; and
- Existing relevant mapping and databases e.g. waterbody status, species and habitat distribution etc. (sourced from the Environmental Protection Agency - http://gis.epa.ie/, the National Biodiversity Data Centre - http://maps.biodiversityireland.ie and the NPWS - http://www.npws.ie/mapsanddata/.

1.5. Consultation

Prior to the preparation of this Screening Statement for AA and NIS consultations were carried out with the National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht (DAHG), the Irish Whale and Dolphin Group (IWDG) and Inland Fisheries Ireland (IFI). All responses received have been taken in to account in the project construction programme.

[5] The most recent Article 17 report (2019) is available at https://www.npws.ie/publications/article-17-reports/article-17-reports-2019

AQUAFACT undertook consultations with NPWS. As part of the consultations, a meeting was held with Dr. David Lyons to provide a brief on the proposed development and to seek advice. The NPWS consultation process informed the identification of the ecological constraints and sensitivities of the habitats and species in the area. The habitats and species of concern are detailed in Section 3.3.Mott MacDonald undertook consultations with IFI. IFI advised that key considerations should include sediment mobility, water quality and the zone of passage of migratory fish. IFI also sought clarification on the proposed biosecurity measures proposed for the development and pollution preventative controls (i.e. biohazard management). To inform the assessment of effects due to sediment mobility and water quality sediment, modelling was undertaken for the proposed development. Biosecurity measures and pollution preventative controls for the proposed development are detailed in Section 3.6. It should be noted that mitigation measures were not considered in the consideration of effects that were undertaken for the Screening for AA.

Figure 1.1: Project Location.

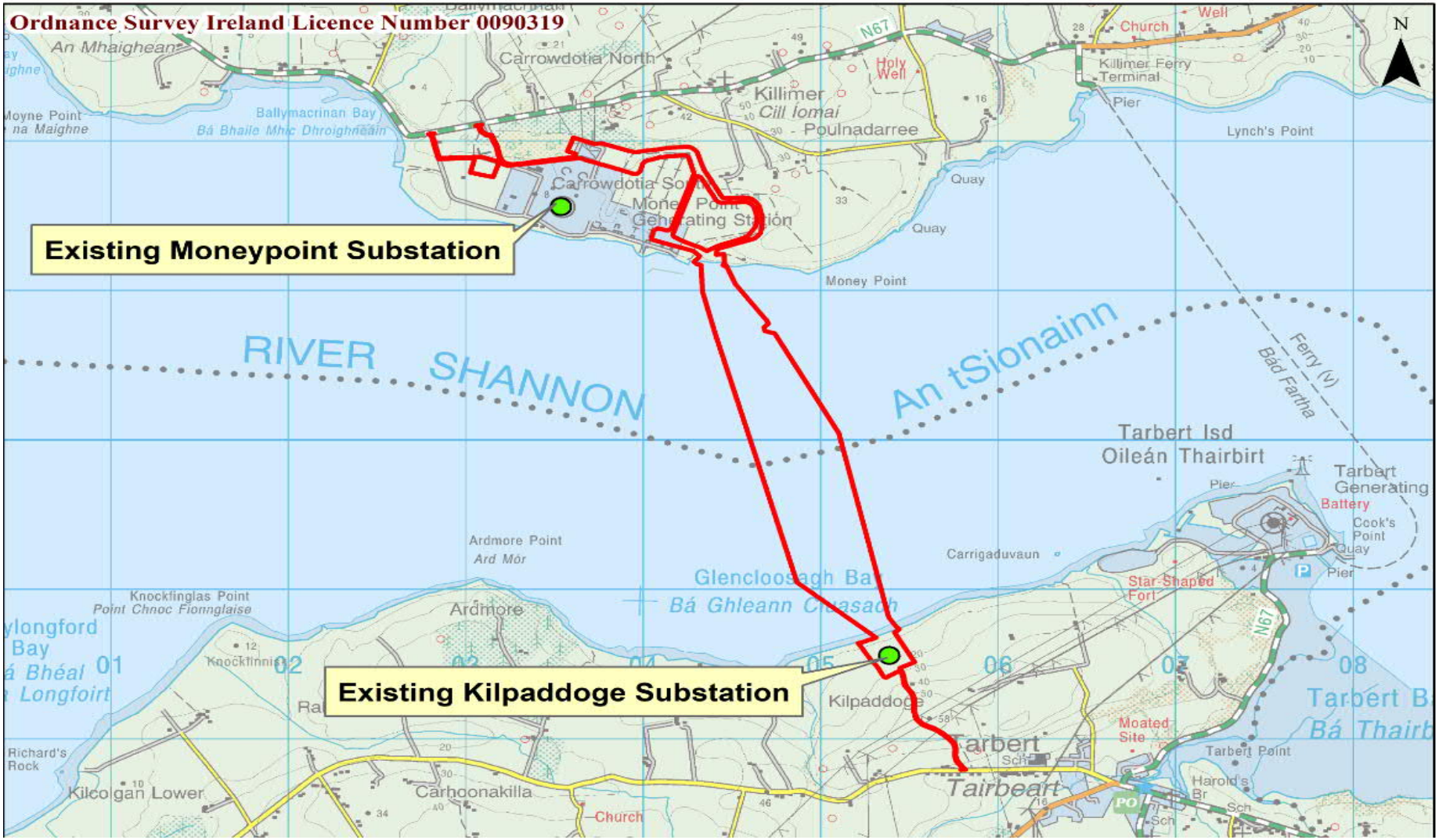


Figure 1.2: The site of the proposed project relative to the Lower River Shannon SAC.

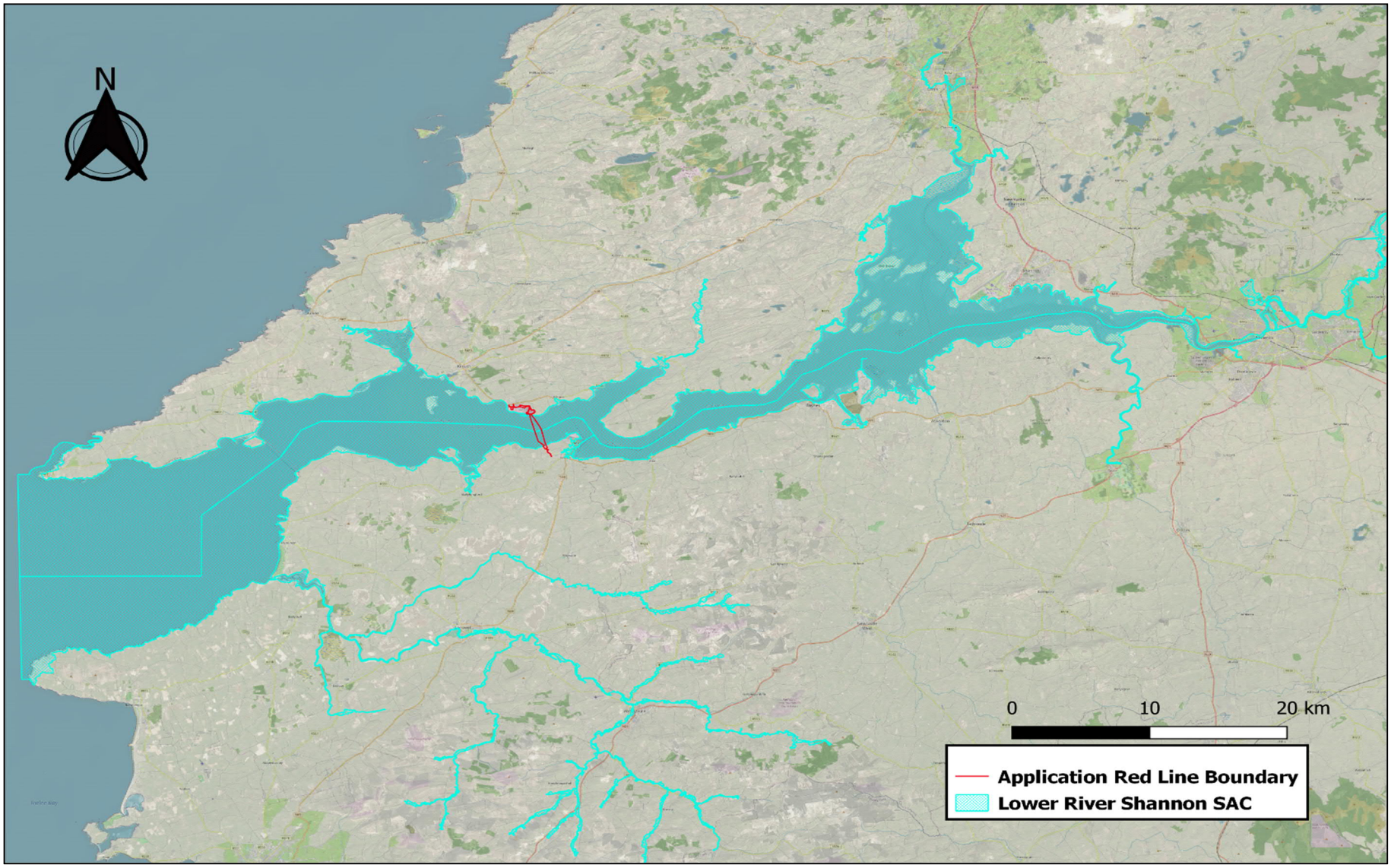
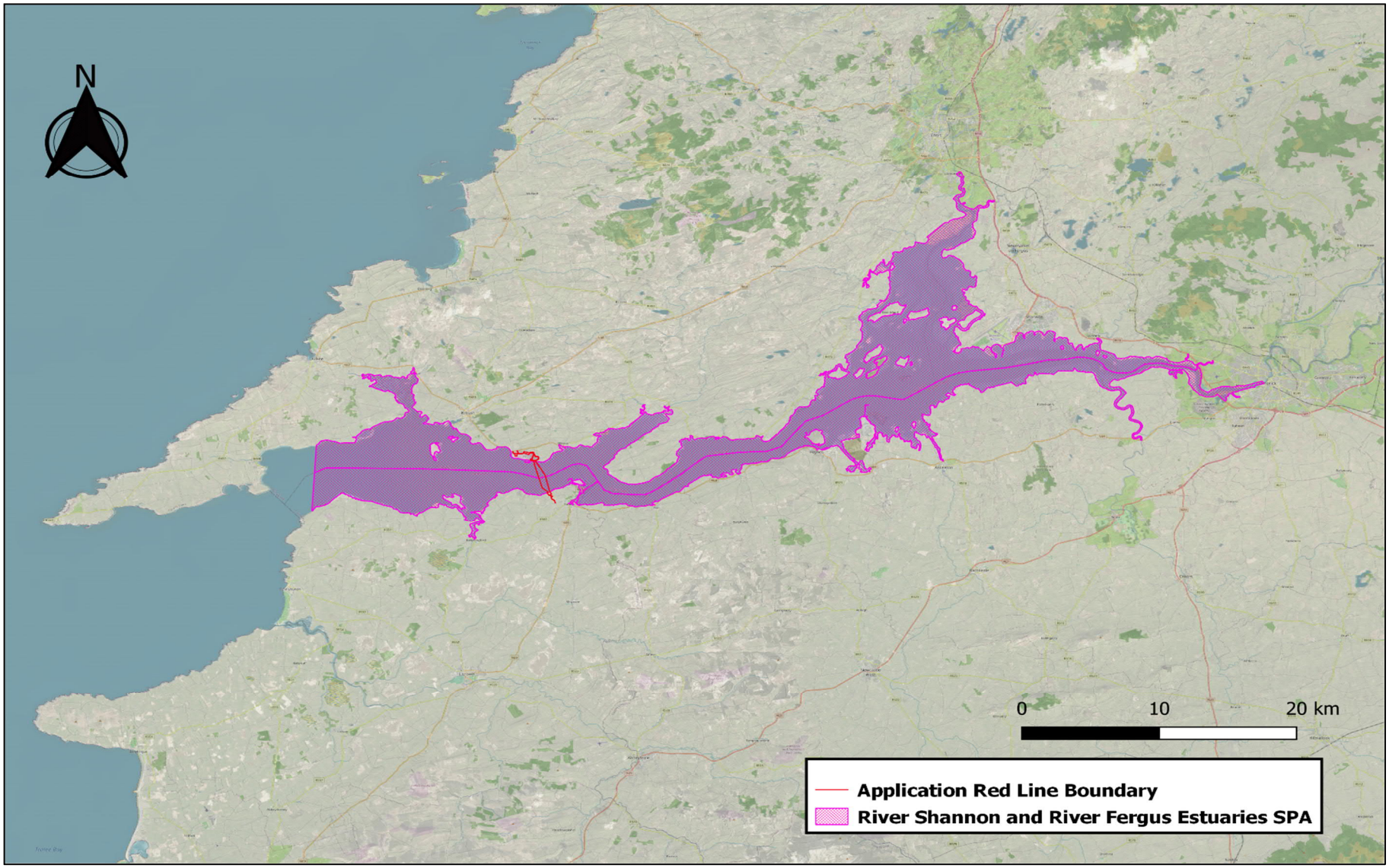


Figure 1.3: The site of the proposed project relative to the River Shannon and River Fergus Estuaries SPA.



2. Screening for Appropriate Assessment

2.1. Management of European Site(s)

Part XAB of the Planning and Development Act 2000 (as amended) requires that for onshore developments requiring development consent a screening for appropriate assessment of the proposed development and, if necessary, an AA be carried out, while under the 2011 Birds and Natural Habitats Regulations all competent authorities are required to conduct a screening for AA and, if necessary, an AA on any plan or project for which it receives an application for consent including an application for a foreshore licence. The obligation to undertake AA under the Part XAB of the Planning and Development Act 2000 and the 2011 Birds and Natural Habitats Regulations derives from Article 6(3) of the Habitats Directive. Regulation 42 (1) of the 2011 Regulations requires that:

> A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site.

The proposed project is not directly connected with or necessary to the management of European sites within the Natura 2000 Network having regard to Article 6 of the Habitats Directive, and as such it is appropriate that the proposed project is subject to a screening for AA. This screening assessment investigates, in view of best scientific knowledge, whether the proposed project, individually or in combination with other plans and projects, would be likely to have a significant effect on European sites.

As outlined in Section 1.1, this Screening Statement for AA and NIS, which has been prepared to address Article 6(3) obligations of the Habitats Directive and associated national legislation, focuses on the potential effect to European sites associated with the proposed project. Section 2.2 below describes the proposed project while Section 2.3 considers the likelihood of significant effects of the project on European sites both in individually and in combination with other plans and projects.

2.2. Description of Project

2.2.1. Introduction

The proposed project has been developed through an iterative process which involved seeking to avoid or reduce potential environmental effects through assessment of alternatives in accordance with EirGrid's Six Step Framework Process. Specifically, in Step 4 of EirGrid's Framework ('Where Will We Build'), following public consultation and a multi-criteria assessment[6], EirGrid identified the route of the proposed development as the Best Performing Option. The proposed development comprises 3 main elements:

Connection of a 400 kV UGC Installation at the Moneypoint 400 kV Electricity Substation (Co. Clare), including:

- the laying of 3 no. 400 kV UGC [approx. 1.8 kilometres (km) each] between the existing Moneypoint 400 kV Electricity Substation and 3 no. land-submarine transition joint bays located east of the existing Moneypoint Generation Station. The UGC will be installed by standard trenching and includes the provision of 3 no. joint bays along their length and the associated provision, upgrading and/or extension of existing internal access tracks to provide operational vehicular access.
- the provision of 4 no. land-submarine transition joint bays located east of the existing Moneypoint Generation Station to connect the land cables to submarine cables (this arrangement also includes a land-submarine transition joint bay for the spare submarine cable).

Laying of 400 kV Submarine Cables across the Lower Shannon Estuary, including:

- the laying of 4 no. 400 kV submarine cables (approx. 2.8 km each) from the proposed land-submarine transition bays located east of the existing Moneypoint Generation Station in Co. Clare across the Lower Shannon Estuary to the proposed 400 kV Air Insulated Switchgear (AIS) Compound at the existing Kilpaddoge 220/110 kV Electricity Substation in Co. Kerry. The submarine cables will be installed by standard submarine installation techniques, which primarily involves them being buried in the seabed.
- the installation of communication links between both substations, this will take the form of a fibre optic cable that will be integrated into each of the proposed 400 kV cables.
- The installation of fibre optic cables for maintenance and cable monitoring, this will take the form of an armoured fibre cable wrapped helically around each of the proposed 400 kV cables.
- Associated works in the foreshore include the reinforcement of the ground beneath and around the cables by various methods including concrete ramps, concrete cable channels, infilling with gravel/concrete, articulated pipes, gabion wall and rock protections where required.

Connection of a 400 kV UGC Installation and substation extension at the Kilpaddoge 220/110 kV Electricity Substation (Co. Kerry) including:

[6] http://www.eirgridgroup.com/the-grid/projects/cross-shannon-cable/related-documents/

- the laying of the 4 no. 400 kV UGC [approx. 51 metres (m) in length] from the southern foreshore of the Lower Shannon Estuary, to a proposed extension (approx. 5,500 m^2) to the north of the existing Kilpaddoge 220/110 kV Electricity Substation.
- the provision, within the proposed substation extension, of a 400/220 kV AIS compound, containing electrical equipment and apparatus to connect the submarine cables to the existing Kilpaddoge 220/110 kV Electricity Substation including the following:
  - 9 no. surge arrestors (approx. 7.9 m high);
  - 6 no. cable sealing ends (approx. 7.4 m high);
  - 1 no. 400 / 220 kV transformer (approx. 8.9 m high);
  - 9 no. post insulators (approx. 9.8 m high);
  - 1 no. disconnector (approx. 8.6 m high);
  - 9 no. instrument transformers (approx. 7.6 m high);
  - 3 no. circuit breakers (approx. 7.5 m high);
  - 5 no. lightning protection masts (approx. 25 m high);
  - a control building (approx. 14.6m x 6.6m x 4.6m high);
  - an associated access track (approx. 155 m in length and 5 m in width);
  - 12 no lighting poles (approx. 9 m high);
  - 3 no. 220 kV UGC (approx. 151 m in length);
  - The AIS compound will be enclosed by a palisade fence (approx. 2.6 m in height).

The proposed development includes all associated and ancillary development, including communication links, temporary construction compounds, temporary construction tracks, site development, landscaping works and vegetation removal. Access to the existing electricity substations will be retained from their existing entrances onto the N67 Road in Co. Clare and the L1010 Tarbert Coast Road in Co. Kerry. ESB Moneypoint Generation Station is licensed by the Environmental Protection Agency (EPA) under an Industrial Emissions (IE) Licence (Ref: P0605-04).

The proposed development includes works located within ESB Moneypoint Generation Station which is an Upper-tier establishment to which the Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (the COMAH Regulations) apply. Article 215 of the Planning and Development Regulations 2001 (as amended) applies to this development.

A Foreshore Licence is separately required to be obtained in respect of this proposed development .

All construction lighting will be placed strategically under the supervision of the EnCoW to ensure there is no light spill on potential bat roosting sites or important foraging sites at the Moneypoint location. All lighting will be positioned away from the River Shannon. Lighting will be cowled and directional to reduce light spill within the area. Low pressure sodium or LED luminaires should be used. No luminaires with UV elements should be used. Column heights should be carefully considered to minimise light spill but Bat Conservation Ireland recommend a maximum height of 8m.

The following sections describe the proposed development under the following headings:

- Onshore activities (see Section 2.2.2)
  - Connection at Moneypoint 400 kV GIS Station; and

- Connection at Kilpaddoge 220 kV GIS Station;
- Submarine/River Shannon Crossing (Section 2.2.3); and
- Construction Phase Activities (Section 2.2.4).

2.2.2. Onshore Activities

2.2.2.1. Connection at Moneypoint 400 kV GIS Station

Location and Access

Moneypoint Electricity Generating Station is an existing operational coal fired power station which consists of three generators to produce electricity to supply the main transmission network. In addition to the three generators, the power station comprises high voltage (HV) electrical infrastructure, associated ancillary process plants, an extensive coal yard and ash storage area connected by a network of internal access roads. Various underground services are routed within this road network and throughout the extent of the site. There are also five wind turbines located around the perimeter of the complex with associated underground cable systems connected into the electrical infrastructure on site.

Moneypoint 400 kV substation is a Gas Insulated Switchgear (GIS) type substation and is located inside the existing operational Moneypoint Electricity Generating Station. The substation is the marshalling point for the electricity, and it acts as a node on the transmission network.

The proposed development will terminate with a cable connection at an existing spare bay in Moneypoint 400 kV GIS Substation. The outdoor cable trench will run to the outside wall of the GIS building and the ducts will enter the cable basement via an existing opening. The cables will then be routed through the basement to terminate at the allocated spare bay.

Both the temporary construction and operational access will be provided via the existing Moneypoint Electricity Generating Station and via existing established tracks within ESB lands. A temporary laydown area and welfare facilities will also be provided within the existing Moneypoint Electricity Generating Station complex, a smaller laydown area will be provided at the northern landfall located within ESB lands. Ancillary car parking will be provided within the GIS compound area.

The area was also searched for evidence of invasive plants species listed in Part 1 of the Third Schedule of S.I. No.477a of 2011 European Communities (Birds and Habitat Regulations). None were recorded within the proposed development area..

Figure 2.1: Moneypoint 400 kV GIS Substation Building

Source Mott MacDonald

Moneypoint Landfall and Access

The landfall is the location where the submarine cable is brought ashore. The landfall comprises concrete cable troughing, associated civil works and transition joint bays. The joint bays encloses the connections made between the land-based cables and the submarine cables.

The proposed northern landfall is located to the south of the main coal yard / ash storage area within Moneypoint Electricity Generating Station. The proposed landfall is located east of the existing Moneypoint-Kilpaddoge 220 kV cable landfall. The alignment of the route can be seen on drawing 229379408-MMD-00-XX-DR-E-1000 and is reproduced in Figure 2.2. The overall estimated land route length is approximately 1.8km.

The transition area, comprising four individual transition joint bays, each with the approximate footprint of 10m (length), 2.5m (width) and 2m (depth). This arrangement also includes a land-submarine transition joint bay for the spare submarine cable. An indicative design for a typical jointing bay prior to reinstatement is shown in Figure 2.6. During construction the landfall area will require access for equipment associated with the construction and cable installation.

The jointing bays will be constructed with concrete floor and sidewalls. Once the cables are connected to the relevant joints within the jointing bay, compact cement-bound sand is put into the bay to surround the cables and joints. Additional sand and excavated material is then backfilled into the bay and the bay is subsequently covered over. An example of the landfall following completion of the works is provided in Figure 2.7.

The geology of the nearshore approaches / intertidal area will determine how the cable will be installed into the transition joint bay. Usually, the cable is brought ashore by an open cut trench requiring access for excavation equipment. Where a rock shelf is present, further civil works will be required, taking the form of gabion bags filled with stone and revetments to support the approach by securing and protecting the cable installation. Cylindrical metallic cable protectors will also be installed as necessary at these locations to provide mechanical protection to the cables.

Temporary construction access will be created via the existing agricultural entrance along the local unnamed road. A temporary surface will be provided, approximately 5m in width, comprising granular stone material with passing bays provided as required. Permanent access will be from the west with a new track from the location of the existing 220kV transition joint bays.

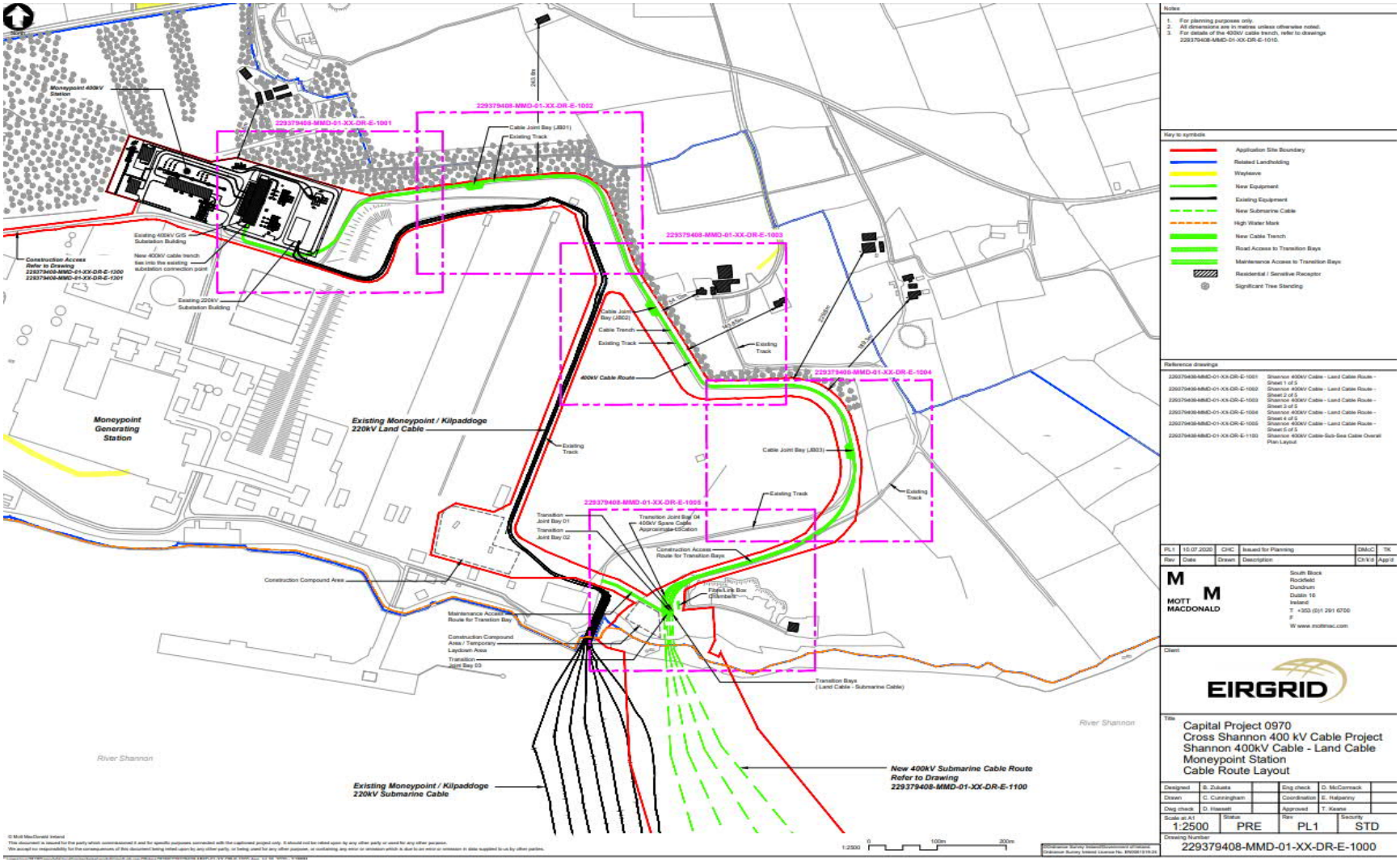
The transition joint pit will be installed to the east of the existing Moneypoint-Kilpaddoge 220 kV cable transition joint bay.

The proposed cable route will head north from the proposed landfall, turn north-east for approximately 280m along third-party land before joining the access road which is elevated and skirts the perimeter of the ash depository and the power station. This route continues north / north east along the road and then turns west towards the 400 kV substation when it inclines and joins on to another access road which runs in front of the substation compound. This access road is approximately 5m wide and comprises mostly made ground with rock and gravel fill.

A desktop assessment of the buried services along the identified route was carried out. The main services along this route were identified at the landfall and approaching the substation. There are minimal services within the elevated access road.

The cable route runs parallel to the Kilpaddoge-Moneypoint 220 kV cable circuits on approach to the substation. It then crosses these cable circuits before entering the 400 kV GIS building. Three precast concrete joints bays will be installed along the cable route during these works at approximately 700m distance internals. The approximate footprint of each is 10 m (length), 3m (wide) and 2m (deep).

Figure 2.2: Land Cable Route Moneypoint Station Overall Layout



Source: Black Route: Existing 220kV cables. Green Route: Proposed 400 kV cables

2.2.2.2. Connection at Kilpaddoge 220 kV GIS Station

Kilpaddoge station is a relatively newly constructed 220 / 110 kV GIS substation to the south of the Shannon Estuary in County Kerry.

Kilpaddoge station is the new bulk supply point in North Kerry. When developing the station EirGrid designed it in such a way as to allow for possible future development or extension if a future project need was to arise. It is standard procedure to reserve enough land when establishing new substations, especially if they are intended for bulk supply points. The area north of the station, between the constructed 220 kV GIS building and the foreshore, has been reserved for development.

The proposed extension at the existing Kilpaddoge substation will be required to facilitate the new AIS equipment and compound. The proposed site comprises a rectangular area of ground on the northeast extent of the existing substation. Access to the site will be provided via a new internal access track along the eastern boundary. The footprint of the proposed extension will require clearing and levelling. The existing ground levels on the site are currently between 6m and 17m AOD. It is expected that the site will be elevated to between 17m and 10.0m AOD. A separate maintenance access will be provided to the proposed transformer located at the southern extent of the site.

The AIS compound will be surfaced with permeable stone with an area of hardstanding along the internal access road.

In order for the 400 kV cable circuit to connect to the station at Kilpaddoge a power transformer is required. This transformer is a piece of outdoor electrical plant that is used to change the system voltage from 400 kV to 220 kV, which is the operating voltage at Kilpaddoge. Since the transformers main insulating medium is mineral oil, the transformer will be located within a bund. The approximate overall footprint of the transformer and bund is 25m x 10m. Prior to connecting to the transformer, the 400 kV cable is connected through switchgear and measuring devices to allow the circuit to be switched off for maintenance or for a circuit fault.

The transformer converts the voltage from 400 kV to 220 kV and a cable connection is required on the 220 kV side to connect the transformer to an existing bay in Kilpaddoge substation. For this cable connection, the outdoor 220 kV cable trench will run right up to the outside wall of the GIS building and the ducts will enter a cable basement located below the outdoor final ground level. The cables can then be routed through the basement in air to terminate at the allocated spare bay.

The cable design within the Kilpaddoge 220 kV substation compound has considered existing buried HV cables, other buried services and existing items of electrical plant. There is an existing stormwater network on site which will be required to be rearranged in order to accommodate the proposed

Air Insulated Switchgear (AIS) equipment and compound layout. The existing drainage network discharges to the Shannon via an outfall pipe.

Proposed Structures at the Kilpaddoge Substation

An extension to the existing Kilpaddoge Electrical Substation of approximately 5,500m^2 will be required to facilitate new 400 /220 kV AIS equipment and associated compound. As set out on the relevant drawings accompanying this application for approval, the key components comprise;

- 400 kV Cables
- Cable Sealing Ends
- Surge Arresters
- Instrument Transformers
- Circuit Breakers
- Disconnectors
- 400/220 kV Transformer
- 220 kV Cables

The 400 kV AIS bay and transformer will be situated to the northeast of Kilpaddoge substation. Since the substation is elevated, this area is sloped, so civil works will be required to fill and either level or grade off the area for installation of the equipment. The equipment and compound will be enclosed by a palisade fence of approximately 2.6m in height. The proposed extension is located wholly within ESB lands. Access to the substation will be from its existing entrance onto the L1010 Tarbert Coast Road. A new internal access road of approximately 155m will be required within the compound.

A lighting plan has been designed in accordance with EirGrid's functional specification requirements. 12no. lighting poles approximately 9m high. Directional light fittings have been incorporated within the plan in order to minimise light pollution in the surrounding area.

Five lightning protection masts approximately 25m high are required to be installed within the compound. The locations of outdoor equipment are detailed by reference to Planning Drawing Number 229379408-MMD-01-XX-DR-E-1200 (see Figure 2.3). The dimensions of the proposed structures and compound site are summarised below.

Table 2.1: Approximate Dimensions of The Control Building And Over Ground Structures

Structure	Number of Structures	Length (m)	Width (m)	Height (m)
Control Building	1	14.6m	6.6	4.6
Lighting poles	12	n/a	n/a	9
Lightning protection masts	5	n/a	n/a	25
220 kV Cables	3	151		
220 kV Surge Arrestors	3	n/a	n/a	6.3
220 kV Cable sealing ends	3	n/a	n/a	6.4
400 / 220 kV Transformer	1	n/a	n/a	8.9
400 kV Surge Arrestors	6	n/a	n/a	7.9
400 kV Post insulators	9	n/a	n/a	9.8
400 kV Disconnector	1	n/a	n/a	8.6
400 kV Instrument Transformers	9	n/a	n/a	7.6
400 kV Circuit Breakers	3	n/a	n/a	7.5
400 kV Cable Sealing Ends	3	n/a	n/a	7.4
400 kV Cables	4	2800	n/a	n/a

Southern Land Cable Route

The proposed 400 kV cable circuit will run south from the southern landfall to the existing Kilpaddoge 220 kV GIS substation via a 400 kV AIS bay and a 400 / 220 kV power transformer. The proposed landfall is located approximately 60m north of the existing substation. The alignment of this route can be seen on drawing 229379408-MMD-XX-DR-E-1200 and reproduced in Figure 2.3 below. The proposed route occurs entirely within ESB lands.

From the 220 kV side of the transformer the 220 kV cable will run south, cross the Kilpaddoge – Tarbert 1 & 2 220 kV circuits and then turn west and finally north towards the 220 kV substation. The 220 kV cable route will cross an existing 110 kV cable circuit and existing buried ducts at the front of the substation building. Adequate space between these circuits will be achieved to mitigate any derating effects on the circuits.

Figure 2.3: Kilpaddoge 400kV AIS Substation Overall Plan Layout

Source Planning Drawing ref: 229379408-MMD-01-XX-DR-E-1200

2.2.2.3. Land Cable Design

The grid connection is accommodated by using High Voltage (HV) underground cables. A one cable per phase design is proposed as this achieves the required rating of 1210MVA at 400 kV. EirGird ensure that when planning new infrastructure, a sustainable balance is achieved between cost, system security and reliability, and social and environmental impact. To this extent sufficient spare capacity will be accommodated in the design of the proposed submarine able whilst maintaining this balance based on best available data. The proposed arrangement uses the largest cable size currently available in the market. The rating of the cable is 1210MVA, but the connection will only initially operate at 500MVA. This allows 710MVA for future use

The cable comprises a single core copper conductor, and the cable size proposed for the required power transfer capacity has a cross sectional area of 2,500mm^2. This conductor is typically surrounded by a triple-extruded, dry-cured, crosslinked polyethylene (XLPE) insulation screen. Extruded over this screen is a sheath, which depending on the application can be made of lead, aluminium or copper.

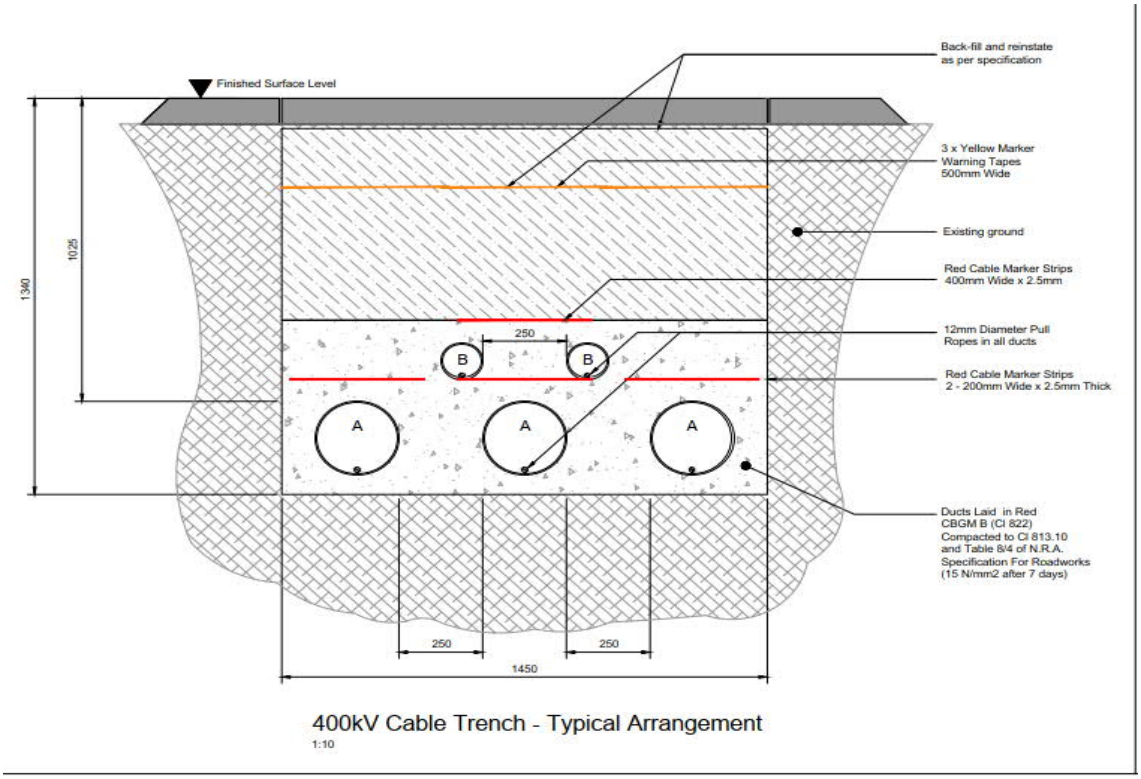
Figure 2.4: Indicative Land Cable Design

Source: Mott MacDonald

A cable connection will require a specific type of trench for the circuit. The trench will be approximately 1,450mm wide and 1,340mm deep, which is based on an EirGrid standard trench profile with an increased phase separation of 500mm centre to centre to achieve the required rating. The trench will contain three plastic ducts that will be laid in a flat formation at the bottom. Three power cables, one cable per phase, will be pulled into these ducts following completion of the civil works. The standard

trench configuration has a further two smaller diameter ducts for communication /fibre optic cables that are located above the three power ducts. A typical 400 kV trench section is shown Figure 2.5.

Figure 2.5: Typical trench Cross Section



Source: Mott MacDonald

Figure 2.6: Typical Transition Joint Bay Before Final reinstatement

Source: Mott MacDonald

Figure 2.7: Typical Transition Joint Bay following final reinstatement

Source: Mott MacDonald

2.2.2.4. Installation activities

The construction works for the 400 kV cable route will comprise the following main activities:

- Cable trench excavation;
- Removal of ground material;
- Installation of trench supports;
- Installation of ducts;
- Installation of concrete;
- Reinstatement of trench; and
- Installation of precast joint bays.

The above works can be carried out on a phased basis with the work area confined to a specific location along the cable route (i.e. the full cable route does not need to be excavated all at once).

Three precast concrete joints bays will be installed along the cable route during these works at approximately 700m distance internals. The approximate footprint of each is 10 m (length), 3m (wide) and 2m (deep).

Following the installation of the cable ducts and the joint bays, cable drums will be positioned at the joint bays and the cables will be pulled through the ducts with a winch. The cable ends will then be connected together in the joint bays with the final connection being made in the basement of the existing 400 kV GIS substation.

2.2.2.5. Commissioning and Operation

Commissioning will require electrical testing of the cable circuits, verification of cable connections and associated fibre optic cables.

Following commissioning and energisation, the cable circuits will be maintained by ESB personnel. Maintenance works will be largely limited to annual electrical tests on the cable screens and inspection of link boxes located at the joint bays.

2.2.2.6. Decommissioning

Subject to the granting of statutory approval, it is expected that the proposed connection to both Moneypoint 400 kV GIS Substation and Kilpaddoge 220 / 110 kV Substation will remain a permanent part of the national electricity transmission network and will be refurbished and / or redeveloped as required rather than be decommissioned. Both Moneypoint 400 kV GIS Substation and Kilpaddoge 220 / 110 kV Substation have only been recently commissioned and have design lives of approximately 40 years. Given the current highly unlikely scenario of decommissioning of this proposed transmission infrastructure, this matter is not addressed further.

2.2.3. Submarine / River Shannon Crossing

2.2.3.1. Location and Access

The Shannon Estuary is approximately 100km in length and has a tidal range of approximately 5m during spring tides. Therefore, there is a large discharge of water volume in a relatively short period. Tidal currents can reach peak velocities of 6 knots during the ebb tide. The new 400 kV submarine cable route runs from a landfall adjacent to the Moneypoint Electricity Generating Station on the north side of the Shannon Estuary to a landfall at Glencloosagh Bay, directly in front of Kilpaddoge substation on the south side. The overall estimated submarine cable route length is approximately 2.8km. The proposed submarine cable corridor between the Mean High Water Mark (MHWM) on each shoreline (for which this application for grant of consent is applied for) is approximately 0.737km^2.. A communication link will also be provided between both substations, this will take the form of two fibre optic cable laid alongside or integrated into the proposed 400 kV cables. Environmental constraints, including the archaeological potential within the study area, were considered in parallel with the design optioneering process in determining the proposed route corridor.

As part of the project development process, design mitigation measures have been put in place in order to design out significant impacts. For example, the proposed submarine route corridor will avoid impact with recorded marine anomalies and known archaeological features identified on the landfalls as part of the archaeological assessment. Further details on the archaeological impact assessment are set out in Chapter 11. A preliminary UXO [7]risk assessment and non-intrusive magnetometer survey were also carried out for the proposed route corridor (Dynasafe, 2017) and the corridor was determined to be a low risk

Figure 2.8 shows the proposed alignment of the submarine cable route... The actual width of the corridor required to facilitate the installation will be subject to final detail design, this will allow optimisation of the final laid submarine cables having regard to the post consent engineering and environmental surveys carried out in advance of installation.

The riverbed varies along the proposed route alignment from fine to coarse gravelly sand to fine sand. The gravelly clay is limited to the near shore areas. The proposed installation techniques are suitable given the sediment conditions encountered along the corridor.

[7] **Unexploded ordnance** (**UXO**, sometimes abbreviated as UO), unexploded bombs (UXBs), or explosive remnants of war (ERW) are explosive weapons (bombs, shells, grenades, land mines, naval mines, cluster munition, etc.)

Figure 2.8: Proposed Alignment of the submarine cable route

Source: Mott MacDonald

Detailed environmental marine surveys and ground investigations including bathymetric, geophysical, geotechnical works and sediment modelling were carried out to understand the baseline offshore geology, soils, hydrodynamics and coastal processes. These were reviewed to inform the alignment of the proposed submarine cables.

For the purpose of the description of the cable installation, chainage is the horizontal distance as measured along straight lines between two points. The beginning denoted by KP 0.0 at Moneypoint and ending denoted by KP 2.8 at Kilpaddoge. The maximum water depth reaches 58 m CD, at the centre of the Shannon Estuary, east of the Bridge feature, at approximately Chainage KP 0.95. Maximum slope angles are up to 15 degrees, mostly confined to the northern half of the route. The maximum slope angle is found close to KP 0.8.

Based on the preliminary burial risk assessment and the results of the marine surveys approximately 1,000m of additional protection is identified as required at the approach to northern landfall, near the centre of the channel and southern landfall.

Local rock supplies would be used as the priority but imported rock may be necessary. In either case it would be common practise that the rock grade, quality etc is screened and tested such that it meets the design specification as defined at the detailed design stage. A rock specification will ensure that fines are removed and rock is washed if necessary. As outlined in Section 3.6 Mitigation clean (washed) rock material will be used as rock protection to minimise the risk of introducing fine materials.

All plant and equipment (excluding vessels) will be cleaned and disinfected in advance of coming to site and post works in accordance with IFI Biosecurity Protocols (see Section 3.6 for further details on IFI Biosecurity Protocols to be implemented). All operatives will be briefed on IFI Biosecurity Protocols, and all disinfection / cleaning of plant and equipment must be witnesses by the EnCoW or said plant / equipment will not be permitted onto the site. Vessels travelling from outside of Irish waters will be required to have a certified Ballast Water Management System.

Typical cross sections at the approach to the landfall at each side of the estuary are shown in Figure 2.9 and Figure 2.10. A plan layout of each landfall approach is provided in the accompanying planning drawings and a plan view of the proposed landfall location reproduced in Figure 2.11 and Figure 2.12.

A typical cross section at the midpoint along the route alignment is shown Figure 2.13.

Figure 2.9: Section of Submarine Route alignment at the Northern Landfall approach (Ch. 150)

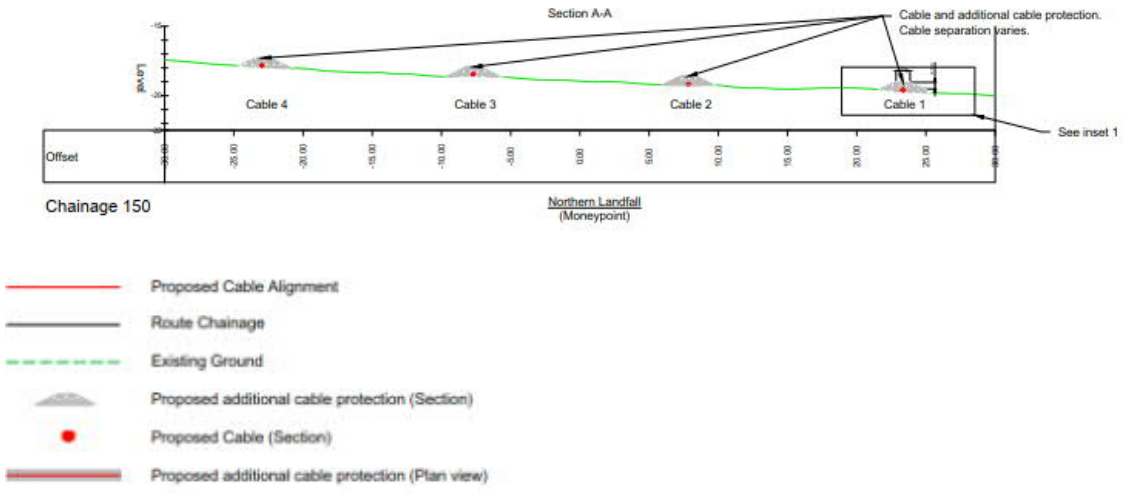


Figure 2.10: Section of Submarine Route alignment at the Southern Landfall approach (Ch. 2750)

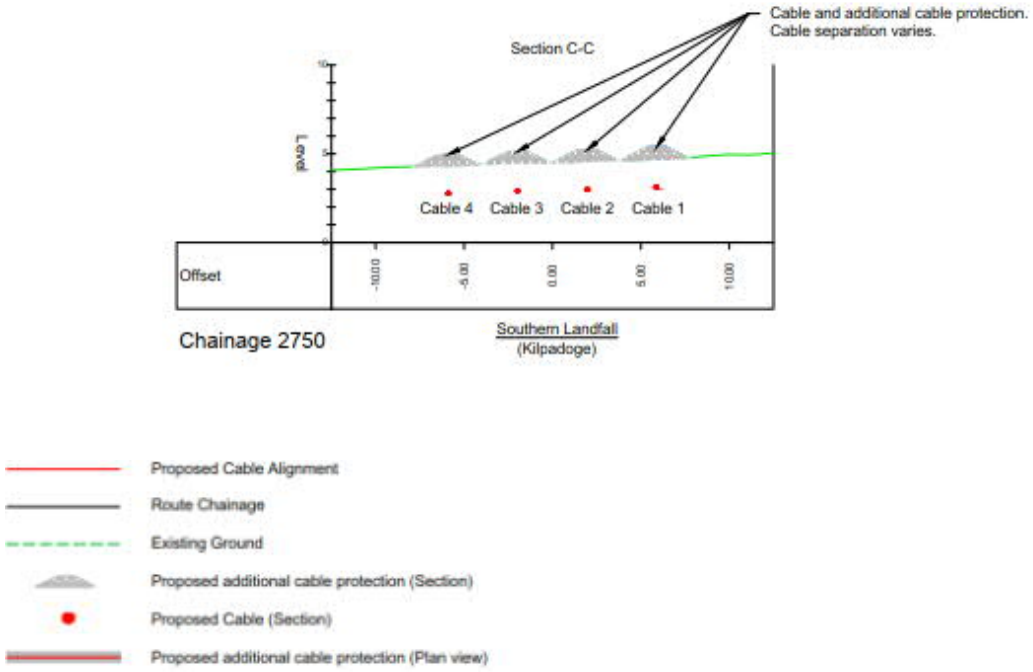
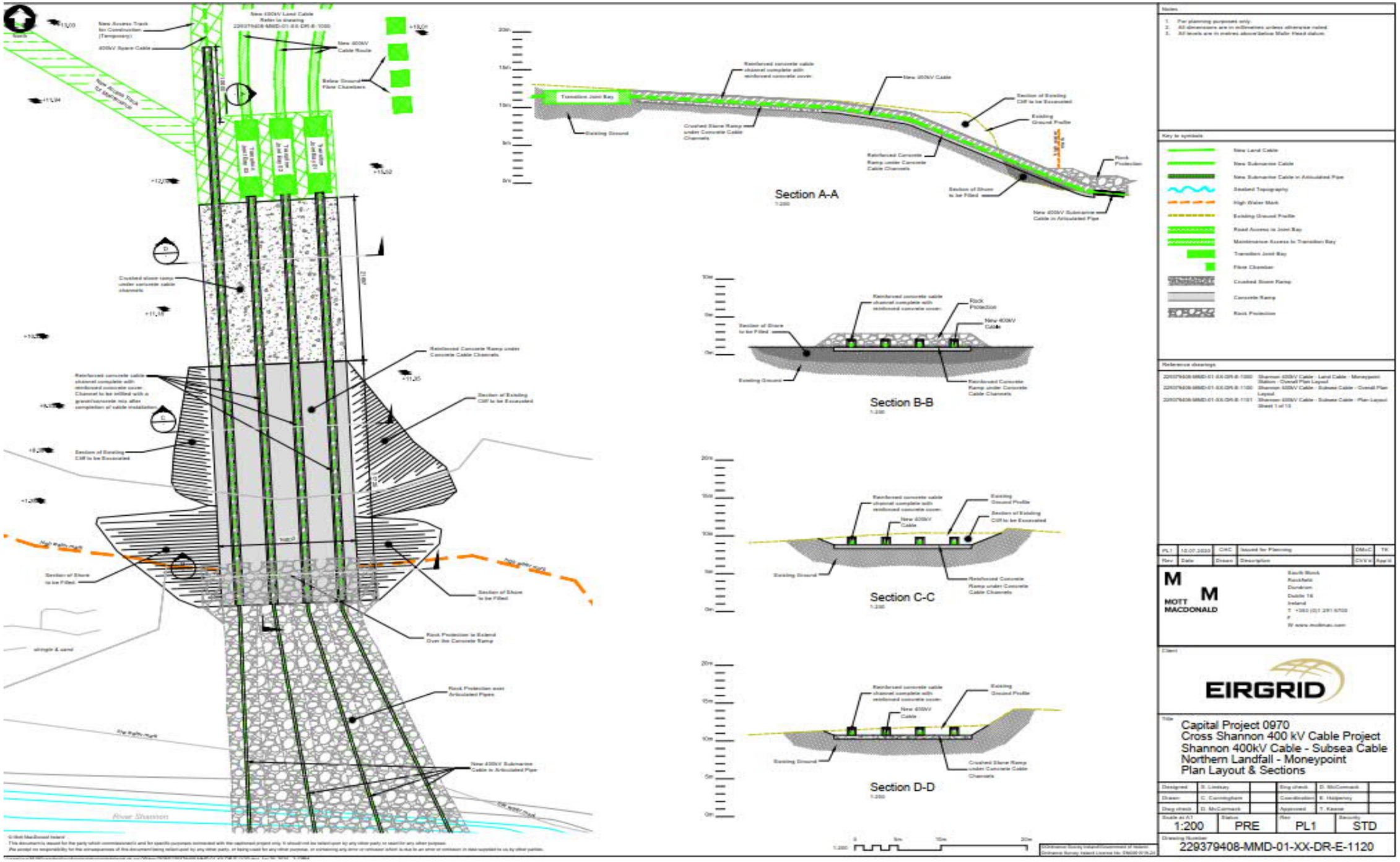
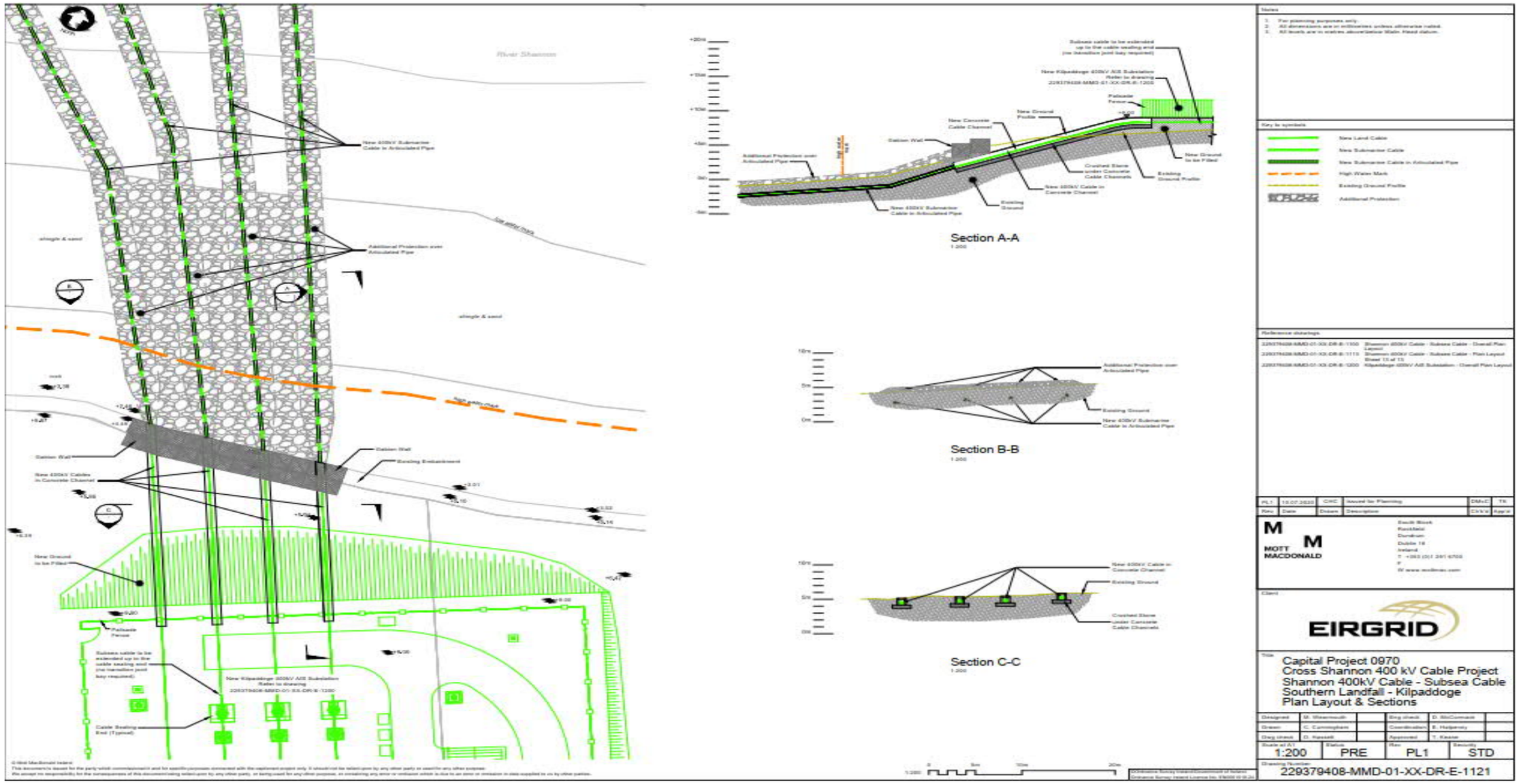


Figure 2.11: Subsea Cable Northern Landfall – Moneypoint Plan Layout & Sections



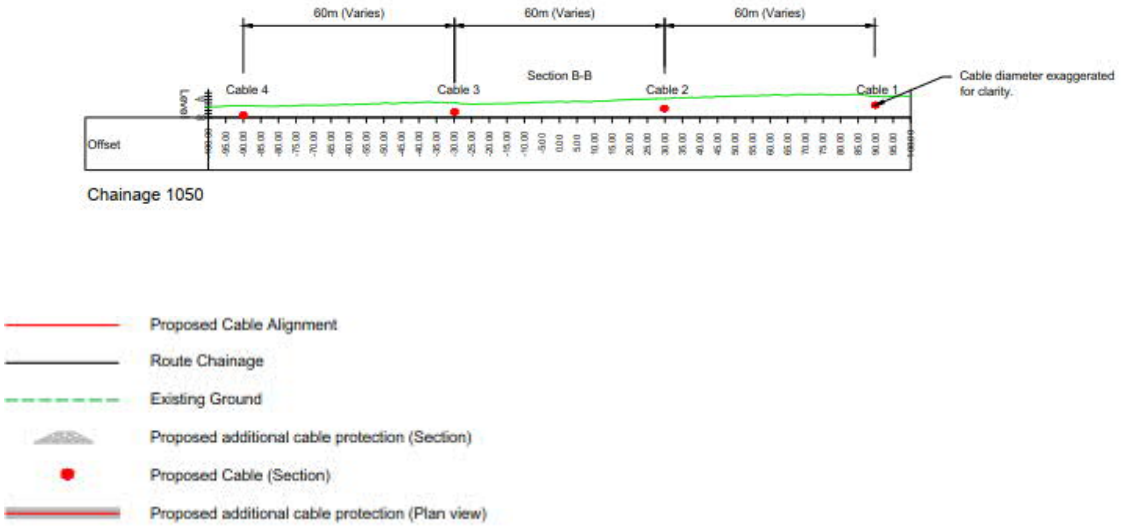
Source: Mott MacDonald

Figure 2.12: Subsea Cable Southern Landfall - Kilpaddoge Plan Layout & Sections.



Source: Mott MacDonald

Figure 2.13: Section of Submarine Route alignment at Chainage 1050



Source: Mott MacDonald

2.2.3.2. Submarine Protection

The cable will be a cross linked polyethylene (XLPE) cable (Figure 2.14). XLPE is an extruded polyethylene material that is thermoset after extrusion through a controlled heating process

For the submarine cable, the sheath is made of lead as it will provide water blocking capabilities and decrease the buoyancy of the cable. The submarine cable has an additional layer of armour made up of typically of copper or stainless steel wires in the case of single core cables which increases the cables tensile strength. This armouring increases the weight and overall diameter of the submarine cable in comparison to the land-based cable. The cable is then surrounded by an outer serving of polypropylene yarn.

Figure 2.14: Typical Submarine Cable design

Source: Mott MacDonald

To assess the operational threat to the cables, such as from third party fishing and shipping activity, a preliminary burial assessment was completed. In areas where ground conditions prevent the target burial depth being achieved, additional protection is required to reduce the risk of anchor strike or third-party damage to acceptable levels.

Additional protection is typically provided by rock placement, installation of concrete mattresses or rock filter bags over the cable for resilience and security (see Figure 2.15). Rock filter bags were used for the protection over the existing 220 kV cables and are the preferred protection solution at this stage of the project as they are inert material, have a high flexibility and it is possible to install many filter bags at a time.

In addition, cylindrical metallic cable protectors/articulated pipes / split pipes can be used as additional protection in areas above and also below the lowest astronomical tide (LAT) mark (see Figure 2.16). The cable protector casing is typically made of cast iron shells that protect the minimum bend radius of the cable, along with providing another layer of defence against third party contact. The cable protector is likely to be installed onto the power cable prior to cable float out / installation (likely on board the vessel). Figure 2.17 shows a typical design cross section for a rock placement solution.

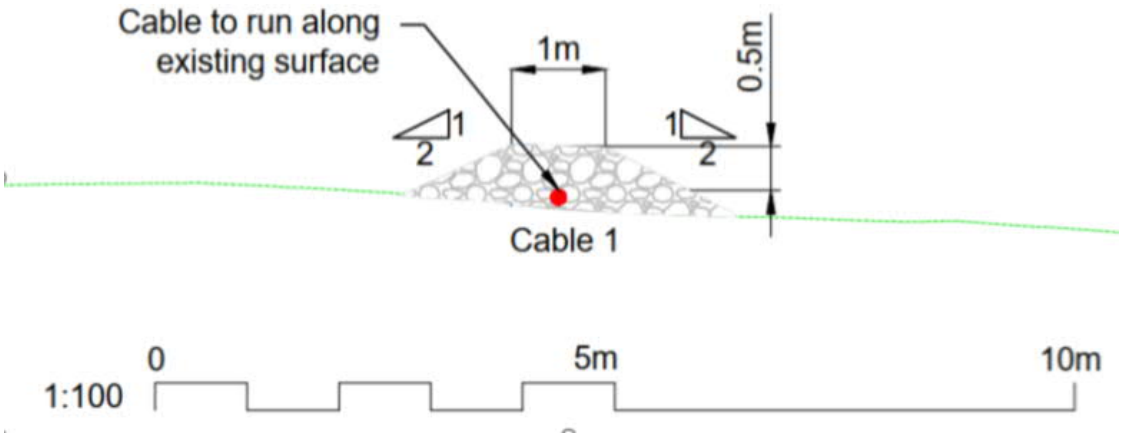
Figure 2.15: Example of Cable Protection Rock Filter Bags

Source: https://www.sps-solutions.co.uk

Figure 2.16: Typical cable protector- Articulated pipes

Source: www.vos-prodect.com

Figure 2.17: Typical section of Rock Protection overlaid on the cable



Source: Mott MacDonald

2.2.3.3. Cable Design Philosophy

For the purpose of this assessment an indicative north to south cable installation direction approach is assumed. Starting the cable installation from the north has the following benefits

- Tidal window –
  - The overall installation time will be minimised by utilisation of the tidal windows. The highest current velocities along the proposed cable route are known to occur close to the northern shoreline. Therefore, by starting the cable pull-in and installation at the northern landfall, works can commence closer to times when the strength of the tidal currents should be at their weakest, i.e. during neap tides instead of spring tides and at slack water. Furthermore, the cable pull-in can also be more confidently programmed to coincide with high water to reduce landing time (and therefore risk) and minimise the cable elevation difference during the pull in operation. These considerations should minimise risks and downtime, reduce pull-in cable loads and ensure a more efficient cable installation programme.
- Installation complexity
  - Due to deeper waters at the northern side of the estuary, the cable pull-in is significantly shorter than it will be on the southern shore. The -15 m CD bathymetry contour is less than 100m from the coastline at Moneypoint but nearly 600m from the coastline at Kilpaddoge. As the cable pull-in sequence is likely to be the riskiest point of the installation, a shorter pull-in is preferred. -15mCD was chosen as the closest possible depth to shore a cable lay vessel could

work in. The water depth is ultimately deemed by the water under keel and the minimum clearance is at the Vessel Captains discretion.

- Logistics
  - A south to north installation would likely have a longer duration of installation activities in the main channel of the estuary. This is because, on approach to the 'exit' landfall, i.e. Moneypoint in the scenario of a south to north installation, shallow water would prevent the vessel pulling the cable burial tool all the way to shore. Therefore, another cable installation tool would be required, which involves additional unloading and loading of the cable. The preference is for this to take place on the south side of the estuary where there is less marine traffic, generally it is more sheltered (in terms of current and weather) and the proposed cable alignment is at it furthest from the existing 220 kV circuit.

A cable installation sequence of west to east (cable no.1, most westerly to cable no.4, most easterly) is assumed in this assessment. This ensures that each cable installation works is only constrained on the west side, either by the existing 220 kV cables (west of the alignment for the 400 kV cable location), or by a 400 kV cable as they are installed in the proposed west-east manner..

A minimum separation distance of one times the water depth (1*WD) is proposed between each cable and between cable no.1 and the existing 220 kV circuits. This allows sufficient space for cable repairs to the 400 kV cables or to the existing 220 kV circuits if required during the lifetime of the asset. A 1*WD offset was used instead of the initially proposed two times water depth (2*WD) because of the planned redundancy in the 400 kV circuits (one of the four cables will be a spare). The separation distance between each 220 kV cable is typically a consistent 25m, which is less than one times the water depth.

2.2.3.4. Submarine Cable Installation Activities

The development of landfall, intertidal and subtidal cable installation and burial methodologies have been informed by geophysical and hydrographic marine surveys, onshore and marine ground investigations, lessons learnt from previous submarine cable projects at Moneypoint, and early engagement with submarine cable installation contractors and submarine cable installation specialists.

The methods and installation sequence described are the proposed indicative methods at the current stage of the project. The actual methods and sequence of the cable installation are subject to detailed design, pre construction surveys and review by stakeholders, authorities and contractors.

All plant and equipment (excluding vessels) will be cleaned and disinfected in advance of coming to site and post works in accordance with IFI Biosecurity Protocols. All operatives will be briefed on IFI Biosecurity Protocols, and all disinfection / cleaning of plant and equipment must be witnesses by the EnCoW or said plant / equipment will not be permitted onto the site. Vessels travelling from outside of Irish waters will be required to have a certified Ballast Water Management System.

Landfall works at Moneypoint and Kilpaddoge are required ahead of the cable installation. The landfall works described in the following sub sections will be undertaken and completed prior to the cable pull-in operations.

A preliminary list of key plant and equipment that is required for the cable installation works at either side of the estuary at the landfall locations set out and is illustrated below.

- Cable winch (one at each landfall)
- Cable quadrant
- Excavators
- Dumper trucks
- Pilling plant (may be required to anchor the winch in place)
- Ancillary plant and tools
- Cylindrical metallic cable protection.

Figure 2.18: Example of a cable winch used during a cable pull-in.

Source: www.toolpusher.com

Figure 2.19: Example of a cable quadrant used to assist cable pull-in operations

Source: www.hizbiz.com

Submarine Works Plant and Equipment

The proposed submarine equipment includes;

- Primary Cable Laying Barge (CLB) or Cable Laying Vessel (CLV)
- Cable floatation devices for submarine-landfall pull in
- Cable burial tool
- Pre-lay Grapnel (PLG) and launch vessel
- Mass Flow Excavator (MFE) tool and launch vessel
- Post-lay trench jetting tool
- Support / guard vessel(s)
- Rock protection installation vessel
- Cylindrical cable protection.

It is anticipated that the launch vessel for the PLG and MFE will be the same vessel.

Figure 2.20: Example of a primary Cable Laying Barge [approximate size 125m (l) x 32m (b)]

Source: https://www.marinetraffic.com/en/ais/home/centerx:-12.0/centery:25.0/zoom:4

Figure 2.21: Example of a cable plough tool

Source: https://atlantic-cable.com/Article/SA/52/index.htm

A typical cable burial tool is shown in Figure 2.21 . gravel and cobble seabed areas. A displacement technique creates an open V-shaped trench in which the cable is placed. This technique requires high pulling forces. The sediment that is excavated from the V-shaped trench is displaced directly next to the trench that is created. This trench is left to refill naturally through sedimentation and

sediment movement processes. The burial tool itself is supported on a sled, which is towed from a CLB or CLV. A burial tool such as sled plough can bury cables in soils and rock, creating comparatively low levels of turbidity. A typical burial speed is in the region of 200m/hr.

Modern cable burial tools use a non-displacement approach, where the cable is lead through a thin-bladed ploughshare, directly laying the cable below the seabed avoiding an open trench and thus causing minimal disturbance to the seabed. This technique uses fluid assistance to lubricate the blade and produces less resistance to bury the cable to the same depth as a classic plough share.

The Pre-Lay Grapnel (PLG) tool will be deployed and recovered from a dedicated marine vessel.

Typically, PLG tools are fully modular and use a connected saddleback and a running line system, monitored from the marine vessel. The system is used to monitor the line tension from the grapnel (or any other wire/rope), where a significant increase may indicate an obstruction encountered by the PLG tool on the seabed.

Figure 2.22: Example of a Pre-Lay Grapnel launch vessel

Source: https://www.marinetraffic.com

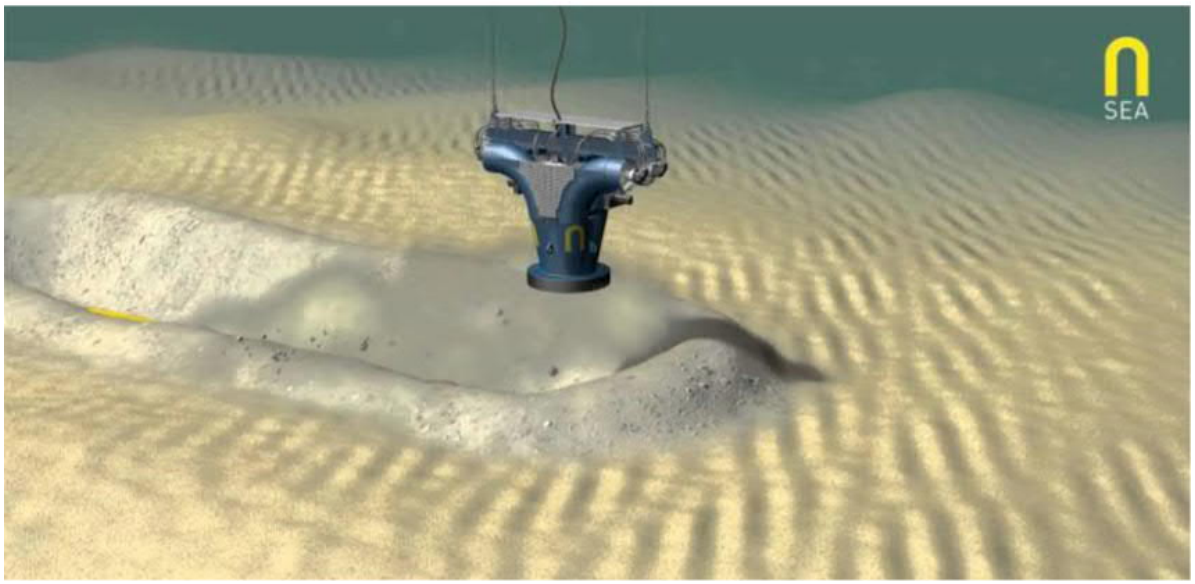
A jetting technique achieves burial by fluidising the soil beneath the cable, thus allowing the cable to fall through the loosened soil under its self-weight to the base of the fluid zone. This results in the cable sinking to the required burial depth. The water jetting equipment is usually mounted on a remotely operated vehicle (ROV) but can be put on a sled. A ROV is capable of operation in shallow water, close inshore.

The typical cable burial depths that can be achieved using modern water jetting tools is in the region of 3m with a soil capacity being sand and clay. Burial speeds up to 400m/hr can be achieved in optimal conditions using a ROV.

MFE is a process used for seabed preparation and sediment wave clearance, rock dispersal, cable trenching and reburial of the seabed. Figure 2.23 shows a typical MFE tool. From a near-stationary vessel, the MFE device is lowered to a controlled position just above the seabed. The tool uses counter-rotating impellers to generate a large volume column of water, propagating towards the seabed at a velocity of up to 10m/s. This high volume, low pressure column of water fluidises and disperses the seabed material. This technique is generally suitable for a range of soil types, including sand and gravel, loose rock, silt and soft clays up to 300+kPa shear strength. The main advantages of using an MFE are:

- Non-contact excavation method
- Excavation in a wide range of seabed conditions (e.g. slopes, sand waves)
- Modern day MFE tools incorporate the use of gyroscopic stability, variable motors and real-time sonar monitoring with sub-sea cameras to allow for greater monitoring and control from the operating crew on deck.

Figure 2.23: Illustration of a Mass Flow Excavator (MFE) tool used to excavate the seabed surface



Source: https://www.n-sea.com/en

Figure 2.24: An example of a jetting tool

Source: http://www.eta-ltd.com/jettingsleds_power_cable_laying.html

Submarine Cable Installation Sequence

The proposed cable installation sequence is listed below. These can be separated spatially into two work areas:

1. Landfall works – All construction above Lowest Astronomical Tide (LAT); and

2. Submarine works – All construction below LAT.

The LAT is defined here as the lowest level that can be expected to occur under average meteorological conditions and under any combination of astronomical conditions. The LAT is often referred to as the common chart datum (relative to m CD).

The following sections broadly follow the proposed installation sequence listed below and refer to construction activities within the 'landfall works' area and 'submarine works' area. Pre construction surveys will also be carried out to inform the detail design of the cable route.

1. Moneypoint and Kilpaddoge landfall works (excavation and civil works);

2. Route clearance (pre-lay grapnel run) along all four cable alignments;
3. Seabed preparation works along all four cable alignments;
4. Submarine works for each cable alignment (assume starting with Cable No.1, most westerly alignment):
    a. Sand wave re-profiling/dispersal by Mass Flow Excavation (MFE)
    b. Post-MFE route clearance (secondary pre-lay grapnel run)
    c. Moneypoint landfall cable pull-in.
    d. Submarine cable installation
5. Repeat step 4 for cable no.2, no.3 and no.4;
6. Post lay submarine cable installation for all four cables;
7. Landfall and submarine cable protection installation for all four cable alignments; and
8. Post construction survey campaigns (cable burial depth and bathymetric surveys.

Moneypoint Landfall (Northside of the Shannon Estuary) (Step 1a)

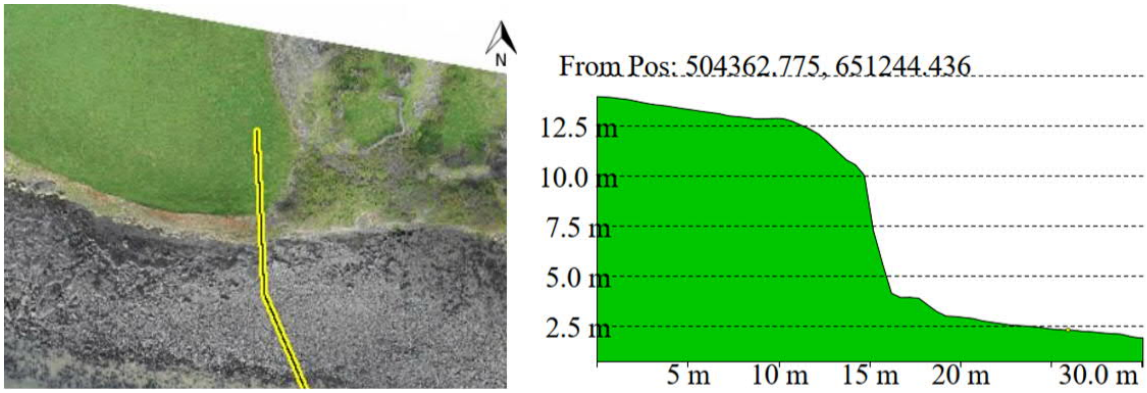
Site preparation works including civil and earthworks are required at Moneypoint to re-profile the existing coastline to the final design profile to enable the cable pull in to take place. The existing profile of the coastline at the proposed landfall is shown in Figure 2.25. The coastline at this location is typically between 8m and 10m AOD high with exposed rock at the cliff face (see Figure 2.26).

Following cable installation, the concrete slipway structure will be backfilled (where appropriate) and encased by a pre-cast concrete slab that will sit on top of the backfilled material. Rock protection will be installed in front of the coastline at the toe of the concrete slipway to mitigate the risk of erosion underlying or outflanking the new structure.

The proposed landfall works at Moneypoint include;

- excavation at the cliff;
- excavation at the foreshore to create four trenches for the cable installation;
- backfilling (including reuse of excavated material);
- construction of a permanent concrete ‘slipway’ structure – see Figure 2.27;
- installation of pre-cast concrete cable troughs to be installed within the permanent concrete structure;
- installation of a temporary anchored cable quadrant on the foreshore to assist with the cable pull-in operations; and
- rock protection.

Figure 2.25: Typical existing topographical profile at the proposed Moneypoint landfall profile (left) and profile, from north to south, left to right (right)



Source: Marine Survey Data 2018

Figure 2.26: Photograph showing the existing geology and topography at the proposed Moneypoint landfall

Source: Mott MacDonald Site Visit August 2019

As noted above, the proposed civil works at the northern landfall at Moneypoint include permanently re-profiling the existing topography and coastline to enable the installation of the subsea cables. In advance of site enabling works, pre-construction surveys will be carried out these will include utilities and UXO[8] search and ground investigations. The proposed temporary works and permanent re-profiling works at this northern landfall.

Traditional civil excavation works to create the two permanent works slopes of approximately 10 and 25 degrees. Temporary works may be required to ensure the excavation is safe to complete the permanent works design (e.g. stability of side slopes and mitigation measures set out in Chapter 8 Marine Aspects of the PECR). The slope angles proposed are based on preliminary design and will be confirmed / optimised following further pre-construction ground investigation(s) and detailed design. It is anticipated that sections of the exposed rock face may be required to be broken out during these excavation works.Towards the toe of the landfall design, backfilled material is proposed to be used to balance the cut and fill works. Where possible, the excavated material will be re-used for the backfill material. Compaction of the backfill material will be completed to ensure the stability requirements and overall integrity of the landfall structure are met. Acceptance criteria for backfill material and compaction works will be set in the specification for the design at the detailed design stage. If the required volume of backfill material cannot be met by the excavated material, then imported backfill material meeting the specification requirements will be used. As detailed in Section 3.6 Mitigation, imported backfill material will be washed (cleaned) to remove fines and, although no invasive plant species were recorded during field surveys, the material will be checked for invasive species before use. Imported material to be used backfill will be stored on the site; measures to avoid the release of sediment will be implemented (including silt fences). Once the re-profiling works are complete the foundation and/or bedding material, concrete cable troughs and cables will be installed before the concrete slipway structure is backfilled (where appropriate) and encased by a pre-cast concrete slab.

[8] **Unexploded ordnance** (**UXO**, sometimes abbreviated as UO), unexploded bombs (UXBs), or explosive remnants of war (ERW) are explosive weapons (bombs, shells, grenades, land mines, naval mines, cluster munition, etc.)

Figure 2.27: Concrete 'slipway' structure at Moneypoint. A similar landfall design is proposed for the 400 kV cable landfall works. Aerial view (left), cable trough installation (top right) and top surface (bottom right Kilpaddoge Landfall Works (Step 1b)

Source: Mott MacDonald

Kilpaddoge Landfall Works (Step 1b)

Earthworks are required at Kilpaddoge landfall location to re-profile the existing coastline to the final design profile for the cable arrangement and to enable the cable pull in to take place. This will likely involve installation of rock / gravel filled gabion bags or backfill material to prevent deep burial of the cable that could induce the risk of cable de-rating.

Prior to any construction activities at the Killpaddoge site, a survey of invasive plant species should be undertaken to document and map such species should it be a suitable time of year to do so.

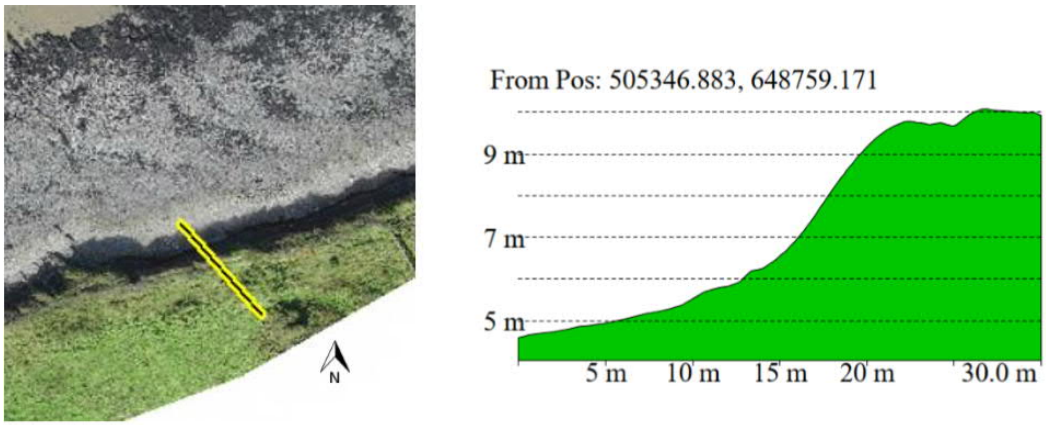
Following cable installation, the existing coastline will be reinstated to its original profile and level. Rock protection may be installed in front of the coastline.

The existing profile of the coastline at the proposed landfall is shown in Figure 2.29. The coastline at this location is typically between 3m and 4m AOD high with the geology of the coastline typically a glacial till material (see Figure 2.29).

The proposed landfall works at Kilpaddoge include:

- excavation at the cliff;
- excavation at the foreshore to create four trenches for the cable installation;
- installation of rock/gravel filled gabion bags and/or backfilling (including reuse of excavated material; and
- rock protection.

Figure 2.28: Typical existing topographical profile at the proposed Kilpaddoge landfall. Aerial view of profile (left) and profile, from northwest to southeast, left to right (right)



Source: Marine survey data 2018

Figure 2.29: Aerial image showing the existing geology and topography at the proposed Kilpaddoge landfall

Source: Mott MacDonald

Route clearance – All Cable Alignments (Step 2)

Seabed clearance will be carried out by use of a Pre-Lay Grapnel tool (PLG), known as a pre-lay grapnel 'run'. At step 2, the PLG will be deployed along all four cable alignments to clear any obstacle that could obstruct the cable burial tool such as end-of-life cables, fishing nets, ropes, lines.

Seabed preparation – All Cable Alignments (Step 3)

The cable alignment has been designed to align parallel to the fall of the steepest seabed slopes (i.e. perpendicular to the seabed contours). A slope parallel alignment reduces the complexity and risk of the cable installation operations. Seabed slopes between 10-25 degrees are observed in marine survey data near to the northern landfall. The steepest slopes angles occur for approximately 25-50m, between the 5m and 10m bathymetry contour. At these locations, seabed preparational works, such as rock filter bag placement, may be required to reduce the slope angles for cable installation purposes.

Submarine works – cable no.1 (step 4)

This section summarises the sequence of installation activities for cable no.1 only. The steps for cable no.1 will be repeated for cable no.2, no.3 and no.4 prior to final cable installation activities at the southern landfall.

Sand wave re-profiling / dispersal– cable no.1 (step 4a)

A Mass Flow Excavation (MFE) tool will be deployed along cable no.1 for the purpose of sea-bed preparation only. This tool will be used to flatten sand waves with amplitudes of more than 0.5m and allow a cable burial tool to bury the cable to a controlled and determined depth. The MFE tool will be deployed for one cable alignment at a time to reduce the risk of sand waves re-establishing before cable installation. Sand wave reprofiling is required along approximately a 2km chainage of each cable alignment. The excavation width will be wide enough to allow the cable burial tool to pass and therefore will involve several passes with the tool. The duration will vary depending on ground conditions and target excavation depth.

Post-MFE route clearance – cable no.1 (step 4b)

A secondary route clearance with a PLG tool will take place along cable no.1 following the recovery of the MFE tool. This will clear obstructions that may have become exposed after the MFE deployment. The PLG deployment will be the same as described above for the MFE tool.

Cable pull-in: Moneypoint landfall – cable no.1 (step 4c)

The cables used in this operation will be loaded onto the CLB/ C LV at a suitable port / facility pre-determined by the submarine cable installation contractor, subject to contractor's mobilisation risk assessment.

The CLB/CLV will start from a position approximately over the 15m bathymetry contour (less than 100m from the shoreline at Moneypoint). A messenger wire will be transported by a support vessel to shore and passed through the cable quadrant, over onshore cable rollers, and up to the cable winch. The winch will then pull the cable from the CLB/CLV to beyond the transition joint bay (TJB) at the top of the cliff. Here, the cable armouring is removed and secured to an armour clamp which will likely be incorporated into the seaward concrete wall of the TJB (subject to the Contractors design). The TJB is where the submarine cable is terminated and jointed to the land cable. Under this scenario, the total cable pull length is approximately 150m.

- Additional cable protection, such as cylindrical metallic cable protectors will be installed onto the cable as it is payed out for post installation protection requirements. Floats will also be attached to the cable as it is payed out from the CLB / CLV to keep the cable afloat during the pull-in. The pull-in will be programmed to coincide with high water on the neap tidal cycle to minimise current velocities and the vertical offset between the winch and CLB / CLV. The latter helps reduce the loading on the cable winch.
- The cable quadrant will assist in minimising the vertical free span of the cable above the ground. This helps from a cable management perspective but also reduces the cable loading as the cable is floating on the sea surface for a longer length. The quadrant will be designed to ensure the cable does not exceed the maximum bending radius.
- The cable alignments at Moneypoint have been designed to keep the alignment as straight as possible. A straight pull is preferred. To achieve a completely straight pull the CLB / CLV may position itself further west than the final installation position of the cable. This is more likely for the more easterly cables as the alignment fans out in a more easterly direction.
- The pull in installation programme will be co-ordinated to maximise the installation window around the neap tidal cycle, however, additional considerations, such as weather and daylight will be factored into the final installation contractors programme, risk assessments and procedures.

Submarine cable no.2, no.3 and no.4 (step 5)

All sequences detailed in steps 4above will be repeated until all four cables have been installed to KP2.2 and pulled ashore to Kilpaddoge. The final steps of the works describe the final activity to bury the cables to their target depth between KP2.2 and 2.8.

Post lay submarine cable installation – all cable alignments: KP2.2 to 2.8 (Step 6)

After all four cables have been installed (buried) between KP0.0 and 2.2, post-lay burial of all four cables between KP2.2 and 2.8 will take place. A cable burial tool or jetting tool, either remotely operated (ROV) or pulled by a combination of the onshore winch and marine vessel.

As noted previously above, based on the preliminary burial risk assessment and the results of the marine surveys additional protection is likely. This is described below in Step 7. Immediately following the cable installation, the trenched route will fill in on itself through natural tidal activity.

Landfall and submarine cable protection installation (step 7)

The likely requirement for where additional cable protection has been identified by the preliminary burial risk assessment (see Section 4.3.2 of the PECR). This is subject to further design as the project progresses to detailed design and construction.

Additional protection over the buried in submarine works areas (below LAT) will be installed by a specialist marine contractor with a marine vessel. Installation of the protection will occur after the completion of the cable burial works described in the sections above. The submarine cable installation within the Shannon Estuary is expected to take approximately three weeks to complete. Each cable installation run is anticipated to take approximately 3-5 days to complete

Post construction survey campaigns (step 8)

Following completion of the cable installation works, a programme of post-construction surveys will be required to confirm the target burial depth has been achieved. Future marine surveys will assist in monitoring the performance of the cables over the life of the new asset. It is anticipated that the rights to maintain and survey the cables over the life of the asset will be subject to the conditions of the grant of Foreshore licence approval. Typically, this is a series of bathymetric surveys over the entire cable route with the frequency of surveys decreasing over the asset life (but informed on the analysis of the previous survey results).

2.2.3.5. Commissioning and Operation

A number of electrical tests will be carried out prior to the cables being made operational. These tests include tests of phasing and electrical integrity. Many of the tests are to be carried out as the construction phase progresses. The installation approach and design of the cables have been designed to minimise the need for routine maintenance works on the submarine cable, however, repair or maintenance activities may be required to monitor buried depths and integrity of the rock placement location. A preliminary cable burial risk assessment has been completed to reduce the risk of the cable

being exposed or undermined due to sediment mobility over the operational life of the cable. The assessment has considered different survey datasets of the study area however predicting long term change in the River Shannon is complex even with sediment modelling. Therefore, full cable risk assessment to be carried out as part of a post consent verification survey and post construction monitoring protocol will also be implemented:

The project is to be operated and monitored by remote control from EirGrid offices. The cables will be monitored in accordance with EirGrid's Asset Maintenance Policy. The maintenance operations of the cables will be undertaken by ESB in their role as Transmission Asset Owner (TAO).

2.2.3.6. Decommissioning

According to the Commission for Regulation of Utilities, formerly known as the Commission for Energy Regulation, assets such as submarine cables have an operational lifetime of at least 50 years. The exact timing of any decommissioning will be decided based on the outcome of the regular maintenance surveys carried out of the project.

As part of decommissioning the cables are to be disconnected at the landward joints and the cable will be left in the seabed. The sea protection rocks overlying the cables will not be recovered. The land-based transition joint pits are also to be left in situ. Any future decommissioning works would be subject to their own Screening for AA (and AA if required). At this time EirGrid would also consider whether decommissioning works would cause more environmental damage than leaving the cables permanently in-situ.

2.2.4. Construction Phase Activities

The following sections provide an outline of the proposed construction phase activities and controls.

2.2.4.1. Outline Construction Schedule and Timing of Works

Subject to the grant of statutory approvals, it is expected that construction will commence in early 2022, for the cable to become fully operational in 2023.

Construction activities will gradually phase out from pre-construction to predominantly civil activities followed by commissioning and testing of the substations and equipment. It is expected that the number of construction workers required throughout the duration of the construction phase will peak at approximately 45 persons.

Construction will occur during normal construction working hours, with the exception of works associated submarine installation works within the Shannon Estuary. Normal construction hours are

expected to be Monday to Friday 7 am to 7 pm and Saturday from 7 am to 2 pm. There may be instances where extended hours / days are required however should working outside these hours / days be required they will only be undertaken with prior agreement with the statutory authority.

The submarine cable installation within the Shannon Estuary is expected to take approximately three weeks to complete. Each cable installation run is anticipated to take approximately 3-5 days to complete. The duration of the works is indicative only, safety requirements for the installation operations / procedures and weather condition may ultimately dictate the final programme. These works will be carried out seven days a week 24 hours a day. Further details on the proposed installation works is set out in the PECR.

The overall duration of the construction phase is expected to be approximately six months, the installation and commissioning will be carried out thereafter over approximately six months. Some of the activities noted in Table 2.2 in will be carried out in parallel. The majority of the construction activities are not dependant on outages on the existing transmission system, however, activities associated with connection to the existing 220 kV network will be planned in line with EirGrid's scheduled outage programme.

A preliminary construction programme has been included. An arbitrary commencement date has been selected. The durations included in the programme are indicative only. Whilst these are based on input from submarine cable contractors and specialists they should not be considered as minimum nor maximum durations for each sequence. Works associated with the submarine cable installation will be carried out outside of the peak dolphin calving season (August).

The safety requirements for the installation operations / procedures may ultimately dictate whether 24/7 working is conducted.

In addition, clearance of vegetation along the onshore cable route, where required, will take place between 1st September and 1st March in order to protect breeding birds, i.e. outside of the bird breeding season.

A preliminary indicative construction schedule for the proposed development is outlined in the Table 2.2 below (some of the activities noted will be carried out in parallel). It is noted that unavoidable delays and changes to the project programme may occur due to weather and sea conditions. These delays are to be minimised where possible and interested parties will be kept notified where possible or necessary.

Table 2.2: Indicative Construction Schedule for onshore works

Construction Phase Kilpaddoge 400 kV AIS Equipment and compound and cable ducting		
Phase	Activity	Anticipated Date/Duration:
Construction of Access Road & Site Compound	Removal of excavated material	Approximate 2 month period
	Delivery of type 1 fill for site compound and access road (including lay down area)	Approximate 2 month period during Month 1 to Month 2
	Miscellaneous (civil materials, fencing)	Approximate 3 month period during Month 1 to Month 2
Construction of 400kV compound Civil Works	Removal of excavated material	Approximate 4 month period Month 3 to Month 6
	Delivery of Concrete	Approximate 4 month period Month 3 to Month 6
	Delivery of type 1 fill for site compound	Approximate 4 month period Month 3 to Month 6
	Miscellaneous (civil materials)	Approximate 4 month period Month 3 to Month 6
Cable trench and duct installation on Kilpaddoge shore	Removal of excavated material	Approximate 4 month period Month 3 to Month 6
	Delivery of cable ducts concrete backfill.	Approximate 4 month period Month 3 to Month 6
	Delivery of type 1 fill for cable route access road.	Approximate 4 month period Month 3 to Month 6
	Miscellaneous (delivery of cable, ducts and accessories)	Approximate 4 month period Month 3 to Month 6
Construction Phase Connection to the Moneypoint 400 kV bay and cable ducting		
Phase	Activity	Anticipated Date/Duration:
Cable trench and duct installation on Moneypoint shore	Removal of excavated material	Approximate 4 month period during Month 1 to Month 4
	Delivery of Cable ducts Concrete backfill.	Approximate 4 month period during Month 1 to Month 4
	Delivery of Type 1 Fill for cable route access road.	Approximate 4 month period during Month 1 to Month 4
	Miscellaneous (delivery of cable, ducts and accessories)	Approximate 4 month period during Month 1 to Month 4

Electrical installation and commissioning of equipment will be carried out thereafter over the remaining six-month period. Details on the submarine cable installation are set out above in Section 2.2.3. The Moneypoint landfall preparation works are anticipated to take approximately 9-10 weeks. The re-profiling works described above will take place within this time period but are not anticipated to take the full 9-10 weeks. The duration is dependent on the ground conditions and / or obstructions encountered but a preliminary estimate of 3-5 weeks has been made.

2.2.4.2. Temporary Construction Area

A temporary laydown area will be located within Moneypoint Electricity Generating Station (approximately 13,900m^2 and 8300m^2) and available lands adjacent to the existing Kilpaddoge substation compound (approximately 10,500m^2, and 3,7506m^2 respectively). Access will be gained initially via the existing entrance to the existing Kilpaddoge substation and the main and secondary entrances to the Moneypoint Electricity Generating Station. All construction works will be directed to use these existing entrances only. The location of the proposed entrances are shown on the planning drawing ref; 229379408-MMD-00-XX-DR-E-1300.

Temporary facilities will be provided which will include construction phase car parking, welfare facilities and laydown areas as necessary. Any discharges from temporary welfare facilities will be connected to a sealed holding tank to be emptied and disposed of off-site by a licenced contractor to an approved licenced facility.

Additional laydown areas will be located in proximity to the proposed landfall locations either side of the Shannon Estuary approximately 1,585m^2 and 3,173m^2. The location of these areas is shown on the accompanying planning drawings.

Storage of fuel and refuelling will be undertaken within bunded hardstanding areas. Water will be tankered onto site as required. The location of the proposed temporary laydown areas are shown on the planning drawing ref; 229379408-MMD-00-XX-DR-E-1300 ; these drawings are reproduced in Figure 2.30 and Figure 2.31 respectively. Drawing 229379408-MMD-01-XX-DR-E-1302 shows the temporary laydown area and access route at Killpaddoge (see Figure 2.32).Temporary facilities will be provided which will include construction phase car parking, welfare facilities and laydown areas as necessary. Any discharges from temporary welfare facilities will be connected to a sealed holding tank to be emptied and disposed of off-site by a licenced contractor to an approved licenced facility.

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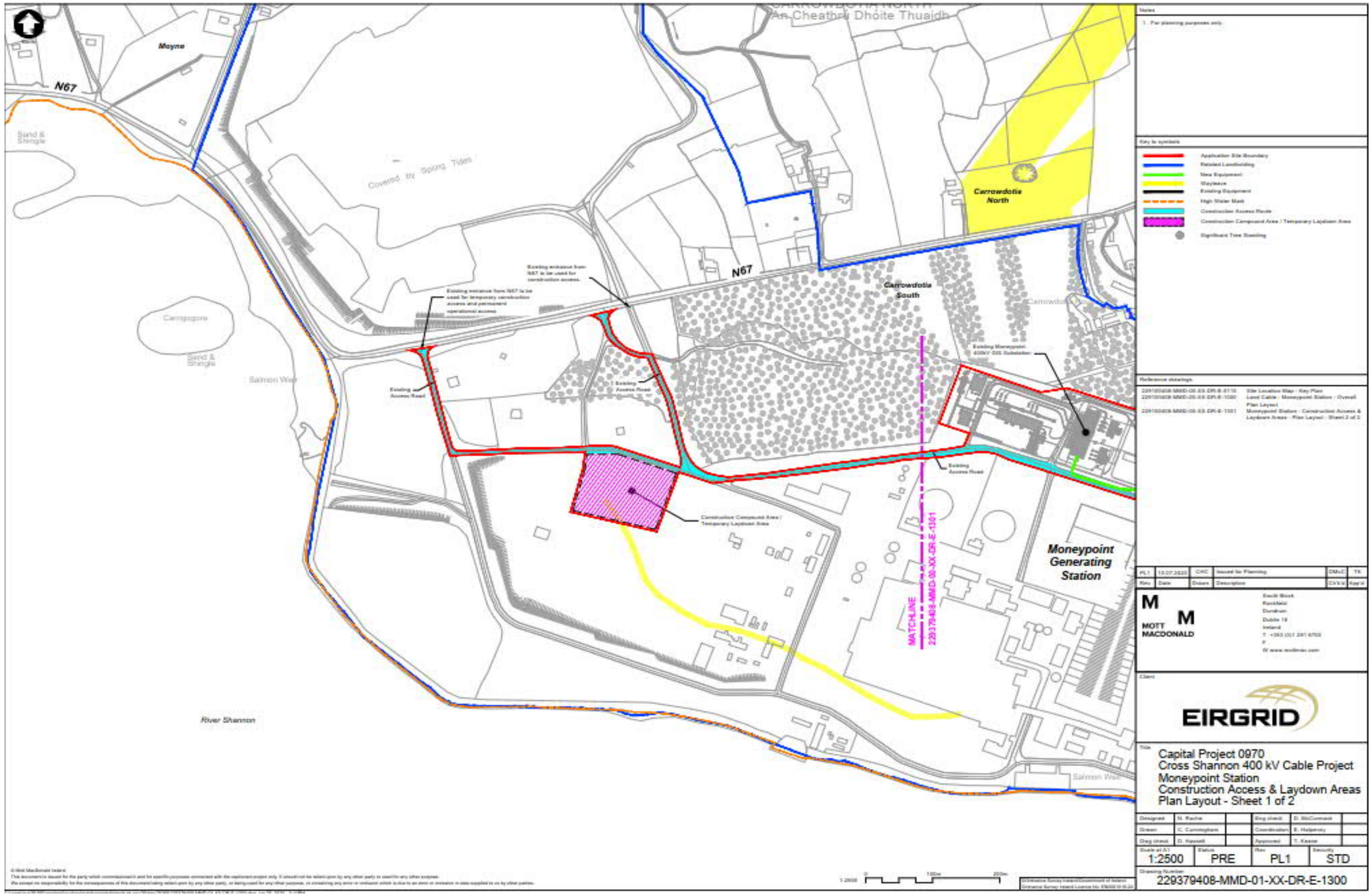
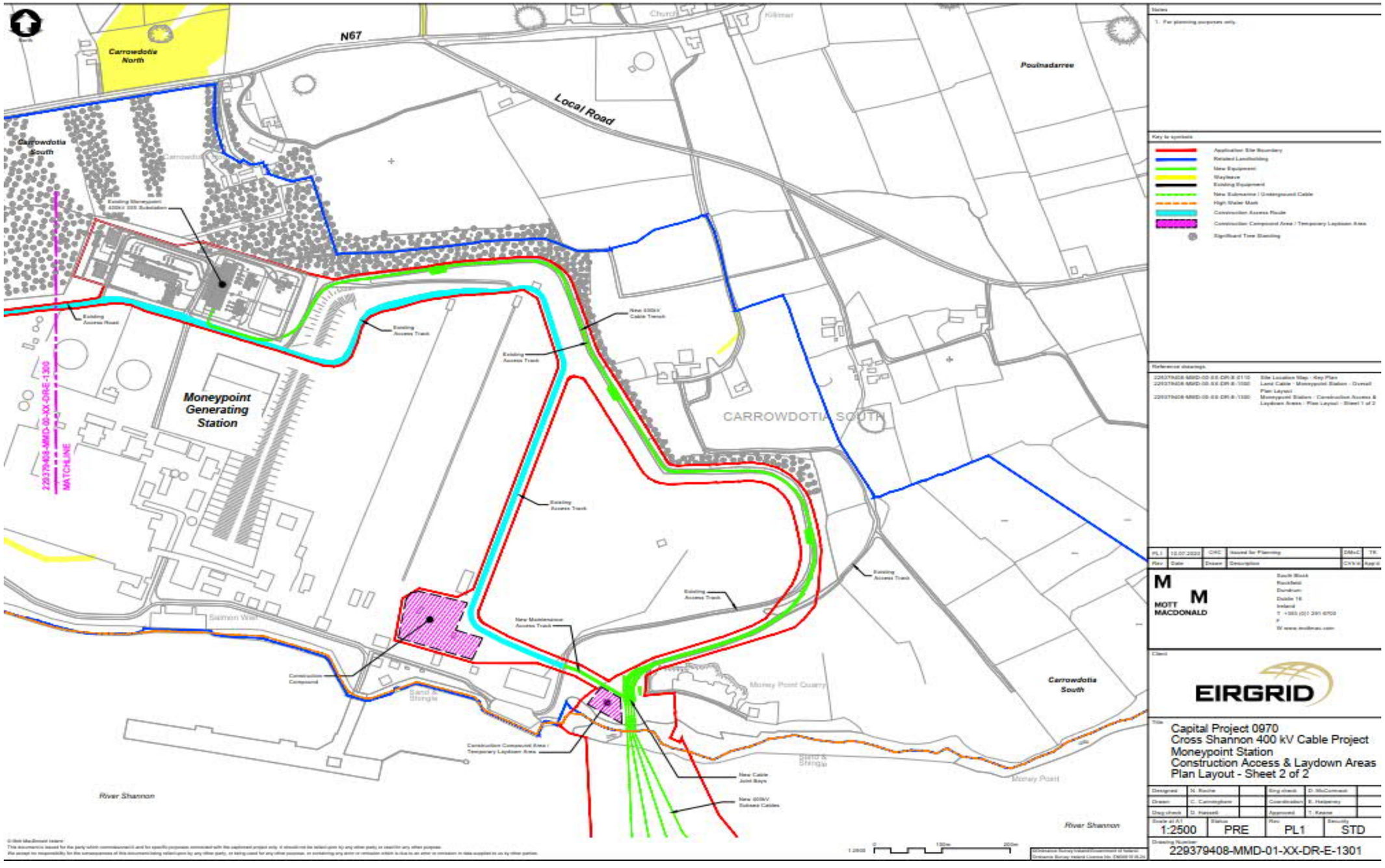
Figure 2.30: Moneypoint Station - Construction Access & Laydown Areas - Plan Layout - Sheet 1 of 2



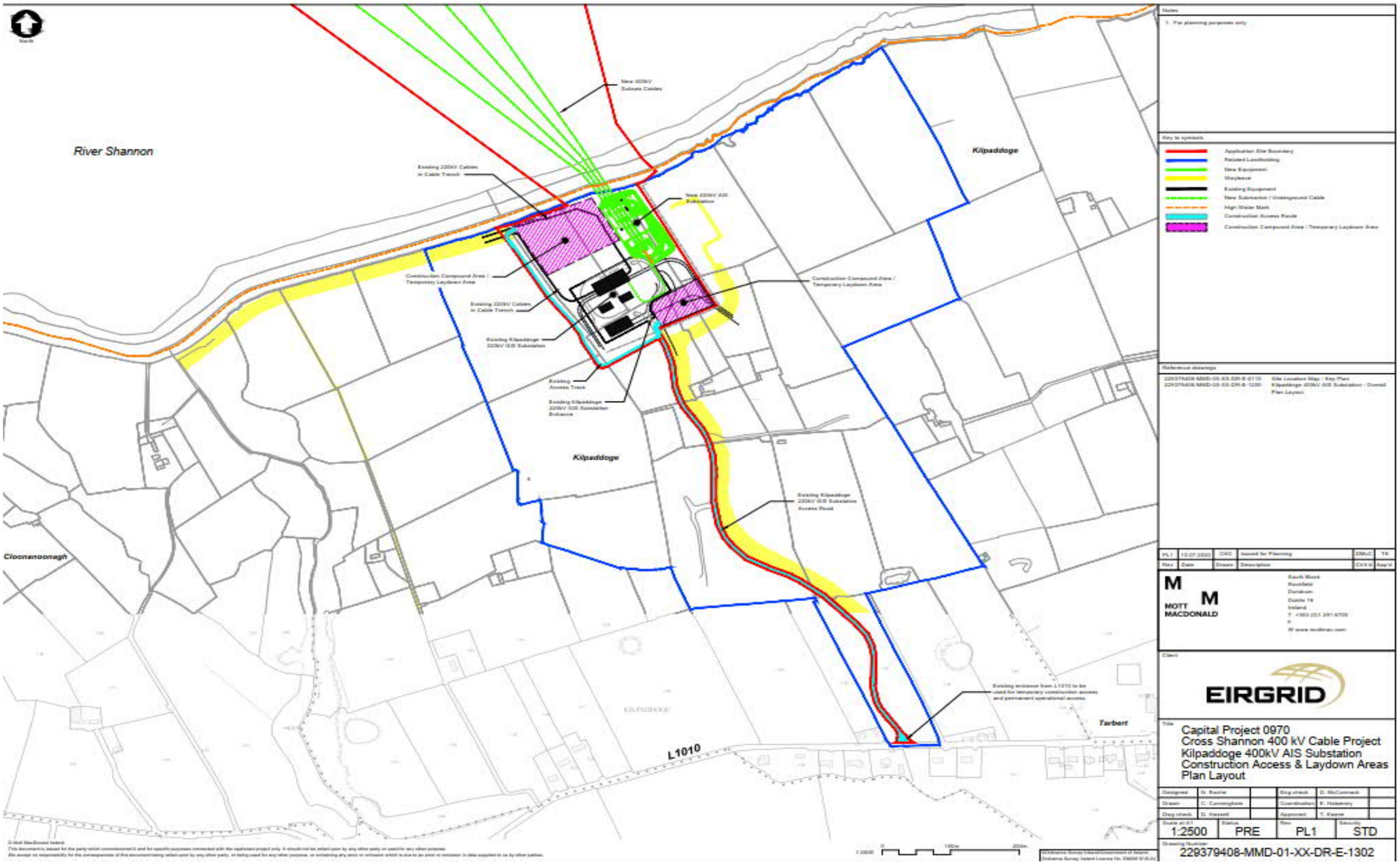
Source: Mott MacDonald

Figure 2.31: Moneypoint Station - Construction Access & Laydown Areas - Plan Layout - Sheet 2 of 2



Source: Mott MacDonald

Figure 2.32: Kilpaddoge 400kV AIS Substation Construction Access & Laydown Areas Plan Layout



Source: Mott MacDonald

2.2.4.3. Construction Traffic

It is expected that a maximum of approximately 30 Heavy Good Vehicles (HGV) movements per day will be required during the construction phase at either side of the Shannon Estuary. The number of construction workers required during the construction phase is expected to peak at approximately 45 persons. Aside from the delivery of the transformers, no abnormal loads are required. It is envisaged the cable laying barge vessel will be routed from Norway up through the Shannon Estuary.

Appropriate marine traffic notices will be issued to all stakeholders in accordance with any requirements specified in the Foreshore Licence. The Contractor's method statements will consider the safety of users of the Shannon Estuary and foreshore when preparing and carrying out the construction works. Works will be coordinated to minimise impact on marine traffic.

Navigational impacts will be minimised through consultation with the Shannon Foynes Port Company and other stakeholders as part of the Foreshore Licence process as specified in the Foreshore Licence. Further details on the marine traffic requirements are set out in Chapter 14 of this PECR.

2.2.4.4. Construction Environmental Management Plan

The Outline CEMP included with the Planning Application defines the boundaries where construction will be undertaken. None of the detailed construction specification to be incorporated post-consent into the final CEMP during the construction phase (including the construction schedule and timing of works) has the potential to adversely affect the integrity of European sites and/or require additional mitigation. The final CEMP will be implemented in consultation with the Planning Authority and the DHPLG. The CEMP will remain a 'live' document which will be reviewed regularly and revised as necessary to ensure that the measures implemented are effective.

The primary objective of the CEMP is to safeguard the environment, site personnel and nearby sensitive receptors, i.e. occupiers of residential and commercial properties, from site activity which may cause harm or nuisance. As such, the CEMP sets out a project framework to ensure key mitigation measures and conditions set out as part of the planning and foreshore consent process are translated into measurable actions and are appropriately implemented during the construction phase of the proposed development. As part of this framework, transparent and effective monitoring of the receiving environment during construction will be used to inform and manage on-going activities on site and to demonstrate effectiveness of the measures outlined therein.

ESB will have the overall responsibility for the compliance of the CEMP with the requirements of the Planning Authority / DHPLG. A technically competent contractor will be appointed by ESB with responsibility for the construction of the proposed development. A contractual obligation will be

included within ESB's tendering processes and implemented on appointment to ensure that the proposed works are developed in compliance with the requirements of the CEMP, and the methods, monitoring and mitigation included in the PECR report and NIS.

ESB will monitor the contractor(s) performance on a regular basis and will undertake the following compliance checks throughout the duration of the construction period:

- Review contractor documents against the requirements of the CEMP;
- Undertake regular audits;
- Continuously check records;
- Set up a contractor reporting structure; and
- Conduct regular meetings where Environmental Health and Safety is an agenda item.

Records of the implementation of the measures identified in the CEMP will be provided if required to the Planning Authority / DHPLG at a time scale to be agreed with the Council.

All project specific mitigation measures will be outlined in the CEMP while mitigation measures relevant to the current assessment of effects to European sites are presented in Section 3.6. Specifically, Section 3.6 outlines the mitigation measures identified to ensure the avoidance of:

- adverse effects to marine habitats from the release of sediment, chemicals or other waste material pollution; and,
- adverse effects to marine mammals from project noise.

It should be noted that mitigation measures were not considered in the Screening for AA which is presented in Section 2.3 below.

2.2.4.5. Environmental Clerk of Works

The EnCoW will form part of the Employers Site Representative Team. The EnCoW shall have suitable environmental qualifications and the necessary experience and knowledge appropriate to the role. ESB will ensure that the EnCoW is delegated sufficient powers under the construction contract so that she/he will be able to instruct the Contractor to stop works and to direct the carrying out of emergency mitigation/clean-up operations. The EnCoW will also be responsible for consultation with environmental bodies including the NPWS and IFI and IWDG. The EnCoW will be responsible for carrying out regular monitoring of the Contractors CEMP.

2.2.4.6. Traffic Management Plan

Prior to commencement of the development, the Contractor appointed by ESB to undertake the works will prepare a Traffic Management Plan which will be developed and implemented to mitigate any

potential construction traffic impacts on the local road network. All construction activities, including construction traffic, will be managed through the site Construction Environmental Management Plan (CEMP).

2.2.4.7. Construction Waste Management Plan

Prior to commencement of the development, the Contractor appointed by ESB to undertake the works will prepare a Construction Waste Management Plan (as part of the overall CEMP) which will provide for the segregation of all construction wastes into recyclable, biodegradable and residual wastes to facilitate optimum levels of re-use, recovery, and recycling operations.

The plan will be prepared in accordance with waste management guidance and principles as outlined in Design Out Waste: A design team guide to waste reduction in construction and demolition projects (EPA, 2015).

All operations at the site will be managed and programmed in such a manner as to prevent / minimise waste production and maximise upper tier waste management (i.e. re-use, recycle, and recovery) in line with the Waste Hierarchy where technically and economically feasible. The Plan will also deal with any litter arising during the construction phase of the development.

Waste sent off site for recovery or disposal will only be conveyed by an authorised waste contractor and transported from the proposed development site to an authorised site of recovery / disposal in a manner which will not adversely affect the environment. All employees will be made aware of the obligations under the Plan.

The Plan will be available for inspection at the site office at all reasonable times for examination by the Consenting Authority.

2.3. Characteristics of European Site(s)

2.3.1. Source-Pathway-Receptor and Impact Assessment

2.3.1.1. Overview

A key factor in the consideration as to whether or not a QI or a SCI (collectively referred to herein as conservation features) is likely to be affected by a proposed project is the existence of connectivity (or interaction/ or impact pathway) between the feature and the impact mechanisms associated with the project. National guidance (DEHLG 2009) outlines that screening for AA should be carried out for any European Site within the likely likely zone of impact (ZoI) of a plan or project.

For projects, the guidance outlines that the ZoI must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, the sensitivities of the ecological receptors, and the potential for in combination effects. Section 2.3.1.2 and Section 2.3.1.3 considers the potential effects due to the proposed project, while Section 2.3.1.3 considers potential in combination effects with other plans and projects.

2.3.1.2. Methodology

As outlined in Section 1.2 above, this Screening Statement for AA and NIS has been prepared to address Article 6(3) obligations under the Habitats Directive and focuses on the potential effects of the project on European sites.

In order to establish the ZoI of the proposed project, the assessment of connectivity between project impact mechanisms (or source) and a conservation feature (i.e. QIs of SACs and SCIs of SPAs) considers the location of the project relative to habitats and non-mobile species, species foraging distances and migration routes, and the proximity of the project to foraging and breeding areas, and potential changes in species behaviour, effects on prey species resulting in alteration in interactions and associated impacts.

Field Surveys

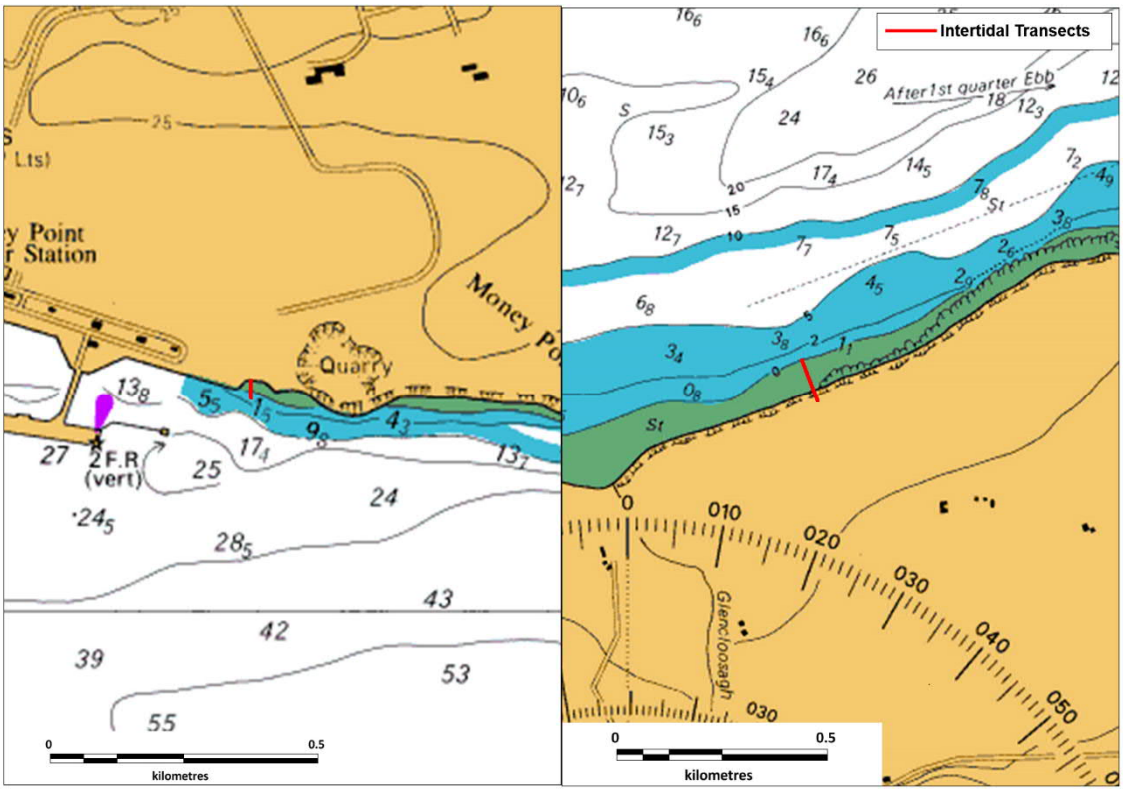
To inform the assessment, field surveys were undertaken of the potential landfall sites and surrounding onshore habitats on various dates between February 2017 and June 2020. Terrestrial walkover surveys were carried out on 15th February 2017, 24th April 2018 and 14th March, 4th April and 30th September 2019 and June 19th 2020.

Intertidal transects of the marine sections of the landfall sites were undertaken to document algae and macroinvertebrate species and to describe habitats present using both Thorson (1957) and the EUNIS classification system (2019)[9]. These surveys were carried out under Spring tide conditions on September 29th and 30th, 2019.

Two transect lines (see Figure 2.33) were sampled at High, Mid and Low water on a Spring tide. Location of two intertidal transect sites at Moneypoint (left) and Kilpaddoge (right), Shannon Estuary.

[9] https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification

Figure 2.33: Location of two intertidal transect sites at Moneypoint (left) and Kilpaddoge (right), Shannon Estuary



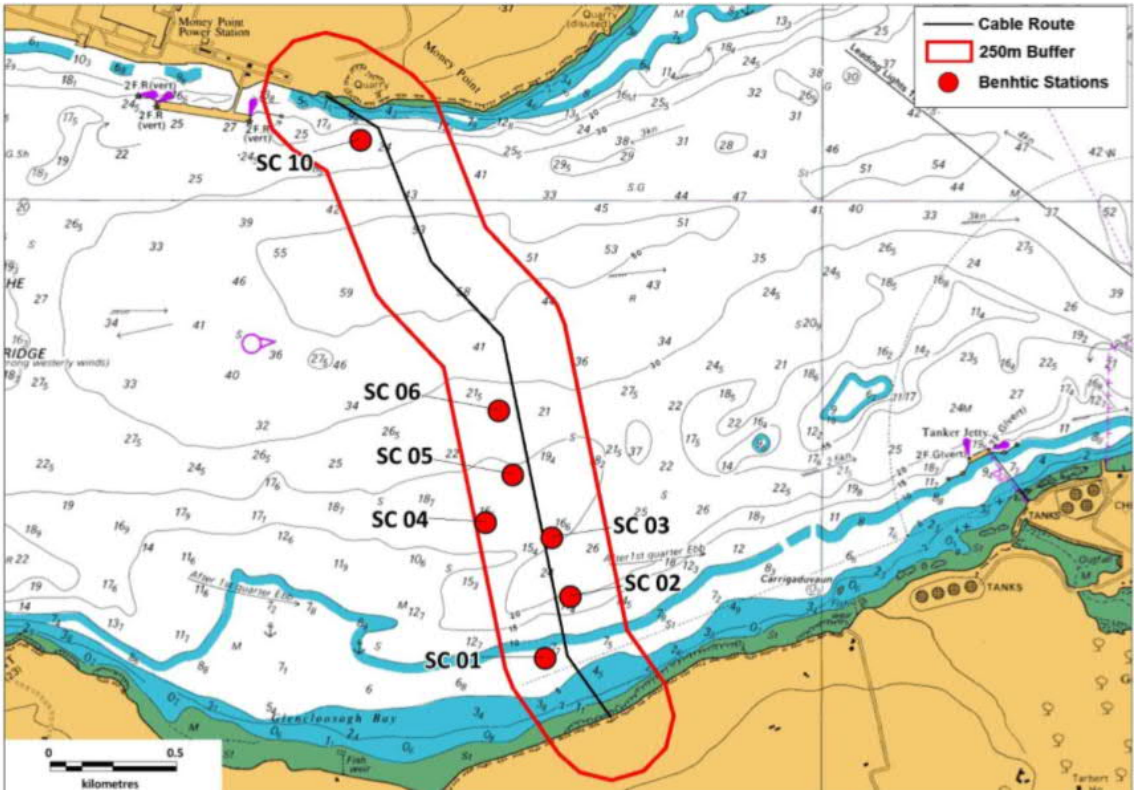
Source Aquafact Ltd (2020)

Where sediments were present, three core samples were taken for fauna and a 4th for sedimentary analyses. The same methodologies as described below for the subtidal survey was followed. Where hard substrates were encountered, taxa were identified in situ and their densities will be evaluated using the SACFOR scale (Superabundant, Abundant, Common, Frequent, Occasional, Rare.

Quantitative subtidal benthic surveys were carried out in December 2019 to describe faunal communities and their component species. As noted previously, the proposed submarine cable route is within the River Shannon and River Fergus Estuaries SPA / Lower River Shannon SAC. Therefore, permission from the NPWS was required to carry out field work and collect samples for analysis. A copy of this permission is presented in Appendix C. Full details on the survey methodology and processing and results are provided in Appendix C of this report. The sample locations are shown in

Figure 2.34. Having regard to the sediment modelling and the marine surveys undertaken a buffer area of 250m either side from the centreline of the proposed cable route was considered representative of the subtidal habitat encountered along the route corridor.

Figure 2.34: Location of the grab stations sampled in December 2019



Source Aquafact 2019

Aquafact Ltd has in-house standard operational procedures for benthic sampling and these were followed for field survey. Additionally, the recently published MESH report on "Recommended Standard methods and procedures" was adhered to. Where possible, quantitative grab sampling was carried out within the study area. At all stations, three faunal samples were collected.

In addition to the quantitative grabs at each station, a fourth sample was collected for particle size analyses (PSA) and % organic carbon. Samples for faunal analysis were sieved on a 1mm mesh sieve, preserved, sorted and identified to species level where possible.

Desktop Surveys and Assessment

Nationally available data on protected habitats and species were mapped using a Geographic Information System (GIS) and interrogated to identify for source-pathway-receptor connectivity. The source (potential project impact mechanisms), pathways (hydrological, physical or ecological connectivity) and receptors (conservation features) were identified using GIS software, and through the examination of aerial photography and a review of ecological surveys undertaken in the area. Any

conservation feature identified to have a viable source pathway-receptor link to the proposed project were then examined further to determine the potential for significant effects.

The assessment of project impact sources (or mechanisms) considers all relevant aspects of the proposed project that have the potential to directly or indirectly effect conservation features.

A detailed description of the Cross Shannon 400 kV Cable Project is provided in Section 2.2 above. In summary, the project involves the laying of a new 400 kV cable across the Shannon Estuary (in the seabed) between the Moneypoint 400 kV Electricity Substation in the townland of Carrowdotia South County Clare and Kilpaddoge 220/110 kV Electricity Substation in the townland of Kilpaddoge County Kerry. The connection at Moneypoint will be at the existing substation on ESB lands. The connection at Kilpaddoge requires an extension of 5,500m^2 to the existing substation on ESB lands.

The activities proposed for the project that have potential to effect conservation features (i.e. QIs of SACs and SCIs of SPAs) can be separated spatially into two work areas:

- onshore activities - pre-construction and civil works.
- marine activities - intertidal and subtidal cable installation.

With the exception of a small area of works on the northern landfall at Moneypoint the majority of onshore works occur within ESB owned lands and adjacent to their existing facilities, while the marine activities occur within the Lower River Shannon SAC and the River Fergus Estuaries SPA.

With regard to the proposed works at the Moneypoint site, the overall length of the cable route is 1.8km of which 1.6km lies within the Moneypoint site owned by ESB. This part of the cable route runs through a brown field site that is of no conservation value. Of the 200m of cable route that lies outside the Moneypoint site, c. 100m of this falls within the intertidal habitat and this is owned by the State. The remaining 100m is scrub land.

At the Killpaddoge site, the cable route from the upper shore line to the boundary of the ESB substation is c. 60m in length of which c. 50m passes through agricultural land. The proposed extension to the existing substation (c. 5,500m^2) lies within the property owned by the ESB. The cable route, extension site and immediately adjacent lands do not include habitats that support protected species. While these areas are of negligible interest to protected species, the areas will act as buffer zones minimising potential impacts to neighbouring habitats and species.

The overall estimated submarine cable route length is approximately 2.8km and traverses the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA.

Given the nature of the proposed onshore and marine activities, and the potential SCI and QI receptors in the Shannon estuary area, the potential project impact mechanisms (or sources of impact) are:

1. activities associated with onshore pre-construction and civil works may result in the release of sediment, chemicals or other waste material pollution or invasive plant species during construction periods.
2. vessel noise disturbance.
3. vessel collision.
4. construction noise disturbance associated with trench excavation and cable laying activities.
5. physical disturbance due to seabed clearance work, submarine trench excavation and cable laying activities.
6. sedimentation of solids resuspended by trench excavation and cable laying activities.
7. electromagnetic field effects

Given the spatial extent of the ZoI of the impact mechanisms, the only receptors that have a viable source-pathway link to the proposed project are QIs and SCIs for which the Lower River Shannon SAC (Site code: 002165) and River Shannon and River Fergus Estuaries SPA (Site code: 004077) are respectively designated. The next nearest SAC to the proposed development is the Tullaher Lough and Bog SAC (site code 2343). This SAC, designated for peatlands, is not hydrologically connected to the proposed development site, and 12 km distant. The next nearest SPA to the proposed development is the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (site code 2343), designated for breeding hen harrier Circus cyaneus. This SPA is located c. 7.5 km distant. There are no source-pathway links with between the proposed development and these or any other European sites.

The QIs of the Lower River Shannon SAC and the SCIs of the River Fergus Estuaries SPA are listed in Table 2.3 and Table 2.4 alongside conservation objectives set for the conservation features. In Table 2.3 and Table 2.4 the QIs and SCIs are assigned to broad ecological groups.

The Lower River Shannon SAC is the largest estuarine complexs in Ireland encompassing the Shannon, Feale, Mulkear and Fergus estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. The sites supports a wide range of Annex I coastal and marine habitats, diadromous fish species, and freshwater invertebrate and fish species. The site is also supports a nationally important population of Bottle-nosed Dolphin.

The River Shannon and River Fergus Estuaries SPA is designated for the following species: Cormorant, Whooper Swan, Light-bellied Brent Goose, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank and Black-headed Gull. The Cormorant population at the site are a nationally important breeding population (93 pairs in 2010). The populations of the other SCI birds

species are non-breeding at the site. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands. The site is designated for Wetland [A999].

The Natura 2000 Standard Forms for the Lower River Shannon SAC[10] and the River Shannon and River Fergus Estuaries SPA[11] list the main habitat characters and outline the most important negative impacting threats and pressures and positive impacting activities/ management affecting the sites; this information is included in Table 2.6 and Table 2.7 respectively. The assessment of potential effect of the project took into account the negative threats and pressures and positive impacts from existing activities as listed in Natura 2000 Forms. With regard to the proposed development the most relevant source of negative impact is Shipping lanes (D03.02) which is listed as a threat/ pressure for the River Shannon and River Fergus Estuaries SPA (see Table 2.7). The assessment of potential in-combination effects (see Section 2.3.2) identified that commercial shipping poses a risk of acting in-combination with the proposed development. Other categories of projects that may act in-combination with the proposed development include; dredging activity, energy storage and geophysical survey (see Section 2.3.2 for details).

[10] Natura 2000 - Standard Data Form. Site IE0002165 Site name Lower River Shannon SAC https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF002165.pdf
[11] Natura 2000 - Standard Data Form. Site IE0004077. Site name River Shannon And River Fergus Estuaries SPA https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF004077.pdf

Table 2.3: Qualifying Interests of Lower River Shannon SAC (NPWS 2012[1], 2013[2]).

Qualifying Interest Ecological Group	Qualifying Interest (*=Priority Habitat)	Conservation Objective
Annex I marine habitats	Sandbanks which are slightly covered by sea water all the time [1110]	To maintain the favourable conservation condition
	Estuaries [1130]	To maintain the favourable conservation condition
	Mudflats and sandflats not covered by seawater at low tide [1140]	To maintain the favourable conservation condition
	*Coastal lagoons [1150]	To restore the favourable conservation condition
	Large shallow inlets and bays [1160]	To maintain the favourable conservation condition
	Reefs [1170]	To maintain the favourable conservation condition
Annex I coastal habitats	Perennial vegetation of stony banks [1220]	To maintain the favourable conservation condition
	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	To maintain the favourable conservation condition
	Salicornia and other annuals colonising mud and sand [1310]	To maintain the favourable conservation condition
	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	To restore the favourable conservation condition
	Mediterranean salt meadows (Juncetalia maritimi) [1410]	To restore the favourable conservation condition
Annex I terrestrial/ freshwater aquatic habitats	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]	To maintain the favourable conservation condition
	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410]	To maintain the favourable conservation condition
	*Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	To restore the favourable conservation condition
Annex II marine species	Tursiops truncatus (Common Bottlenose Dolphin) [1349]	To maintain the favourable conservation condition
Annex I diadromous fish species	Petromyzon marinus (Sea Lamprey) [1095]	To restore the favourable conservation condition

Qualifying Interest Ecological Group	Qualifying Interest (*=Priority Habitat)	Conservation Objective
	Lampetra fluviatilis (River Lamprey) [1099]	To maintain the favourable conservation condition
	Salmo salar (Salmon) [1106]	To restore the favourable conservation condition
Annex II freshwater aquatic species	Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]	To restore the favourable conservation condition
	Lampetra planeri (Brook Lamprey) [1096]	To maintain the favourable conservation condition
	Lutra lutra (Otter) [1355]*	To restore the favourable conservation condition

Table 2.4: Special Conservation Interests of River Shannon and River Fergus Estuaries SPA (NPWS 2012[3], 2013[4]).

Special Conservation Interest Ecological Group	Special Conservation Interest	Conservation Objective
Habitat	Wetland [A999]	To maintain the favourable conservation condition
Bird species with diving foraging behaviour	Cormorant (Phalacrocorax carbo) [A017]	To maintain the favourable conservation condition
Bird species with shallow diving and dabbling behaviour	Shelduck (Tadorna tadorna) [A048]	To maintain the favourable conservation condition
	Wigeon (Anas penelope) [A050]	To maintain the favourable conservation condition
	Teal (Anas crecca) [A052]	To maintain the favourable conservation condition
	Pintail (Anas acuta) [A054]	To maintain the favourable conservation condition
	Shoveler (Anas clypeata) [A056]	To maintain the favourable conservation condition
	Scaup (Aythya marila) [A062]	To maintain the favourable conservation condition
	Ringed Plover (Charadrius hiaticula) [A137]	To maintain the favourable conservation condition
	Golden Plover (Pluvialis apricaria) [A140]	To maintain the favourable conservation condition
	Grey Plover (Pluvialis squatarola) [A141]	To maintain the favourable conservation condition
	Lapwing (Vanellus vanellus) [A142]	To maintain the favourable conservation condition
	Knot (Calidris canutus) [A143]	To maintain the favourable conservation condition
	Dunlin (Calidris alpina) [A149]	To maintain the favourable conservation condition

Special Conservation Interest Ecological Group	Special Conservation Interest	Conservation Objective
	Black-tailed Godwit (Limosa limosa) [A156]	To maintain the favourable conservation condition
	Bar-tailed Godwit (Limosa lapponica) [A157]	To maintain the favourable conservation condition
	Curlew (Numenius arquata) [A160]	To maintain the favourable conservation condition
	Redshank (Tringa totanus) [A162]	To maintain the favourable conservation condition
	Greenshank (Tringa nebularia) [A164]	To maintain the favourable conservation condition
	Black-headed Gull (Chroicocephalus ridibundus) [A179]	To maintain the favourable conservation condition
	Whooper Swan (Cygnus cygnus) [A038]	To maintain the favourable conservation condition
Bird species that predominately forage on grassland	Light-bellied Brent Goose (Branta bernicla hrota) [A046]	To maintain the favourable conservation condition

Table 2.5: General Site Character of Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA (Natura 2000 - Standard Data Form[6]).

Lower River Shannon SAC		River Shannon and River Fergus Estuaries SPA	
Habitat class	% Cover	Habitat class	% Cover
Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins) (N02)	44.0	Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins) (N02)	96.0
Marine areas, Sea inlets (N01)	39.0	Salt marshes, Salt pastures, Salt steppes (N03)	1.0
Improved grassland (N14)	3.0	Shingle, Sea cliffs, Islets (N05)	1.0
Salt marshes, Salt pastures, Salt steppes (N03)	2.0	Bogs, Marshes, Water fringed vegetation, Fens (N07)	1.0
Inland water bodies (Standing water, Running water) (N06)	2.0	Dry grassland, Steppes (N09)	1.0
Heath, Scrub, Maquis and Garrigue, Phygrana (N08)	2.0		
Humid grassland, Mesophilic grassland (N10)	2.0		
Coastal sand dunes, Sand beaches, Machair (N04)	1.0		
Shingle, Sea cliffs, Islets (N05)	1.0		
Bogs, Marshes, Water fringed vegetation, Fens (N07)	1.0		
Dry grassland, Steppes (N09)	1.0		
Broad-leaved deciduous woodland (N16)	1.0		
Artificial forest monoculture (e.g. Plantations of poplar or Exotic trees) (N20)	1.0		

Table 2.6: Threat, pressures and activities affecting Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA (Natura 2000 - Standard Data Form[7]).

Lower River Shannon SAC						River Shannon and River Fergus Estuaries SPA					
Negative impacts			Positive impacts			Negative impacts			Positive impacts		
Rank	Threats and pressure	i = inside, o = outside, b = both	Rank	Activities, management	i = inside, o = outside, b = both	Rank	Threats and pressure	i = inside, o = outside, b = both	Rank	Activities, management	i = inside, o = outside, b = both
L	invasive non-native species (I01)	i	L	paths, tracks, cycling tracks (D01.01)	i	H	Industrial or commercial areas (E02)	o	M	Marine and Freshwater Aquaculture (F01)	i
M	Fertilisation (A08)	o	L	Leisure fishing (F02.03)	i	M	nautical sports (G01.01)	i	M	Shipping lanes (D03.02)	i
M	Urbanised areas, human habitation (E01)	o	L	nautical sports (G01.01)	i	H	Discharges (E03)	i	M	nautical sports (G01.01)	i
M	Air pollution, air-borne pollutants (H04)	o	L	Marine and Freshwater Aquaculture (F01)	i	M	Shipping lanes (D03.02)	i			
M	Fertilisation (A08)	i				H	Fertilisation (A08)	o			
M	Discharges (E03)	o				M	Marine and Freshwater Aquaculture (F01)	i			

L	paths, tracks, cycling tracks (D01.01)	i		H	Urbanised areas, human habitation (E01)	0	
M	eutrophication (natural) (K02.03)	o					
L	nautical sports (G01.01)	i					
L	Sylviculture, forestry (B)	i					
L	Marine and Freshwater Aquaculture (F01)	i					
L	Hunting (F03.01)	i					
L	removal of beach materials (C01.01.02)	i					
M	Discharges (E03)	i					
L	hand cutting of peat (C01.03.01)	i					
M	grazing (A04)	i					
L	sea defence or coast protection works, tidal	i					

	barrages (J02.12.01)				
M	polderisation (J02.01.01)	i			
L	management of aquatic and bank vegetation for drainage purposes (J02.10)	i			
M	reclamation of land from sea, estuary or marsh (J02.01.02)	o			

2.3.1.3. Assessment of Potential Significant Effects

This section describes the screening assessments of the potential effects (direct or indirect) of project impact mechanisms (identified in Section 2.3.1.2 above) to the QIs and SCIs for which the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA are respectively designated (see Table 2.7 to Table 2.12).

Where a significant effect to a designated conservation feature from an impact mechanism is deemed likely, the designated feature and the impact mechanism combination is brought forward in the assessment for a detailed consideration of the potential for adverse effects (see Section 3 NIS).

In contrast, where the risk of a significant effect to a designated feature from an impact mechanism can be excluded on the basis of objective evidence, the designated feature and impact mechanism combination is screened out of further assessment.

The following provides summaries of the findings of the screening assessments outlined in Table 2.7 to Table 2.12. The conservation features for which likely significant effects exist are highlighted in bold; these conservation features are brought forward to the NIS in Section 3.

Lower River Shannon SAC (Site code 002165)

There is potential for significant effects to the following QIs of the Lower River Shannon SAC:

- Sandbanks which are slightly covered by sea water all the time [1110]
- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Coastal lagoons [1150] (*priority habitat)
- Large shallow inlets and bays [1160]
- Reefs [1170]
- Tursiops truncatus (Common Bottlenose Dolphin) [1349]
- Petromyzon marinus (Sea Lamprey) [1095]
- Lampetra fluviatilis (River Lamprey) [1099]
- Salmo salar (Salmon) [1106]

In contrast, as there is no viable pathway for effects to the following Qis, because they do occur within the zone of influence of likely significant effects from the proposed development site. As such it can be concluded that there is no likelihood for significant effects:

- Perennial vegetation of stony banks [1220]
- Vegetated sea cliffs of the Atlantic and Baltic coasts [1230][12]
- Salicornia and other annuals colonising mud and sand [1310]
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]

[12] Present within the wider studya area, but located outside the zone of influence of likely significant effects from the proposed develpoment

- Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]
- Mediterranean salt meadows (Juncetalia maritimi) [1410]
- Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410]
- Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
- Lampetra planeri (Brook Lamprey) [1096]
- Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]
- Lutra lutra (Otter) [1355]

River Shannon and River Fergus Estuaries SPA (Site code 004077)

Light-bellied Brent Goose utilise intertidal areas to feed. Suitable intertidal foraging habitat for the species area are not found within the zone of influence of the proposed development site. There is no suitable intertidal feeding habitat within approximately 2 km of the proposed development site, the nearest being ca 4 km to the west at Ballylongford Bay and ca 5 km to the east at Clonderlaw and Tarbert Bays. Consequently, there is no potential pathway for significant disturbance effects to the SCI Light-bellied Brent Goose (Branta bernicla hrota) [A046] as there is no viable pathway for effects to habitats used for foraging). Given the foraging behaviour of the following SCI bird species there is potential pathways for effects (i.e. a likelihood for potential significant effects):

- Bar-tailed Godwit (Limosa lapponica) [A157]
- Black-headed Gull (Chroicocephalus ridibundus) [A179]
- Black-tailed Godwit (Limosa limosa) [A156]
- Cormorant (Phalacrocorax carbo) [A017]
- Curlew (Numenius arquata) [A160]
- Dunlin (Calidris alpina) [A149]
- Golden Plover (Pluvialis apricaria) [A140]
- Greenshank (Tringa nebularia) [A164]
- Grey Plover (Pluvialis squatarola) [A141]
- Knot (Calidris canutus) [A143]
- Lapwing (Vanellus vanellus) [A142]
- Pintail (Anas acuta) [A054]
- Redshank (Tringa totanus) [A162]
- Ringed Plover (Charadrius hiaticula) [A137]
- Scaup (Aythya marila) [A062]
- Shelduck (Tadorna tadorna) [A048]
- Shoveler (Anas clypeata) [A056]
- Teal (Anas crecca) [A052]
- Whooper Swan (Cygnus cygnus) [A038]
- Wigeon (Anas penelope) [A050]

There is also potential for effects to the SCI habitat Wetland [A999] for which the River Shannon and River Fergus Estuaries SPA is designated.

Table 2.7: Annex I marine/ coastal habitats of the Lower River Shannon SAC (Site code 002165) - Source-Pathway-Receptor assessment of potential significant effects. Potential significant effects to Qualifying Interests are highlighted in bold.

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
1 activities associated with onshore pre-construction and civil works	Estuaries [1130] Reefs [1170]	Potential direct effects	With the exception of a small area of works on the northern landfall at Moneypoint the majority of the onshore works occur within ESB owned lands and adjacent to their existing facilities. The proposed onshore works lie outside but adjacent to the Lower River Shannon SAC. There is potential that the activities proposed for the onshore pre-construction and civil works may result in the release of sediment, chemicals or other waste material pollution during the construction periods to nearby QI habitats. Consequently, there are potential pathways for interaction between the impact mechanisms and the QIs of the site (i.e. connectivity exists).	Yes. The QIs and impact mechanism combinations are bought forward in the assessment for a detailed consideration of the potential for adverse effects (see Section 3 NIS).
1 activities associated with onshore pre-construction and civil works	[1110] Sandbanks which are slightly covered by sea water all the time [1140] - Mudflats and sandflats not covered by seawater at low tide [1150] - *Coastal lagoons [1160] - Large shallow inlets and bays [1220] - Perennial vegetation of stony banks [1230] - Vegetated sea cliffs of the Atlantic and Baltic coasts [1310] - Salicornia and other annuals colonising mud and sand [1330] - Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	No effect	Given the distance between the habitats and the proposed onshore works there is no viable pathway for significant effect between the impact mechanisms and the QIs; 1110] Sandbanks which are slightly covered by sea water all the time = c. 19 km at nearest point [1140] - Mudflats and sandflats not covered by seawater at low tide = c. 2 km at nearest point [1150] - *Coastal lagoons = c. 6 km at nearest point [1160] - Large shallow inlets and bays [1220] - Perennial vegetation of stony banks = c. 3.5 km at nearest point	Given that there is no potential significant effects, the QIs and impact mechanism combinations are screened out of further assessment.

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
	[1410] - Mediterranean salt meadows (Juncetalia maritimi)		[1230] - Vegetated sea cliffs of the Atlantic and Baltic coasts = 0.2 km at nearest point [1310] - Salicornia and other annuals colonising mud and sand (c.8 km) [1330] - Atlantic salt meadows (Glauco-Puccinellietalia maritimae) = c. 4.5 km These QIs are outside of the ZoI of the project (i.e. no connectivity exists).	
2 vessel noise disturbance. 3 vessel collision. 4. construction noise disturbance associated with trench excavation and cable laying activities.	[1110] - Sandbanks which are slightly covered by sea water all the time [1130] - Estuaries [1140] - Mudflats and sandflats not covered by seawater at low tide [1150] - *Coastal lagoons [1160] - Large shallow inlets and bays [1170] - Reefs [1220] - Perennial vegetation of stony banks [1230] - Vegetated sea cliffs of the Atlantic and Baltic coasts [1310] - Salicornia and other annuals colonising mud and sand [1330] - Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1410] - Mediterranean salt meadows (Juncetalia maritimi)	No effect	No viable pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	No. Given that there is no potential significant effects, the QIs and impact mechanism combinations are screened out of further assessment.
5 physical disturbance due to seabed	[1110] - Sandbanks which are slightly covered by sea water all the time	No effect	No spatial overlap	No. Given that there is no potential

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
clearance work, submarine trench excavation and cable laying activities. 6. sedimentation of solids resuspended by trench excavation and cable laying activities.	1140] - Mudflats and sandflats not covered by seawater at low tide [1150] - *Coastal lagoons [1160] - Large shallow inlets and bays [1220] - Perennial vegetation of stony banks [1230] - Vegetated sea cliffs of the Atlantic and Baltic coasts [1310] - Salicornia and other annuals colonising mud and sand [1330] - Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1410] - Mediterranean salt meadows (Juncetalia maritimi)		[1110] Sandbanks which are slightly covered by sea water all the time = c. 19 km at nearest point [1140] - Mudflats and sandflats not covered by seawater at low tide = c. 2 km at nearest point [1150] - *Coastal lagoons = c. 6 km at nearest point [1160] - Large shallow inlets and bays [1220] - Perennial vegetation of stony banks = c. 3.5 km at nearest point [1310] - Salicornia and other annuals colonising mud and sand (c.8 km) [1330] - Atlantic salt meadows (Glauco-Puccinellietalia maritimae) = c. 4.5 km These coastal Annex I habitats are outside of the ZoI of likely significant effects from the sediment plume from the project. There is no pathway at all in the case of [1230] - Vegetated sea cliffs of the Atlantic and Baltic coasts (0.2 km at nearest point) No viable pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	significant effects, the QIs and impact mechanism combinations are screened out of further assessment.
5 physical disturbance due to seabed clearance work, submarine trench excavation and cable laying activities.	[1130] - Estuaries [[1170] - Reefs	Potential direct effects	The proposed marine cable route is located near or partially overlaps the Annex I habitats and/ or their constituent marine community types. Consequently, there are potential pathways for interaction between the impact mechanisms and the QIs of the site (i.e. connectivity exists).	Yes. The QIs and impact mechanism combinations are bought forward in the assessment for a detailed consideration of the potential for adverse

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
				effects (see Section 3 NIS).
6 sedimentation of solids resuspended by trench excavation and cable laying activities.	[1110] - Sandbanks which are slightly covered by sea water all the time [1130] - Estuaries [1140] - Mudflats and sandflats not covered by seawater at low tide [1150] - *Coastal lagoons [1160] - Large shallow inlets and bays [1170] - Reefs	Potential direct effects	The QIs are marine/ coastal habitats whose structure and functionality are influenced by tidal regime and sediment transport. Sediment plumes generated during trench excavation and cable laying activities may partially overlap the Annex I habitats and/ or their constituent marine community types. Consequently, there is potential pathways for interaction between the impact mechanisms and the QIs (i.e. connectivity exists).	Yes. The QIs and impact mechanism combinations are bought forward in the assessment for a detailed consideration of the potential for adverse effects (see Section 3 NIS).
* Priority habitat under the Habitats Directive				

Table 2.8: Annex I terrestrial/ freshwater aquatic habitats of the Lower River Shannon SAC (Site code 002165) - Source-Pathway-Receptor assessment of potential significant effects. Potential significant effects to Qualifying Interests are highlighted in bold.

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
1 activities associated with onshore pre-construction and civil works	[3260] - Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [6410] - Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [91E0]* - Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	No effect	The proposed onshore works lie outside the Lower River Shannon SAC, so there could be no potential for direct effects. There is no potential for indirect pollution effects (via overland flow), because these habitats do not occur in the locality. There is no viable pathway for significant effect between the impact mechanisms and the QIs; these QIs are outside of the ZoI of the project (i.e. no connectivity exists).	Given that there is no potential pathway for significant effects, the QIs and impact mechanism combinations are screened out of further assessment.
2 vessel noise disturbance. 3 vessel collision. 4 construction noise disturbance associated with trench excavation and cable laying activities. 5 physical disturbance due to seabed clearance works, and excavation and cable laying activities. 6 sedimentation of solids resuspended by trench excavation and cable laying activities.	[3260] - Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [6410] - Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [91E0]* - Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	No effect	These terrestrial/ freshwater aquatic Annex I habitats are outside of the ZoI of the project. No spatial overlap. No viable pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	No. Given that there is no potential pathway for significant effects the QIs and impact mechanism combinations are screened out of further assessment.

Table 2.9: Annex II marine mammal species and diadromous fish species - Source-Pathway-Receptor assessment of potential significant effects. Potential significant effects to Qualifying Interests are highlighted in bold.

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
1 activities associated with onshore pre-construction and civil works	[1349] - Tursiops truncatus (Common Bottlenose Dolphin) [1095] - Petromyzon marinus (Sea Lamprey) [1099] - Lampetra fluviatilis (River Lamprey) [1106] - Salmo salar (Salmon)	No effect	No viable pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	No. Given that there is no potential significant effects, the QI and impact mechanism combinations are screened out of further assessment
2 vessel noise disturbance.	[1349] - Tursiops truncatus (Common Bottlenose Dolphin) [1095] - Petromyzon marinus (Sea Lamprey) [1099] - Lampetra fluviatilis (River Lamprey) [1106] - Salmo salar (Salmon)	No effect	Based on previous similar works in the Shannon, it is anticipated that a CLB/ CLV vessel of c. 125m in length will be employed to conduct the cable laying. Other project vessels that will be used include a launch vessel and guard/ support vessel(s). Vessel noise is a combination of tonal sounds at specific frequencies (e.g. propeller blade rotational frequency and its harmonics) and broadband noise (Vella et al., 2001). Propeller cavitation noise is the primary source of sound from underway vessels, whilst noise from propulsion machinery originates inside a vessel and reaches the water via the vessel hull. Noise from shipping is roughly related to vessel size, larger ships have larger, slower rotating propellers, which produce louder, lower frequency sounds (SMRU, 2001). Overall, vessel noise covers a wide range of frequencies from 10Hz to 10kHz. A typical 12m fishing vessel moving at 7 knots will have a peak frequency of 300 Hz with sound pressure level of 150 dB re 1 µPa at 1 m	No. Given that there is no potential significant effects, the QI and impact mechanism combinations are screened out of further assessment

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
			(DAHG, 2014). Dolphins, salmon and lamprey would hear such vessel noise. According to the SA Shannon Foynes Port Company (SFPC) approximately 1800 vessel movements are made within the estuary, equating to 900 different AIS (automatic identification system) tracked vessels travelling into the estuary annually. Cargo in excess of 12 million tonnes (approximately 20% of goods tonnage handled at national ports in Ireland) is delivered to the six main facilities. The presence of the project vessels (i.e. CLB/ CLV, launch vessel, guard/ support vessel) will not significantly increase the level of overall vessel activity or vessel engine noise in the area. It is deemed that there is no potential pathway for significant effect of the project impact mechanism on the QIs. There will be no likely significant effects.	
3 vessel collision.	[1349] - Tursiops truncatus (Common Bottlenose Dolphin)	No effect	During operations the vessels will be travelling at low speeds below which most lethal and serious injuries occur (Laist et al., 2001). It is therefore very unlikely that a mammal will collide with the slow moving vessel. Consequently it is deemed that there is no potential pathway for significant effect of the project on the QI. There will be no likely significant effects.	No. Given that there is no potential significant effects, the QI and impact mechanism combination is screened out of further assessment

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
3 vessel collision.	[1095] - Petromyzon marinus (Sea Lamprey) [1099] - Lampetra fluviatilis (River Lamprey) [1106] - Salmo salar (Salmon)	No effect	No viable pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	No. Given that there is no potential pathway for significant effects, the QI and impact mechanism combinations are screened out of further assessment.
4 construction noise disturbance associated with trench excavation and cable laying activities.	[1349] - Tursiops truncatus (Common Bottlenose Dolphin) Petromyzon marinus (Sea Lamprey) [1095] Lampetra fluviatilis (River Lamprey) [1099] Salmo salar (Salmon) [1106]	Potential effect	Noise is readily transmitted underwater and there is potential that Common Bottlenose Dolphin may be present during trench excavation and cable laying activities. There is potential for significant effects on Common Bottlenose Dolphin resulting from displacement and/or other behavioural changes. There is potential that diadromous fish species moving/ migrating through the project area may be present during excavations and cable laying operations. There is potential for significant effects on diadromous fish species	Yes. There is potential for significant effects on marine mammals and diadromous fish species. The QIs and impact mechanism combinations are bought forward in the assessment for a detailed consideration of the potential for adverse effects (see Section 3 NIS).
5 physical disturbance due to seabed clearance works, and excavation and cable laying activities. 6 sedimentation of solids resuspended by trench excavation and cable laying activities.	[1349] - Tursiops truncatus (Common Bottlenose Dolphin) [1095] - Petromyzon marinus (Sea Lamprey) [1099] - Lampetra fluviatilis (River Lamprey) [1106] - Salmo salar (Salmon)	No effect	These species do not depend on the seabed for spawning, feeding, or breeding. Prey resources for these species would not be significantly impacted by the sediment plume from the proposed development. No viable pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	No. Given that there is no potential pathway for significant effects, the QI and impact mechanism combinations are screened out of further assessment.

Table 2.10: Annex II freshwater aquatic species of the Lower River Shannon SAC (Site code 002165) - Source-Pathway-Receptor assessment of potential significant effects. Potential significant effects to Qualifying Interests are highlighted in bold.

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
1 activities associated with onshore pre-construction and civil works	[1029] - Margaritifera margaritifera (Freshwater Pearl Mussel) [1096] - Lampetra planeri (Brook Lamprey)	No effect	There are no populations of these species downstream of the proposed development. No viable pathway for significant effect exists between the activities associated with civil and earthworks at the landfall sites, and the QIs (i.e. no connectivity exists).	No. Given that there is no potential pathway for significant effects, the QI and impact mechanism combinations are screened out of further assessment.
2 vessel noise disturbance. 3 vessel collision. 4 construction noise disturbance associated with excavation and cable laying activities. 5 physical disturbance due to seabed clearance works, and excavation and cable laying activities. 6 sedimentation of solids resuspended by trench excavation and cable laying activities.	[1029] - Margaritifera margaritifera (Freshwater Pearl Mussel) [1096] - Lampetra planeri (Brook Lamprey)	No effect	No spatial overlap. There are no populations of these species downstream of the proposed development. These freshwater aquatic Annex II species are outside of the ZoI of the project. No viable pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	No. Given that there is no potential pathway for significant effects, the QI and impact mechanism combinations are screened out of further assessment.
1 activities associated with onshore pre-	Lutra lutra (Otter) [1355]	No effect	Otter is more a freshwater mammal rather than a truly marine mammal. While otter	No. Given that there is no potential significant effects,

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
construction and civil works 4 construction noise disturbance associated with excavation and cable laying activities.			habitat overlaps the coastal sections of the proposed project (NPWS 2012), sightings reported through the National Biodiversity Data Centre[13] identify areas immediate to where freshwater enters the estuary as being more typical of otter usage e.g. Ballylongford Bay, Tarbert Bay, Kilrush. These areas are outside of the project areas. No otter holt or couch sites were observed during walkover surveys[14] undertaken at the site. Whilst there is potential for otter to forage or commute within the zone of influence of the proposed development site, there is no likelihood for damage to breeding or resting sites, injury, permanent displacement, significant reductions in prey availability, or any other significant impact to occur from the proposed development. No pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	the QI and impact mechanism combinations are screened out of further assessment
2 vessel noise disturbance.	Lutra lutra (Otter) [1355]	No effect	. According to the SA Shannon Foynes Port Company (SFPC) approximately 1800 vessel movements are made within the estuary, equating to 900 different AIS (automatic identification system) tracked vessels travelling into the	No. Given that there is no potential significant effects, the QI and impact mechanism combinations are screened out of further assessment

[13] Data from the Lutra lutra database held by the National Biodiversity Data Centre www.biodiversityireland.ie.

[14] Walkover surveys undertaken on 15/02/2017, 24/04/2018, 14/03/2019, 04/04/2019 and 30/09/2019.

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
			estuary annually. Cargo in excess of 12 million tonnes (approximately 20% of goods tonnage handled at national ports in Ireland) is delivered to the six main facilities. The presence of the project vessels (i.e. CLB/ CLV, launch vessel, guard/ support vessel) will not significantly increase the level of overall vessel activity or vessel engine noise in the area. Consequently it is deemed that there is no potential pathway for significant effect of the project on the QIs. There will be no likely significant effects.	
3 vessel collision.	Lutra lutra (Otter) [1355]	No effect	Otter are mainly active in the very early morning and/ or late evening. Given this behaviour it is unlikely that the species will be active in the project area during operations. In addition, vessels used will for the project operation will be travelling at low speeds and therefore very unlikely that an otter will collide with the slow moving vessel. No viable pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	No. Given that there is no potential significant effects, the QI and impact mechanism combinations are screened out of further assessment
5 physical disturbance due to seabed clearance works, and excavation and cable laying activities. 6 sedimentation of solids resuspended by trench excavation	Lutra lutra (Otter) [1355]	No effect	No viable pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	No. Given that there is no potential significant effects, the QI and impact mechanism combinations are screened out of further assessment

Impact Mechanism	Qualifying Interest (NPWS 2012[1]).	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
and cable laying activities.				

Table 2.11: Special Conservation Interest Habitat of the River Shannon and River Fergus Estuaries SPA (Site code 004077) - Source-Pathway-Receptor assessment of potential significant effects. Potential significant effects to Special Conservation Interests are highlighted in bold.

Special Conservation Interests (NPWS 2012[2]).	Impact Mechanism	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
[A999] - Wetland	1 onshore pre-construction and civil works activities	No effect	The Conservation Objectives for the SPA include the single attribute of 'total area' for this feature. There is no potential for the onshore works to reduce the area of wetland habitat below the high tide mark. No pathway for significant effect exists between the impact mechanism and the SCI (i.e. no connectivity exists).	No. Given that there is no potential pathway for significant effects, the SCI and impact mechanism combinations are screened out of further assessment.

Special Conservation Interests (NPWS 2012[2]).	Impact Mechanism	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
	2 vessel noise disturbance. 3 vessel collision. 4 construction noise disturbance associated with excavation and cable laying activities. 5 physical disturbance due to seabed clearance works, and excavation and cable laying activities.	No effect	SCI wetland habitat includes all areas of the proposed development site below high water., The Conservation Objectives for the SPA include the single attribute of 'total area' for this feature. The total wetland area (which includes areas of open water at high tide) will not decrease as a result of the proposed development. No pathway for significant effect exists between the impact mechanism and the SCI (i.e. no connectivity exists). No pathway for effect exists between the impact mechanisms and the SCI (i.e. no connectivity exists).	No. Given that there is no potential pathway for significant effects, the SCI and impact mechanism combinations are screened out of further assessment.
[A999] - Wetland	6 sedimentation of solids resuspended by trench excavation and cable laying activities.	Potential direct effects	Wetland structure and functionality are influenced by hydrological regime and sediment transport. If sediment plumes generated during excavation activities overlap wetland habitats there is potential for significant effect. Consequently, there is potential pathways for interaction between the impact mechanisms and the SCI (i.e. connectivity exists).	As the only attribute for wetlands is the areal extent and since this will not be affected by the proposed development, there is no potential for significant effects on this habitat.

Table 2.12: Special Conservation Interest Species of the River Shannon and River Fergus Estuaries SPA (Site code 004077) - Source-Pathway-Receptor assessment of potential significant effects. Potential significant effects to Special Conservation Interests are highlighted in bold.

Special Conservation Interests (NPWS 2012[2]).	Impact Mechanism	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
[A017] Cormorant (Phalacrocorax carbo) [A048] Shelduck (Tadorna tadorna) [A050] Wigeon (Anas penelope) [A052] Teal (Anas crecca) [A054] Pintail (Anas acuta) [A056] Shoveler (Anas clypeata) [A062] Scaup (Aythya marila) [A137] Ringed Plover (Charadrius hiaticula) [A140] Golden Plover (Pluvialis apricaria) [A141] Grey Plover (Pluvialis squatarola) [A142] Lapwing (Vanellus vanellus) [A143] Knot (Calidris canutus) [A149] Dunlin (Calidris alpina) [A156] Black-tailed Godwit (Limosa limosa) [A157] Bar-tailed Godwit (Limosa lapponica) [A160] Curlew (Numenius arquata) [A162] Redshank (Tringa totanus) [A164] Greenshank (Tringa nebularia) [A179] Black-headed Gull (Chroicocephalus ridibundus) [A038] Whooper Swan (Cygnus cygnus)	1 activities associated with onshore pre-construction and civil works	No effect	Given the distance of suitable intertidal feeding area from the onshore works (c. 2km) SCIs will be present in the vicinity of the proposed works within the zone of influence of significant disturbance from the proposed works (estimated at 0.5 km). Consequently no pathway for significant effect exists between the impact mechanism and the SCIs (i.e. no connectivity exists).	Given that there is no potential pathway for significant effects, the SCI and impact mechanism combinations are screened out of further assessment.
	2 vessel noise disturbance.	No effects	According to the SA Shannon Foynes Port Company (SFPC) approximately 1800 vessel movements are made within the estuary, equating to 900 different AIS (automatic identification system) tracked vessels travelling into the estuary annually. Cargo in excess of 12 million tonnes (approximately 20% of goods tonnage handled at national ports in Ireland) is delivered to the six main facilities. Given the ambient level of activity in the area, the temporary additional vessel activity will the temporary presence of the project vessels in	Given that there is no potential significant effects, the SCI and impact mechanism combinations are screened out of further assessment

Special Conservation Interests (NPWS 2012[2]).	Impact Mechanism	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
			the area will not significantly increase the level of overall vessel activity or vessel engine noise in the area. Consequently it is deemed that there is no potential pathway for significant effect of the project on the QIs . There will be no likely significant effects.	
[A017] Cormorant (Phalacrocorax carbo) [A048] Shelduck (Tadorna tadorna) [A050] Wigeon (Anas penelope) [A052] Teal (Anas crecca) [A054] Pintail (Anas acuta) [A056] Shoveler (Anas clypeata) [A062] Scaup (Aythya marila) [A137] Ringed Plover (Charadrius hiaticula) [A140] Golden Plover (Pluvialis apricaria) [A141] Grey Plover (Pluvialis squatarola) [A142] Lapwing (Vanellus vanellus) [A143] Knot (Calidris canutus) [A149] Dunlin (Calidris alpina) [A156] Black-tailed Godwit (Limosa limosa) [A157] Bar-tailed Godwit (Limosa lapponica) [A160] Curlew (Numenius arquata) [A162] Redshank (Tringa totanus) [A164] Greenshank (Tringa nebularia) [A179] Black-headed Gull (Chroicocephalus ridibundus)	3 vessel collision. 5 physical disturbance due to seabed clearance works, and excavation and cable laying activities.	No effect	These species feed on intertidal habitats which are not present within c. 2km of the proposed development. These species would not be present within the potential zone of influence of disturbance from the marine works (estimated at c. 500 m). No viable pathway for significant effect exists between the impact mechanisms and the QIs (i.e. no connectivity exists).	Given that there is no potential pathway for significant effects, the SCIs and impact mechanism combinations are screened out of further assessment.

Special Conservation Interests (NPWS 2012[2]).	Impact Mechanism	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
[A038] Whooper Swan (Cygnus cygnus)				
[A017] - Cormorant (Phalacrocorax carbo) [A048] - Shelduck (Tadorna tadorna) [A050] - Wigeon (Anas penelope) [A052] - Teal (Anas crecca) [A054] - Pintail (Anas acuta) [A056] - Shoveler (Anas clypeata) [A062] - Scaup (Aythya marila) [A137] - Ringed Plover (Charadrius hiaticula) [A140] - Golden Plover (Pluvialis apricaria) [A141] - Grey Plover (Pluvialis squatarola) [A142] - Lapwing (Vanellus vanellus) [A143] - Knot (Calidris canutus) [A149] - Dunlin (Calidris alpina) [A156] - Black-tailed Godwit (Limosa limosa) [A157] - Bar-tailed Godwit (Limosa lapponica) [A160] - Curlew (Numenius arquata) [A162] - Redshank (Tringa totanus) [A164] - Greenshank (Tringa nebularia) [A179] - Black-headed Gull (Chroicocephalus ridibundus) [A038] - Whooper Swan (Cygnus cygnus)	4 construction noise disturbance associated with excavation and cable laying activities.	Potential effect	Given the foraging behaviour of the species there is potential that the SCIs may be present in the project area during operations. Noise emissions could potentially cause behavioural changes and/ or injury to foraging birds	There is potential that the project may affect bird species designated for the River Shannon and River Fergus SPA (see Section 3 NIS).
	6 sedimentation of solids resuspended by trench excavation and cable laying activities.	Potential indirect effect	Bird species use wetland habitats for foraging. The structure and functionality of wetlands are influenced by hydrological regime and sediment transport. If sediment deposition plumes generated during excavation activities overlap wetland habitats there is potential for significant direct effect to wetlands and indirect effect to bird foraging (i.e. connectivity exists).	There is potential that the project may indirectly effect bird foraging through direct sedimentation of solids on wetlands (see 3 NIS).

Special Conservation Interests (NPWS 2012[2]).	Impact Mechanism	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
[A046] - Light-bellied Brent Goose (Branta bernicla hrota)	1 activities associated with onshore pre-construction and civil works 2 vessel noise disturbance. 3 vessel collision. 4 construction noise disturbance associated with excavation and cable laying activities. 5 physical disturbance due to seabed clearance works, and excavation and cable laying activities. 6 sedimentation of solids resuspended by trench	No effect	Light-bellied Brent Goose utilise intertidal areas to feed. Suitable intertidal foraging habitat for the species are not found within or immediately adjacent to the proposed development. Consequently, there is no potential pathway for significant effects as there is no viable pathway for effects to foraging habitats. .	Given that there is no potential pathway for significant effects the SCI and impact mechanism combinations are screened out of further assessment.

Special Conservation Interests (NPWS 2012[2]).	Impact Mechanism	Potential Effects	Source-Pathway-Receptor Assessment	Potential for Significant Effects
	excavation and cable laying activities.			

2.3.2. Plans or Projects That Might Act In Combination

As outlined in Section 2.1, Part XAB of the Planning and Development Act 2000 (as amended) requires that for onshore developments requiring development consent a screening for appropriate assessment of the proposed development and, if necessary, an AA be AA are carried out , while under the 2011 Birds and Natural Habitats Regulations all competent authorities are required to conduct a screening for AA and, if necessary, an AA on any plan or project for which it receives an application for consent including those projects that require an application for a the foreshore licence.

Regulation 42 (1) of the 2011 Regulations requires that:

> A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site.

It is therefore required that the potential impacts of the proposed project are considered in combination with other relevant plans or projects.

As described above in Section 2.3.1.2 the impact mechanisms of the proposed cable laying project that are likely to result in significant effects to European sites are:

1. activities associated with onshore pre-construction and civil works.
2. vessel noise disturbance.
3. vessel collision.
4. construction noise disturbance associated with trench excavation and cable laying activities.
5. physical disturbance due to trench excavation and cable laying activities.
6. sedimentation of solids resuspended by trench excavation and cable laying activities
7. Electromagnetic fields.

The assessment of potential in combination effects considers the above potential impact mechanisms associated with the proposed project that in combination with other plans and project may result in significant effects.

To inform the assessment of potential in combination effects a review of consent applications for projects in the vicinity of the proposed cable laying project included on the following web-sites was completed in March 2020:

- DHPLG (http://www.housing.gov.ie/planning/foreshore/foreshore-consenting and https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal)
- ABP (http://www.pleanala.ie/lists/2018/sid/index.htm)
- Clare County Council (http://www.eplanning.ie/ClareCC/searchtypes)
- Kerry County Council (http://maps.kerrycoco.ie/flexviewers/kerrymaps/)

The assessment of potential in combination effects also considered negative impacting threats and pressures and positive impacting activities/ management affecting the sites as identified in Natura 2000 forms published for the sites and presented in Table 2.7.

Projects and activities identified that pose a risk of acting in combination with the project can be broadly categorised as:

- commercial shipping
- dredging activity
- energy storage
- geophysical survey

Screening assessments of potential in combination effects from the each of the above categories of project are summarised in Table 2.13.

It was concluded that there is potential likelihood for significant effects from the proposed project in combination with other plans or projects. There is potential for the works to coincide with the Moneypoint Synchronous Condenser development (20/318).

Table 2.13: Screening Assessment of potential in combination effects.

Project Category	Project Summary and Assessment of Potential In Combination Effects
Commercial Shipping	The level of commercial shipping in the Shannon has remained relatively stable over the last 10 years (pers. comm[15]). The Natura 2000 Forms for the Lower River Shannon SAC[6] and the River Shannon and River Fergus Estuaries SPA[7] list the main habitat characters and outline the most important negative impacting threats and pressures and positive impacting activities/ management affecting the sites (see Table 2.5 and Table 2.6 respectively). With regard to the proposed development the most relevant source of negative impact is Shipping lanes (D03.02) which is listed as a threat/ pressure listed for the River Shannon and River Fergus Estuaries SPA (see

[15] Personal communication 18/06/2020 Captain Hugh Conlon – Shannon Foynes Harbour Master

Project Category	Project Summary and Assessment of Potential In Combination Effects
	Table 2.6).. The Natura 2000 form also indicates a medium positive impact of management of Shipping lanes (D03.02) within the site. According to the SA Shannon Foynes Port Company (SFPC) approximately 1800 vessel movements are made within the estuary, equating to 900 different AIS (automatic identification system) tracked vessels travelling into the estuary annually. Cargo in excess of 12 million tonnes (approximately 20% of goods tonnage handled at national ports in Ireland) is delivered to the six main facilities. Given the ambient level of activity in the area the temporary presence of the project vessels (i.e. CLB/ CLV, launch vessel, guard/ support vessel) will not significantly increase the overall level of vessel activity in the area and so it is deemed that there is no likelihood of potential significant in combination effect on SCIs of the River Shannon and River Fergus Estuaries SPA or QIs of the Lower River Shannon SAC. Based on the above it is concluded here that commercial shipping does not pose a risk of significant in combination effect to SCIs of the SPA. Conclusion on Potential for Significant In Combination Effects: There is no potential for significant effects from the proposed project in combination with commercial shipping.
Dredging Activity	The level of maintenance dredging activities in the Shannon has remained relatively stable over the last 10 years (pers. comm[14]). The temporary additional vessel activity required to carry out the proposed project does not represent a significant increase in vessel activity in the area. Consequently, it can be concluded that ambient ship associated noise levels will not increase significantly as a result of the project vessels. It should be noted that for the construction phase of the proposed project there will be no marine dredging or 'Dumping at Sea'. Based on the above it is concluded here dredging activity does not pose a risk of significant in combination effect to on SCIs of the River Shannon and River Fergus Estuaries SPA or QIs of the Lower River Shannon SAC. Assessment of Potential for Significant In Combination Effects: There is no potential for significant effects from the proposed project in combination with dredging activity.
Kilpaddoge Battery Energy Storage Project	Shannon Clean Tech Ltd has applied for a 10-year permission for the development of a Battery Energy Storage System (BESS) Facility on a site of c. 0.6ha in the townland of Kilpaddoge, Tarbert, Co. Kerry[16]. The BESS facility will provide balancing services to the Irish national grid allowing short term battery energy storage for surplus energy which can be subsequently transferred back into the grid at peak energy demand periods. The facility will contain a series of 26 no. BESS units with associated heating ventilation and air conditioning system and control building, together with associated site works including ESB sub-station installation, transformer, access roadways, footpaths, paving, site security (lighting, CCTV etc.), drainage and landscaping. The development area is currently used for agriculture and has low biodiversity value. The development is located 300m from the boundary of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. An AA Screening report prepared for the BESS development concluded that the development will not have a significant effect on any Natura 2000 site. Findings of the AA Screening report for the development relevant to the assessment of in combination effect with current cable installation project are summarised below. Direct and Indirect Habitat Loss or Deterioration of Natura 2000 sites The AA Screening report for the BESS development outlined that the development is not located within of the boundaries of Natura 2000 site and will not result in any direct of

[16] http://docstore.kerrycoco.ie/planningfiles/18878.pdf

Project Category	Project Summary and Assessment of Potential In Combination Effects
	habitat loss. The AA Screening report also outlined that indirect loss of habitat or deterioration of Natura 2000 sites… can occur from the effect of run-off or discharge into the marine environment through impact such as increased siltation, nutrient release and/or contamination. It was concluded that there is no potential impact to Natura sites as there are no hydrological links (impact pathways) between the development and the Lower River Shannon SAC and the River Shannon and River Fergus Estuary SPA. There are no potential impact pathways between the BESS project and habitat receptors; consequently it is concluded that there is no potential for significant in combination effects with current cable installation project to QI habitats of the Lower River Shannon SAC or SCI habitat of the River Shannon and River Fergus Estuaries SPA. Disturbance/ Displacement of Species The AA Screening report for the BESS development concluded that the construction and operation of the development would not cause disturbance to the birds using the River Shannon (and hence the SPA) as the development site is located 300m from the estuary (and boundary of the SPA) and is not suitable for roosting and foraging of the qualifying bird species of the River Shannon and River Fergus Estuary SPA. Lower River Shannon SAC and the River Shannon and River Fergus Estuary SPA. There is no potential for significant in combination disturbance effects to SCIs of the River Shannon and River Fergus Estuaries SPA. Impact on Water Quality With respect to water quality AA Screening report for the BESS development concluded that following adherence to standard construction codes there will be no significant impacts from the proposed development on water quality in the River Shannon. There is no potential for these impact mechanisms to act in combination with effects from the BESS development; consequently it can be concluded that there is no potential for in combination effects on water quality in the Shannon estuary.
Moneypoint Synchronous Condenser	The Electricity Supply Board (ESB) is proposing to develop a Synchronous Condenser on a plot of land at Moneypoint Power Station, Carrowdotia, Co. Clare. This application is a resubmission of a previous 2019 application but located in a different location within the Moneypoint Power Station. The planning application for this development (Ref: 20/318 Clare County Council) notes that the synchronous condenser compound will be approximately 100 m by 40 m in total. The proposed development will comprise a main building and ancillary equipment such a cooling equipment, electrical and control equipment, transformer, circuit breaker, connections to existing site services networks including electrical, water and wastewater and an underground surface water attenuation tank connecting to existing surface water drains, and fencing. The proposed development lands are located approximately 800m west of the proposed cable landfall at Moneypoint as associated with the Cross Shannon 400 kV project. A Natura Impact Statement (NIS) was prepared for the Synchronous Condenser development. The associated screening assessment noted that piling works during the construction phase of the development may result in elevated underwater noise in the immediate vicinity of the Moneypoint site which could affect bottlenose dolphin. The NIS prescribes a marine mammal observer (MMO) operating in accordance with 'Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters' as mitigation to alleviate the potential for adverse effects on the Lower River Shannon SAC. Assessment of Potential for Significant In Combination Effects: The Synchronous Condenser development will be delivered over a 12 – 18 month programme (as per the planning application). There is potential for the works to coincide with the Cross Shannon 400 kV project which could in turn exacerbate the noise effects on bottle nosed dolphin. There is potential for in-combination effects with the Moneypoint Synchronous Condenser development.

Project Category	Project Summary and Assessment of Potential In Combination Effects
Geophysical Survey	There are plans to carry out a geophysical survey of the Prospect Tarbert pipelines which extend across the River Shannon estuary from Tarbert Generating Station in Co. Kerry to Kilkerin Point in Co. Clare. This survey will be carried out under the conditions of its 2005 licence.The project is planned for Q2/ Q3 2020, and as such is unlikely to overlap temporarily with the proposed development. Furthermore, the contract documentation for the proposed works includes for a Marine Mammal Observer, and implementation of NPWS guidelines on underwater noise. Conclusion on Potential for Significant In Combination Effects: There is no potential likelihood for significant effects from the proposed project in combination with proposed geophysical surveys.
LNG project at Ballylongford	Planning permission for a liquefied natural gas electricity generating plant was granted by Kerry County Council. A recent European Court of Justice ruling stated that the Shannon LNG terminal does not have a valid planning permission. Alterations to the previous development are expected to include the construction of a jetty in the River Shannon where vessels carrying gas will deliver it to the plant. Potential in combination effects could arise if both projects are constructed at the same time. However, as the design of the LNG project has not yet being completed, the likelihood of this eventuality is extremely unlikely. Conclusion on Potential for Significant In Combination Effects: There is no potential likelihood for significant effects from the proposed project in combination with proposed construction of a jetty as part of the LNG project.

2.4. Screening Outcome

The current assessment investigates the potential for the proposed project to have significant effects on European Sites within the Natura 2000 network. The assessment has determined, in light of best available scientific data, that there is potential for significant effects on the Lower Shannon River SAC and the River Shannon and River Fergus Estuaries SPA from the proposed project. The likelihood of significant effects on all other European sites has been ruled out. The assessment also determined that there is no potential for significant effects from the proposed project in combination with other plans or projects. The findings of the assessment are summarised in Table 2.14.

Table 2.14: Screening matrix of the proposed project.

Screening Matrix	
Brief description of the project or plan	The Cross Shannon 400 kV Cable Project involves the laying of a new 400 kV cable across the Shannon Estuary (in the seabed) between the Moneypoint 400 kV Electricity Substation in the townland of Carrowdotia South County Clare and Kilpaddoge 220/110 kV Electricity Substation in the townland of Kilpaddoge County Kerry. The connection at Moneypoint will be at the existing substation on ESB lands. The connection at Kilpaddoge requires an extension of 5,500m^2 to the existing substation on ESB lands. The application line boundary area is shown in red in Figure 1.1. The application boundary area partially overlaps the Lower River Shannon SAC (Site code 002165) (NPWS 2012[1], 2013[2]) and the River

	Shannon and River Fergus Estuaries SPA (Site code 004077) (NPWS 2012[3], 2015[4]); the application boundary relative to the SAC site and SPA site is shown in Figure 1.2 and Figure 1.3 respectively. With the exception of a small area of works on the northern landfall at Moneypoint the majority of the works occur within ESB owned lands and adjacent to their existing facilities. The proposed onshore works lie outside but adjacent to the Lower River Shannon SAC.
European Site(s)	
Brief description of the European site(s)	Following source-pathway-receptor assessment potential significant effects were determined to exist for the following: SCI species of River Shannon and River Fergus Estuaries SPA: • Bar-tailed Godwit (Limosa lapponica) [A157] • Black-headed Gull (Chroicocephalus ridibundus) [A179] • Black-tailed Godwit (Limosa limosa) [A156] • Cormorant (Phalacrocorax carbo) [A017] • Curlew (Numenius arquata) [A160] • Dunlin (Calidris alpina) [A149] • Golden Plover (Pluvialis apricaria) [A140] • Greenshank (Tringa nebularia) [A164] • Grey Plover (Pluvialis squatarola) [A141] • Knot (Calidris canutus) [A143] • Lapwing (Vanellus vanellus) [A142] • Pintail (Anas acuta) [A054] • Redshank (Tringa totanus) [A162] • Ringed Plover (Charadrius hiaticula) [A137] • Scaup (Aythya marila) [A062] • Shelduck (Tadorna tadorna) [A048] • Shoveler (Anas clypeata) [A056] • Teal (Anas crecca) [A052] • Whooper Swan (Cygnus cygnus) [A038] • Wigeon (Anas penelope) [A050] SCI habitat of River Shannon and River Fergus Estuaries SPA: • Wetlands (A999) QI species of Lower River Shannon SAC: • Tursiops truncatus (Common Bottlenose Dolphin) [1349] • Petromyzon marinus (Sea Lamprey) [1095] • Lampetra fluviatilis (River Lamprey) [1099] • Salmo salar (Salmon) [1106] QI habitats of Lower River Shannon SAC: • Sandbanks which are slightly covered by sea water [1110] • Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Coastal lagoons [1150] (*identified as a priority habitat under the Habitat Directive) • Large shallow inlets and bays [1160] • Reefs [1170]

Assessment Criteria	
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European site.	The impact mechanisms associated with the proposed project may result in potential direct and indirect effects to the SCIs and QIs listed above can be separated spatially into two work areas: • onshore activities - pre-construction and civil works. • marine activities - intertidal and subtidal cable installation Onshore activities: Impact Mechanism 1 - potential that the proposed works may affect habitat quality and water quality through the release of sediment, chemicals or other waste material pollution or invasive plant species during construction. Marine activities: Impact Mechanism 4 - potential that the proposed trench excavation and cable laying activities may result in noise disturbance. Impact Mechanism 5 - potential physical disturbance due to seabed clearance works and trench excavation and cable laying activities. Impact Mechanism 6 potential sedimentation impact associated with transport and deposition of solids resuspended by excavation and cable laying activities. Significant effects to QIs and SCIs associated with impact mechanism 2 vessel noise disturbance and 3 vessel collision were screened out.
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of Size and scale, Land-take.	
Distance from the Natura 2000 site or key interests of the site;	Onshore activities: With the exception of a small area of works on the northern landfall at Moneypoint the majority of the onshore works occur within ESB owned lands and adjacent to their existing facilities. The proposed onshore works lie outside but adjacent to the Lower River Shannon SAC. Marine activities: The cable route overlaps the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA.
Resource requirements (water abstraction etc.);	Onshore activities: During the proposed project, construction equipment and plant (excavators etc.) will be in operation. The fuel used by the construction equipment, dumper trucks and plant and vessels will be petrol/ diesel. Works at the landfall site will involve the uses of rock/ gravel filled gabion bags or backfill material and rock protection. Where possible excavated material will be reused. Concrete will be sued to create the slipways and permanent structures. Marine activities: Where ground conditions along the cable route prevent the target burial depth being achieved, addition protection will be provide to the cable by rock placement, installation of concrete mattresses or rock filter bags.
Emissions (disposal to land, water or air);	Onshore activities and Marine activities: Atmospheric and noise emissions from construction equipment, dumper trucks, plant, vessels and cable laying equipment. Onshore activities:

	Potential release of sediment, chemicals or other waste material pollution at the landfall sites during construction periods Subsea activities: Resuspension of resuspended by trench excavation activities.
Excavation requirements; Transportation requirements;	Onshore activities: Excavation requirements Excavation of trenches across ESB held lands and at the foreshore for the cable installation. Excavation/ reprofiling the upper shorelines/ cliff edges. Transportation requirements Where possible excavated material will be reused as backfill on site. Excavated material not reused will be taken from site using dumper trucks for disposal at licenced facilities. Marine activities: Excavation requirements Excavation of trenches through Annex I habitats. The sediment that is excavated from trenches is displaced either side of the trench that is created. Cables will be laid within the trench. The trench will be infilled through natural sediment movement processes due to water currents. These natural sediment movement processes will also act to flatten and remove sediment mounds created by the sediment displaced from the trench by the excavation. Transportation requirements None – no dredging or 'Dumping at Sea' proposed
Duration of construction, operation, Decommissioning Other.	The proposed project activity comprises civil and earthworks at the Moneypoint and Kilpaddoge sites and the installation of electricity submarine cables across the Shannon estuary. The connection at Moneypoint will be at the existing substation on ESB lands. The connection at Kilpaddoge requires an extension of 5,500m^2 to the existing substation on ESB lands. The civil and earthworks involves the use of excavators and dumper trucks. Cable laying activity will be undertaken using a number of project vessels including a cable laying barge (CLB)/ cable laying vessel (CLV), a launch vessel and guard/ support vessel(s). On completion of the work at the sites and the installation of cable, all equipment will leave the project areas. Subject to securing the necessary consents, it is anticipated that installation operations will commence in early 2022. It is expected that the development will become fully operational in 2023. The dates and timeframes for the project may change dependent on the outcome of the consenting process. A mitigation measure will prevent any marine works during the dolphin calving season.
Describe any likely changes to the site arising as a result of: Reduction in habitat area; Disturbance to key species; Habitat or species fragmentation; Reduction in species density;	Onshore activities: The onshore activities are located outside the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. With regard to the proposed works at the Moneypoint site, the overall length of the cable route is 1.8km of which 1.6km lies within the Moneypoint site owned by ESB. This part of the cable route runs through a brown field site that is of no conservation value. Of the 200m of cable route that lies outside the Moneypoint site, c. 100m

Changes in key indicators of conservation value (water quality etc.); Climate change	of this falls within the intertidal habitat and this is owned by the State. The remaining 100m is scrub land and grassland. At the Killpadogue site, the cable route from the upper shore line to the boundary of the ESB substation is c. 50m in length of which c. 50m passes through agricultural land that is of no conservation value. The proposed extension to the existing substation (c. 5,500m^2) lies within the property owned by the ESB. This is a brown field which is of no conservation value site. The brown field site has no QI habitats or species of the Lower River Shannon SAC. The onshore works does not involve land take within the SAC; the works will not result in a reduction of habitat area. The only potential impact mechanism associated with the onshore works is the potential release of sediment, chemicals or other waste material pollution or invasive plant species during construction periods (i.e. Impact Mechanism 1). Of the QIs of the Lower River Shannon SAC the screening assessment identified potential effects to QI habitats Estuaries 1130 and Reefs 1170. The screening assessment identified no potential effects to SCIs of the SPA. Release of sediment, chemicals or other waste material or pollution vectors of invasive plant species has the potential to directly affect water quality and indirect effects the community types identified in the QI habitats. Mitigation measures required to avoid significant effects on water quality are discussed in Section 3 NIS. Marine activities: The cable route overlaps the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. Where ground conditions along the route allow the cable will be buried in trenches while where ground conditions prevent the target burial depth being achieved, addition protection will be provided to the cable by rock placement, installation of concrete mattresses or rock filter bags. The potential impact mechanisms associated with the subsea works are: Impact Mechanism 4 - construction noise disturbance associated with trench excavation and cable laying activities. Impact Mechanism 5 - physical disturbance due to seabed clearance work, and trench excavation and cable laying activities. Impact Mechanism 6 - sedimentation of solids resuspended by trench excavation and cable laying activities. Impact Mechnaism 7- electromagnetic fields (EMF) The screening assessment identified potential effects to the following QIs and SCIs: Common Bottlenose Dolphin [1349], Sea Lamprey [1095], River Lamprey [1099], Salmon [1106], Sandbanks which are slightly covered by sea water all the time [1110], Estuaries [1130], Mudflats and sandflats not covered by seawater at low tide [1140], *Coastal lagoons [1150], Large shallow inlets and bays [1160], Reefs [1170], Wetland [A999], Cormorant [A017], Shelduck [A048], Wigeon [A050], Teal [A052], Pintail [A054], Shoveler [A056], Scaup [A062], Ringed Plover [A137], Golden Plover [A140], Grey Plover [A141], Lapwing [A142], Knot [A143], Dunlin [A149] Black-tailed Godwit [A156], Bar-tailed Godwit [A157], Curlew [A160], Redshank [A162], Greenshank [A164], Black-headed Gull [A179] and Whooper Swan [A038].

	Potential for the subsea works activity to result in noise disturbance effects to SCI and QI species (i.e. Impact Mechanism 4). Potential effects are assessed in Section 3 NIS; the assessments considered potential impacts to species population attributes including abundance. QI habitats may be effected by Impact Mechanism 5 and6 while SCI habitat may be effected by Impact Mechanism 6. The assessment of potential effects presented in Section 3 NIS considered potential impact to habitats attributes including habitat area, habitats fragmentation and disturbance to species. Onshore Activities and Marine Activities The main source of atmospheric emissions from the proposed activity at the landfall sites will result from engine exhaust gases from engines associated with the plant and vessels. Given the short duration of the project, significant effect on climate from atmospheric emissions can be discounted.
Describe any likely impacts on the Natura 2000 site as a whole in terms of: Interference with the key relationships that define the structure of the site; Interference with key relationships that define the function of the site.	Behavioural changes and/ or injury to QIs and SCI could have knock on effects to the wider function of the SAC and SPA in particular predator/ prey relationships and foraging opportunities.
Provide indicators of significance as a result of the identification of effects set out above in terms of: Loss; Fragmentation; Disruption; Disturbance; Change to key elements of the site.	Indicators of significance are loss of SCI and QI species and habitats. Indicators of significance are behavioural changes in SCI and QI species.
Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	Potential impacts to water quality from onshore activities to habitats adjacent to the sites have the potential to be significant; mitigation measure required to avoid impacts occurring are identified in Section 3 NIS. Potential noise disturbance effects to SCI bird species and QI mammal and diadromous fish species have the potential to be significant; significance of potential effects is assessed in Section 3 NIS. Potential physical disturbance and sedimentation effects to QI habitats have the potential to be significant; significance of potential effects is assessed in Section 3 NIS

3. Natura Impact Statement

3.1. Summary of Screening Outcome

The Screening for AA determined that the proposed project has the potential to result in significant effects on QIs of the Lower River Shannon SAC and SCIs of the River Shannon and River Fergus Estuaries SPA.

The QIs of the Lower River Shannon SAC for which there is potential for significant effects are:

- Sandbanks which are slightly covered by sea water all the time [1110]
- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Coastal lagoons [1150] (*priority habitat)
- Large shallow inlets and bays [1160]
- Reefs [1170]
- Tursiops truncatus (Common Bottlenose Dolphin) [1349]
- Petromyzon marinus (Sea Lamprey) [1095]
- Lampetra fluviatilis (River Lamprey) [1099]
- Salmo salar (Salmon) [1106]

SCI species of the River Shannon and River Fergus Estuaries SPA for which there is potential for significant effects are:

- Bar-tailed Godwit (Limosa lapponica) [A157]
- Black-headed Gull (Chroicocephalus ridibundus) [A179]
- Black-tailed Godwit (Limosa limosa) [A156]
- Cormorant (Phalacrocorax carbo) [A017]
- Curlew (Numenius arquata) [A160]
- Dunlin (Calidris alpina) [A149]
- Golden Plover (Pluvialis apricaria) [A140]
- Greenshank (Tringa nebularia) [A164]
- Grey Plover (Pluvialis squatarola) [A141]
- Knot (Calidris canutus) [A143]
- Lapwing (Vanellus vanellus) [A142]
- Pintail (Anas acuta) [A054]
- Redshank (Tringa totanus) [A162]
- Ringed Plover (Charadrius hiaticula) [A137]
- Scaup (Aythya marila) [A062]
- Shelduck (Tadorna tadorna) [A048]
- Shoveler (Anas clypeata) [A056]
- Teal (Anas crecca) [A052]
- Whooper Swan (Cygnus cygnus) [A038]
- Wigeon (Anas penelope) [A050]

There is also potential effect to the SCI habitat Wetland [A999] for which River Shannon and River Fergus Estuaries SPA is designated.

This Natura Impact Statement (NIS) has been produced in support of the AA of the proposed project to be undertaken by the competent authority. The NIS considers in greater detail the aspects of the proposed project with potential for significant effects and further examines the implications of the proposed project, alone and in-combination with other plans and projects, on the integrity of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA in view of the

Conservation Objectives established for the sites. Where potential significant adverse effect are identified, mitigation measures are identified to prevent adverse effects on the integrity of the sites.

3.2. Description of the Proposed Project

The Cross Shannon 400 kV Cable Project involves the laying of a new 400 kV cable across the Shannon Estuary (in the seabed) between the Moneypoint 400 kV Electricity Substation in the townland of Carrowdotia South County Clare and Kilpaddoge 220/110 kV Electricity Substation in the townland of Kilpaddoge County Kerry. The connection at Moneypoint will be at the existing substation on ESB lands. The connection at Kilpaddoge requires an extension of 5,500m^2 to the existing substation on ESB lands. Subject to securing the necessary consents, it is anticipated that installation operations will commence in early 2022. It is expected that the development will become fully operational in 2023. The dates and timeframes for the project may change dependent on the outcome of the consenting process.

Descriptions of the proposed project are presented in Section 1.1 and Section 2.2 including mapping of the project relative to European sites for which significant effects could not be ruled out in the screening for AA.

3.3. Description of Receiving Environment

3.3.1. Lower River Shannon SAC

The proposed project is located in the Lower River Shannon SAC (see

Figure 1.2). The Natura 2000 Standard Data Form[6] for the SAC lists the negative impacting threats and pressures and positive impacting activities/ management affecting the site (see

Table 2.6). The existing pressures, threats or activities that impose negative impact on the site are:

- Discharges (E03)
- Air pollution, air-borne pollutants (H04)
- Fertilisation (A08)
- Urbanised areas, human habitation (E01)
- Eutrophication (natural) (K02.03)
- Grazing (A04)
- Polderisation (J02.01.01)
- Reclamation of land from sea, estuary marsh (J02.01.02)

The above pressures, threats or activities impose moderate negative impacts on the site.

The Lower River Shannon SAC is designated for a total of twenty-one Annex I Habitat and Annex II species. These Annex I Habitat and Annex II species are listed in Table 2.3. Table 3.1 lists the QIs of the Lower River Shannon SAC for which there is potential for significant effects (as identified in the screening assessment), alongside their Conservation Objective and national status. A detailed description of the site is included in the Site Synopsis report (NPWS, 2013[2]) which is included in Appendix 1.

Table 3.1: Qualifying Interests of the Lower River Shannon SAC.

Qualifying Interest		Site Conservation Objective (NPWS 2012[1])	National Status,[17] [18]
Annex I marine habitats	Sandbanks which are slightly covered by sea water all the time [1110]	To maintain the favourable conservation condition	Overall Conservation Status is assessed as Favourable Overall Trend in Conservation Status is assessed as Stable
	Estuaries [1130]	To maintain the favourable conservation condition	Overall Conservation Status is assessed as Inadequate Overall Trend in Conservation Status is assessed as Deteriorating
	Mudflats and sandflats not covered by seawater at low tide [1140]	To maintain the favourable conservation condition	Overall Conservation Status is assessed as Inadequate Overall Trend in Conservation Status is assessed as Deteriorating
	*Coastal lagoons [1150]	To restore the favourable conservation condition	Overall Conservation Status is assessed as Bad Overall Trend in Conservation Status is assessed as Deteriorating
	Large shallow inlets and bays [1160]	To maintain the favourable conservation condition	Overall Conservation Status is assessed as Inadequate

[17] NPWS 2019 The Status of EU Protected Habitats and Species in Ireland – Habitats Assessments - Volume 2 https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol2_Habitats_Article17.pdf
[18] NPWS 2019 The Status of EU Protected Habitats and Species in Ireland - Species Assessments - Volume 3 https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol3_Species_Article17.pdf

			Overall Trend in Conservation Status is assessed as Deteriorating
	Reefs [1170]	To maintain the favourable conservation condition	Overall Conservation Status is assessed as Bad Overall Trend in Conservation Status is assessed as Stable
Annex II marine species	Tursiops truncatus (Common Bottlenose Dolphin) [1349]	To maintain the favourable conservation condition	Overall Status is assessed as Favourable Overall Trend in Conservation Status is assessed as Stable
Annex I diadromous fish species	Petromyzon marinus (Sea Lamprey) [1095]	To restore the favourable conservation condition	Overall Conservation Status is assessed as Unknown Overall Trend in Conservation Status is unknown
	Lampetra fluviatilis (River Lamprey) [1099]	To maintain the favourable conservation condition	Overall Status is Unknown (data deficient species)
	Salmo salar (Salmon) [1106]	To restore the favourable conservation condition	Overall Status is assessed as Inadequate Overall Trend in Conservation Status is assessed as Stable

3.3.2. Qualifying Interest Annex I Habitats

3.3.2.1. Overview

Lower River Shannon SAC very large site stretches along the Shannon valley from Killaloe in Co. Clare to Loop Head/ Kerry Head, a distance of some 120 km. The SAC supports a wide variety of Annex I habitats. A brief description of Annex I marine habitats of the SAC for which potential effects from the proposed project could not be discounted in the screening for AA is provided below.

The SAC supports examples of the following Annex I habitats for which significant effects could not be screened out; Sandbanks which are slightly covered by sea water all the time [1110], Estuaries [1130], Mudflats and sandflats not covered by seawater at low tide [1140], *Coastal lagoons [1150], Large shallow inlets and bays [1160] and Reefs [1170].

The site supports littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and also in areas extremely sheltered from wave action. Characteristically, exposed sediment communities are composed of coarse sand and have a sparse fauna. Species richness increases as conditions become more sheltered. All shores in the site have a zone of sand hoppers at the top, and below this each of the shores has different characteristic species giving a range of different shore types.

The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. Known sites are steeply sloping and show a good zonation down the shore. Well developed lichen zones and littoral reef communities offering a high species richness in the sublittoral fringe and strong populations of the Purple Sea Urchin Paracentrotus lividus are found. The communities found are tolerant to sand scour and tidal streams. The infralittoral reefs range from sloping platforms with some vertical steps, to ridged bedrock with gullies of sand between the ridges, to ridged bedrock with boulders or a mixture of cobbles, gravel and sand. Kelp is very common to about 18m. Below this it becomes rare and the community is characterised by coralline crusts and red foliose algae.

A more detailed description of the communities located within and adjacent to the proposed project is provided in Section 3.3.2.2 below. The description below of marine/ coastal Habitats is informed by an ecological survey undertaken by AQUAFACT in the area. The description is also part informed by reports of the SAC prepared by NPWS.

Predicted impacts to Annex I Habitats are considered in Section 3.4.1 below.

3.3.2.2. Marine/ Intertidal QI Habitats

The proposed cable route will run from the high water mark across the estuary in waters with a maximum depth of c. 60m. Figure 3.1 shows multibeam data of the seabed in the cable laying area indicating seabed topography and bathymetry. Substrate type between 0-30m towards the southern shore consists of a mix of sand, slightly gravelly sand, gravelly sand, slightly gravelly muddy sand, gravelly muddy sand and sandy gravel (AQUAFACT, 2008; 2009). Slightly gravelly sandy mud is present between 0-10m towards the northern shore and the 30-60m zone consists of a rocky seabed with boulders, cobbles and gravel.

Figure 3.2 shows the marine habitats in the cable laying area derived from NPWS Conservation Objective mapping for Lower River Shannon SAC (Site code: 002165). The habitats that overlap the cable laying area include ‘subtidal sand to mixed sediment with Nucula nucleus community complex’, ‘faunal turf dominated subtidal reef community’, ‘subtidal sand to mixed sediment with Nephtys spp. community complex’, ‘fucoid dominated intertidal reef community complex’ and ‘Laminaria dominated community complex’. As outlined in Table 3.2 these community types have been identified in the Annex I habitat Sandbanks which are slightly covered by sea water all the time [1110], Estuaries

[1130], Mudflats and sandflats not covered by seawater at low tide [1140], Large shallow inlets and bays [1160] and Reefs [1170] (NPWS 2012[19]).

AQUAFACT (2008; 2009) recorded the following species from the 'subtidal sand to mixed sediment with Nucula nucleus community complex': the polychaetes Macrochaeta clavicornis, Nephtys hombergii, Paradoneis lyra, Sphaerosyllis bulbosa, Capitella sp. complex, Scoloplos armiger and Spirobranchus sp., the bivalves Nucula nucleus, Nucula nitidosa, Nucula tenuis and Abra alba, the amphipods Unicola crenatipalma, Abludomelita obtusata, Pisidia longicornis and Maera othonis, the mysid shrimp Gastrosaccus spinifer and the gooseberry sea-squirt Dendrodoa grossularia. AQUAFACT (2008) recorded the following species from the 'subtidal sand to mixed sediment with Nephtys spp. community complex': the polychaetes Terebellides stroemi, Nephtys hombergii and Scoloplos armiger and the amphipods Metaphoxus pectinatus and Ampelisca brevicornis.

Within the 'faunal turf dominated subtidal reef community', AQUAFACT (2008; 2009) recorded a rocky seabed with boulders up to 0.5m in diameter either in tight clumps or more diffuse with some intervening mud, sands and gravel. Species of note included the queen scallop Aequipecten opercularis, the green crab Carcinus maenas, harbour crab Liocarcinus depurator, spider crab Maja squinado, the dahlia anemone Urticina feline, the gooseberry sea-squirt Dendrodoa grossularia, Sabellaria sp. and other tubeworms and a variety of sponges and hydroids. Figure 3.3 shows some images from the rocky seabed.

The 'fucoid dominated intertidal reef' is characterised by Fucus spiralis on the upper shore, F. vesiculosus on the mid shore and F. serratus on the lower shore (AQUAFACT, 2008; 2009). The associated fauna included talitrids, limpets Patella vulgata, dogwhelks Nucella lapillus, periwinkles Littorina littorea and L. obtusata, hermit crab Pagurus bernhardus, barnacles and the polychaetes Spirobranchus sp. and spirorbid spp.

[19] NPWS (2012) Lower River Shannon SAC (site code: 2165) Conservation objectives supporting document marine habitats and species https://www.npws.ie/sites/default/files/publications/pdf/002165_Lower%20River%20Shannon%20SAC%20Marine%20Supporting%20Doc_V1.pdf

Figure 3.1: Multibeam bathymetry of the seabed.

Figure 3.2: Marine community types identified within QI Habitats in relation to the proposed project (NPWS, 2012[1]).

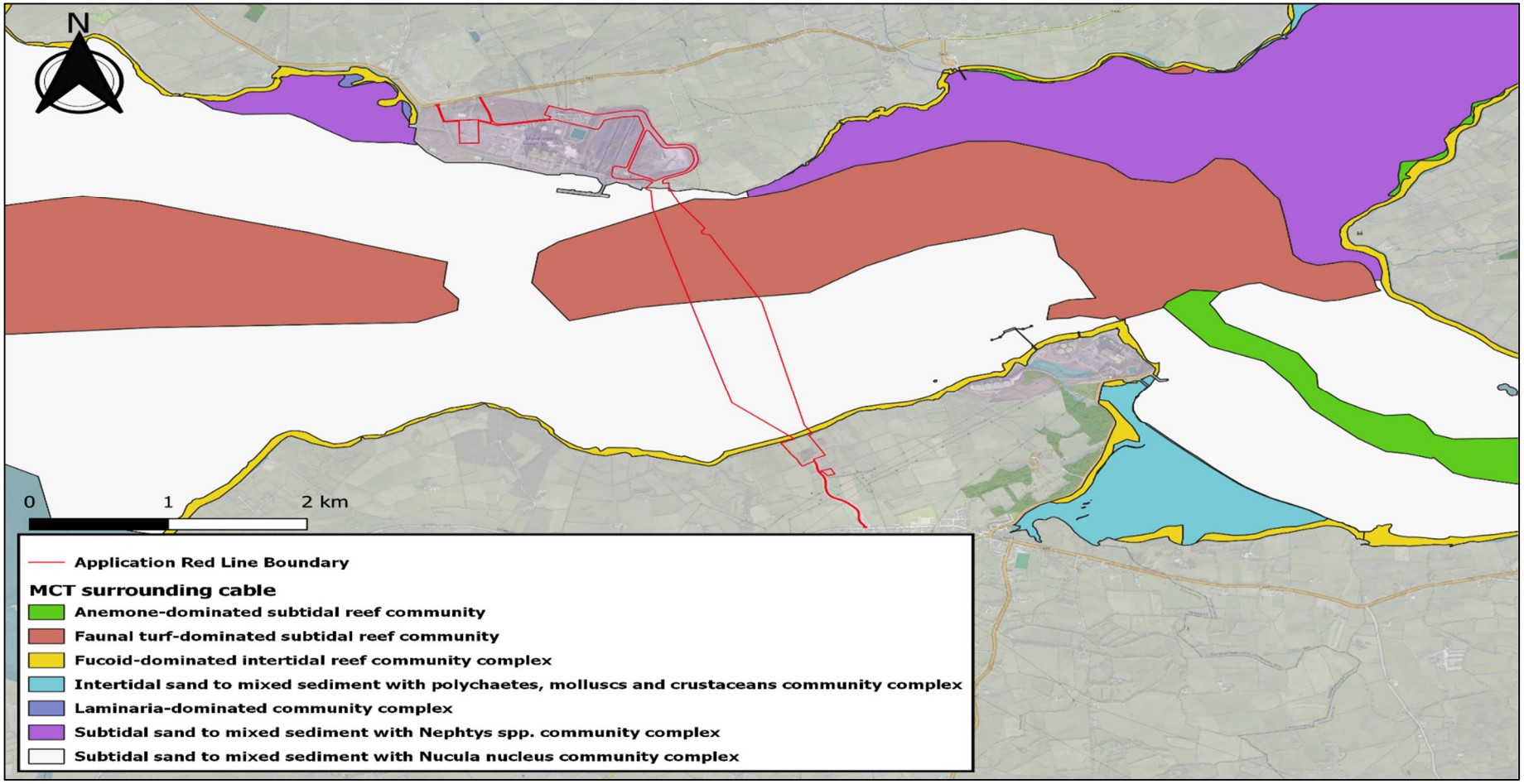


Table 3.2: QI Community types of the Lower River Shannon SAC.

Community type	1110	1130	1140	1160	1170
Intertidal sand with Scolelepis squamata and Pontocrates spp. community			✓	✓	
Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex		✓	✓	✓	
Estuarine subtidal muddy sand to mixed sediment with gammarids community complex		✓			
Subtidal sand to mixed sediment with Nucula nucleus community complex		✓		✓	
Subtidal sand to mixed sediment with Nephtys spp. community complex	✓	✓		✓	
Fucoid-dominated intertidal reef community complex				✓	✓
Mixed subtidal reef community complex				✓	✓
Faunal turf-dominated subtidal reef community		✓		✓	✓
Anemone-dominated subtidal reef community		✓		✓	✓
Laminaria-dominated community complex		✓		✓	✓

Figure 3.3: Representative images from rocky seabed within the cable laying area (AQUAFACT, 2008).

3.3.2.3. Other Coastal QI Habitats

Vegetated sea cliff is a QI of the Lower River Shannon SAC. There is no QI sea cliff habitat within the zone of influence of the proposed development. Low hard cliff habitat is present at the Moneypoint landfall (Figure 3.4). However Aquafact has determined this does not qualify as 1230 Vegetated sea cliff habitat, due to the absence of characteristic maritime plant communities there.

Figure 3.4: Northern termination of the cable route showing boulders, stones, exposed bedrock and vertical cliff.

Source Aquafact Ltd, 2017

By way of contrast to the non-Annex cliff habitat within the zone of influence of the proposed development at the Moneypoint landfall, Aquafact has determined there is Annex 1 QI sea cliff habitat present outside the zone of influence of the proposed development, approximately 200m to the east of the landfall site (Figure 3.5 and Figure 3.6).

Figure 3.5: QI Sea Cliff Habitat of the Lower River Shannon, east of the Moneypoint site showing Thrift and Samphire (Source: Aquafact Ltd 2020).

Figure 3.6: Sea Plantain and Thrift on the sea cliff habitat east of the Moneypoint site (Source: Aquafact Ltd 2020).

3.3.3. Qualifying Interest Annex II Species

3.3.3.1. Bottlenose Dolphin

The Shannon Estuary is the most important site in Ireland for bottlenose dolphins (Tursiops truncatus) and was designated as a cSAC for this species in 1999 (Berrow et al., 2012). The Lower River Shannon SAC is one of only two sites designated for this species in Ireland and one of only about 20 in Europe. A study on genetics of bottlenose dolphins in Ireland suggested that the bottlenose dolphins in the Shannon Estuary are genetically discrete and thus of very high conservation value (Mirimin et al., 2011). NPWS (2013[2]) reports that this resident population of bottlenose dolphin is the only known resident population of this species in Ireland. The population at the site was estimated in 2006 to be approximately 140 individuals (NPWS, 2013[2]). The most recent surveys of the species in the estuary were undertaken during June to early October 2018 and estimated the population to be approximately 139 (Rogan et al., 2018). The population size estimated in 2018 was reported by Rogan et al (2018) to lie within the range of population estimates calculated for the site since 1997 and indicated a stable population size. Bottlenose dolphins in the Shannon Estuary calf between June and September with the peak calving period occurring in August (Ingram, 2000).

The proposed project is located in an area of the Lower River Shannon SAC identified as important for bottlenose dolphin (NPWS, 2012[1]). Specifically, the proposed project is located in a critical habitat area identified for the species (see Figure 3.7) (NPWS, 2012[1]). Critical habitat areas are preferentially used by the species. Furthermore, the project is located in an area identified by Berrow et al. (2012) as having high habitat suitability for the species (see Figure 3.8). Surveys reported by Rogan et al. (2018) indicated relatively high counts of the species in the vicinity of the proposed project area (see

Figure 3.9: Locations of bottlenose dolphin schools encountered during surveys of the lower Shannon Estuary, 2018. Estimated group sizes are denoted by symbol diameters (adapted from Rogan et al., 2018).

Predicted impact to the bottlenose dolphin are discussed in Section 3.4.2 below. An assessment of the potential impacts of the project on the integrity of the SAC is undertaken in Section 3.5 in relation to the attributes and targets identified for the species in the site Conservation Objectives (NPWS, 2012[1]) while mitigation measures are identified in Section 3.6 to prevent adverse effects on the integrity of the SAC.

3.3.3.2. Diadromous Fish

Sea Lamprey Petromyzon marinus and River Lamprey Lampetra fluviatilis

Both sea lamprey (Petromyzon marinus) and river lamprey (Lampetra fluviatilis) are QIs of the Lower River Shannon SAC and have the potential to feed and migrate within the project area although they do not spawn there.

The sea lamprey (Petromyzon marinus) is a migratory species which grows to maturity in the sea and migrates to freshwater to spawn. They migrate through the estuary from the sea in April and May (Hardisty, 1969) and spawn in rivers in late May or June and then return to sea.

The river lamprey (Lampetra fluviatilis) is a migratory species which grows to maturity in estuaries and migrates to freshwater to spawn from October to December (Maitland, 2003). Spawning occurs in the rivers in March and April. Between July and September young adults at 3-5 years of age migrate during darkness to the estuary.

Atlantic Salmon Salmo salar

Atlantic salmon (Salmo salar) is also a QI of the Lower River Shannon SAC. A number of rivers that flow into the Shannon Estuary are fished for salmon. These include the River Fergus, Castleconnell Salmon Fishery, River Mulchair, River Maigue and River Deel.

Smolts typically head out to sea between March and June and adults return to the river between March and August. There are no spawning sites at the project area; however adult fish will pass through the site when travelling up the river to spawn or on return to the sea or as smolts on their first migration to the sea.

Predicted effects to diadromous fish (lamprey and salmon) are discussed in Section 3.4.2 below.

Figure 3.7: Bottlenose dolphin critical areas, representing habitat used preferentially by the species (adapted from NPWS 2012[1]).

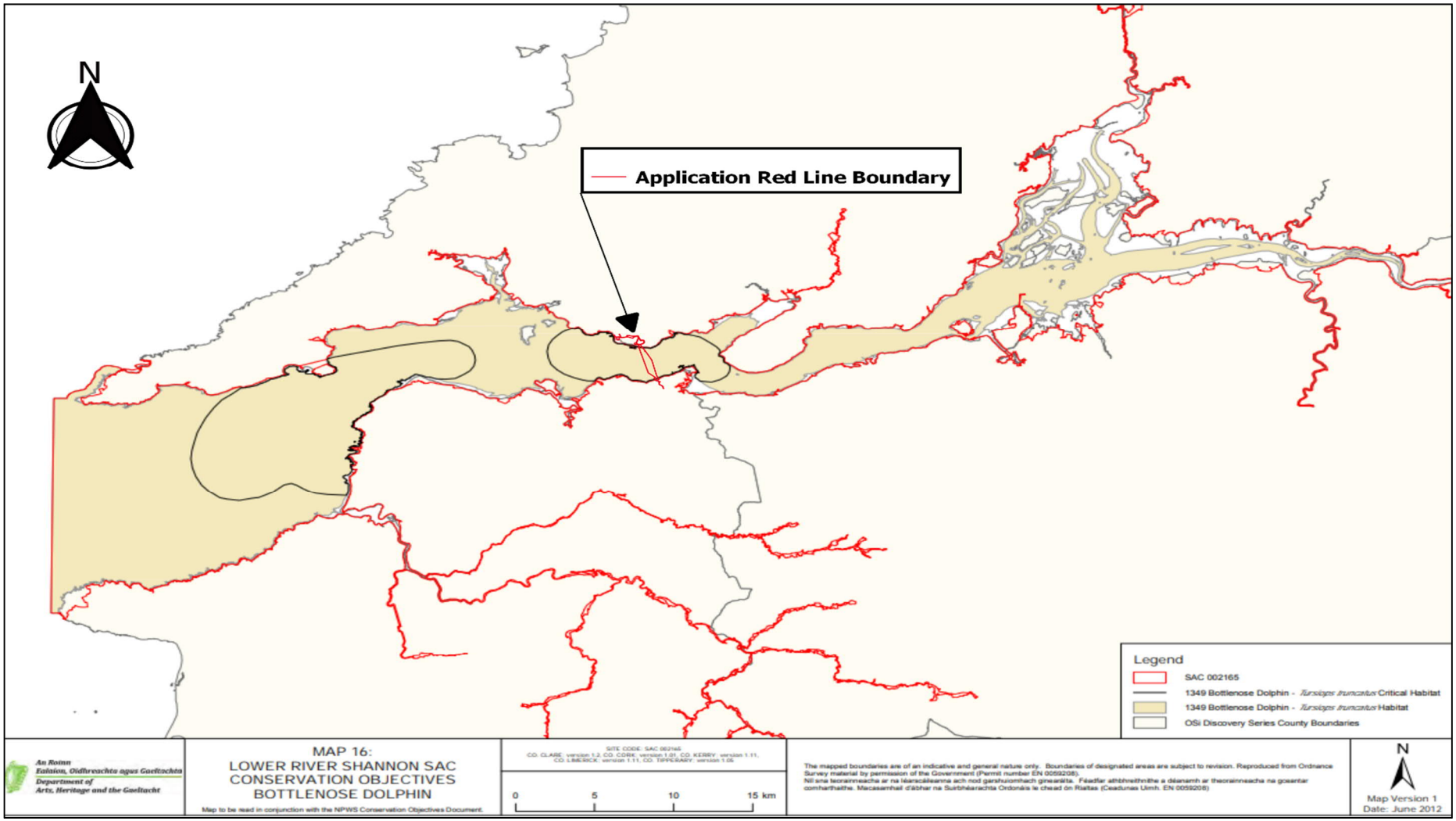


Figure 3.8: Scoring assessment for habitat suitability for bottlenose dolphins in the Shannon Estuary (adapted from Berrow et al., 2012).

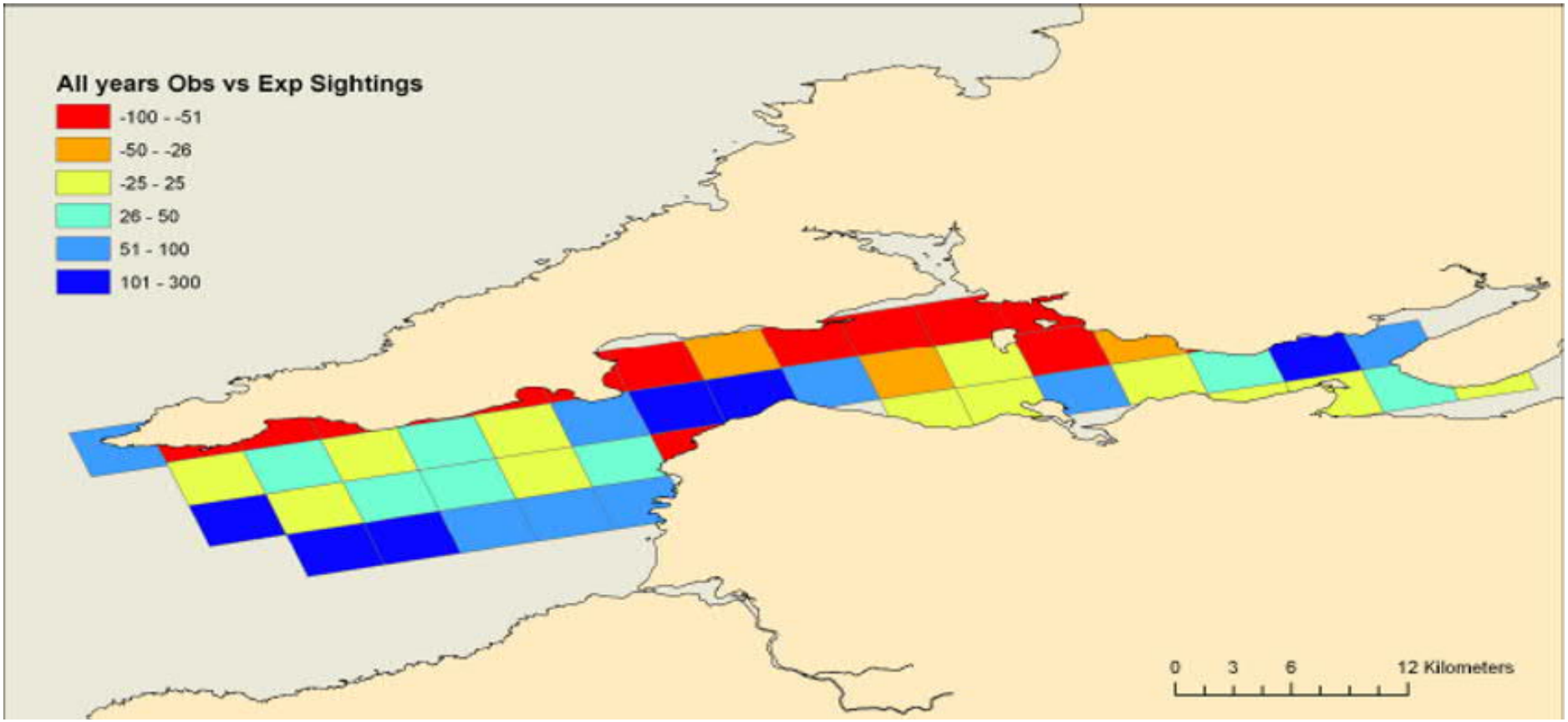
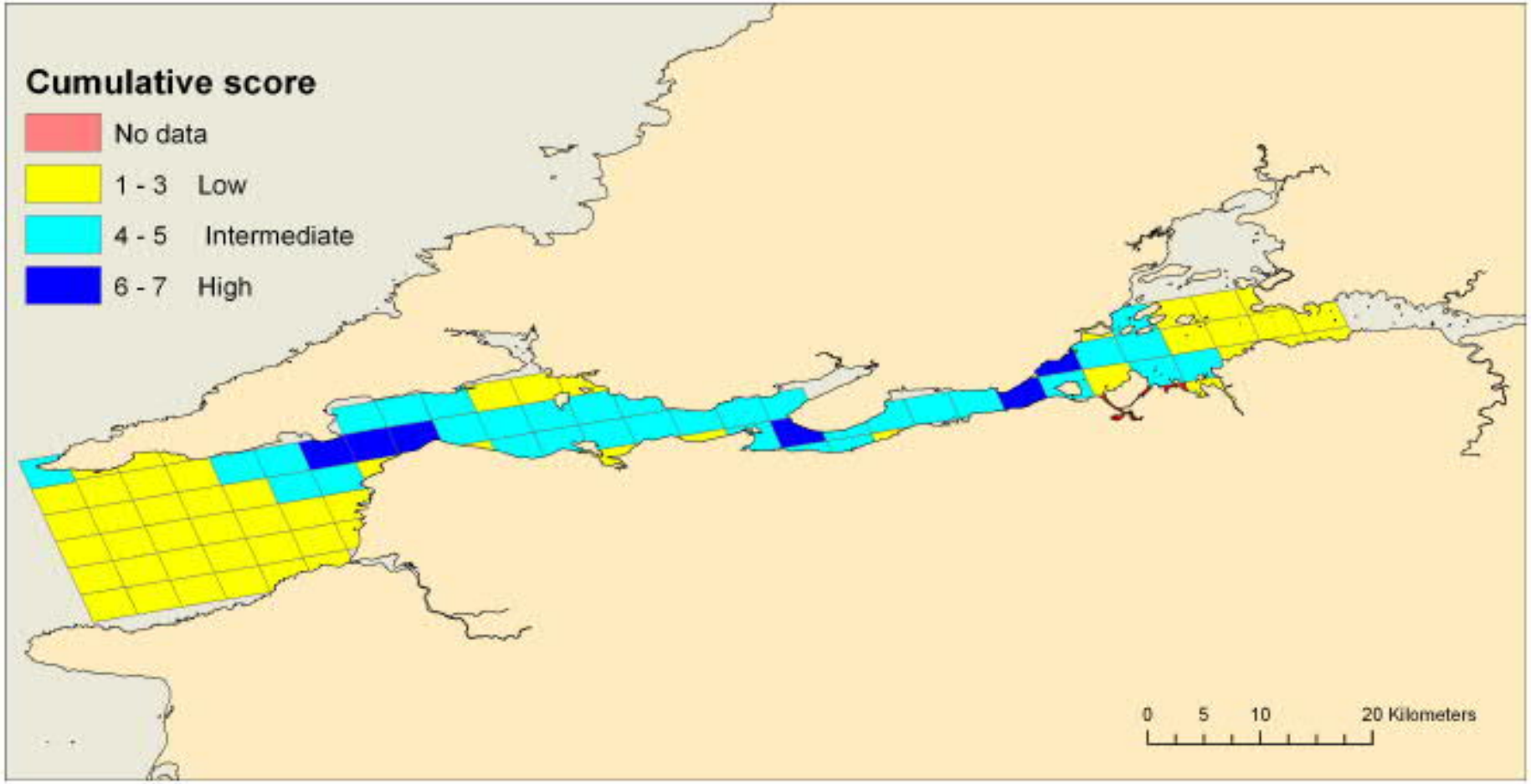


Figure 3.9: Locations of bottlenose dolphin schools encountered during surveys of the lower Shannon Estuary, 2018. Estimated group sizes are denoted by symbol diameters (adapted from Rogan et al., 2018).



3.3.4. River Shannon and River Fergus Estuaries SPA.

The proposed project is located in the River Shannon and River Fergus Estuaries SPA (see Figure 1.3). The Natura 2000 Standard Data Form[7] for the SPA lists the negative impacting threats and pressures and positive impacting activities/ management affecting the site (see Table 2.7). The existing pressures, threats or activities that impose moderate negative impact on the site are:

- Shipping lanes (D03.02)
- Nautical sports (G01.01)
- Marine and Freshwater Aquaculture (F01)

The above pressures, threats or activities impose moderate negative impacts on the site.

The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The site comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry. The site has vast expanses of intertidal flats which contain a diverse macroinvertebrate community which provides a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches. The site is a Special Protection Area (SPA) under the E.U. Birds Directive for the following species: Cormorant, Whooper Swan, Light bellied Brent Goose, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank and Black-headed Gull. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of is designated for Wetlands (A999).

3.3.4.1. Special Conservation Interests - Bird Species and Wetlands

The SPA is designated for a total of twenty-one bird species. The site is also designated for the habitat Wetland. These SCIs are listed in Table 2.4. Table 3.3 lists SCIs for which there is potential for significant effects (as identified in the screening assessment). A detailed description of the site is included in the Site Synopsis report (NPWS, 2013[4]) which is included in Appendix 1. Predicted impacts to bird species are discussed in Section 3.4.3 below.

Table 3.3: Special Conservation Interests the River Shannon and River Fergus Estuaries SPA (NPWS, 2012[3]).

Special Conservation Interest	Conservation Objective
Cormorant (Phalacrocorax carbo) [A017]	To maintain the favourable conservation condition
Whooper Swan (Cygnus cygnus) [A038]	To maintain the favourable conservation condition
Shelduck (Tadorna tadorna) [A048]	To maintain the favourable conservation condition

Special Conservation Interest	Conservation Objective
Wigeon (Anas penelope) [A050]	To maintain the favourable conservation condition
Teal (Anas crecca) [A052]	To maintain the favourable conservation condition
Pintail (Anas acuta) [A054]	To maintain the favourable conservation condition
Shoveler (Anas clypeata) [A056]	To maintain the favourable conservation condition
Scaup (Aythya marila) [A062]	To maintain the favourable conservation condition
Ringed Plover (Charadrius hiaticula) [A137]	To maintain the favourable conservation condition
Golden Plover (Pluvialis apricaria) [A140]	To maintain the favourable conservation condition
Grey Plover (Pluvialis squatarola) [A141]	To maintain the favourable conservation condition
Lapwing (Vanellus vanellus) [A142]	To maintain the favourable conservation condition
Knot (Calidris canutus) [A143]	To maintain the favourable conservation condition
Dunlin (Calidris alpina) [A149]	To maintain the favourable conservation condition
Black-tailed Godwit (Limosa limosa) [A156]	To maintain the favourable conservation condition
Bar-tailed Godwit (Limosa lapponica) [A157]	To maintain the favourable conservation condition
Curlew (Numenius arquata) [A160]	To maintain the favourable conservation condition
Redshank (Tringa totanus) [A162]	To maintain the favourable conservation condition
Greenshank (Tringa nebularia) [A164]	To maintain the favourable conservation condition
Black-headed Gull (Chroicocephalus ridibundus) [A179]	To maintain the favourable conservation condition
Wetlands [A999]	To maintain the favourable conservation condition

3.4. Impact Prediction

As described in Section 2.3 and Section 2.4 above[20], the impact mechanisms associated with the proposed project that may result in effects to marine habitats, marine mammals and diadromous fish species of the Lower River Shannon SAC, and to the bird species and habitats of River Shannon and River Fergus SPA are:

1. activities associated with onshore pre-construction and civil works may result in the release of sediment, chemicals or other waste material pollution or invasive plant species during construction periods.
4. construction noise disturbance associated with trench excavation and cable laying activities.
5. physical disturbance due to seabed clearance work, submarine trench excavation and cable laying activities.

[20] Significant effects associated with 2. vessel noise disturbance and 3. vessel collision were discounted.

6. sedimentation of solids resuspended by trench excavation and cable laying activities
7. Electromagnetic fields.

Significant effects associated with the impact mechanism 1, 4, 5, 6 and 7 are considered with respect to the designated features of Lower River Shannon SAC and River Shannon and River Fergus SPA in Section 3.4.1 and Section 3.4.3 respectively, while an assessment of potential adverse effects on SAC and SPA site integrity is presented in Section 3.5.

3.4.1. Lower River Shannon SAC – Marine Habitats

The following sections considers the risk of potential effects to Annex I marine habitats from:

- Impact Mechanism 1 - activities associated with onshore pre-construction and civil works may result in the release of sediment, chemicals or other waste material pollution or invasive species plant during construction periods.
- Impact Mechanism 5 - physical disturbance due to seabed clearance work, submarine trench excavation and cable laying activities.
- Impact Mechanism 6 - sedimentation of solids resuspended by trench excavation and cable laying activities.

3.4.1.1. Zone of Influence - Impact Mechanism 1

Activities associated with onshore pre-construction and civil works may result in the release of sediment, chemicals or other waste material pollution during construction periods. Consequently, there are potential pathways for impact to the following QI habitats that are located immediately adjacent to the onshore works (see Figure 3.10)

- Estuaries [1130]
- Reefs [1170]

Two community types within the QI habitats Estuaries [1130] and Reefs [1170] have been identified immediately adjacent to the onshore works (see Table 3.4 and Figure 3.11).

Table 3.4: Relevant community types within Annex I habitat 1130 and 1170.

Community type	1130	1170
Subtidal sand to mixed sediment with Nucula nucleus community complex	✓	
Fucoid-dominated intertidal reef community complex		✓

3.4.1.2. Zone of Influence - Impact Mechanism 5

Activities associated with Impact Mechanism 5 have the potential to result in direct physical disturbance to Annex I habitats and constituent community type due to seabed clearance works, and excavation and cable laying activities. These activities are limited to those habitats that are overlapped by the proposed cable route.

Consequently, based on the distribution of QI habitats in relation to the proposed development (see Figure 3.10) it can be concluded that the proposed project will have no significant effect to the following:

- Sandbanks which are slightly covered by sea water all the time [1110]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Coastal lagoons [1150] (*identified as a priority habitat under the Habitat Directive)
- Large shallow inlets and bays [1160]

In contrast, as shown by Figure 3.10 relevant Annex I habitats that may be effected by the proposed project are:

- Estuaries [1130]
- Reefs [1170]

The community types within the QI Habitats Estuaries [1130] and Reefs [1170] that are overlapped by the development are listed in Table 3.5 and shown in Figure 3.11.

Table 3.5: Relevant community types within Annex I habitat 1130 and 1170.

Community type	1130	1170
Subtidal sand to mixed sediment with Nucula nucleus community complex	✓	
Fucoid-dominated intertidal reef community complex		✓
Faunal turf-dominated subtidal reef community	✓	✓

3.4.1.3. Zone of Influence - Impact Mechanism 6

For the proposed cable laying project, three-dimensional sediment modelling was undertaken to determine the transport, dispersion and sedimentation of solids resuspended by excavation activities. Details of the model are presented in full in Appendix 2.

Modelling shows maximum sediment deposition will occur in the middle of the channel while in the remaining areas in the estuary sediment deposition will be low. Figure 3.12 shows maximum sediment deposition depth relative to Annex I Habitats. Based on the spatial overlap of the modelling plumes

with Annex I habitats, it can be concluded that sedimentation will have no significant effect to the following:

- Sandbanks which are slightly covered by sea water all the time [1110]
- Coastal lagoons [1150] (*identified as a priority habitat under the Habitat Directive)
- Large shallow inlets and bays [1160]

In contrast, as shown by Figure 3.12 relevant Annex I habitats that may be effected by the proposed project are:

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Reefs [1170]

The community types identified within the Estuaries [1130], Mudflats & sandflats not covered by seawater at low tide [1140] and Reefs [1170] overlapped by the proposed project are shown in Figure 3.13 and listed in Table 3.6.

Table 3.6: Community types within Annex I habitats 1130, 1140 and 1170 of the Lower River Shannon SAC.

Community type	1130	1140	1170
Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex	✓	✓	
Subtidal sand to mixed sediment with Nucula nucleus community complex	✓		
Subtidal sand to mixed sediment with Nephtys spp. community complex	✓		
Fucoid-dominated intertidal reef community complex			✓
Faunal turf-dominated subtidal reef community	✓		✓
Anemone-dominated subtidal reef community	✓		✓
Laminaria-dominated community complex	✓		✓

Figure 3.10: Known occurances of QI marine Habitats within the Lower River Shannon SAC in relation to the proposed project (NPWS, 2012[1]).(Note the Annex 1 QI sea cliff habitat present outside the zone of influence of the proposed development, approximately 200m to the east of the landfall site

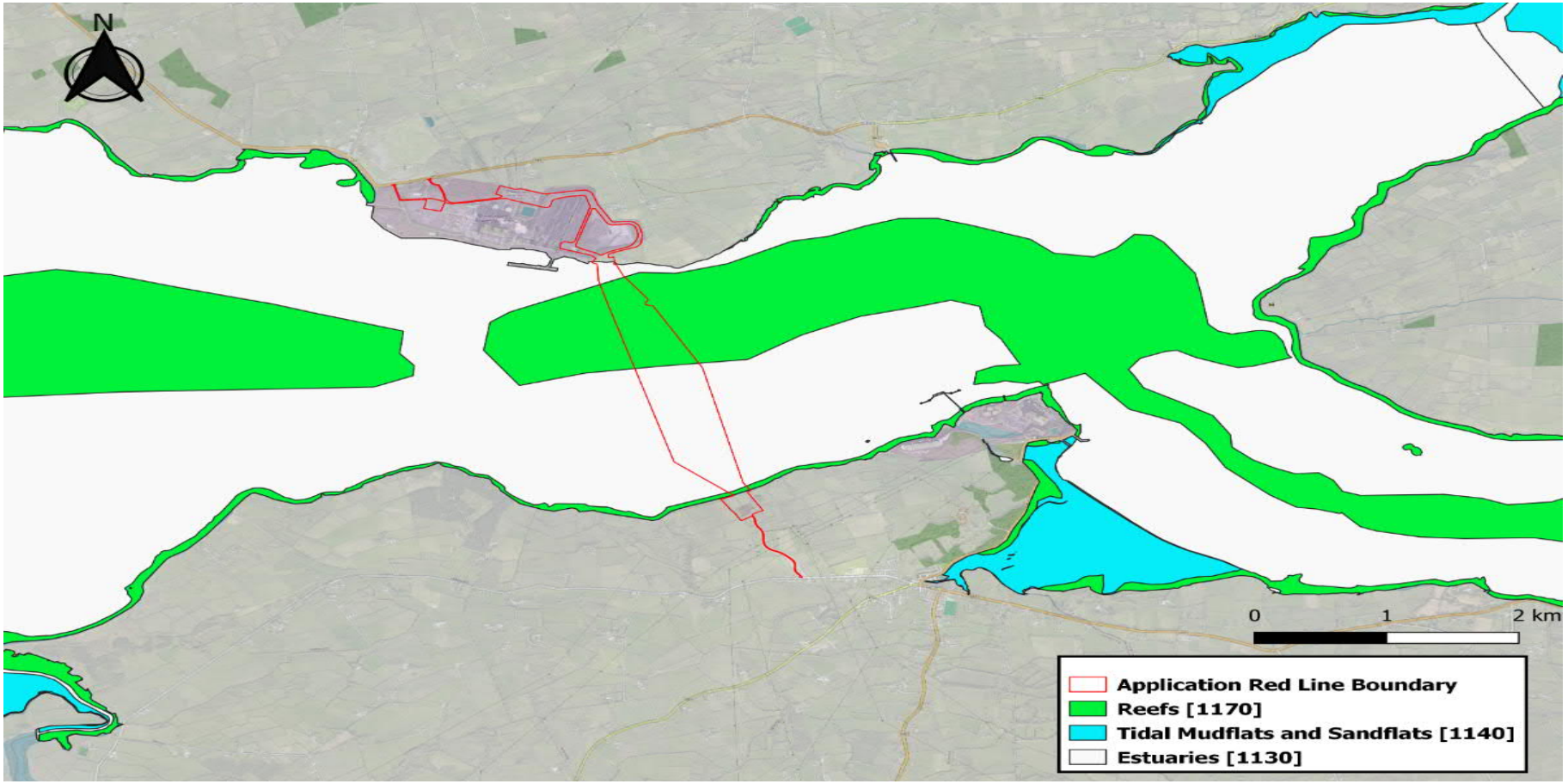


Figure 3.11: Marine community types identified within QI habitats of the Lower River Shannon SAC in relation to the proposed project (NPWS, 2012[1])
Note the Annex 1 QI sea cliff habitat present outside the zone of influence of the proposed development, approximately 200m to the east of the landfall site.

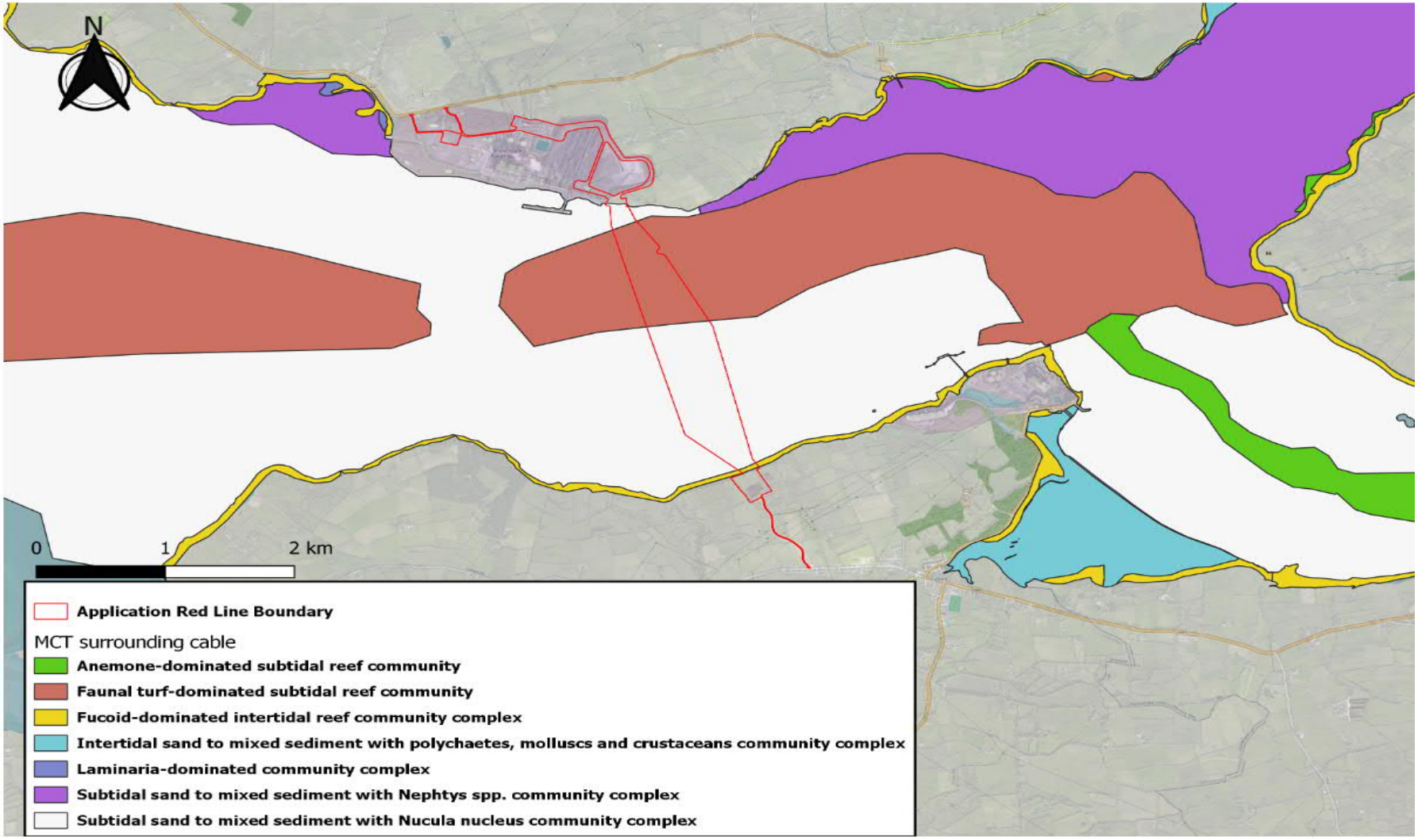


Figure 3.12: QI marine habitats of Lower River Shannon SAC in relation to the modelled sediment plume (Mott McDonald, 2019).

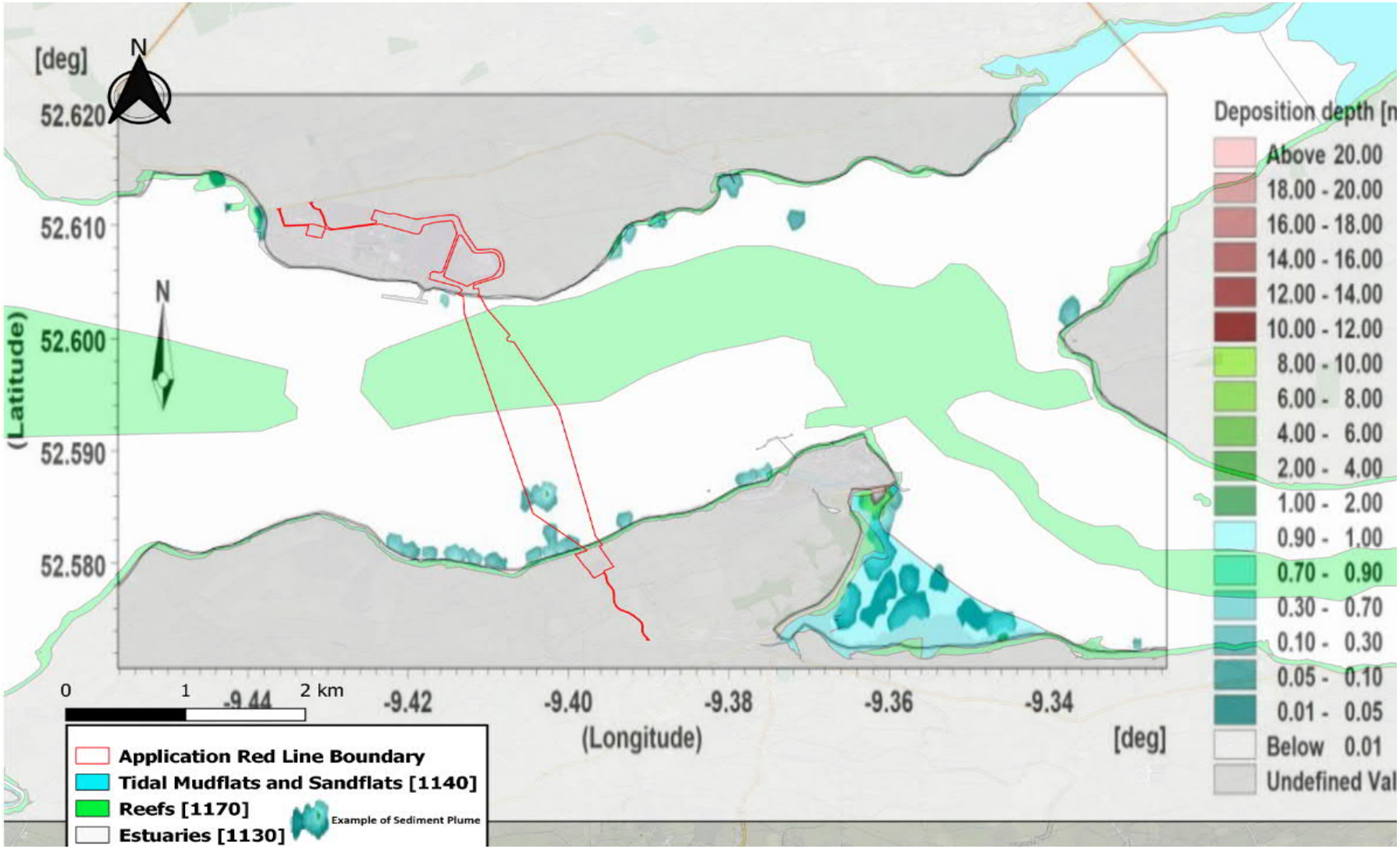
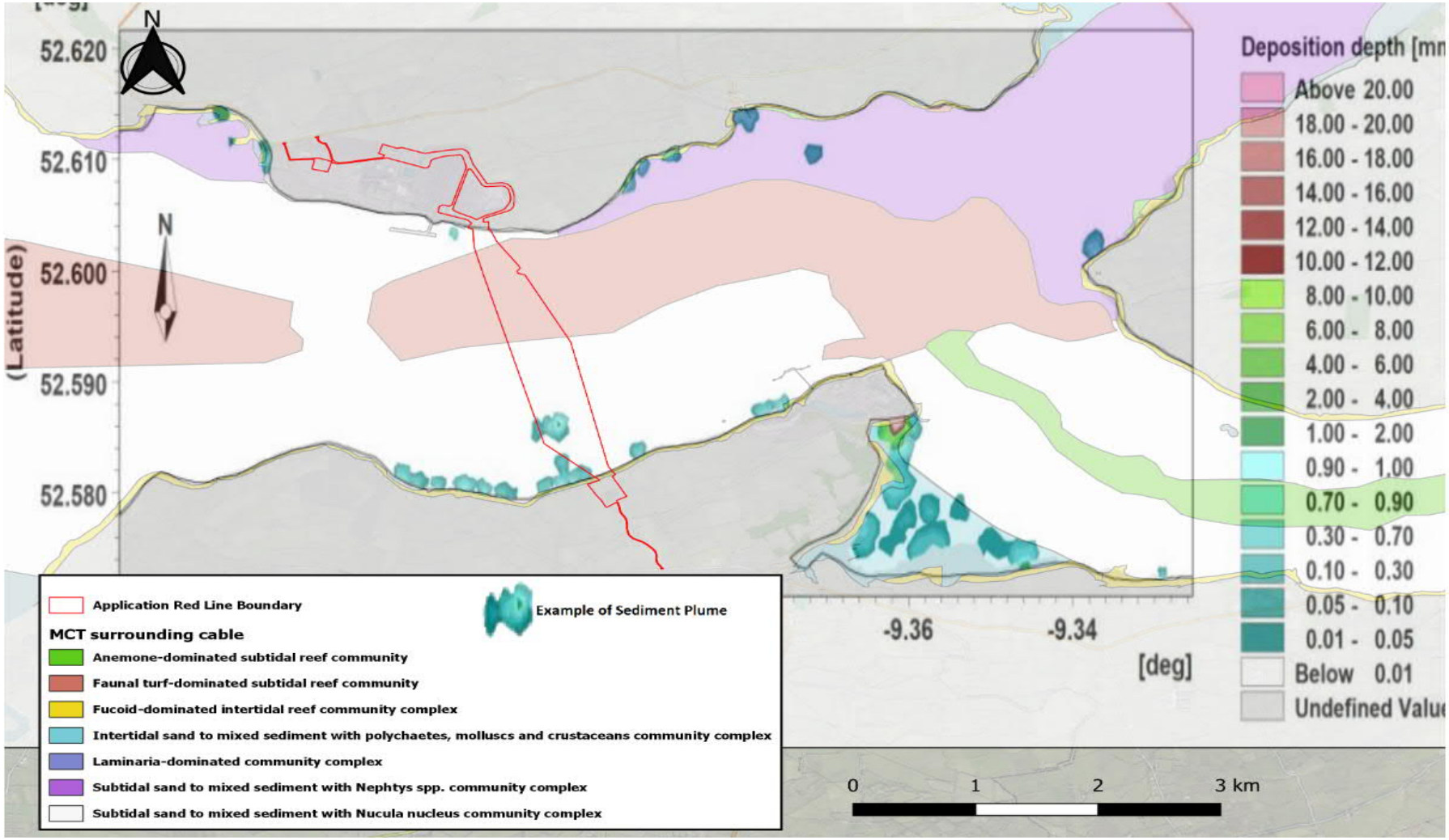


Figure 3.13: Marine community types identified within Annex I Habitats in relation to the modelled sediment plume (Mott McDonald, 2019).



3.4.1.4. Assessment of Effects - Impact Mechanism 1

A description of the onshore works required at Moneypoint and Kilpaddoge is provided in Section 2.2.1. In summary, at the landfall locations works are required to profile the coastline, excavate cable trenches on the foreshore for the cable, construct permanent concrete 'slipway' structure and cable protection works using rock/ gravel filled gabion bags or backfill material. Following cable installation, the existing coastline will be reinstated to its original profile and level. Cables will lead from the landfall points to the existing substations at Moneypoint and Kilpaddoge. The substation at Kilpaddoge requires an extension of 5,500m^2. As with any construction project and cable laying project there is potential for the release of sediment, chemicals or other waste material pollution during construction periods. There is no evidence of invasive species as listed in part 1 of Schedule 3 of S.I no 477 of 2011, European Communities (Birds and Natural Habitats Regulations 2011 with the proposed development area. Mitigation measures required to avoid significant release of sediment and chemical pollutants or invasive plant species to the marine environment are summarised in Section 3.6.

3.4.1.5. Assessment of Effects - Impact Mechanism 5 and 6

Cable trenching activities proposed for the current project will impact sediments up to a depth of c. 2.5m. Typically bottom fishing using bottom towed trawl and dredge gear disturbs sediment up to a depth of 50cm. While there are is a significant difference in the sediment disturbance depths associated with cable installation and bottom fishing, the potential impact mechanisms and effects of the activities on sediments and resident communities are comparable. The effect of fishing on the benthos is widely reported in the literature; fishing has the potential to cause damage:

- directly through physical (mechanical) damage and removal of fauna (e.g. Kaiser et al., 2006; Hinz et al., 2008) and,
- indirectly through smothering due to increased sedimentation (e.g. Kaiser et al., 2006; Puig et al., 2012).

Soft Sediment Communities

Like fishing activity using bottom contacting gear (such as otter trawls, beam trawls and scallop dredges), clearance of seabed obstructions using the PLG equipment has the potential to scrap the top-most substrate layers removing and dislodging fauna. It should be noted, however, that PLG equipment damage will be of a limited footprint, and the associated impacts will not be of similar scale of the damage associated with fishing which can be widespread. Direct impacts from trawling include displacement of sediment and removal of in- and epi-fauna as by-catch in commercial fisheries (Kaiser et al., 2006). While chronic fishing can result in significant adverse environmental impact and in

extreme cases can destroy benthic communities and habitats leaving tracts, the PLG activities proposed which be limited spatial and temporally; consequently, the impact will be temporary.

Bottom contacting gear using otter trawls, beam trawls and scallop dredges can result in physical impacts to the sea bed creating trawl furrows (up to 20 cm deep). This action can eliminate natural features such as ripples, bioturbation mounds and faunal tubes. The target trench depth proposed is far greater than fishing trawl furrows, and will result in the elimination of natural seabed topography and the creation of sediment mounds created by the sediment displaced from the trench by the excavation. The impacts to the seabed will be temporary. The trenches created will be infilled through natural sediment movement processes due to water currents while natural sediment movement processes will also act to flatten and remove sediment mounds created by the displaced sediment.

Trawling can also impact the seafloor via the resuspension of sediments (Clarke et al., 2016; Puig et al., 2012, Martín et al., 2014). These impacts can be imparted over larger areas than those actually trawled due to advection of plumes of resuspended sediment to other area (Puig et al., 2012; Martín et al., 2014). Trenching activities proposed for this project will result in resuspension of sediment. As shown in the sediment modelling exercise, sediment plumes generated will lead to deposition of sediment on Annex I habitats and constituent community types. The deposition of sediment has the potential to smother resident communities.

The sediment modelling exercise predicted sediment deposition depths after completion of the cable installation are:

- Up to 2mm towards the south of the cable route (see Figure 3.12);
- Generally less than 1mm and located towards the shoreline where flow speeds are lower than in the central part of the estuary (see Figure 3.12); and
- Up to 20mm inside the small bay to the south east of the cable route.

Relatively high sediment deposition has been predicted in the intertidal area of the small bay to the south east of the project. However, it is noted that by the OSPAR Commission (OSPAR 2008, 2009), marine life can survive rapid sediment deposition up to depths of 100mm, five times the depth predicted by the model for the worst-case scenario (see Appendix 2). Further, OSPAR (2008, 2009) also state that negative impacts to marine life are only expected when sediment deposition depths exceed 150mm.

NPWS (2012[21]) Conservation objectives supporting document for marine habitats in the Lower River Shannon SAC provides guidance on interpretation of the Conservation Objectives which are, in effect, management targets for habitats and species in the SAC. This guidance is scaled relative to the anticipated sensitivity of habitats and species to disturbance by the proposed activities. For the practical purpose of management of sedimentary habitats a 15% threshold of overlap between a disturbing activity and a habitat is given in the NPWS guidance. Below this threshold disturbance is deemed to be non-significant. Disturbance is defined as that which leads to a change in the characterizing species of the habitat (which may also indicate change in structure and function). Such disturbance may be temporary or persistent in the sense that change in characterizing species may recover to pre-disturbed state or may persist and accumulate over time. As the disturbance of the proposed project to sedimentary community types is temporary and well below the threshold of 15%, it can be concluded that there will be no potential for significant adverse effects.

Reef Communities

Should cable laying occur over rocky areas, it will meet with resistance. If contact is made with an epifaunal community or species, then some damage to the community/species could occur. Cable laid across areas or reef will require additional protection provided by rock placement, installation of concrete mattresses or rock filter bags. In addition, clearance of seabed obstructions using the PLG equipment has the potential to remove and dislodge reef fauna. The area overlaid with rock protection or damaged by PLG activity will be re-colonised by either the damaged species itself or from neighbouring specimens of the same species. A study undertaken at Lyme Bay, south west UK, showed recovery of reef habitats and assemblages within 3 years following the cessation of chronic towed demersal dredge and trawl fishing (Sheehan et al., 2013). The recovery reported in Sheehan et al (2013) is broadly consistent with other studies which have reported detectable trends towards recovery within the space of a few years (e.g. Beukers-Stewart, 2005). It should be noted that cable laying and seabed clearance activities will be limited to the immediate surroundings of the cable route and will only occur as a once-off event, therefore recovery will be considerably more rapid than recovery from bottom fishing impact. Consequently, it can be concluded that any effects will be temporary and there will be no significant adverse effects.

[21] NPWS 2012. Lower River Shannon Special Area of Conservation (Site Code 2165) Conservation Objectives Supporting Document VERSION 1 National Parks & Wildlife Service 2012 https://www.npws.ie/sites/default/files/publications/pdf/002165_Lower%20River%20Shannon%20SAC%20Marine%20Supporting%20Doc_V1.pdf

3.4.2. Lower River Shannon SAC - Bottlenose Dolphin and Diadromous Fish Species

3.4.2.1. Assessment of Effects - Impact Mechanism 4

The following section considers the risk of potential effects to Annex II species from:

- Impact Mechanism 4 - construction noise disturbance associated with trench excavation and cable laying activities.

Bottlenose Dolphin

Bottlenose dolphin use echolocation as their principal means of navigation, communication, foraging and predator avoidance. The individual monitors its surroundings by emitting sound waves and waiting for them to reflect off different objects (Weilgart, 2007; Ansmann, 2005; Potter and Delroy, 1998). The time taken for these pulses to return to the animal, as well as the characteristics of the reflected pulse, gives an indication of the distance and nature of the object. Light propagates poorly in the viscous and opaque marine environment and is absorbed within a few tens of metres (Potter and Delroy, 1998; Nowacek et al., 2007). Low frequency underwater sound may travel for hundreds of km without losing intensity (Nowacek et al., 2007). In murky waters, the use of echolocation means that objects are often "heard" before they are seen (Ansmann, 2005). This ability is extremely effective; bottlenose dolphin, can differentiate between two aluminium plates varying by just 0.23 mm and can detect objects up to 113 m away (Au, 2002). This level of precision is indicative of the importance of echolocation for foraging and navigation by some species of cetaceans.

The potential impacts of noise on marine mammals have been the subject of considerable research; reviews are provided by Richardson et al. (1995), Nowacek et al. (2007), Southall et al. (2007), Weilgart (2007) and Wright et al. (2007). If the frequency of anthropogenic noise overlaps with the frequencies used by marine mammals, this may reduce the animal's ability to detect important sounds for navigation, communication and prey detection (Weilgart, 2007). This is termed acoustic masking, which may occur anywhere within an organism's auditory range (Wright et al., 2007; Richardson et al., 1995). Masking of important vocalisations will result in increasing information ambiguity and, in extreme circumstances, may result in cetaceans being unable to orientate themselves or hunt/ evade predation in the marine environment (Wright et al., 2007).

Exposure to high energy noise emissions (piling, drilling, and seismic noise) can result in non-recoverable auditory injury (termed Permanent Threshold Shift [PTS]). Behavioural reactions to acoustic exposure are generally more variable, context-dependent, and less predictable than the effects of noise exposure on hearing or physiology. This is because behavioural responses to

anthropogenic sound are dependent upon operational and environmental variables, and on the physiological, sensory, and psychological characteristics of exposed animals. It is important to note that the variables may differ (greatly in some cases) among individuals, of a species and even within individuals depending on various factors (e.g. sex, age, previous history of exposure, season, and animal activity). NOAA (2013) outline that noise can effect cetacean behavioural patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

As individual dolphins are unlikely to remain in the vicinity of sources of injurious noise, prolonged exposure of individuals is unlikely occur. However, given the vulnerability of bottlenose dolphin to noise significant adverse effects to the species are possible. Section 3.5 assesses potential adverse effects on site integrity with respect to the attributes and targets defined for the species in the site Conservation Objectives (NPWS, 2012[1]) . Mitigation measures required to avoid significant noise impact are summarised in Section 3.6.

Diadromous Fish Species

Sound is perceived by fish through the ears and the lateral line (the acoustico-lateralis system) which is sensitive to vibration. Some species of fish such as salmon have a structure linking the gas filled swim bladder to the ear. The swim bladder is sensitive to the pressure component of a sound wave, which resonates as a signal that stimulates the ears. These species, therefore, usually have increased hearing sensitivity. Such species are considered to be more sensitive to anthropogenic underwater noise sources than species, such as lamprey that do not possess a structure linking the swim bladder and inner ear.

It should be noted that the potential impact of noise on juvenile and adult fish in open water are considered to be minimal as they can readily move away from the noise source. Experiments on fry demonstrated balance problems resulting from exposure to an energy source, however, the effects were temporary with full recovery observed after a few minutes upon cessation of the noise (Kostyuchenko, 1971). Some studies of high energy seismic noise sources have also demonstrated fish's ability to acclimatise to noise associated with an energy source over time (e.g. Chapman and Hawkins, 1969).

Hearing in salmon is poor, responding only to low frequency tones (below 0.38 kHz). While there are no data available for hearing in lamprey, it is highly unlikely that they detect sound close to 10 kHz (Popper, 2005). The lamprey ear is relatively simple and there is nothing within the structure of the ear or associated structures to suggest any specialisations that would make them into anything but a hearing generalist, with maximum hearing to no more than several hundred Hz.

Prolonged exposure of individual fish to injurious noise from excavation and cable laying activities is unlikely occur as fish are unlikely to stay in the vicinity noise sources; there will be no potential for significant adverse effects.

3.4.3. River Shannon and River Fergus Estuaries SPA - Bird Species

3.4.3.1. Assessment of Effects - Impact Mechanism 4

The following section considers the risk of potential effects to bird species from:

- Impact Mechanism 4 - construction noise disturbance associated with trench excavation and cable laying activities.

To assess the potential risk to SCI species, the species are assigned to risk categories[22] based on typical behaviour, distribution and occurrence. The risk categories are described in Table 3.7. Risk categories assigned to the SCIs are presented in

Table 3.8.

Table 3.7: Risk categories for disturbance from underwater noise.

Risk Category	Relative Risk	Description
3	High	Foraging distributions extending from inshore coastal waters to offshore areas. Diving birds.
2	Medium	Predominately foraging in coastal waters. Shallow diving behaviour. Dabbler birds.
1	Low	Main foraging habitats are intertidal with limited foraging in coastal waters. Limited diving behaviour. Dabbler birds.
0	Negligible risk/ no risk	Species typically associated with terrestrial habitats. Rarely found foraging outside of terrestrial habitats. Non-diving birds.

Table 3.8: Special Conservation Interests Risk Categories.

Qualifying Interest	Risk Category
Cormorant (Phalacrocorax carbo) [A017]	3
Black-headed Gull (Chroicocephalus ridibundus) [A179]	2
Bar-tailed Godwit (Limosa lapponica) [A157]	1
Black-tailed Godwit (Limosa limosa) [A156]	1

[22] Risk categories are relative measures of risk. Risk categories identified using the approach presented in RPS (2019) https://www.dccae.gov.ie/documents/Europa%20Oil%20and%20Gas%20-%20Kiely%20East%20Prospect%20Site%20Survey%20-%20Screening%20for%20AA%20and%20NIS%20Report%20F01.pdf

Qualifying Interest	Risk Category
Curlew (Numenius arquata) [A160]	1
Dunlin (Calidris alpina) [A149]	1
Golden Plover (Pluvialis apricaria) [A140]	1
Greenshank (Tringa nebularia) [A164]	1
Grey Plover (Pluvialis squatarola) [A141]	1
Knot (Calidris canutus) [A143]	1
Lapwing (Vanellus vanellus) [A142]	1
Pintail (Anas acuta) [A054]	1
Redshank (Tringa totanus) [A162]	1
Ringed Plover (Charadrius hiaticula) [A137]	1
Scaup (Aythya marila) [A062]	1
Shelduck (Tadorna tadorna) [A048]	1
Shoveler (Anas clypeata) [A056]	1
Teal (Anas crecca) [A052]	1
Wigeon (Anas penelope) [A050]	1
Whooper Swan (Cygnus cygnus) [A038]	1/ 0

Of the Qualifying Features listed above, the diving species Cormorant (Phalacrocorax carbo) is the species that are at risk to significant effects from underwater noise as the species can remain underwater for extended periods of time while the other species exhibit limited diving or no-diving behaviour. Cormorant is one of the deepest divers among the cormorant family. Daunt and Wanless (2008) reported that the maximum recorded feeding range of the species is foraging distance of 35km and a mean range of 25km. The species distribution is related to water-depth and bottom sediment type.

In the national Irish Offshore Strategic Environment Assessment 5 (IOSEA5 5; PAD, 2015[23]) the potential for seismic acoustic emissions affecting seabirds is considered. It was concluded that acoustic emissions from seismic airguns are unlikely to have a direct impact on seabirds as they spend most of their time above water and studies have identified no effect of seismic survey activity on the movements and diving behaviour of birds or result in variation in the abundance of birds seen at

[23] Irish Offshore Environmental Assessment 5 https://www.dccae.gov.ie/en-ie/natural-resources/topics/Oil-Gas-Exploration-Production/environment/strategic-environmental-assessment/Pages/Irish-Offshore-Environmental-Assessment-(IOSEA)-5.aspx

nesting sites (PAD, 2015a). As such, the IOSEA 5 assesses impact of seismic surveys on seabirds as 'Neutral'.

As the noise emissions anticipated from the proposed project are significantly less than that produced by large scale seismic surveys (and these are assessed as having a neutral impact on seabirds including Cormorant), construction noise arising from the proposed excavation and cable laying activities will have no adverse effects on the diving species Cormorant or on the Conservation Objectives of the River Shannon and River Fergus Estuaries SPA.

3.4.4. River Shannon and River Fergus Estuaries SPA - Wetlands

3.4.4.1. Assessment of Effects - Impact Mechanism 5 and 6

The following section considers the risk of potential effects to wetlands from:

- Impact Mechanism 5 - Physical disturbance due to seabed clearance works, and excavation and cable laying activities.
- Impact Mechanism 6 - sedimentation of solids resuspended by excavation and cable laying activities.
- Impact Mechanism 7 Electromagnetic fields

The boundary of the River Shannon and River Fergus Estuaries SPA was defined to include the primary wetland habitats of the site. The Conservation Objective for Wetland (A999) is to maintain the permanent extent of these wetland habitats, which constitute an important resource for regularly-occurring migratory waterbirds. The wetland habitat A999 of the SPA comprise five broad types of constituent habitats: namely, subtidal; intertidal; supratidal; lagoon and associated; and freshwater and associated (NPWS 2012[24]). Description of the habitat groups are provided in Table 3.9.

Table 3.9: Wetland habitats of River Shannon and River Fergus Estuaries SPA (adapted from NPWS 2012[21]).

Habitat Category	Description	Potential Risk
Subtidal	Subtidal areas refer to those areas contained within the SPA that lie below the mean low water mark and are predominantly covered by marine water. Tidal rivers, creeks and channels are included in this category. For the River	Yes - potential overlap with proposed

[24] NPWS 2012. River Shannon & River Fergus Estuaries Special Protection Area (Site Code 4077) Conservation Objectives Supporting Document VERSION 1 National Parks & Wildlife Service September 2012 https://www.npws.ie/sites/default/files/publications/pdf/004077_River%20Shannon%20and%20River%20Fergus%20Estuaries%20SPA%20Supporting%20Doc_V1.pdf

Habitat Category	Description	Potential Risk
	Shannon and River Fergus Estuaries SPA this broad category is estimated to be 20,636 ha. Subtidal areas are continuously available for benthic feeding and dabbling ducks (e.g. Wigeon and Teal) and piscivorous/other waterbirds (e.g. Cormorant). Various waterbirds roost in subtidal areas.	project ZoI exists
Intertidal	The intertidal area is defined, in this context, as the area contained between the mean high water mark and the mean low watermark. For the River Shannon and River Fergus Estuaries SPA this is estimated to be 9,085 ha. When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of waterbirds, particularly wading birds, as well as providing roosting/loafing[25] areas. When the intertidal area is inundated by the tide it becomes available for benthic and surface-feeding ducks and piscivorous/other waterbirds. During this tidal state this area can be used by various waterbirds as a loafing/roosting resource	Yes - potential overlap with proposed project ZoI exists
Supratidal	The supratidal category, in this context, refers to areas that are not frequently inundated by the tide (i.e. occurring above the mean high watermark) but contain shoreline and coastal habitats and can be regarded as an integral part of the shoreline. For the River Shannon and River Fergus Estuaries SPA this is estimated to be 2,448 ha. Supratidal areas are used by a range of waterbird species as a roosting resource as well as providing feeding opportunities for some species	No - No overlap with proposed project ZoI exists
Lagoon and associated	The category known as 'Lagoon and associated habitats' in this context refers to lagoons and brackish lakes and their associated habitats. For the River Shannon and River Fergus Estuaries SPA this habitat category is estimated to be 36 ha, and relates to Mangan's Lagoon, near Aughinish Island, and the larger Shannon Airport Lagoon. This latter area provides was included in the SPA primarily for supporting large concentrations of Black-tailed Godwit but it also provides both feeding and roosting/refuge habitats for a several other waterbird species.	No - No overlap with proposed project ZoI exists
Freshwater and associated	The category known as 'Freshwater and associated habitats' in this context refers to freshwater lakes and their associated habitats. For the River Shannon and River Fergus Estuaries SPA this habitat category is estimated to be 56 ha, and relates specifically to Bunlickey Lake and Cooperhill Lakes. These habitats provide both feeding and roosting/refuge habitats for a variety of waterbird species that also use the wider estuarine habitats.	No - No overlap with proposed project ZoI exists

As outlined in Table 3.9 the proposed project posed a potential risk to the broad habitats types: Subtidal, Intertidal.

The assessment of potential adverse effect to subtidal and intertidal constituent habitats of Wetland relies on the assessments presented in Section 3.4.1 of the effects to QI marine habitats and their constituent community types from the impact mechanisms (i.e. Impact Mechanism 4, 5, 6 and 7).

[25] Loafing can be described as any behaviour not connected with breeding or feeding, and includes preening and resting.

Specifically, Section 3.4.1.1 demonstrates that impact mechanism 4 and 6 will have no significant adverse effects on subtidal habitats while and Section 3.4.1.3 demonstrates the impact mechanism 5 will have no adverse effects on intertidal habitats. Consequently, it is concluded here that the proposed project will have no adverse indirect effects on the foraging of SCI bird species.

With regard to potential effects of electromagnetic fields (EMF)(impact mechanism 7), studies on EMF that arise from the power as it passes along a cable on marine organisms have shown that decapods (Cancer pagurus), elasmobranchs e.g. Lesser Spotted Dogfish (Scyliorhinus canicula) and agnathans e.g. Sea Lamprey (Petromyzon marinus) are attracted to such fields (see Hutchinson et al., 2018 and Scott et al., 2019). It is unclear which sensory cells or organs in decapods react to these fields but crabs have been recorded as being attracted to them. The lower jaws of elasmobranchs have extensive cluster of sensitive cells called the ampullae of Lorenzini and in Agnatha, the lateral line which is a concentration of nerve cells that run along the mid-line of the body extending to the head area (McCormack, 1988). According to these studies, it is these cells that pick up the electromagnetic fields from cables. No negative impacts have been recorded on any of these marine organisms. Consequently, it is concluded here that the proposed project will have no adverse indirect effects on the foraging of SCI bird species.

3.5. Potential for Adverse Effects on Site Integrity

Potential for effect to Estuaries [1130] and Reefs [1170] were identified in Section 3.4.1.1. The Conservation Objective for the Estuaries [1130] and Reefs [1170] are to maintain the favourable conservation condition (NPWS, 2012[1]). In addition, potential adverse noise effects have been identified in Section 3.4.2.1 for common bottlenose dolphin; the Conservation Objective for the species is to maintain the favourable conservation condition (NPWS, 2012[1]).

For the QI habitats and species, favourable conservation condition is defined by a list of attributes and targets. An assessment of the potential impacts on the integrity of the SAC was undertaken in relation to the attributes and targets set for the habitats and species (see Table 3.10).

Table 3.10: Assessment of potential for adverse effects on the integrity of the Lower River Shannon SAC – estuaries, reef and common bottlenose dolphin. Attributes, measure and targets identified in NPWS (2012[1]).

QI	Attribute	Measure	Target	Potential Impact	Potential for Adverse Effects on Site Integrity in the Absence of Mitigation
Estuaries [1130]	Habitat area	Hectares	The distribution of permanent habitat is stable, subject to natural processes	None – the proposed development will not impede or alter the coastal flooding regime. As such, there will no change in habitat area of estuaries habitat.	No
	Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand with Scolelepis squamata and Pontocrates spp. community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with Nucula nucleus community complex; Subtidal sand to mixed sediment with Nephtys spp. community complex; Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and Laminaria-dominated community complex	Pollution effects. Release of sediment, chemicals or other waste material pollution or invasive plant species during construction (i.e. impact mechanism 1) could result in impact to constituent community types and ecological function.	Yes – pollution effects and associated impacts would constitute a negative effect on site integrity.
Reef [1170]	Habitat distribution	Occurrence	The distribution of Reefs is stable, subject to natural processes	None	No
	Habitat area	Hectares	The permanent habitat area is stable, subject to natural processes	None	No

QI	Attribute	Measure	Target	Potential Impact	Potential for Adverse Effects on Site Integrity in the Absence of Mitigation
	Community distribution	Hectares	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and Laminaria-dominated community complex	Pollution effects. Release of sediment, chemicals or other waste material pollution during construction (i.e. impact mechanism 1) could result in impact to constituent community types and ecological function.	Yes – pollution effects and associated impacts would constitute a negative effect on site integrity.
Bottlenose dolphin [1349]	Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use	None	No
	Habitat use: critical areas	Location and hectares	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition	None	No
	Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site	Noise disturbance. Physical injury including permanent or temporary auditory damage. Disruption of natural behaviour.	Yes - noise disturbance and associated impacts would constitute a negative effect on site integrity.

3.6. Mitigation

All proposed project works will be carried according to best practice guidance, including but not limited to guidance on preventing pollution from construction sites and pollution prevention guidance. The Outline CEMP included with the Planning Application defines the boundaries where construction will be undertaken as outlined in Section 2.2.4.4 the detailed measures to be implemented for the project to avoid environmental effects occurring will be detailed in full in a CEMP that will be prepared by the appointed Contractor.

Measures relevant to the current assessment and the avoidance of adverse effects to marine habitats from the release of sediment, chemicals or other waste material pollution or invasive plant species are detailed in Section 3.6.1 and Section 3.6.2 while Section 3.6.3 outlines measures to mitigate potential effects of project noise to marine mammals. In addition, measures required to address IFI observations regarding biosecurity and pollution prevention controls are detailed in Section 3.6.2.

3.6.1. Prevention of release sediment, chemical or other waste material pollution

- No construction works will be undertaken within 10m of any drainage ditch, with the exception of the crossing points;
- Temporary construction surface drainage and sediment control measures will be in place before earthworks commence. A preventative maintenance programme for all wastewater, stormwater, fuel and chemical management systems will be implemented on site;
- Topsoil and subsoil will be excavated to facilitate the construction of the proposed development. Unless re-used as backfill or in local landscaping works all soil/stones (topsoil & subsoil) arising on the site will be removed from the site and disposed of as a waste or, where appropriate, as a by-product by an appropriately permitted Contractor subject to the relevant permissions by consenting authorities. In the event that any soils are suspected as being potentially contaminated with fill or other pollutants, soil will be tested and classified as hazardous or non-hazardous in accordance with the EPA Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous publication, HazWasteOnline tool or similar approved method following consultation with Kerry and Clare County Councils (depending on the location). The material will then need to be classified as inert, nonhazardous, stable non-reactive hazardous or hazardous in accordance with EC Decision 2003/33/EC to inform the most appropriate disposal location;
- During the installation of the grid side connection circuits across drainage ditches, the works area will be completely isolated from the watercourse and any water present will over

pumped to percolate to ground, or a diversion will be created in accordance with IFI Guidelines[26]. All machinery used in proximity to the drainage ditches will be stored in bunded areas during the works;

- No on-site concrete batching will be permitted at the proposed works areas. Concrete will instead be transported to the site within a concrete truck. Quick setting concrete mixes will be used to reduce the risk of contaminated run-off to the nearby watercourses. Concrete trucks will be washed down to a mortar bin / skip which has been examined in advance for any defects. The wash down area will not be located within 50m of any watercourse or drainage ditch;
- Silt fences will also be installed around stockpiles of excavated material to ensure no runoff from the stored material discharges into watercourses. The alignment of silt fences will be identified by the EnCoW and installed under EnCoW supervision.
- The Outline CEMP included with the consent Applications defines the boundaries where construction will be undertaken. A Construction Waste Management Plan (as part of the overall CEMP) which will provide for the segregation of all construction wastes into recyclable, biodegradable and residual wastes will be adhered to. All operations at the site will be managed and programmed in such a manner so as to minimise waste production and maximise recycling in order to prevent potential ground pollution. Wastes sent off site for recovery or disposal will only be conveyed by an authorised waste contractor and transported from the proposed development site to an authorised site of recovery / disposal in a manner which will not adversely affect the environment;
- To minimise the risk of instability, stockpiling of excavated materials will be undertaken only to heights and slope angles which the material is capable of supporting. These stockpiles will be stored at level ground, with a silt fence inserted at the base, at a minimum distance of 10 metres from a drain or watercourse;
- Imported materials and any site won materials excavated from the trench will be tested prior to use in order to determine their geotechnical and geo-environmental properties in order to assess their suitability for use. This will minimise the potential for instability of finished landforms / stockpiles and prevent importation of contaminated materials to site;

[26] Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.

- Bunds for the storage of chemicals will be lined or constructed of materials resistant to damage by the materials stored therein. Additionally, the capacity of such bunds will be a minimum of 110% of the volume of the largest container stored therein. Bunds will be designed in accordance with Environmental Protection Agency guidance in relation to the storage of potentially polluting liquids ("IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities", 2004);
- Where refuelling is to take place on site it will be within a designated impermeable, bunded area, away from all drains. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment;
- Drip trays will be used where hydrocarbons are being used for vehicle maintenance/refuelling;
- Portable chemical toilets will be provided for the duration of the works and all waste material will be removed from site and disposed of to an appropriately licensed facility;
- Rainfall accumulating in the base of the trenches will be discharged to a designated percolation area (via a fuel interceptor if required to reduce risk of impact to groundwater quality; and
- Concrete material will be stored in bunded areas.
- The following measures will be implemented for underground grid cable installation:
- Compacted concrete material will be placed around the ducts;
- For the concrete / road sections of the cable route (i.e. along the internal access tracks) the reinstatement will be carried out in consultation with the landowners, as appropriate;
- For unsurfaced/grass sections, backfilling with suitable excavated material (gravel/soil) placed and compacted above the top row of ducting to ground level; and
- Excavated material and topsoil will be stored and capped for re-use in separate stockpiles alongside the trenches. Surplus material will be stored or reused elsewhere inside the allocated construction boundary. These stockpiles will be stored at level ground, with a silt fence inserted at the base, at a minimum distance of 10 metres from a drain or watercourse.

3.6.2. Biosecurity and Pollution Prevention Controls

Biosecurity measures must be employed during the construction phase. No evidence of invasive species were noted during the site survey undertaken to inform this assessment. A pre construction invasive species survey will be undertaken within the proposed development boundary and along access tracks by a competent Ecologist to determine if invasive species listed under Part 1 of the Third Schedule of S.I No.

477 of 2011 have established in the area in the period between pre-planning and post consent. The survey should be undertaken in the appropriate botanical survey season. In the event that invasive species are identified within the works area a site-specific Invasive Species Management Plan will be developed and implemented by a competent specialist on behalf of the Contractor. In addition, in order to comply with Regulations 49 and 50 of the European Communities (Birds and Natural Habitat) Regulations (2011) the appointed Contractor will ensure biosecurity measures are implemented throughout the construction phase to ensure the introduction and translocation of invasive species is prevented. The appointed EnCoW will carry out a toolbox talk which will identify invasive species and will also implement biosecurity measures such as the visual inspection of vehicles for evidence of attached plant or animal material prior to entering and leaving the works area.

The biosecurity measures will have regard to IFI Biosecurity Protocols including:

- IFI Biosecurity Protocol for Field Survey Work (December 2010);
- IFI Invasive Species Biosecurity Guidelines for Anglers – leaflet (2011);
- IFI Invasive Species Biosecurity Guidelines for Boaters – leaflet (2011); and
- IFI Invasive Species Biosecurity Guidelines for Scuba Diving (2012).

An Environmental Clerk of Works will be appointed by the Contractor to oversee and monitor the implementation of biosecurity protocols.

To ensure the spread of invasive species is avoided a 'Check, Clean, Dry' protocol will be undertaken by the appointed EnCoW with all equipment, machinery and vehicles entering and leaving the proposed development boundary. these include but not limited to the following

- Before and after use, all relevant equipment (e.g. construction/ plant equipment, dumper trucks, vessels etc.) will be thoroughly cleaned using Virkon Aquatic to guard against the spread of fish viruses, bacteria, fungi, and moulds.
- All water used in the cleansing, testing or disinfection of structures or machinery shall be rendered safe prior to discharge to the environment, particularly any chlorinated water
- Storage oil spill accident response equipment. At a minimum the response equipment will include absorbent mats and waste- bags.
- Imported backfill material will be washed (cleaned) to remove fines and checked for invasive plant species before use.
- Imported material to be used backfill will be stored on the site; measures to avoid the release of sediment will be implemented (including silt fences).
- Clean (washed) rock material will be used as rock protection to minimise the risk of introducing fine materials.

3.6.3. Noise Mitigation Measures

To mitigate any potential impact to marine mammal species the appointed Contractor, under supervision and direction of the MMO, will implement relevant impact mitigation and monitoring measures in relation to marine mammals as outlined in DAHG Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (DAHG, 2014[27]).

The DAHG (2014) guidance on measures required to manage the risk of man-made sound to marine mammals relates to the following human activities that can introduce sound into the marine environments at levels that may harm and/ or disturb species that are legally protected;

- geophysical acoustic surveys
- dredging
- drilling activities
- pile driving
- blasting activities

While the activities proposed for the Cross Shannon 400 kV Cable Project do not align with the human activities listed above, the appointed Contractors will adhere to DAHG (2014) guidance on including use of marine mammal observers (MMOs)to mitigate the risk of potential impacts of trench excavation and cable laying noise to marine mammals from the proposed project. In summary, trench excavation and cable laying operations shall not commence until after the successful completion of pre-start visual monitoring, undertaken by MMOs as per DAHG guidance, with no marine mammals observed over the required monitoring period in the monitored zone.

The short duration and temporary nature of the cable laying works and the employment of an MMO and the 'soft-start' procedure throughout the works.

Once pre-start monitoring requirements have been achieved, operations can be commenced. To further mitigate potential risk of adverse effects occurring, the subsea cable installation operations will be carried out outside of peak bottlenose dolphin calving season (August). Prior to undertaking the project, the MMO will consult with the NPWS on the full scope of measures required to be implemented. The MMO will consult with IWDG, prior do, during and after completion of the works, unless otherwise agreed with the IWDG.

It is noted that there are proposals for the development of the Moneypoint Synchronous Condenser (Planning Application Ref: 20/318 Clare County Council) approximately 800m west of the Cross Shannon cable landfall at Moneypoint. The NIS for the Moneypoint Synchronous Condenser notes

[27] DAHG 2014 Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters https://www.npws.ie/sites/default/files/general/Underwater%20sound%20guidance_Jan%202014.pdf

potential for underwater noise effects on bottlenose dolphin and the need for an MMO. Both the proposed development, and the Moneypoint Synchronous Condenser would, if consented, be supervised by an MMO, who will implement the NPWS guidance on underwater noise. Even if the works to complete the Moneypoint Synchronous Condenser, and the proposed development are completed simultaneously, there will be potential for adverse in-combination effects on European sites.

3.7. Outcomes

Adherence to the mitigation measures detailed in Section 3.6 ensures that the proposed project will not result in adverse effects to the Annex I habitats Estuaries [1130] and Reefs [1170], and Annex II species Bottlenose dolphin [1349] of the Lower River Shannon SAC

The mitigation measures detailed in Section 3.6 of this NIS have been carefully considered to ensure no adverse effects on the integrity of the Lower River Shannon SAC and River Shannon And River Fergus Estuaries SPA in light of the conservation objectives and status of the sites. For the reasons set out in detail in this NIS, in the light of the best scientific knowledge in the field, all aspects of the proposed project which, by itself, or in combination with other plans or projects, may affect the relevant European Sites have been considered. The NIS contains information which the competent authorities, may consider in making their own complete, precise and definitive findings and conclusions and upon which each competent authority is capable of determining that all reasonable scientific doubt has been removed as to the effects of the proposed project on the integrity of the relevant Natura 2000 sites. In the light of the conclusions of the assessment which it shall conduct on the implications for the European sites concerned, each competent authority is enabled to ascertain that the proposed project will not adversely affect the integrity of any of the European sites concerned.

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