MOTT MACDONALD

EIRGRID

Planning and Environmental Considerations Report

Cross Shannon 400 kV Cable Project (Capital Project 0970)

30 July 2020

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1 Introduction

1.1 Introduction

Mott MacDonald has been appointed by EirGrid plc (EirGrid) to prepare this Planning and Environmental Considerations Report (PECR) to accompany an application for statutory approval to An Bord Pleanála (ABP) and a foreshore licence application to the Department of Housing, Planning and Local Government (DHPLG).

The Cross-Shannon Cable 400 kV Project (Capital Project Reference 0970) 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.

1.2 About EirGrid

EirGrid is the state-owned independent Transmission System Operator (TSO) and developer of Ireland's national high voltage electricity grid (also called the "Transmission System"). The European Communities Regulations 2000 (SI 445 of 2000) sets out the role and responsibilities of the TSO in particular Article 8(1) (a) gives EirGrid, as TSO, the exclusive function:

"*To operate and ensure the maintenance of and, if necessary, develop a safe, secure, reliable, economical, and efficient electricity transmission system, and to explore and develop opportunities for interconnection of its system with other systems, in all cases with a view to ensuring that all reasonable demands for electricity are met having due regard for the environment*."

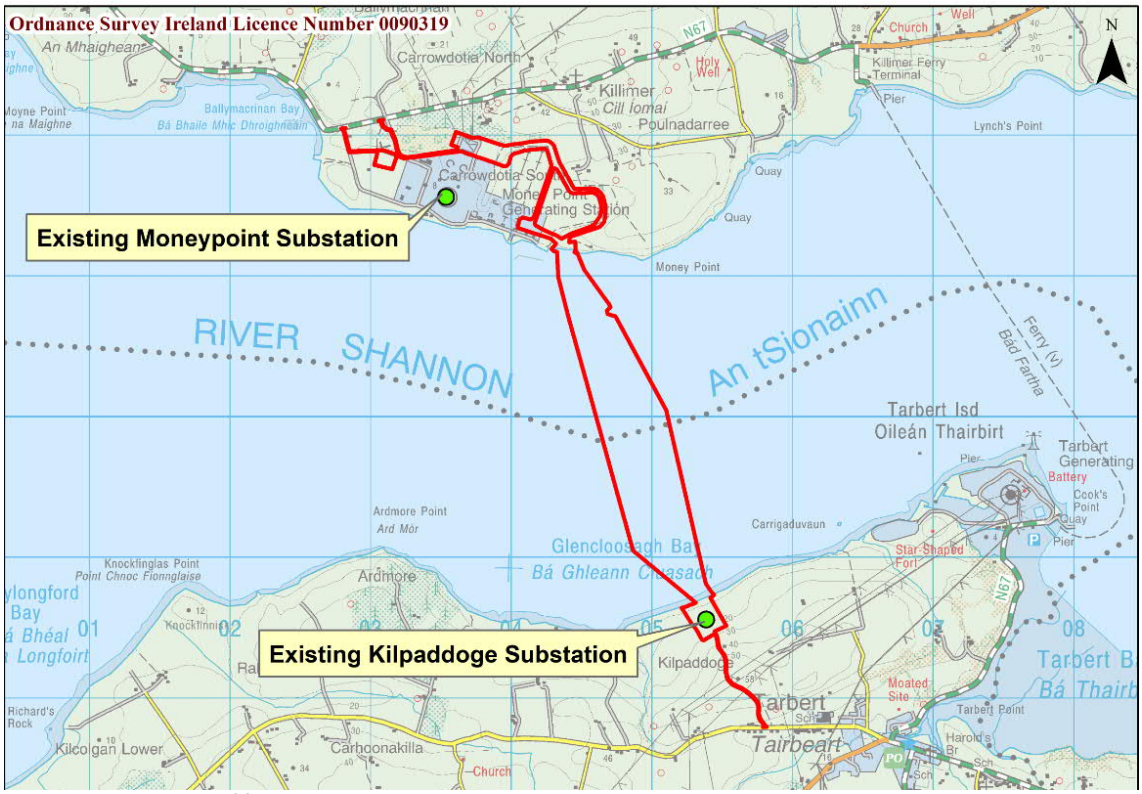
In addition, Article 8(1)(i) requires EirGrid:

"to offer terms and enter into agreements, where appropriate, for connection to and use of the transmission system with all those using and seeking to use the transmission system."

1.3 Project Overview

The proposed development will involve the installation and operation of an additional cable crossing of the Shannon Estuary between the existing transmission substation on the site of the existing electricity generating station at ESB Moneypoint (north side of the Shannon estuary, near Killimer in County Clare) and a new 400/220 kV transformer at the transmission substation at Kilpaddoge (south side of the Shannon estuary near Tarbert in County Kerry). A full description of the proposed development is set out in Chapter 4 of this report.

Figure 1.1: Project Location



Source: Mott MacDonald

1.3.1 EirGrid Framework for Grid Development

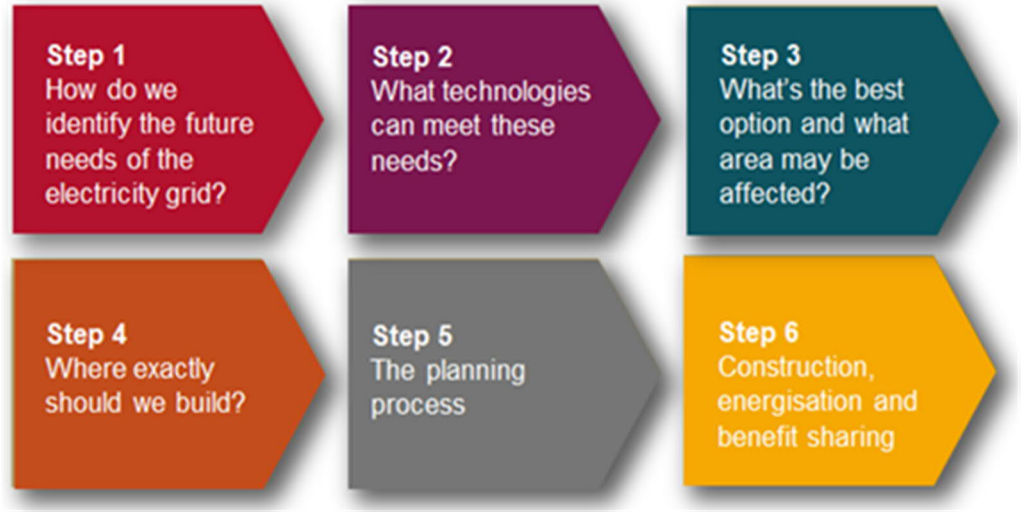
EirGrid follow a six step approach when developing and implementing the best performing solution option to any identified transmission network problem. This six step approach is described in the EirGrid document '[Have Your Say](#)'. Each step has a distinct purpose with defined deliverables. However, when connecting customers, Steps 1, 2 and 3 are managed under the EirGrid Connections Process. The proposed development is now in Step 5 which involves the preparation and submission of the application for approval. In this particular case to a planning application to An Bord Pleanála and a foreshore licence application to the Department of Housing, Planning and Local Government. The six steps are shown on Figure 1.2.

The Step 4 analysis provided an overview of the consent and environmental context and constraints for the proposed development, the identification and evaluation of potential options and the identification of a Best Performing Option (BPO). The BPO forms the basis of the proposed development which now comprises the subject of this report. Whilst generally comprising an internal EirGrid document, it is considered beneficial for the purposes of the environmental appraisal in respect of the proposed development to append the Step 4 report to this report (as provided in Appendix A of this report).

It should be noted that there may be some duplication between information contained in the Step 4 report and information contained in this Planning and Environmental Considerations Report. Also, in this regard, it should be noted that the Step 4 report was prepared in December 2019, and information and details therein may have been superseded by the information now

contained in this report, primarily on account of subsequent studies or analysis having been undertaken, additional landowner and public engagement having occurred etc. Where any discrepancy occurs between information contained in the Step 4 report and that contained in this report, the information contained in this report should take precedence.

Figure 1.2: EirGrid Six-Step Framework for Grid Development

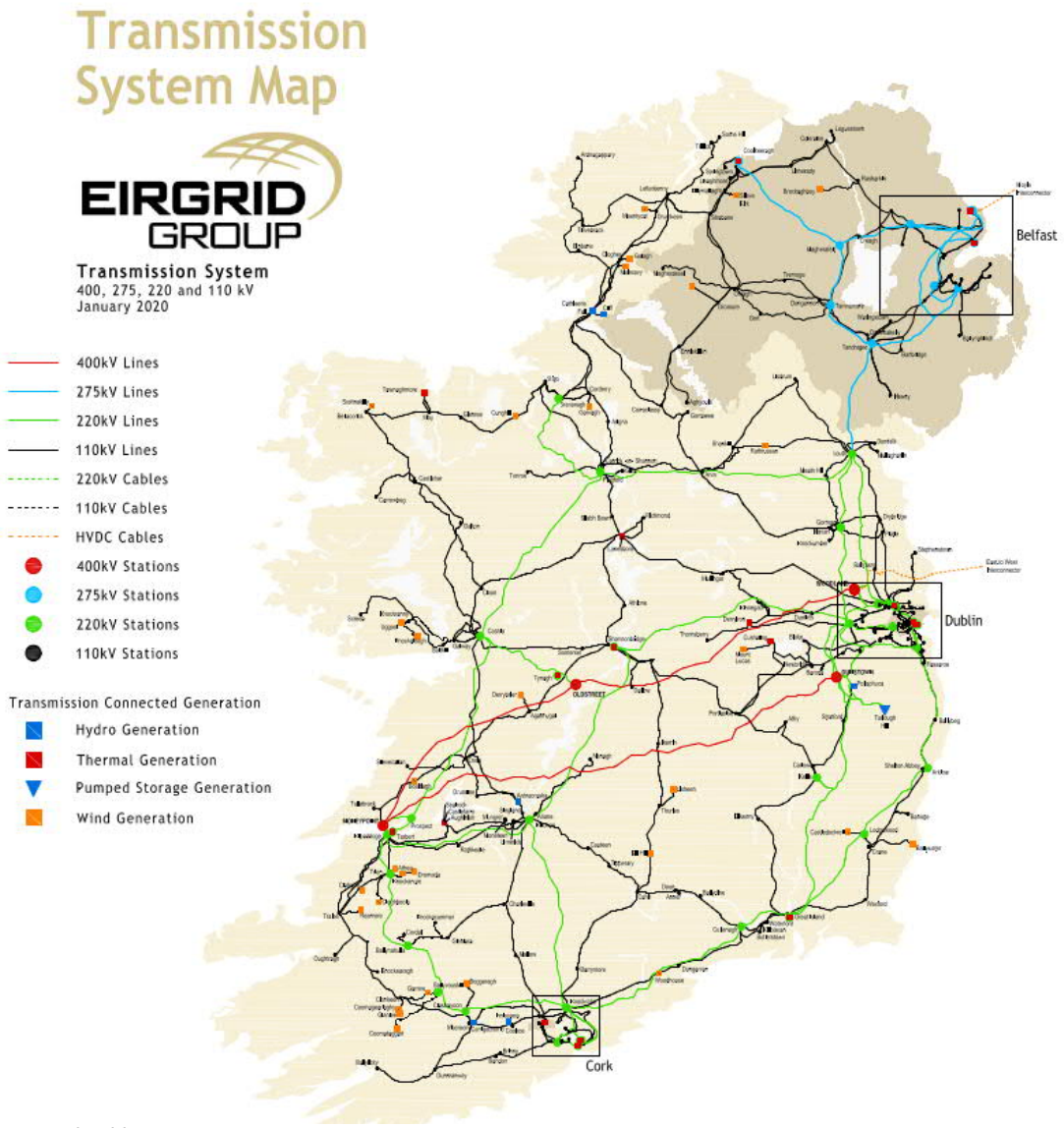


Source: EirGrid

1.3.2 Need for the Project

Figure 1.3 overleaf illustrates the High Voltage (HV) transmission network in the south and west of Ireland. High levels of renewable generation are currently being integrated into the south-west of Ireland. At times of medium to high wind generation output, it is expected that the south west of Ireland will export the excess generation to areas where it is needed. This will create, large power flows from the west and south-west towards the east coast. To be able to facilitate this and to utilise the existing 400 kV network better, a system reinforcement across the Shannon is required, which is the Cross Shannon 400 kV cable circuit (Capital Project Reference CP0970). This reinforcement forms part of the 'regional solution' consisting of a suite of reinforcement projects designed to maximise the capabilities of the existing network.

Figure 1.3: High Voltage Transmission Network around Shannon Estuary



Source: EirGrid 2020

1.3.3 The EirGrid Group Strategy 2020-2025

The EirGrid Group Strategy 2020-2025 aims to transform the power system in Ireland, with the primary goal being to lead the transition of Ireland's electricity sector to low carbon-renewable energy. The Strategy involves a €2 billion investment over five years aiming to ensure that renewable energy accounts for 70% of all electricity in Ireland by 2030. Key to the new strategy is upgrading the power system so that it can handle world-leading levels of renewable energy, supplied through a combination of offshore and onshore wind, along with solar energy.

1.3.4 Where Are We Now

The system reinforcement required to meet the need set out above was originally termed the 'Grid Link' project. A number of options were considered by EirGrid including;

- A high voltage alternating current (HVAC) 400 kV overhead line between Knockraha, County Cork and Dunstown in County Kildare;
- A high voltage direct current (HVDC) circuit between Knockraha and Dunstown; and
- A regional solution including series compensation of the three existing 400 kV circuits.

In September 2015, EirGrid submitted a report on the Grid Link project to the Government appointed Independent Expert Panel (IEP). This report included an analysis of each of the options from technical, environmental and economic perspectives. Subsequent to the publication of this report EirGrid has decided to progress the 'regional solution' to meet the needs of the Grid Link project. The 'regional solution' consists of the following individual components;

- Moneypoint-Kilpaddoge 400 kV Circuit;
- Series Compensation Oldstreet 400 kV Station;
- Series Compensation Moneypoint 400 kV Station;
- Series Compensation Dunstown 400 kV Station;
- Wexford 110 kV Station Upgrade;
- Great Island-Wexford 110 kV OHL Uprate; and
- Great Island-Kilkenny 110 kV OHL Uprate.

The Moneypoint-Kilpaddoge 400 kV Circuit involves the installation of a cable across the Shannon at 400 kV between the existing substations at Moneypoint in County Clare and Kilpaddoge in County Kerry. This component of the 'regional solution' is called the Cross Shannon Cable Project.

1.4 Development Approval – Legislative Basis

1.4.1 Strategic Infrastructure Development

The Planning and Development Acts 2000-2020 form the basis for the Irish planning system setting out the detail of regional planning guidelines, development plans and local area plans as well as the basic framework of the planning development management and consent system. The Planning and Development Act has been amended at various times since 2000. The Planning and Development (Strategic Infrastructure) Act 2006, (the 'SIA') introduced a planning process for development which is of strategic economic or social importance to the State or a region, where the application is made to an Bord Pleanála (ABP), rather than a local planning authority.

Section 182A of the Planning and Development Act 2000, as amended as inserted by Section 4 of the SIA, states that, where a person (the "undertaker") intends to carry out a "development comprising or for the purposes of electricity transmission", an application for approval of the development under Section 182B shall be made to An Bord Pleanála.

Under Section 182A (9) 'transmission' in relation to electricity shall be construed in accordance with section 2(1) of the Electricity Regulation Act 1999, which states as follows:

"transmission", in relation to electricity, means the transport of electricity by means of a transmission system, that is to say, a system which consists, wholly or mainly, of high voltage

lines and electric plant and which is used for conveying electricity from a generating station to a substation, from one generating station to another, from one substation to another or to or from any interconnector or to final customers but shall not include any such lines which the Board [Electricity Supply Board] may, from time to time, with the approval of the Commission, specify as being part of the distribution system but shall include any interconnector owned by the Board [Electricity Supply Board]".

It shall also be construed as meaning the transport of electricity by means of—

(a) a high voltage line where the voltage would be 110 kilovolts or more, or an interconnector, whether ownership of the interconnector will be vested in the undertaker or not

With regard to the above, the development comprises or is for the purposes of electricity transmission as defined in Section 182A (9) of the Act as the proposed 220 kV GIS substation constitutes 'electric plant' as defined in Section 2(1) of the Electricity Regulation Act 1999. The proposed development will ultimately form a node on or part of the transmission network.

Following pre-application consultation meetings with the Board, on 25th October 2019 and 13th March 2020, the Board determined that the proposed development would be Strategic Infrastructure Development (SID) within the meaning of Section 182A of the Planning and Development, 2000 as amended and that any application for approval for the proposed development must therefore be made directly to An Bord Pleanála under Section 182A (1) of the Act. A copy of the signed Board Direction issued on the 11th May 2020 is included in Appendix A Strategic Infrastructure Notification.

1.4.2 Foreshore Licence

The Marine and Foreshore Licence Section of the Department of Housing, Planning and Local Government requires that a foreshore licence is applied for under the Foreshore Acts 1933 as amended before commencement of any works or activity can take place.

Foreshore is the land and seabed between the high water of ordinary or medium tides (shown HWM on Ordnance Maps) and the twelve-mile limit (twelve nautical miles is appropriately 22.24 kilometres).

1.4.3 The Foreshore and Dumping at Sea (Amendment) 2009

The Foreshore and Dumping at Sea (Amendment) Act 2009 amends the Dumping at Sea Act 1996 as amended so that certain functions relating to dumping at sea are transferred from the Minister for Agriculture, Fisheries and Food to the Environmental Protection Agency (EPA).

From 15th February 2010 it is the function of the EPA to issue Dumping at Sea permits under the Dumping at Sea Act 1996 as amended.

The Dumping at Sea Act 1996 as amended, prohibits the dumping at sea from vessels, aircraft or offshore installation of a substance or material unless permitted by the Environmental Protection Agency. There are no planned dredging and / or 'Dumping at Sea' activities associated with the project. A Dumping at Sea permit is not required.

1.4.4 Screening for Environmental Impact Assessment

The Environmental Impact Assessment (EIA) Directive 2011/92/EU on the assessment of the effect of certain public and private projects on the environment (codification), as amended by EIA Directive 2014/52/EU (the EIA Directive), sets out the process by which the anticipated

effects of a project on the environment are assessed. The relevant requirements of the EIA Directive have been implemented into Irish law pursuant to the provisions of, inter alia, the Planning and Development Regulations 2001, as amended.

The provisions of Schedule 5 of the Planning and Development Regulations 2001, as amended, identify the requirements of EIA for different project types.

The determination of whether or not an EIA is required for a particular project may be carried out through a case by case examination or by setting thresholds and/or criteria.

Part 1 of Schedule 5 identifies projects of a class that will always have the potential for significant environmental effects and therefore will require an EIA. Part 2 of Schedule 5 identifies projects that may have an environmental impact and identifies thresholds or criteria which require EIA. The potentially relevant classes of development include;

Paragraph 19 of Part 1 of Schedule 5

Paragraph 19 refers to the "*Construction of overhead electrical power lines with a voltage of 220 kilovolts or more and a length of more than 15 kilometres*". The Cross Shannon 400 kV Cable Project involves the installation of four new 400 kV underwater submarine cable installations across the River Shannon which will connect to the existing substation building at Moneypoint Electricity Generating Station in County Clare. The connection in County Kerry will comprise construction of an extension of 5,500 square metres to facilitate new 400 /220 kV Air Insulated Switchgear (AIS) equipment and compound directly adjacent to the existing Kilpaddoge 220/110 kV substation. The proposed extension at Kilpaddoge will occur wholly on ESB lands. The Cross Shannon 400 kV Cable Project does not involve the construction of new overhead electrical power lines with a voltage of 220 kilovolts or more and a length of more than 15 kilometres. The routing of the grid connection will be accommodated by using High Voltage (HV) underground cables which will be brought ashore at the proposed landfall[1] locations on either side of the River Shannon. As such, there is no requirement for EIA to be undertaken in the context of Part 1 Paragraph 19 requirements.

Paragraph 2d of Part 2 of Schedule 5

Paragraph 2d refers to the "Extraction of stone, gravel, sand or clay, by marine dredging (other than maintenance dredging), where the area involved would be greater than 5 hectares or, in the case of fluvial dredging (other than maintenance dredging), where the length of river involved would be greater than 500 metres". The Cross Shannon 400 kV Cable Project will not require extraction of material by marine dredging. Submarine preparation works including seabed profiling will be required for cable installation works, these works will not require dredging or extraction/disposal off site of marine sediment. As such, there is no requirement for EIA to be undertaken in the context of Part 2 Paragraph 2d requirement.

Paragraph 3b of Part 2 of Schedule 5

Refers to "Industrial installations for carrying gas, steam and hot water with a potential heat output of 300 megawatts or more, or transmission of electrical energy by overhead cables not included in Part 1 of this Schedule, where the voltage would be 220 kilovolts or more'. The Cross Shannon 400 kV Cable Project does not involve the transmission of electrical energy by overhead cables. As such, there is no requirement for EIA to be undertaken in the context of Part 2 Paragraph 3b requirements.

[1] The landfall is the location where the submarine cable is brought ashore

Paragraph 10dd of Part 2 of Schedule 5

Refers to "*All private roads which would exceed 2000 metres in length"*

The Cross Shannon 400 kV Cable Project will require vehicular access to the proposed joint bays for maintenance. Where possible access will utilise existing access roads and farm access tracks. However, the proposed development will include Private internal access tracks of granular stone, less than 500 metres in length, to will tie into the existing tracks. This is well below the 2000 metre threshold and the lengths of track are discontinuous. No significant impacts, described below in subsequent sections, are anticipated as a result of the proposed development. In reaching that conclusion, regard has been had to the criteria under Schedule 7 of the regulations. As such, there is no requirement for EIA to be undertaken in the context of Part 2 Paragraph 10dd requirements.

Paragraph 13a of Part 2 of Schedule 5

Refers to '(a) Any change or extension of development already authorised, executed or in the process of being executed (not being a change or extension referred to in Part 1) which would-

(i) result in the development being of a class listed in Part 1 or paragraphs 1 to 12 of Part 2 of this Schedule, and

(ii) result in an increase in size greater than –

- 25 per cent, or
- an amount equal to 50 per cent of the appropriate threshold, whichever is the greater.'

The proposed development comprises the installation of four new 400 kV underwater submarine cable installations across the River Shannon. The cables will connect from an existing bay which has been allocated to the project in the substation building at Moneypoint Electricity Generating Station to the existing substation building at Kilpaddoge where an extension comprising a new substation control cabin and outdoor electrical equipment is required. None of the project components are of a class listed in Schedule 5 Part 1 and 2 and therefore an EIA is not required under Paragraph 13(a)(i)(ii).

It would not result in it being of a Class requiring environmental impact assessment under subsection (i) above. The proposed extension will comprise approximately 0.5 hectare on lands adjacent to the existing substation. Due to the nature of the change or extension being the construction it would not qualify under subsection (ii) above.

Summary Conclusions

The Cross Shannon 400 kV Cable Project does not constitute a 'project' identified in either Annex I or Annex II of the EIA Directive or within either Part 1 or Part 2 of Schedule 5 to the Planning and Development Regulations 2001, as amended. As such, there is no statutory requirement under the Directive for it to be subject to EIA.

1.4.5 Screening for Appropriate Assessment

The submarine cable will be installed within designated NATURA 2000 sites [Lower River Shannon Special Area of Conservation (002165) and the River Shannon and River Fergus Special Protection Area (004077)]. Consequently, a Natura Impact Statement (NIS) accompanies this application for statutory approval to An Bord Pleanála. The provision of a NIS also complies with the requirements of an ABP Direction notification dated 13th March 2020 that a NIS is to accompany the application for approval.

1.4.5.1 Foreshore Licence

As noted above, a Natura Impact Statement (NIS) accompanies the licence application The provision of a NIS also complies with the requirements of the Department of Housing, Planning and Local Government notification dated 11th December 2019 that a NIS is to accompany the application for approval.

1.5 Structure of this Report

The structure of this report is set out in Table 1.1

Table 1.1: Structure of this PECR

Chapter	Title
1	Introduction
2	Policy and Land Use Considerations
3	Alternative Options Considered
4	Description of the Project
5	Consultation and Engagement
6	Population and Human Beings
7	Biodiversity
8	Marine Aspects
9	Land, Sediment and Geology
10	Water, including Flood Risk
11	Archaeology and Cultural Heritage
12	Noise and Air
13	Landscape and Visual
14	Material Assets, including Traffic
15	Summary of Mitigation Measures

1.6 Other Assessments and Supporting Documentation

To further inform the application for approval the following accompany the application;

- Natura Impact Statement; and
- Outline Construction and Environmental Management Plan (OCEMP).

This PECR was prepared by Mott MacDonald with expert technical contributions provided by a number of specialists;

- ADCO Ltd- Archaeology and Cultural Heritage Assessment;
- Aquafact Ltd- Biodiversity Assessment and Natura Impact Statement; and
- Macroworks Ltd- Landscape and Visual Assessment.

2 Policy and Land Use Considerations

2.1 Introduction

This section of the report considers both the onshore and offshore planning history and land use and offshore considerations comprising the application site boundary. This section sets out the relevant national, regional and local planning policies and objectives associated with the proposed development.

2.2 Planning Policy

A detailed review of national, regional and planning policy was carried out as part of the project development (i.e. captured in the Step 4 Report). The objective of which was to ensure that the proposed development is developed in line with sustainable planning policies and objectives. For clarity the review has been summarised below.

The following documents were considered in this assessment;

- Project Ireland 2040 - National Planning Framework;
- Marine Planning and Development Management Bill 2019;
- National Marine Planning Framework (Draft);
- National Mitigation Plan 2017;
- National Development Plan 2018-2027;
- Government White Paper – Ireland's Transition to a Low Carbon Energy Future 2015-2030;
- Regional Spatial and Economic Strategy for Southern Region;
- Strategic Integrated Framework Plan for the Shannon Estuary (2013-2020);
- Clare County Development Plan 2017-2023; and
- Kerry County Development Plan 2015-2021.

2.2.1 National Planning Policy Context

Project Ireland 2040 – National Planning Framework

Ireland 2040 - National Planning Framework (NPF), is a 20-year planning framework designed to guide public and private investment, to create and promote opportunities for Irish citizens, and to protect and enhance Ireland's built and natural environment. The Cross Shannon 400 kV Cable Project will strengthen energy provision within the Mid-East Region to meet the growing demand and deliver a secure and sustainable electricity system. This will improve the performance of local and regional enterprises in terms of *innovation, export potential and productivity, supporting technology-led start-ups and by attracting further investment to the regions* as described in **National Strategic Outcome 6** (*A Strong Economy Supported by Enterprise, Innovation and Skills*). The NDP states that investments within grid infrastructure, including improvements to transmission networks, are an important enabler of economic growth and as such, the energy sector will play a critical role in meeting priority infrastructural needs at both national and local levels.

Marine Planning and Development Management Bill 2019

The *Marine Planning and Development Management Bill* (MPDM Bill) seeks to establish in law a completely new regime for the maritime area which will replace existing State and

development consent regimes and streamline arrangements on the basis of a single consent principle. The streamlined regime will result in a Maritime Area Consent to enable occupation of the Maritime Area and one development consent (planning permission), with a single environmental assessment.

A final General Scheme of the Bill was approved by Government in December 2019. The MPDM Bill incorporates a forward planning model, with decisions to be taken in a manner that secures the objectives of the National Marine Planning Framework which provides the spatial and policy context for decisions about the maritime area. The MPDM Bill highlights the key role marine planning plays in our national climate efforts in terms of meeting Ireland's renewable energy targets.

National Marine Planning Framework (Draft)

The *National Marine Planning Framework* (NMPF) will be Ireland's first marine spatial plan strategy and will contribute to more sustainable and effective management of marine activities and marine resources. The draft NMFP is currently out for public consultation and is anticipated to be adopted in late 2020.

The NMPF is a parallel document to the NPF and forms part of a new development management system being introduced under the Marine Planning and Development Management Bill 2019. The NMPF will set out policies that would support a range of marine activities such as aquaculture, defence, energy, fisheries, ports and harbours, telecommunications cables, water treatment and disposal. The NMPF will provide an overarching framework for decision-making that is consistent, evidence-based and provides sustainable development of maritime areas. All activities within Ireland's maritime area will be assessed in terms of consistency with the objectives of the NMPF.

The Energy-Transmission objectives of the draft NMPF are as follows;

- Support Ireland's decarbonisation journey through diversification of supply options;
- Strengthen the policy framework to incentivise interconnection;
- Provide enhanced security of energy supply for Ireland in the short to medium term in accordance with the Government White Paper on Energy and Government Action Plan to Tackle Climate Disruption; and
- Ensure good regulatory practices in the provision of gas and electricity transmission infrastructure, according to international best practice.

There are four Transmission Planning Policies within the draft NMPF, the proposed project is consistent with the objectives of the draft NMPF and is supported by the following planning policy;

- **Transmission Policy 1** – Gas or electricity transmission proposals that maintain or improve the security and diversity of Ireland's energy supply, including interconnectors, should be supported.
- **Transmission Policy 2**- Proposals for activities that are in or could affect energy transmission proposals in sites held under a permission or that are subject to an ongoing permitting or consenting process for energy transmission proposals should demonstrate that they will in order of preference
  - Avoid;
  - minimise;
  - mitigate adverse impacts; and

  - if it is not possible to mitigate significant adverse impacts, proposals should state that case for proceeding.
- **Transmission policy 3**- decisions on transmission developments should be informed by consideration of space required for other activities of national importance described in the NMPF.
- **Transmission policy 4**- where possible, opportunities for land-based, coastal infrastructure that is critical to and supports energy transmission should be prioritised in plans and policies.

The National Mitigation Plan

Irelands first statutory *National Mitigation Plan* (2017), gives effect to the provisions of the Climate Action and Low Carbon Development Act 2015, and represents a national milestone in the advancement of climate change policy in Ireland. The Plan provides for the statutory basis for the transition to a low carbon, climate resilient and environmentally sustainable economy by 2050. The Plan reaffirms Ireland's commitment to concerted and multilateral action to tackle climate change following Ireland's adoption of the legally binding Paris Agreement. Under the Paris Agreement, the EU is committed to reducing greenhouse gas emissions by at least 40% by 2030, compared with 1990 levels. The Plan outlines a range of measures to lay the foundations for transitioning Ireland to a low-carbon, climate-resilient and environmentally sustainable economy by 2050. The Plan confirms that *Onshore wind has, to date, been the most cost-competitive renewable electricity technology in Ireland, accounting for 22.8% of overall electricity generation in 2015*. As noted in Section 1.3.2 at times of high wind, large bulk power flows are expected to flow from the west and south-west towards the large load centres on the east coast. A system reinforcement is required to facilitate these projected power flows. As part of a regional solution to meet this reinforcement EirGrid are proposing the Cross Shannon 400 kV cable circuit. The Plan also notes that the transition towards a low-carbon economy requires engagement from stakeholders at all levels of Government, including those decisions made at the higher levels of planning governance.

The National Development Plan 2018-2027

The *National Development Plan 2018-2027* (NDP) states that investments within grid infrastructure, including improvements to transmission networks, are an important enabler of economic growth and as such, the energy sector has a critical role to play in meeting priority infrastructural needs at both national and local levels. The implementation of the proposed development by EirGrid represents the type and nature of investment described within the NDP required to achieve the NPF's strategic outcomes.

Government White Paper – Ireland's Transition to a Low Carbon Energy Future 2015-2030

The Government White Paper entitled *Ireland's Transition to a Low Carbon Energy Future 2015-2030* sets out a framework to guide Ireland's energy policy development. The White Paper acknowledges the need for the 'development and renewal' of energy networks to meet economic and social goals. Enhanced energy infrastructure, such as the proposed development, will be critical for economic development, regional development and the secure provision of energy and other services for the proper functioning of the markets.

2.2.2 Regional Planning Policy Context

Regional Spatial and Economic Strategy for the Southern Region

The *Regional Spatial and Economic Strategy for the Southern Region* (RSES), which came into effect in January 2020, supports a safe, secure and reliable transmission and distribution of

electricity and the successful implementation of the "Ireland's Grid Development Strategy "Your Grid, Your Tomorrow", prepared by EirGrid.

The following objectives are outlined in the RSES;

- RPO 219 New Energy Infrastructure
  - It is an objective to support the sustainable reinforcement and provision of new energy infrastructure by infrastructure providers (subject to appropriate environmental assessment and the planning process) to ensure the energy needs of future population and economic expansion within designated growth areas and across the Region can be delivered in a sustainable and timely manner and that capacity is available at local and regional scale to meet future needs.
- RPO 222 Electricity Infrastructure
  - It is an objective to support the development of a safe, secure and reliable supply of electricity and to support and facilitate the development of enhanced electricity networks and facilitate new transmission infrastructure projects that might be brought forward in the lifetime of this plan under EirGrid's (2017) Grid Development Strategy (subject to appropriate environmental assessment and the planning process) to serve the existing and future needs of the region and strengthen all-island energy infrastructure and interconnection capacity.

Strategic Integrated Framework Plan for the Shannon Estuary (2013-2020)

The *Strategic Integrated Framework Plan for the Shannon Estuary* (2013-2020) (SIFP) is an inter-jurisdictional land and marine based framework plan to guide the future development and management of the Shannon Estuary. It was commissioned by Clare County Council, Kerry County Council, Limerick City and County Councils, Shannon Development and the Shannon Foynes Port Company. The project is being overseen by a multi-agency steering group comprised of a number of local authorities and other key stakeholders, including EirGrid, with an interest in the Estuary.

The SIFP identifies Moneypoint Power Plant and Tarbert Power Plant as having created a strategic energy hub within the Shannon Estuary, identifying the area of Moneypoint Power Plant in County Clare and the area between Ballylongford and Tarbert Power Plant in County Kerry as Strategic Development Locations (SDLs).

The Development Objectives outlined in the SIFP include:

- SIFP MRI 1.2.2 Moneypoint Strategic Energy Location
  - To safeguard the role and function of ESB Moneypoint as a key strategic driver of economic growth in the Region, encouraging its sustainable growth, operational expansion and diversification in accordance with national and regional energy objectives.
- SIFP ERG 1.2: Safeguarding the role & function of energy sites
  - To safeguard the role and function of the strategic energy infrastructure existing within and adjacent to the Shannon Estuary, and encourage the further sustainable development of energy, enterprise and industry within these identified strategic energy locations, subject to the requirements of the Habitats & Birds Directive, Water Framework Directive, and all other relevant EU Directives.
- SIFP ERG 1.3: Facilitating energy development
  - To facilitate the further development of the energy infrastructure at identified strategic energy sites and encourage appropriate diversification projects subject to compliance

with sustainable planning, and the requirements of the Habitats & Birds Directive, Water Framework Directive and all other relevant EC Directives.

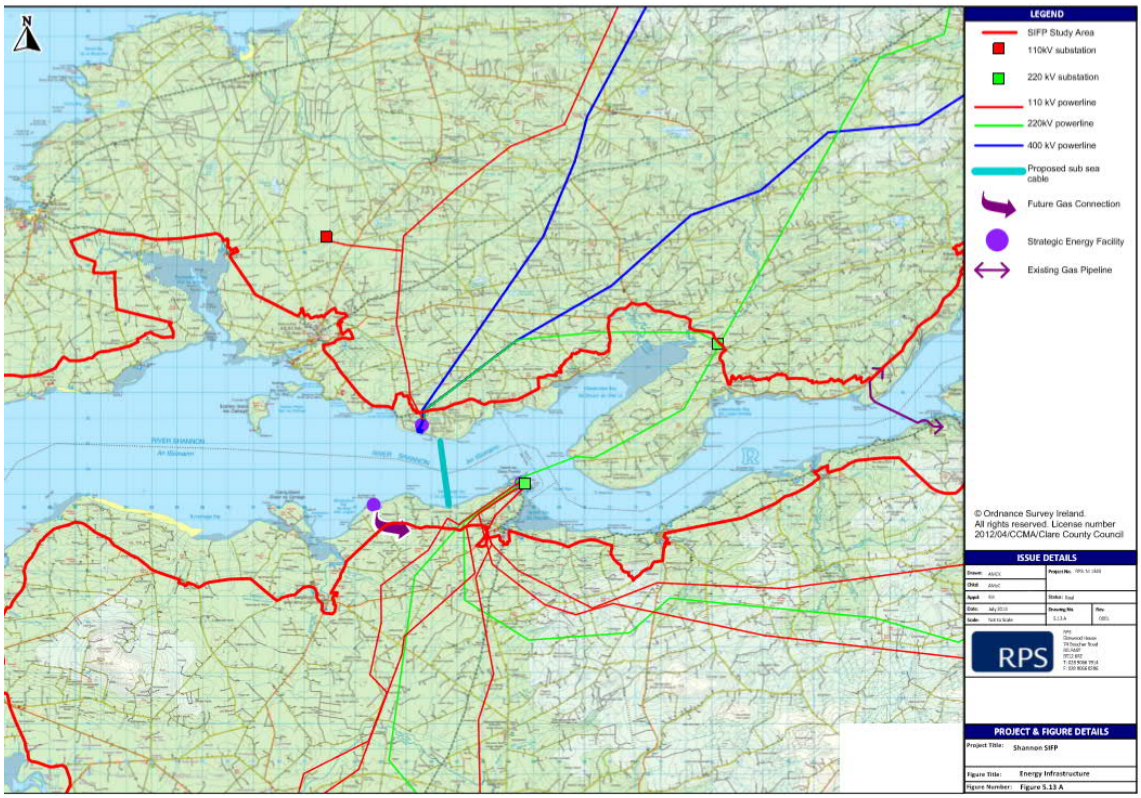
- SIFP ERGI 1.5: Electricity Network
  - To support and facilitate the sustainable development, upgrade and expansion of the electricity network, transmission, storage and distribution infrastructure ensuring that all such developments comply with the requirements of the Habitats & Birds Directives, Water Framework Directive, and all other EC Directives.

The Plan notes;

> *There is a growing network of wind powered electricity generators in both Cork and Kerry and significant potential exists for additional electricity generation by sustainable wind, wave and tidal energy sources. However, many of these sources of renewable energy are not served by existing electricity transmission routes. Significant reinforcement of the electricity grid would be required to cater for the new power flows from renewable generation.*

The proposed development has regard to the guiding principles set out in the Plan for future development on Strategic Development location at Moneypoint and lands adjacent. The Strategic Development Locations have emerged as the locations which were likely to generate the greatest potential opportunities in terms of economic and social aspirations, while still safeguarding the essential integrity of the natural environment. The proposed development is identified as 'proposed subsea cable' in Figure 5.13A Energy Infrastructure map accompanying the Plan and reproduced in Figure 2.1.

Figure 2.1: Energy Infrastructure in the Shannon Estuary

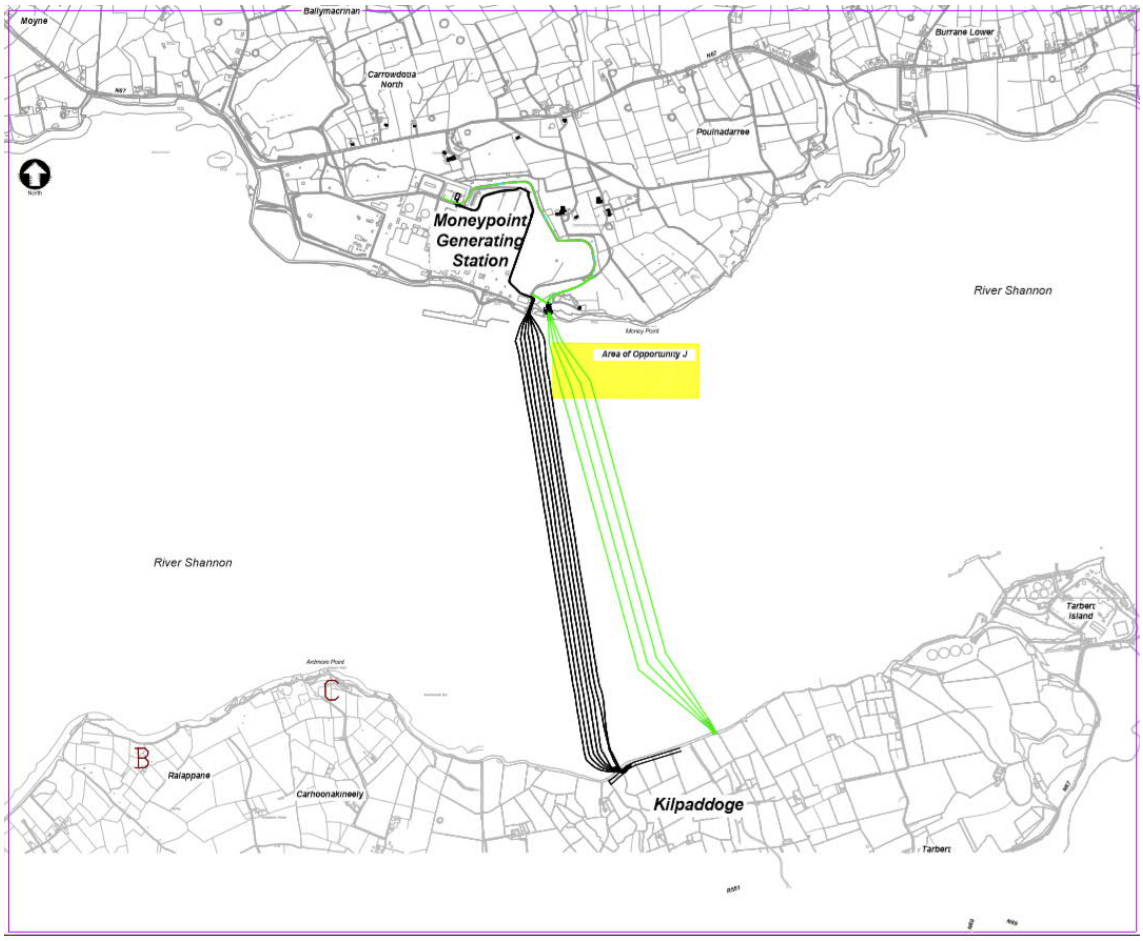


Source: Figure 5.13A Strategic Integrated Framework Plan for the Shannon Estuary (2013-2020)

The Plan also notes that there are several pockets of deep water in the Shannon Estuary area, and it has identified Areas of Opportunity for Tidal Energy. One opportunity area is located just off the coast at the Moneypoint strategic energy site. The proposed development is partially located within this Area of Opportunity as shown in Figure 2.2.

The SIFP acknowledges that this framework also needs to provide sufficient flexibility to accommodate projects of potentially national and regional significance that cannot be developed at the proposed Strategic Development Locations. The SIFP has no immediate statutory remit within marine waters and as such, the land use zoning will remain within the terrestrial environment. The objectives of the SIFP should however continue to guide and inform the development of policies and objectives for the future development within the marine area and will be particularly useful as guidance in any future marine spatial planning exercise. There is potential risk of damage to the cables from any anchorage of potential future renewable energy development. The route of the proposed cable project will be set out within a defined route corridor and will be clearly identified to potential future renewable development within this area.

Figure 2.2: Area of Opportunity within the Shannon Estuary (existing 220 kV Cable indicated as Black lines. Green lines illustrate the proposed 400 kV cables)



Source: Location of the area of opportunity is reproduced from Figure 5.13A SIFP 2013-2020

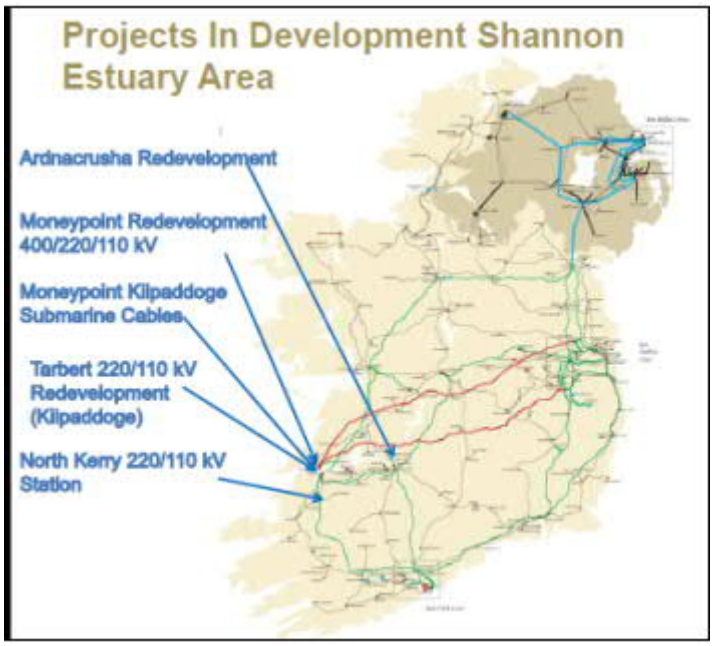
The SIFP represents strategic level planning and it is intended that it would feed down into relevant county development plans and be adopted as variations to these plans. A review of plans, policies and programmes relevant to the SIFP was carried out as part of the Strategic

Environmental Assessment process having regard to the Planning and Development (Strategic Environmental Assessment) (Amendment) Regulations 2004 as amended.

The key environmental issues, constraints and opportunities identified as part the SIFP Strategic Environmental Assessment (SEA) process in proximity to the proposed development were reviewed. At a project level, the proposed development is sympathetic to the overall strategic environmental objectives set out in the development of the SIFP SEA and all relevant principles of proper planning.

The SEA sets the baseline environments under each of the environmental themes including material assets within the Shannon Estuary. The SEA environmental report specifically notes Irelands ongoing commitment to increasing the level of renewable energy on the power system by 2020. As such as noted in Chapter 1 as part of a regional solution EirGrid are proposing the Cross Shannon 400 kV cable circuit. Figure 5.21 of the SEA environmental report and reproduced below in Figure 2.3 specifically notes “Moneypoint Kilpaddoge Submarine cable” as a EirGrid project in the Shannon Estuary. The SEA considered potential in-combination effects with other plans and programme that are of a similar nature. The following preliminary review of regional plans is provided hereunder.

Figure 2.3: Projects in Development Shannon Estuary Area (Reproduced Figure 5.20 of the SEA Environmental Report)



Source: SEA of the Strategic Integrated Framework Plan for the Shannon Estuary

Figure 2.4: Preliminary Review of Legislations, Plans, Policies and Programme-Regional Level (Reproduced from SEA Environmental Report

Preliminary Review of Legislations, Plans, Policies and Programmes – Regional level

Policy, Plan or Programme	Summary of Objectives	Possible impacts from Policy, Plan or Programme?	Is there a risk of significant "in combination" effects with other policies, plans or programmes including the SIFP?
Clare County Development Plan 2011 – 2017	Developing on the Clare County Development Plan of 2005 – 2011, this Plan aims to facilitate the sustainable economic and social development of the county, to conserve the natural and built environment of the county; and to improve Clare's physical infrastructure.	No significant impacts on European sites either within or outside the plan area as the plan has already been subjected to appropriate assessment and the outputs of the SIFP will be adopted into the plan.	No risk of significant "in combination" effects as the outputs of the SIFP will be adopted into the CDP. Any developments arising from the identification of potential areas for future development will still be subject to project level assessment.
Proposed Renewable Energy Strategy	Onshore wind energy development is guided by the existing Clare Wind Energy Strategy 2011-2017 therefore onshore wind energy will not be included in the scope of the proposed renewable energy strategy. It is envisaged the the proposed renewable energy strategy for County Clare will incorporate off-shore wind and other forms of renewable energy technologies.	The 'plan area', which includes the entire county, the Shannon Estuary and other offshore areas, supports sites, habitats and species of international to local importance for biodiversity and nature conservation. These elements form ecological networks locally and interconnecting with other counties and offshore.	Yes, plans and projects of particular relevance include the SEAI Offshore Renewable Energy Development Plan (particularly with respect to the Shannon Estuary), the SIFP, EirGrid's Grid 25 Programme, the Clare Wind Energy Strategy, the county's Development Plans and Local Area Plans, Regional Planning Guidelines for the Mid-Western Region, any wind/renewable energy strategies for surrounding counties. Existing projects and infrastructure (constructed and permitted) should also be taken into account.

Source: SEA of the Strategic Integrated Framework Plan for the Shannon Estuary

It also recognises that whilst the sites identified optimal opportunities for strategic development set out in the SIFP it does not prohibit alternative opportunities being brought forward as development proposals by both the public and private sectors. A suite of project level mitigation measures and proposed monitoring have been developed for the proposed development to ensure that the potential to impact on the receiving environment are minimised.

The cultivation of an integrated and coordinated consultation process is set out as a key strategic objective of the SIFP, as such EirGrid is a member of the multi-agency steering group with an interest in the Estuary. EirGrid has actively engaged with the steering group throughout the project development.

2.2.3 County Development Planning Policy Context

Clare County Development Plan 2017-2023 (Variation No.1)

The *Clare County Development Plan 2017–2023* (Variation No.1) (hereafter referred to as CCDP) includes the following objective in terms of energy security;

- To promote and facilitate the achievement of secure and efficient energy supply, storage and distribution for County Clare

The CCDP states that 'Clare County Council will continue to work closely with EirGrid to facilitate the on-going development of the grid infrastructure in line with national, regional and local requirements.' Energy transmission objectives have been provided within the CCDP to support this:

In terms of objectives related to electricity networks (Objective CDP8.38), the CCDP states that it is an objective of Clare County Council;

- To facilitate improvements in energy infrastructure and encourage the expansion of the infrastructure within the County;
- To facilitate future alternative renewable energy developments and associated utility infrastructure throughout the County;

- To collaborate with EirGrid to facilitate the delivery of quality connection, transmission and market services to electricity generators, suppliers and customers utilising the high voltage electricity system in County Clare;
- To collaborate with EirGrid over the lifetime of the Plan to ensure that the County's minimum target of 966MW renewable energy generation is achieved and can be accommodated on the electricity network in County Clare; and
- To have regard to environmental and visual considerations in the assessment of developments of this nature.

Specific reference is made to the Cross Shannon Cable project as follows:

> *EirGrid is currently progressing a number of projects to accommodate various energy generators and reinforce the National Grid. In County Clare the project will involve works at Moneypoint in order to allow increased use of the capability of the existing 400 kV overhead lines and the proposed construction of a new submarine 400 kV cable to connect Moneypoint to North Kerry on the southern side of the Shannon Estuary.*

The Plan identifies Moneypoint Power Plant, and the immediate surroundings, as a Strategic Development Location (SDL) B, within an Area of Deep-Sea Water. Moneypoint and lands adjacent are identified for energy use.

The Strategic Development Locations outlined in the SIFP do not define the extent of future land zonings. The role of ESB Moneypoint is recognised in the regional importance, as such one of the guiding principles set out within the SIFP states *their role shall be safeguarded within the Region, ensuring that its power generation, transmission capability and distribution functions are protected, as well as those core assets required for their operation, including key access to cooling water, marine waters and the commercial shipping lane access are maintained.*

Moneypoint SDL comprises approximately 280 hectares, 227 hectares of which is occupied by the Moneypoint Power Generating Station. The general area surrounding the electricity generating station is also identified as a rural area under strong urban pressure.

The overall collection of policies and objectives contained within the CCDP establish a clear precedence for developing a sustainable and secure energy transmission system to facilitate emerging industrial sectors and continued investment within the growing Clare and national economy.

Kerry County Development Plan 2015-2021 (Variation No.1)

The *Kerry County Development Plan 2015 – 2021* (Variation No.1) (hereafter referred to as KCDP) includes the following objective in terms energy and power;

- **EP-1:** Support and facilitate the sustainable provision of a reliable energy supply in the County, with emphasis on increasing energy supplies derived from renewable resources whilst seeking to protect and maintain biodiversity, archaeological and built heritage, the landscape and residential amenity.
- **EP-3:** Facilitate sustainable energy infrastructure provision, so as to provide for the further physical and economic development of the County.
- **EP-4:** Support and facilitate the sustainable development of enhanced electricity and gas supplies, and associated networks, to serve the existing and future needs of the County.
- **EP-7:** To support the sustainable expansion of the network. National grid expansion is important in terms of ensuring adequacy of regional connectivity as well as facilitating the development and connectivity of sustainable renewable energy resources.

- **EP-8:** Ensure that the siting of electricity power lines is managed in terms of the physical and visual impact of these lines on both the natural and built environment, the conservation value of Natura 2000 sites and especially in sensitive landscape areas. When considering the siting of powerlines in these areas the main technical alternatives considered should be set out, with particular emphasis on the undergrounding of lines, and the identification of alternative routes at appropriate locations. It should be demonstrated that the development will not have significant, permanent, adverse effects on the environment including sensitive landscape areas and the ecological integrity of Natura 2000 sites.
- **EP-9:** Support the sustainable implementation of EirGrid's Grid 25 Investment Programme, subject to landscape, residential, amenity and environmental considerations.

With specific reference to the Shannon Integrated Framework Plan, it is an objective of Kerry County Council to:

- *Promote and facilitate the sustainable development of these lands for marine related industry, utilising the presence of deep water, existing infrastructure, natural resources, and waterside location to harness the potential of this strategic location. Alternative proposals for general industrial development, compatible or complimentary with marine related industry and / or those creating a synergism with existing or permitted uses and / or those contributing to the sustainable development of a strategic energy hub at this location will also be encouraged. Development will be subject to compliance with the objectives of this Plan, particularly as they relate to the protection of the environment and will also be subject to compliance with the Environmental Reports prepared in support of the SIFP, where appropriate.*

The project is located within an area identified in the Plan as the Tarbert / Ballylongford Industrial Landbank. The Kerry County Development Plan 2015-2021 (Variation No.1) makes specific reference to the zoning of the 'Tarbert/Ballylongford Land Bank', for marine-related industry, compatible or complimentary industries and enterprises which require deep water access. The proposed development will compliment and support other existing and proposed energy and industrial uses in this landbank.

2.3 Land Use Planning Considerations

2.3.1 Site Location Description

The proposed development extends over two land-based administrative areas within counties Clare and Kerry which are separated by the Lower Shannon Estuary.

The terrestrial extents of the project location are characterised by a blend of towns / villages including Killimer in County Clare and Tarbert in County Kerry, significant industrial (electricity generation) sites at Moneypoint (County Clare) and Tarbert (County Kerry), agricultural lands, residential dwellings and community facilities (tourism and recreation).

The Shannon Estuary is the largest estuary in Ireland and is located between Loop Head in County Clare and Limerick City. The estuary has accommodated industrial development in the past and currently continues to do so including major industries such as Shannon Foynes Port (commenced 1846), Limerick Docks (commenced 1750 to 1840), Shannon International Airport (commenced 1942), ESB Moneypoint (commissioned 1985), SSE Tarbert Power Station (commissioned 1969), the National Oil Reserves Agency Fuel Storage at Tarbert and Aughinish Alumina (commenced 1983). The Strategic Integrated Framework Plan for the Shannon Estuary (SIFP) recognises that the electricity generating stations at Moneypoint and Tarbert have *created a strategic energy hub within the Shannon Estuary, facilitating the growth of*

strategic grid infrastructure and other synergistic industries such as renewable energy and combined heat and power.

Within the project location the most significant employer is the Electricity Supply Board (Moneypoint Electricity Generating Station). To the east of the study area is Tarbert island where the SSE Electricity Generating Station is located. Kilpaddoge Energy Limited secured planning permission from Kerry County Council (Planning Reference: 13138) for the development of an Electricity Generating Station. Glencloosagh Energy Limited was granted planning permission by Kerry County Council (planning register reference: 19115) to construct rotating stabilisers and battery storage units and associated equipment in the townland of Kilpaddoge as an alternative to the permitted and under construction Kilpaddoge Peaking Plant (planning register reference 13138, as extended by 139138). Shannon Clean Tech Ltd also secured planning permission (planning register reference: 18878 ABP PL.08.305739) to construct a battery storage energy system facility in the townland of Kilpaddoge located south of the existing GIS substation. There are also five turbines located within the Moneypoint Generating Station complex.

The Shannon Estuary within the proposed development boundary and wider environs functions as a commercial shipping channel. According to the Marine Traffic Database and Shannon and Foynes Port Authority approximately 1,000 ships per year use the shipping channel carrying in excess of 12 million tonnes of cargo (approximately 20% of goods tonnage handled at national ports in Ireland) to six main facilities - the largest of which is Shannon Foynes Port. Equally it should be noted that the Shannon Estuary itself provides significant natural capital for the tourism, fisheries and aquaculture industries.

Within the project area, a significant portion of the lands are used for agricultural enterprise. In addition, it should be noted that there are a range of utilities installed and maintained by services providers in the project area including water services, telecommunications and electricity infrastructure.

2.3.2 Land use and offshore patterns

Connection to Moneypoint 400 kV GIS Station

The general location within which the proposed landfall and associated underground cable infrastructure on the northern shoreline of the Shannon Estuary occur in south County Clare. The land-use in the area is dominated by the ESB Electricity Generating Station at Moneypoint, agricultural pasturelands and one-off housing. The nearest areas of settlement within the study area is Killimer to the east.

ESB Moneypoint is subject to the COMAH Regulations due to the presence of substances on site that are collectively above the threshold values listed in Column 3, Schedule 1 of the Regulations. The site is classified as an ‘Upper Tier’ site. It is understood there are a number of substances stored on site which lead to this classification, with the storage of approximately 50,000t of Heavy Fuel Oil (HFO) being the largest quantity. The proposed development does not include additional hazardous materials. The proposed development will not change the receiving environment in the context of the over ground activities within the Moneypoint Generating Station and is not anticipated to interface with major accident scenarios for the site and the control measures associated with them.

Operations at the Moneypoint Generating Station are currently regulated by the EPA under the existing IED licence (Ref No. P0605-04). Noise, air and water / waste emissions produced by

the operator are subject to the criteria set out within the IED licence which is regulated by the EPA.

Connection to Kilpaddoge 220/110 kV GIS Station

The general location within which the proposed landfall and associated underground cable infrastructure on the southern shoreline of the Shannon Estuary is located in north County Kerry in the townland of Kilpaddoge adjacent to Tarbert.

The immediate area surrounding the existing Kilpaddoge 220/110 kV substation within this landbank can be categorised as predominantly rural or on the fringes of ribbon development associated with Tarbert, however, a number of planning applications have been submitted for industrial type and energy related developments in the general location which are addressed further below.

Submarine / River Shannon Crossing

The most significant existing submarine infrastructure are the existing seven 220 kV cables, spanning from Moneypoint Electricity Generating Station on the northern shoreline of the Shannon Estuary, to the southern shoreline where the cables make landfall approximately 600m west of the Kilpaddoge substation. A foreshore licence was previously consented for the installation of the existing 220 kV cables (Ref: FS005791).

The Moneypoint Electricity Generating Station jetty is the largest jetty within the project area, facilitating 180,000 Dead Weight Tonnages (DWT) vessels to berth to unload coal for the power station. The jetty is located on the northern shoreline of the Shannon Estuary, and is approximately 600m in length and positioned 200m seaward of the shoreline.

A disused slipway is located on the western side of Moneypoint Electricity Generating Station. This slipway is thought to be currently unused.

Shannon Foynes Port Company (SFPC) have confirmed that two known anchorages at Moneypoint are no longer in use due to the fact that there are now high voltage cables running from Moneypoint to Kilpaddoge through these areas. Analysis of publicly available Marine Traffic information shows that the largest vessels often anchor to the west of the project area. However, no evidence was found of anchoring in the selected route area.

SFPC also confirmed that there is not a defined navigational channel in this part of the Shannon Estuary, meaning that ships pass freely within these waters. Based on advice from local vessel owners, the experience from the marine survey campaign and analysing publicly available Marine Traffic information[2] the largest vessels tend to use the centre and northern part of the Shannon Estuary to navigate upstream and downstream of the project area.

SFPC also confirmed that they are not aware of any restrictions in place for the installation of surface structures (e.g. rock or concrete mattresses).

A digital marine chart data and non-intrusive geophysical dataset review did not identify areas of shipwrecks or seabed debris within the project area, however, the possibility of wrecks within the proposed development boundary cannot be completely ruled out.

As noted previously, the SIFP identifies an Area of Opportunity for tidal energy within Shannon Estuary. The location of this area is illustrated in Figure 2.1 above. There are no known or planned projects recorded within the identified Area of Opportunity. Strategic Integrated

[2] www.Marinetraffic.com

Framework Plan (SIFP) for the Shannon Estuary notes *The Estuary and the west coast of Ireland generally possess a considerable but, as yet, un-harnessed renewable energy resource in its wind wave and tidal capacity. EirGrid and Bord Gáis Networks have plans to upgrade and further develop their transmission networks in the area to accommodate rising demand as well as provide additional capacity for the anticipated renewable energy generating connections.* Any future tidal energy projects should be aware of the existing and proposed cable route and no anchoring should occur at these locations. These will be mapped on navigational charts for the study area.

There are a range of designated aquaculture sites within the wider lower estuary. These include the *West Shannon Ballylongford Designated Shellfish Waters* and the *West Shannon Poulnasherry Designated Shellfish Waters*. The oysters are produced by bag and trestle.

Licensed Site ID T08/004BO is partially located at the western extent of the study area adjacent to Moneypoint and relates to an Oyster Fishery Order issued in 1961 to SO Limited. It is understood that this area has not been cultivated to date and there are no known future plans to cultivate this area. Discussions have been ongoing with the owners of the Oyster Fishery Order and will continue in advance of and during construction works.

Figure 2.5: Aquaculture and Fisheries Interest

Source: Mott MacDonald

There were two licence applications in process for oyster cultivation (application referenceT08/94) and mussels/seaweed (application reference Site T06/394B). Both occur outside the proposed development site boundary. A licence has been issued in respect of application reference T08/94 and the application in respect of T06/394B is still in process at the time of writing of this report. It is noted that the existing 220 kV submarine electricity cables are located between Moneypoint (County Clare) and Glencloosagh Bay (adjacent to Kilpaddoge, County Kerry). A Foreshore licence was granted, and the electricity cables have been installed, commissioned and are currently operating.

A noted in Section 1.4, under the provisions of the Foreshore Act 1933 as amended a Foreshore Licence application is required before the commencement of any works or activities within the foreshore. A Foreshore Licence application should demonstrate it has met all legal requirements under relevant European Union Directive, in particular where applicable the following;

- Directive 2014/52/EU (amending Directives 2011/92/EU and 85/337/EEC) on the assessment of the impacts of certain private and public projects on the environment (Environmental Impact Assessment [EIA] Directive) (Section 1.4);
- Directive 92/43/EC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive); and
- Directive 2009/147/EC on the conservation of wild birds (Birds Directive (Section 1.4).

2.4 Planning History

A desktop search was undertaken of each Planning Authority's online planning enquiry system to review valid (granted) planning applications or currently live planning applications within the general Moneypoint and Kilpaddoge areas within the last 5 years. The only planning applications granted within close proximity are listed in the table hereunder;

Table 2.1: Planning Decisions within the last Five Years (Moneypoint)

Planning Authority	Reference Number	Applicant	Location	Description of The Development	Decision Made
Clare County Council	20/318	The Electricity Supply Board (ESB)	Moneypoint	The development will consist of a up to 400 MVA (electrical rating) synchronous condenser which shares the existing 400 KV/17 kV transformer and 400kV underground cable belonging to the existing coal fired unit 2	16th July 2020
Clare County Council	19746	The Electricity Supply Board	Moneypoint	A 1.8 ha site with a 300 to 400 MVA synchronous condenser – including a generator and flywheel building and associated works	20 November 2019
Clare County Council	18520	The Electricity Supply Board	Carrowdotia South	A c.7.5 MW capacity battery storage facility	21 August 2018
Clare County Council	17809	ESB Power Generation and Wholesale Market	Carrowdotia South	Two water storage tanks above ground level and an underground pump chamber	14 December 2017
Clare County Council	161011	EirGrid plc	Moneypoint	The refurbishment of the existing Moneypoint - Oldstreet 400 kV overhead line	24 August 2017
Clare County Council	16616	EirGrid plc	Carrowdotia South,	To extend the Appropriate Period of Planning Permission P11-457 for the development of electrical transmission infrastructure and associated works	21 September 2016
Clare County Council	14373	ESB Power Generation & Wholesale	Carrowdotia North, and South	Development comprising works to the existing 32 HA ash repository site located	14 August 2014

Planning Authority	Reference Number	Applicant	Location	Description of The Development	Decision Made
		Markets Division		within the Moneypoint Generating station complex. A 20 year planning permission is requested.	ABP Appeal decision date 29 January 2015 (Developer Contribution Appeal)
Clare County Council	14190	EirGrid plc	Carrowdotia South	A new indoor Gas Insulated Switchgear (GIS) 400 kV substation building (3463m2), 17m high, Two new 400/220 kV transformers with associated Switchgear, Three new 30m high lightning masts, and associated drainage and site works	28 May 2014

Source:(https://clarecoco.maps.arcgis.com/apps/webappviewer/index.html?id=7b81e3372c17498589994ec61006e846&find=17809, accessed 23rd June 2020

Table 2.2: Planning History (Kilpaddoge)

Planning Authority	Reference Number	Applicant	Location	Description of The Development	Decision Made
Kerry County Council	19115	Glencloosagh Energy Limited	Kilpaddoge	Battery Storage Units and Associated Equipment as an Alternative to the permitted and under construction Kilpaddoge Peaking Plant (Ref: 13138, As Extended By 139138	7 February 2020
Kerry County Council	18878	Shannon Clean Tech Ltd.	Kilpaddoge	Battery Energy Storage System Comprising 26 Units Adjacent to Kilpaddoge 220 kV Substation	ABP PL08.305739 decision granted date 10 February 2020 Granted permission with revised conditions
Kerry County Council	18392	SSE Renewables (Ireland) Ltd.	Tarbert Island	Battery Storage Unit Comprising 50 Units Within Tarbert Power Plant	18 February 2019

Source:(http://kerry.maps.arcgis.com/apps/webappviewer/index.html?id=60710831bedf4d988572eb0ed41e618a , accessed 23rd June 2020)

2.4.1 Notable Future Development(s)

ESB Moneypoint Generating Station

As noted above planning permission has been granted for a number of developments within the Moneypoint Generating Station complex, namely 7.5MW Battery Energy Storage System (BESS) (Ref: 18/520) and a Synchronous Condenser (Ref: 19/746). Both of these applications occur outside the proposed development boundary. Planning Ref 19/1746 includes for the routing of an underground cable connection. The construction programme of each of these developments are defined over a relatively short duration. There may be some temporal overlap in the construction activities and potential for cumulative impact during the construction phase. The consented developments however will implement mitigation measures and controls to protect the environment during the construction phase to mitigate these impacts.

ESB has submitted a new application (20/318) to Clare County Council for the development of 400 MVA (electrical rating) synchronous condenser which shares the existing 400 KV/17 kV transformer and 400kV underground cable belonging to the existing coal fired unit 2. The application was granted consent by Clare County Council on the 16th July 2020. This development is a resubmission of the previously approved development (19/746) on a different site within Moneypoint. It is noted within the application" *it was not considered necessary to submit a full planning and environmental considerations report, as the rationale for the proposed development, the description of development, EIA screening and SID screening conclusions remain unchanged*". The application was accompanied by a NIS. Whilst part of the proposed ESB boundary is routed partly through the proposed red line boundary it does not interface with Cross Shannon Cable Project. The ESB development is expected to connect into an existing cable circuit and will not impact on the proposed works outlined in this application.

The planning report for the application notes "the characteristics of the potential impacts would not be considered significant, provided adherence to the best practice guidance and measures and best practices construction methodologies". The report further notes in relation to the consideration of the cumulation with other proposed developments"…..*following review of information submitted in the form of the Environmental Impact Assessment Screening Report and in addition the Screening for Appropriate Assessment Report it can be concluded that the proposed development alone or in combination will have no potential for significant impacts on the receiving environment*".

There may be temporal overlap in the construction activities and potential for cumulative impacts during the construction phase. The Framework of environmental controls will be set out within the relevant project Construction Environmental Management Plans. There is therefore no potential for significant cumulative effects with the proposed development under appraisal in this report.

Kilpaddoge

As noted above in Section 2.3.1, there are a number of future and ongoing works directly adjacent to the existing Kilpaddoge GIS substation. Kilpaddoge Energy Limited secured planning permission (Ref: 13138) for the development of an Electricity Generating Station. In February 2020, Kerry County Council granted consent to Glencloosagh Energy Limited (Ref: 19115) to construct rotating stabilisers and battery storage units and associated equipment as an alternative to the permitted and under construction Kilpaddoge Peaking Plant (Ref: 13138, as extended by 139138). Shannon Clean Tech Ltd also secured planning permission (planning register reference: 18878 ABP PL.08.305739) to construct a battery energy storage system facility located south of the existing Kilpaddoge GIS substation. Each of the above-mentioned applications will access Kilpaddoge via the existing private access track. Subject to the grant of statutory approval, it is expected that construction for the Cross Shannon Cable Project will commence in early 2021. The consented developments will implement mitigation measures and controls to protect the environment during the construction phase. The Framework of environmental controls will be set out within the relevant project Construction Environmental Management Plans

Shannon LNG

Plans for a Liquified Natural Gas (LNG) import terminal had been proposed on the southern shores of the Shannon Estuary. It should be noted that the Shannon LNG terminal has been proposed for over 10 years. A recent European Court of Justice ruling stated that the Shannon LNG terminal does not have a valid planning permission. Pre- application consultations are currently ongoing with An Board Pleanála (PL08 .304007). The proposed development

comprises alteration to Shannon LNG regasification terminal to provide for a reduced footprint, less onshore facilities and equipment and the omission of four onshore storage tanks and associated pond for hydrotesting.

2.5 Summary Conclusion

As demonstrated by the key strategic policies and objectives set out within the national, regional, and local development plans, investment within Ireland's transmission grid is a key prerequisite in delivering a sustainable, and robust economy. The proposed development is sympathetic to the overall development strategy set out in the Clare and Kerry County Development Plans in relation to the sustainable development of their respective counties. The proposed development satisfies both Planning Authorities (Local Authorities) tests for proper and sustainable development both in the context of broader county objectives and associated benefits of an augmented transmission network, as well as the specific land zoning and offshore land use considerations for the area under consideration for the construction of the proposed development.

This PECR and the accompanying Natura Impact Statement will provide sufficient information to allow ABP and the DHPLG to assess and understand the likely impacts of the proposed activities on the environment.

3 Alternative Options Considered

3.1 Introduction

The proposed development comprises the following key elements;

- Installation and burial of four 400 kV submarine cables of approximately 2.8km in length from the two landfall points;
- A 400 kV cable circuit running from the northern landfall located south of the main coal yard to the existing Moneypoint 400 kV Gas Insulated Switchgear (GIS) substation;
- A land cable running from the southern landfall location to cable sealing ends on the 400 kV Air Insulated Switchgear (AIS) bay in Kilpaddoge; and
- Construction of a new 400/220 kV transformer with a 220 kV underground cable connection to the existing Kilpaddoge 220 kV substation.

This project has been developed in accordance to EirGrid's Framework for Grid Development. As part of the Step 4 of this Framework, a series of evaluative studies were conducted which assessed a range of feasible option concepts for the development of the proposed Cross Shannon Cable project. The options were identified based on the infrastructural needs and surveys conducted of the existing site and surrounding area. A copy of the Step 4 report, which documents these evaluations, accompanies this report and is provided in Appendix A.

The following sections provide a summary of the key alternatives considered in the development of proposed development.

3.2 Consideration of Alternatives in Identifying the Project Study Area

As noted in Section 1.4.4, the Cross Shannon 400 kV Cable Project does not constitute a "project" identified in either Annex I or Annex II of the EIA Directive or within either Part 1 or Part 2 of Schedule 5 to the Planning and Development Regulations 2001, as amended. As such, there is no statutory requirement under the Directive for it to be subject to EIA, however, EirGrid follow a six step approach when developing and implementing the best performing solution option to any identified transmission network problem. As such the Step 4 process had regard to the potential environmental impacts associated with each alternative option.

The Step 4 process was informed by a number of factors, but specifically the connection point for each end of the cable installation at the existing 400 / 220 / 110 kV and 220 / 110 kV substations at Moneypoint and Kilpaddoge respectively. Due to the fact that the nearest land-route for a cable connection between both substations would involve a distance of between 100 and 140 kilometres (direct line or exclusively in the public road, incorporating a crossing using the N18 Limerick Tunnel) and that an overhead line would involve a crossing of an approximately 3 kilometres across the River Shannon Estuary these were not considered to be reasonable alternatives or appropriate or sustainable alternative solutions.

The study area therefore comprised approximately 65km^2 including the functional areas of both Clare County Council and Kerry County Council, encompassing lands adjacent to the existing ESB Moneypoint Electricity Generating Station, the existing Kilpaddoge 220 / 110 kV electricity substation and the River Shannon Estuary.

Figure 3.1: Project Study Area

Source: EirGrid 2017

3.3 Alternative Northern Landfall and Connection at Moneypoint 400 kV GIS Substation

All options considered terminated at Moneypoint 400 kV GIS Substation. There were three proposed landfall locations at the northern / Moneypoint side of the estuary. These landfalls were designated as N01, N02 and N03 and are located along the coast from west to east in proximity to Moneypoint Electricity Generating Station (see Figure 3.2).

Four land cable route options associated with these landfalls were evaluated in the Step 4 process:

- Option 1 – Land Cable Route from N01 through the Public Road;
- Option 2 - Land Cable Route from N02 through the Elevated Access Road (“High Road”);
- Option 3A – Land Cable Route from N03A through Public Road (local road) and Private Land; and

- Option 3B – Land Cable Route from N03B through Public Road (N67).

Each of these options are depicted on drawing 229379408-MMD-XX-GIS-Y-108 (Feasible Cable Route Options General) and reproduced in Figure 3.2. Further details on the evaluation are set out in the accompanying Step 4 report in Appendix A.

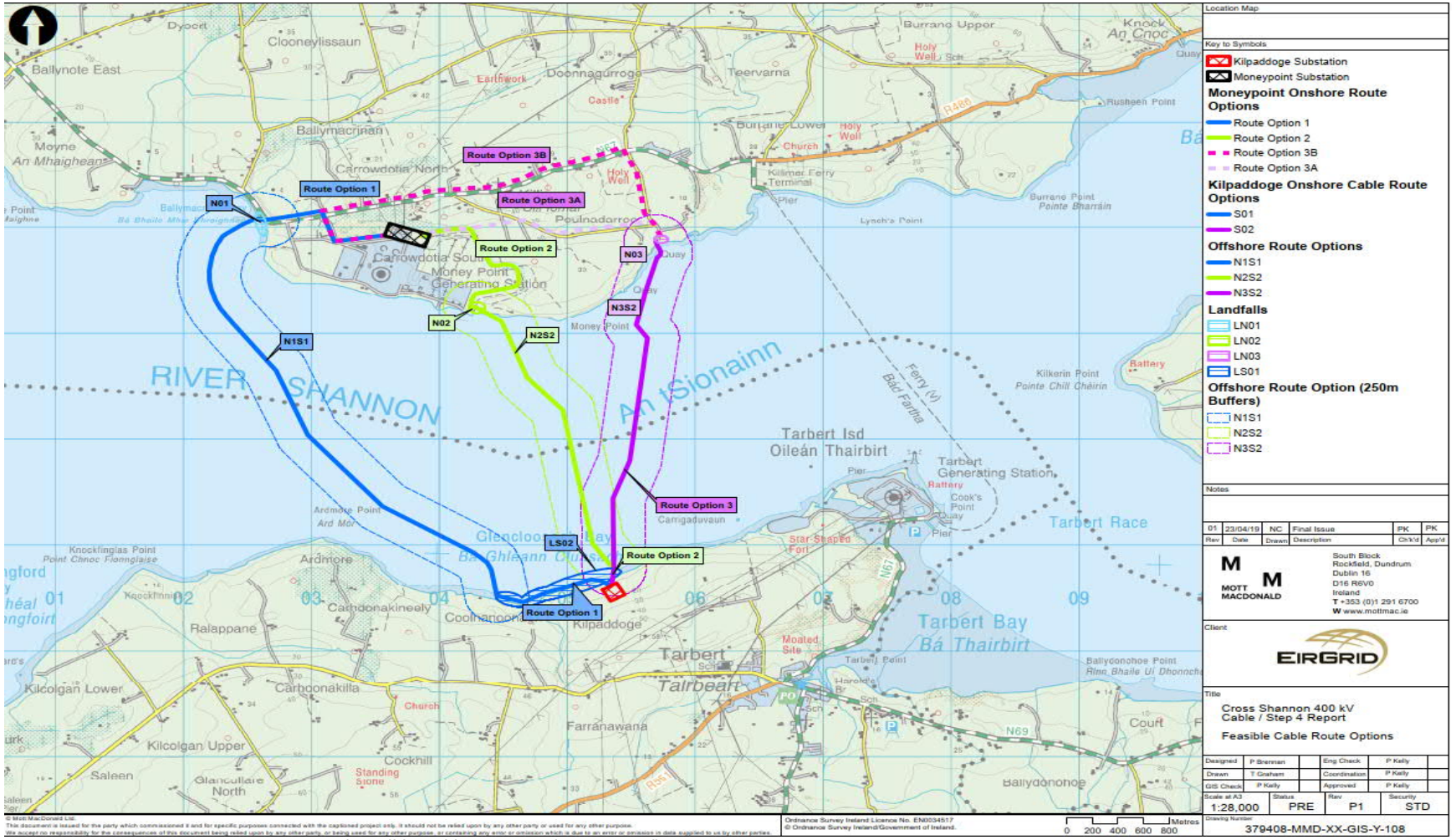
3.4 Alternative Submarine Cable Route

Three cable route options were brought forward, noted as N01-S01, N02-S02 and N03-S02. These locations are annotated in Figure 3.2.

- Option 1 – Marine Cable Route from N01 to S01 (4.6 km route length)
  - The marine cable route N01-S01 is the most westerly route running from a landfall at Ballymacrinan Bay (N01) on the north side of the Shannon Estuary to a landfall at Glencloosagh Bay (S01) on the south side.
- Option 2 – Marine Cable Route from N02 to S02(2.8 km route length)
  - The marine cable route N02-S02 is the central route running from a landfall adjacent to the Moneypoint Electricity Generating Station (N02) on the north side of the Shannon Estuary to a landfall at Glencloosagh Bay (S02), directly in front of Kilpaddoge substation on the south side.
- Option 3 – Marine Cable Route from N03 to S02 (3.2 km route length)
  - The marine cable route N03-S02 is the most easterly route running from the shoreline near Killimer (N03) on the north side of the Shannon Estuary to a landfall at Glencloosagh Bay (S02), directly in front of Kilpaddoge substation on the south side.

The alignment of the three marine route options can be seen on drawing 229379408-MMD-XX GIS-Y-108 (Feasible Cable Route Options General) and reproduced in Figure 3.2.

Figure 3.2: Feasible Alternatives Options



Source: 229379408-MMD-XX-GIS-Y-108 (Feasible Cable Route Options General)

3.5 Alternative Southern Landfall and Connection at Kilpaddoge 220 kV Substation

There were two proposed landfall locations at the south / Kilpaddoge side of the estuary. These landfalls were designated as S01 and S02 (see Figure 3.2). Landfall S01 was approximately 1km west and S02 was approximately 250m northeast of the existing Kilpaddoge 220 / 110 kV substation. The landfall at S01 was the proposed landing point for the route option 1 from N01 or the northern side of the estuary. The landfall at S02 was the proposed location for both route options 2 and 3 from N02 and N03 on the northern side.

Two cable route options associated with these landfalls were brought forward:

- Land Cable Route from S01 through private land; and
- Land Cable Route from S02 through ESB land.

There were three connection alternatives at the existing Kilpaddoge 220/110 kV substation, and these were summarised below

- Option 1 - Single 400 kV AIS bay into a 400 / 220 kV transformer;
- Option 2 - C-type 400 kV GIS station with two 400 / 220 kV transformers; and
- Option 3 - C-type 400 kV AIS station with two 400 / 220 kV transformers.

Two of the options could have been accommodated within the existing Site A, however, when considering Option 3, Site B was examined as the design could not physically fit into site A. One of the bays was considered to be too close to the shoreline and posed significant technical, environmental and deliverability risks. Based on the above, the options were further developed and considered on the following sites.

- Option 1 - Single 400 kV AIS bay into 400/220 kV transformer – Site A;
- Option 2 - C-type 400 kV GIS station with two 400/220 kV transformers – Site A; and
- Option 3 - C-type 400 kV AIS station with two 400/220 kV transformers – Site B.

The locations of these alternatives were overlaid on the aerial mapping in Figure 3.3

Figure 3.3: Kilpaddoge Alternative Options

Source: EirGrid

3.6 Conclusions

Consenting and environmental constraints were considered in parallel with the technology optioneering. The results of the evaluation process were fed into the EirGrid Performance Matrix as set out in the Step 4 Report along with the other criteria examined and the Best Performing Option emerged. Having regard to each criteria the Best Performing Option was selected to meet the specific circumstances of this project. The Proposed Development has been developed through an iterative process which involved seeking to avoid or reduce potential environmental effects through routeing of the cables. The design for the Best Performing Option was refined and optimised to address the potential impacts associated with the technical and environmental challenges set out in the evaluation process. The proposed development description as set out in Chapter 4 is assessed in this PECR.

4 Description of the Project

4.1 Introduction

The proposed development 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 Step 4 Framework Development. The development includes work in the foreshore for which a Foreshore Licence is required. The proposed development comprises three 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:
    - 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.

Article 215 provides that where a proposed development under Section 182A"*relates to the provision of, or modification to, an establishment… and the Health and Safety Authority has not previously provided to the Board, either in relation to the proposed development or on a generic basis, relevant technical advise on the risk or consequences of a major accident, the Board shall notify the Health and Safety Authority. "*

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

- Onshore activities
  - Connection at Moneypoint 400 kV GIS Station; and
  - Connection at Kilpaddoge 220 kV GIS Station;
- Submarine/River Shannon Crossing; and
- Construction Phase Activities.

4.2 Onshore Activities

4.2.1 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.

Figure 4.1: 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 generally comprises concrete cable troughing, associated civil works and transition joint bays. The joint bays enclose 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 on third party lands. 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 which is reproduced in Figure 4.2. The overall 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 4.6. During construction the landfall area will require access for equipment associated with the construction and cable installation.

The jointing bay 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 4.7.

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 provided via the existing Moneypoint main entrance and existing established secondary entrance into the Moneypoint Generating Station. A temporary construction traffic route will be provided along the established internal tracks adjacent to the main coal yard/ash storage area towards the landfall with passing bays provided as required. This access road is approximately 5m wide and mostly made ground with rock and gravel fill. Permanent access will be from the west with a new track from the location of the existing 220 kV transition joint bays. See Drawing Ref. 229379408-MMD-00-XX-DR-E-1300 for details.

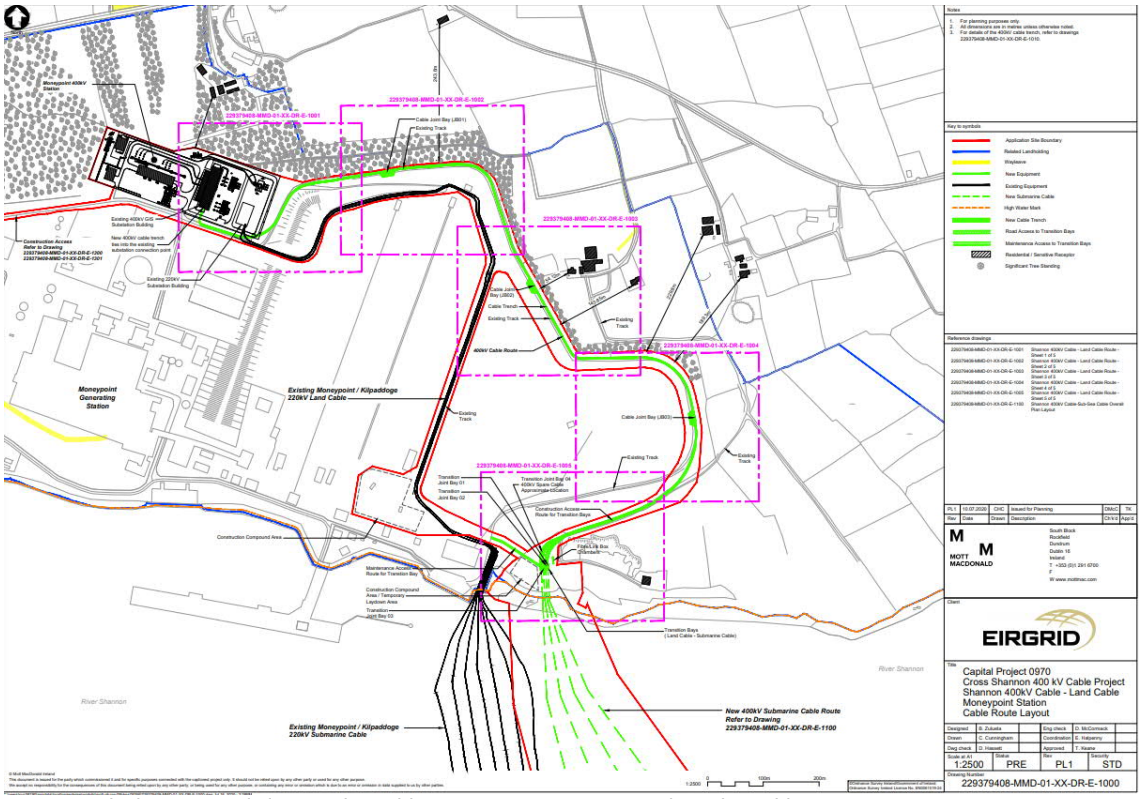
The transition joint pit will be installed to the east of the existing Moneypoint-Kilpaddoge 220 kV cable transition joint bay on third party lands.

The proposed cable route will head north from the proposed landfall, turn north-east for approximately 280 metres along third-party land before joining the internal access road which is elevated and skirts the perimeter of the ash storage area 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 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 4.2: Proposed Land Cable Route (Moneypoint)



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

4.2.2 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. A new internal access track will be located along the eastern boundary of the existing substation compound. 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.

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 appears to discharge directly into the Shannon via an outfall pipe.

Proposed Structures at the Kilpaddoge Substation

An extension to the existing Kilpaddoge Electrical Substation of approximately 5,500 square metres will be required to facilitate new 400 and 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 2.6 metres 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.

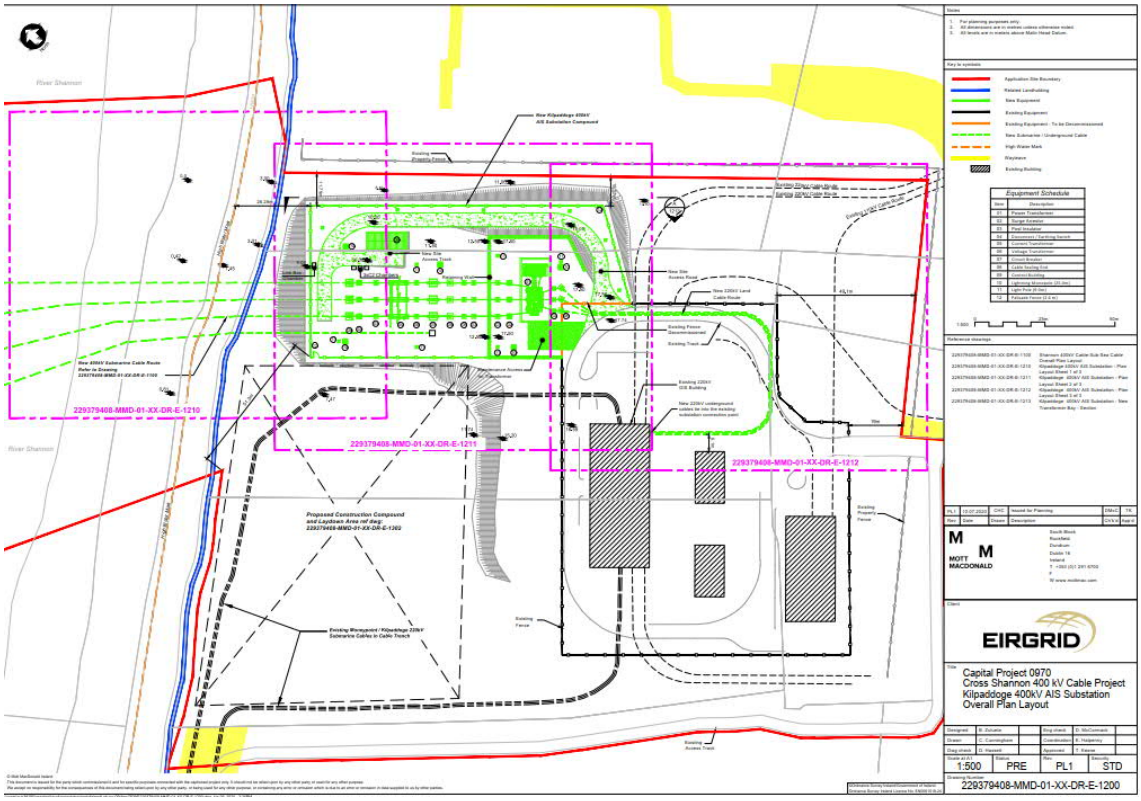
A lighting plan has been designed in accordance with EirGrid's functional specification requirements. 12no. lighting poles approximately 9 metres high. Directional light fittings have been incorporated within the plan in order to minimise light pollution in the surrounding area.

Five lightning protection masts approximately 25 metres 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. The dimensions of the proposed structures and compound site are summarised below;

Table 4.1: 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

Figure 4.3: Kilpaddoge Plan Layout



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

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 4.3. 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. In addition, there will be a temporary access road that will be used to the west of Kilpaddoge to access the southern landfall point.

4.2.3 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 to achieve the need identified in section 1.3.2 at 400 kV. EirGrid ensure that when planning new infrastructure, a sustainable balance is achieved between cost, system security, reliability, 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 rating of the cable is 1210MVA, but the connection will only initially operate at 500MVA. This allows 710MVA for future use.

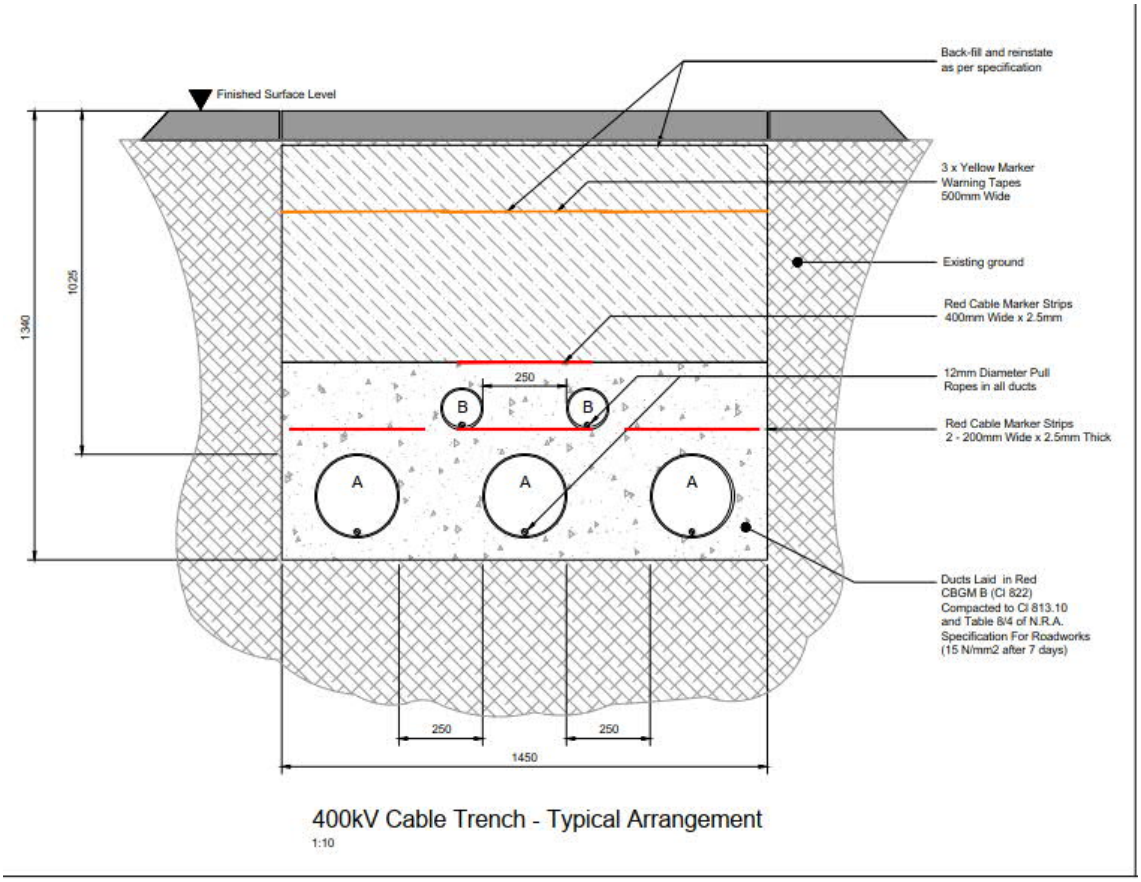
The cable comprises a single core copper or aluminium conductor, and the cable size proposed for the required power transfer capacity has a cross sectional area of 2,500mm^2 or its equivalent in aluminium. This conductor is typically surrounded by a triple-extruded, dry-cured, crosslinked polyethylene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

Figure 4.4: Indicative Land Cable Design

Source: MM

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 4.5.

Figure 4.5: Typical Trench Cross Section



Source: Mott MacDonald

Figure 4.6: Typical Transition Joint Bay Before Final reinstatement

Source: Mott MacDonald

Figure 4.7: Typical Transition Joint Bay Following Final Reinstatement

Source: Mott MacDonald

4.2.4 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.

4.2.5 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.

4.2.6 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.

4.3 Submarine / River Shannon Crossing

4.3.1 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 a fibre optic cable that will be integrated into each of the proposed 400 kV cables. It is also envisaged fibre optic cables for maintenance and cable monitoring will also be provided, this will take the form of an armoured fibre cable wrapped helically around each of 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 [3]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 4.8 shows the proposed alignment of the submarine cable route. The foreshore area is outlined in red and the grid coordinates defining the foreshore area are provided in Table 4.2. The actual width of the corridor required to facilitate the installation will be subject to final detail

[3] **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.)

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. A summary of the strata encountered along the proposed route during the non-intrusive and intrusive investigations is presented in the Step 4 Report in Appendix A. The proposed installation techniques are suitable given the sediment conditions encountered along the corridor.

Table 4.2: Grid coordinates defining the proposed submarine cable route for the purpose of defining the Foreshore Area

Easting	Northing
104335.1259E	151194.8673N
104662.4924E	151164.1788N
105350.9328E	148707.3908N
105386.0020E	148717.1260N
104335.1259E	151194.8673N
104662.4924E,	151164.1788N

.

Figure 4.8: 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. Details on these surveys are presented in the Step 4 Report in Appendix A and summarised in Chapter 8 *Marine Aspects* of this report. A summary of the strata encountered along the proposed route during the non-intrusive and intrusive investigations is also presented in Chapter 8 of this report.

For the purpose of this report, 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[4], at the centre of the Shannon Estuary, east of the Bridge feature, at approximately Chainage[5] 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 as necessary.

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.

Typical cross sections at the approach to the landfall at each side of the estuary are shown in Figure 4.9 and Figure 4.10. 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 4.11 and Figure 4.12.

A typical cross section at the midpoint along the route alignment is shown Figure 4.13.

[4] CD-Chart Datum

[5] Chainage - is the horizontal distance as measured along straight lines between two points. The beginning denoted by KP 0.0 at Kilpaddoge and ending denoted by KP 2.8 at Moneypoint).KP- Kilometre Point

Figure 4.9: Section of Submarine Route alignment at the Northern Landfall approach (Ch. 150)

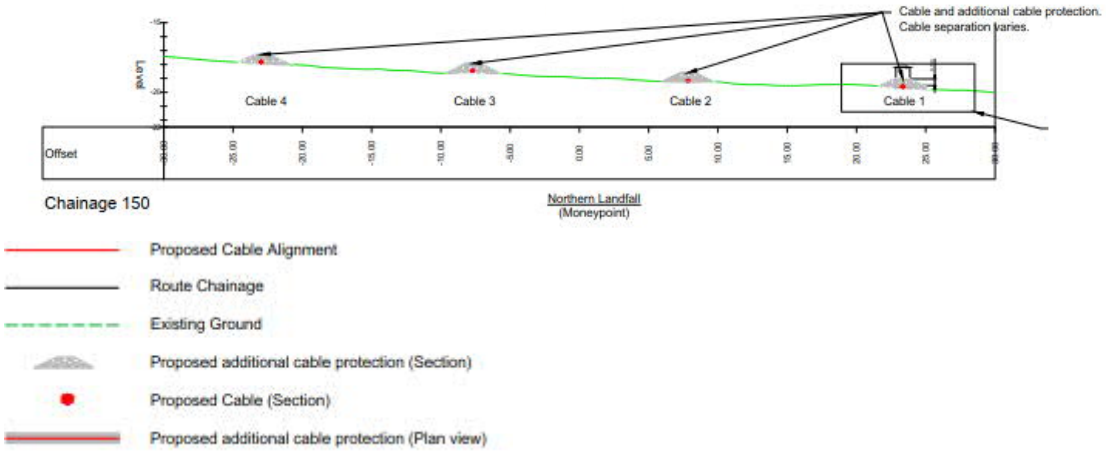


Figure 4.10: Section of Submarine Route alignment at the Southern Landfall approach (Ch. 2750)

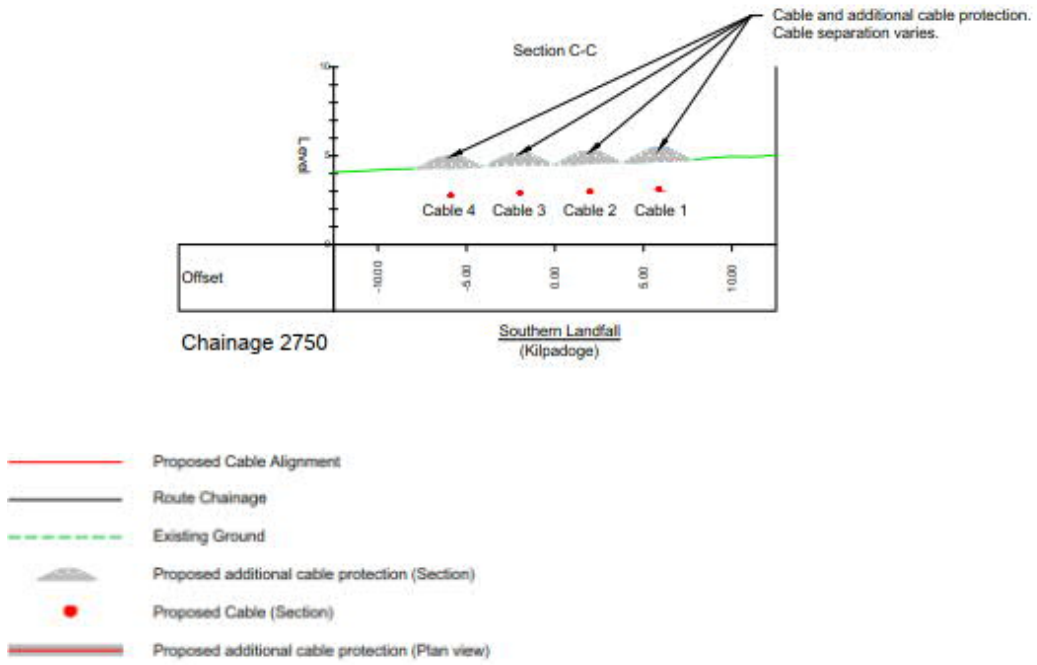


Figure 4.11: Plan Layout at the Northern Landfall

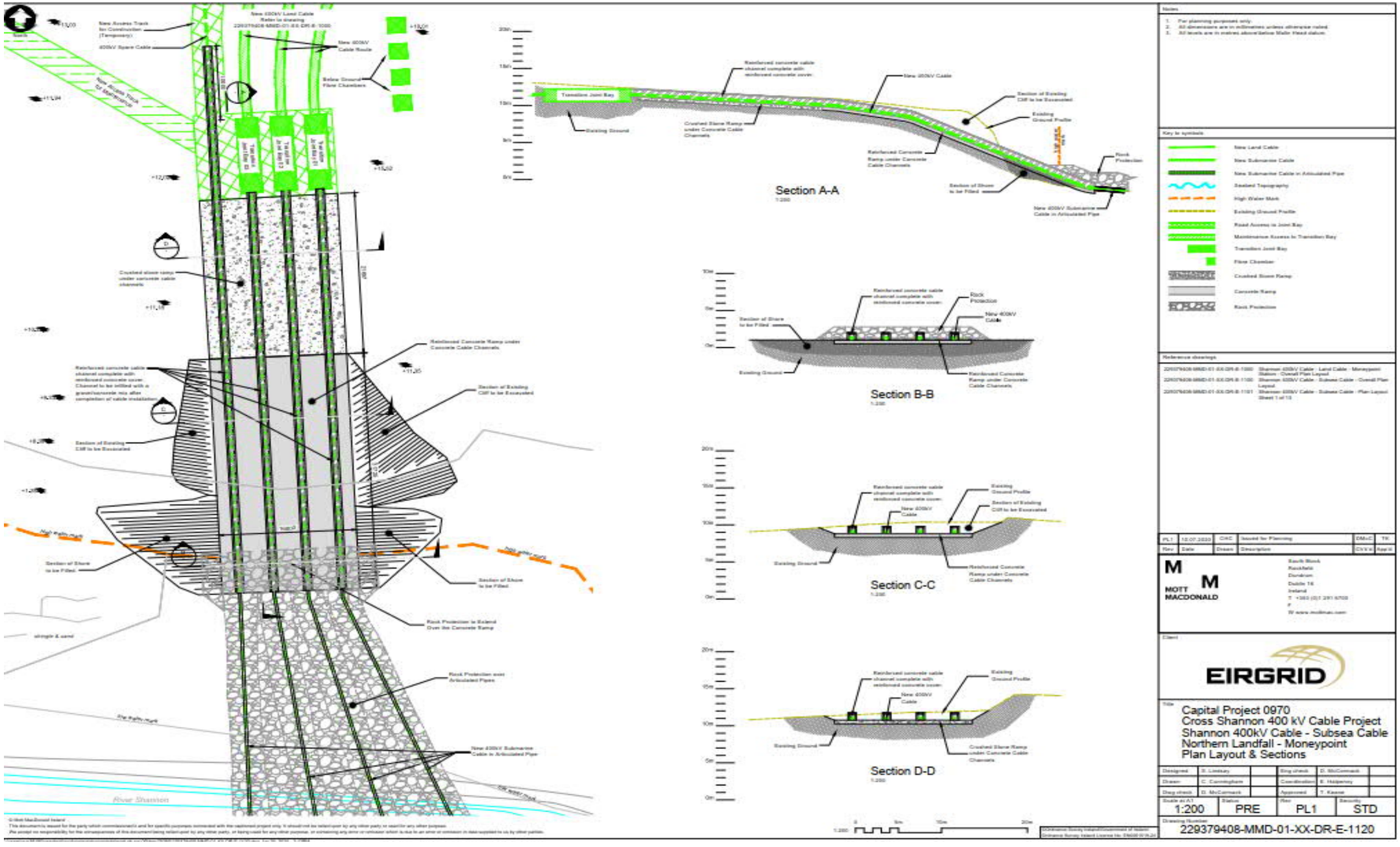


Figure 4.12: Plan layout at the Southern Landfall at Kilpaddoge.

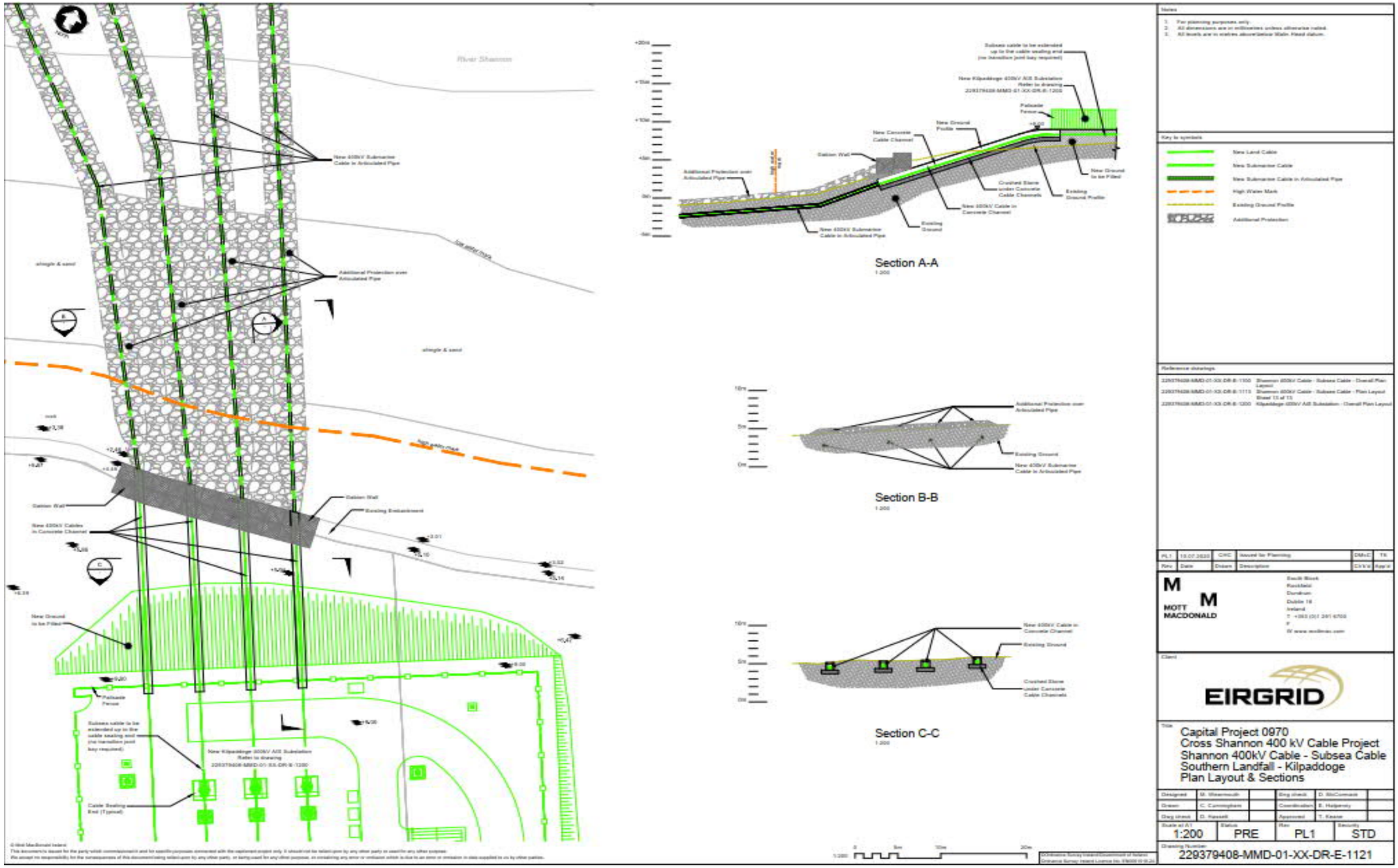
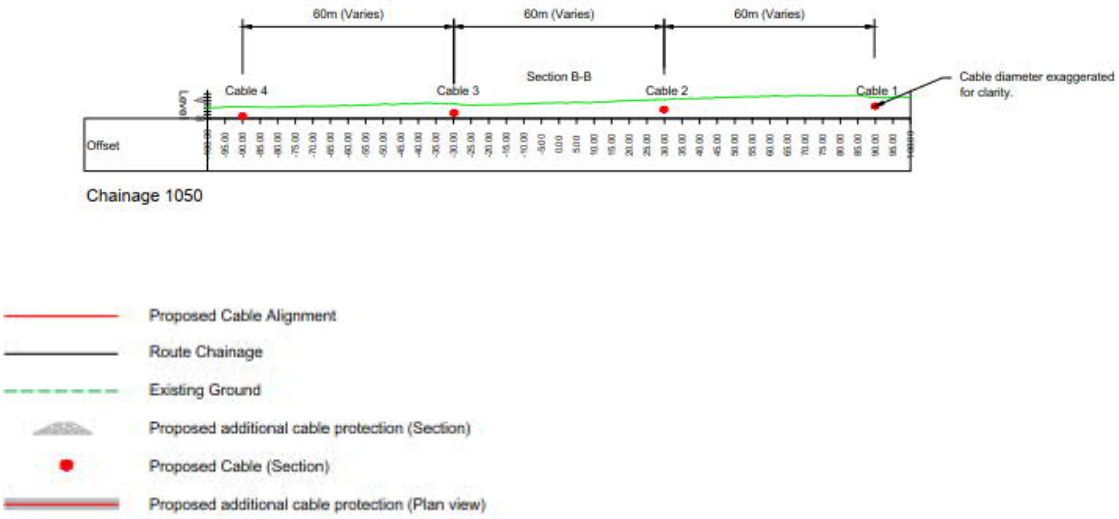


Figure 4.13: Section of Submarine Route alignment at Chainage 1050



4.3.2 Submarine Protection

The cable will be a cross linked polyethylene (XLPE) cable (Figure 4.14). XLPE is an extruded polyethylene material that is thermoset after extrusion through a controlled heating process

For the submarine cable, the sheath is typically lead, stainless steel or corrugated copper 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 4.14: Typical Submarine Cable design

Source: MM

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 4.15). 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 4.16). 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 4.17 shows a typical design cross section for a rock placement solution.

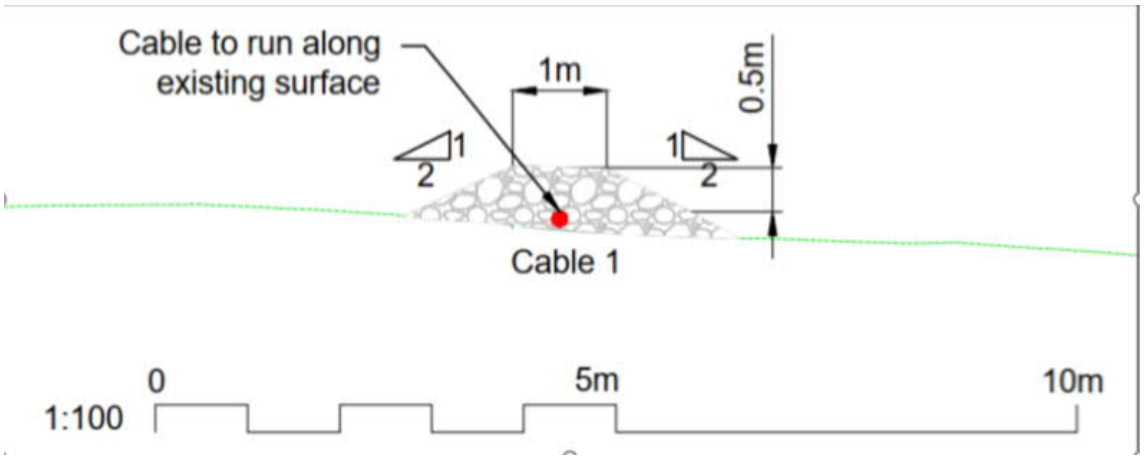
Figure 4.15: Example of Cable Protection Rock Filter Bags

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

Figure 4.16: Typical cable protectors Articulated pipes

Source: www.vos-prodect.com

Figure 4.17: Typical section of Rock Protection overlaid on the submarine cable



Source: Mott MacDonald

4.3.3 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 will prevent the vessel pulling the cable burial tool all the way to shore. Therefore, another cable installation tool will 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 time 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.

4.3.4 Submarine Cable Installation Activities

The development of landfall, intertidal and subtidal cable installation and burial methodologies described in this section of the report 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 4.18: Example of a cable winch used during a cable pull-in

Source: toolpusher.com

Figure 4.19: 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 4.20: 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 4.21: Example of a cable burial tool

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

A typical cable burial tool is shown in Figure 4.22. Cable burial techniques can be used in areas of coarse and more mixed sediment, 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 4.22: 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 4.23 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.

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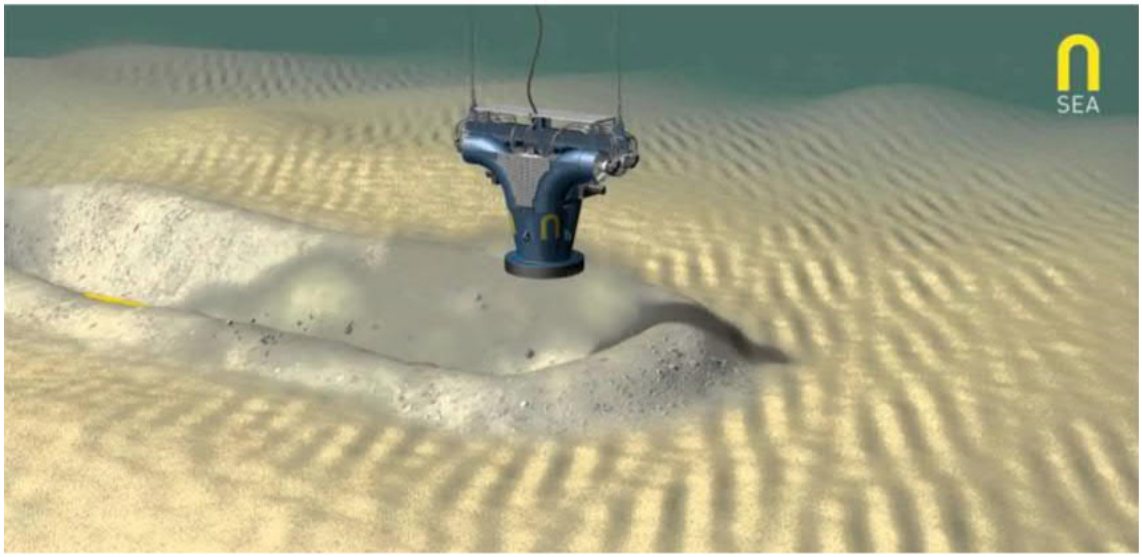
Figure 4.23: Illustration of a Mass Flow Excavator (MFE) tool used to excavate the seabed surface



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

Figure 4.24: An example of a jetting tool

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

4.3.4.1 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.

For the purpose of this report, the LAT is defined 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)

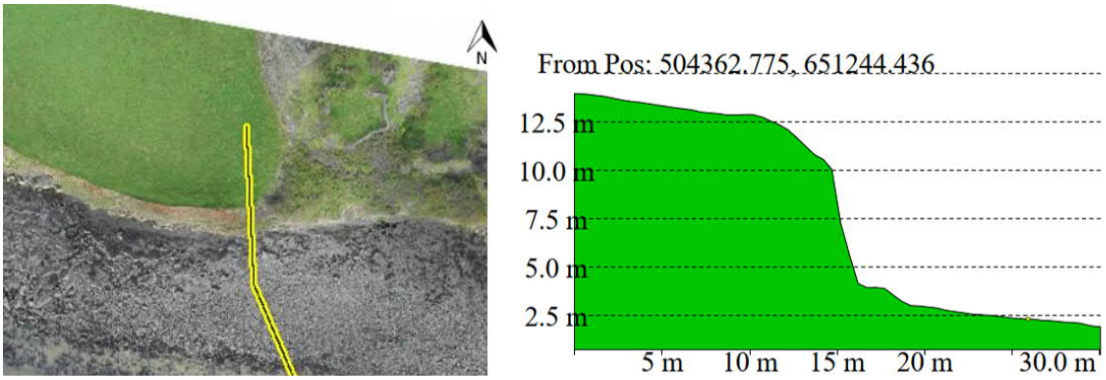
Site preparation works including civil and earthworks are required at Moneypoint to re-profile the existing coastline to the final design profile to enable the cable pull in to take place. The existing profile of the coastline at the proposed landfall is shown in Figure 4.25. The coastline at this location is typically between 8m and 10m AOD high with exposed rock at the cliff face (see Figure 4.26).

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 4.27;
- 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 4.25: 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 4.26: 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[7] 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 this report). 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

[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.)

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.

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.

Figure 4.27: 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)

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.

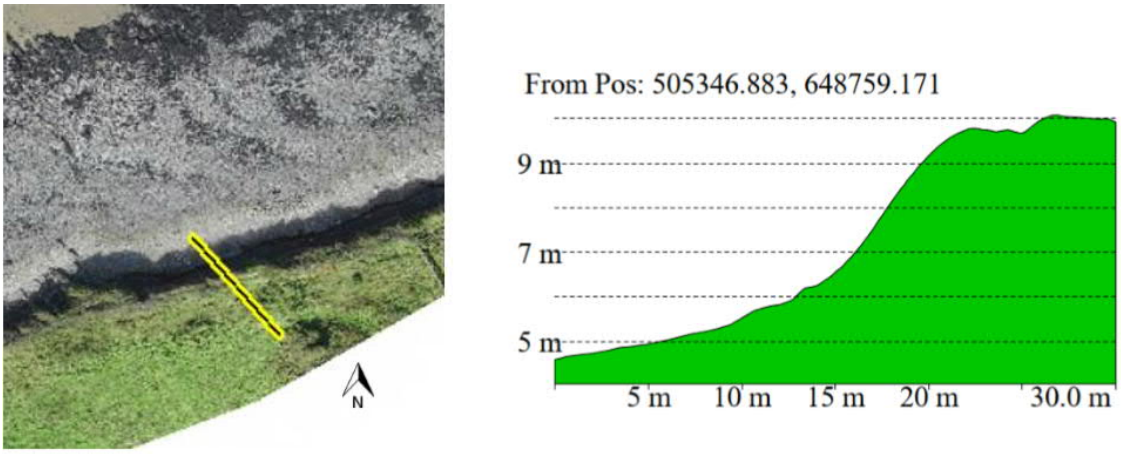
Following cable installation, the existing coastline will be reinstated to its original profile and level. Rock protection may be installed in front of the coastline.

The existing profile of the coastline at the proposed landfall is shown in Figure 4.28. 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 4.29).

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 4.28: 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 4.29: 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 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)

Should burial not be possible along the route post lay installation will be required. A cable burial tool, either remotely operated (ROV) or pulled by a combination of the onshore winch and marine vessel. Post lay jetting or ploughing will occur, Figure 4.24 shows an example of a typical jetting tool.

As noted previously above, based on the preliminary burial risk assessment and the results of the marine surveys additional protection is likely due to shallow bedrock. 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). 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).

4.3.5 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. A full cable risk assessment will be carried out as a post consent verification survey and post construction monitoring protocol will 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 Transmission Asset Owner (TAO).

4.3.6 Decommissioning

According to the Commission of 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 are not be recovered. The land-based transition joint pits are also to be left in situ.

4.4 Construction Phase Activities

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

4.4.1 Outline Construction Schedule and Timing of Works

Subject to the grant of statutory approvals, it is programmed that construction will commence in 2022, for it to become fully operational by the end of 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 with the 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 authorities.

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 Section 4.3.4 above.

The duration of the civil and electrical construction phase is expected to be approximately six months, with the installation and commissioning carried out thereafter over approximately six months. The overall duration will be approximately one year. Some of the activities noted in

Table 4.3 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. Using an arbitrary commencement date. 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) depending on weather conditions, refer to Chapter 7 *Biodiversity*.

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 4.3 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.

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 in Section 4.3. The Moneypoint landfall preparation works are anticipated to take approximately 9-10 weeks. The re-profiling works described in Section 4.3.4 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.

Table 4.3: Indicative Construction Schedule for onshore works

Phase	Activity	Anticipated Date/Duration:
Construction Phase Kilpaddoge 400 kV AIS Equipment and compound and cable ducting		
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 400 kV 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		
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

4.4.2 Temporary Construction Areas

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 37,506m^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.

4.4.3 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.

4.4.4 Construction Environmental Management Plan

A copy of the Outline Construction Environmental Management Plan (OCEMP) accompanies this application for statutory approval. This will form the basis for the CEMP when, assuming SID Approval is given by ABP and Foreshore Licence approval is given by the DHPLG, all conditions of the Approvals can be included in the CEMP.

A CEMP will be prepared and implemented during the construction phase in consultation with the Planning Authority and the Department of Planning, Housing and Local Government (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 this report.

As a responsible developer, 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.

It is proposed that 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 made in this PECR are additionally listed in Chapter 15 of this report.

4.4.5 Environmental Clerk of Works (EnCoW)

The EnCoW will form part of the Employers Site Representative Team. The EnCoW will 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 review 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.

4.4.5.1 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).

4.4.5.2 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.

5 Consultation and Engagement

5.1 Introduction

Public and Stakeholder Engagement is a key tenet in EirGrid's project development process. EirGrid's approach, which is outlined in EirGrid's publication[8] '*Have your say'* provides for the local community, landowners, elected representatives, media and prescribed bodies be made aware of the project and most importantly have the opportunity to provide feedback as the project develops. In addition to the above, all grid development projects are required to develop a specified Project Development Strategy (PDS) which will demonstrate how the project will progress.

5.2 Consenting Authorities Consultations

5.2.1 Pre-Application Consultation with An Bord Pleanála

EirGrid entered into consultations with An Bord Pleanála (ABP) under Section 182E of the Planning and Development Act 2000, as amended. It was requested that the Board advise whether or not the proposed development is Strategic Infrastructure Development (SID) in accordance with the provisions of Section 182A of the Planning and Development Act 2000, as amended. A pre-application meeting was held with ABP on the 25th October 2019. The purpose of the meeting was to provide an overview of the need for the Cross Shannon 400 kV Cable Project and provide the Board with information on the project option evaluation process.

A second pre-application meeting was held 13th March 2020 with ABP to present the project description and to discuss the potential impacts associated with the proposed development and the process and planned deliverables in respect of the submission of the application for approval. The pre-application consultation process concluded on the 11th May 2020 with ABP confirming the proposed development as SID, and the application for Approval to be made directly to the Board.

5.2.2 Pre application Consultation with the Department of Housing, Planning and Local Government

The Foreshore Act 1933, as amended, requires applicants to undertake pre-application consultation prior to submitting any application for development on the foreshore. The purpose of this consultation is to determine stakeholder views regarding the development and determine the scope of environmental assessment required as part of the application.

Pre application consultation was carried out with the Department of Housing, Planning and Local Government (DHPLG), Marine Planning and Foreshore Section, in December 2019. It was confirmed on the 12th December by both the Water Marine Advisory (WMA) and Marine Licencing Vetting Committee (MLVC) chair that a formal application can be made to the DDHPLG (Foreshore Licence Application FS007083). It was also noted that a project Natura Impact Statement and Planning and Environmental Considerations Report will be prepared, and these documents will accompany the foreshore application.

[8] http://www.eirgridgroup.com/__uuid/7d658280-91a2-4dbb-b438-ef005a857761/EirGrid-Have-Your-Say_May-2017.pdf

5.3 Key Stakeholders Consultations

Stakeholder consultation was carried out proportionate to the scale and significance of likely impacts associated with the needs of the proposed development. In this instance, where a formal response was provided by a stakeholder, these were disseminated to the project team. Table 5.1 below summarises the key points from the process and responses received from various bodies and identifies where such points have been addressed in the PECR.

Table 5.1: Consultee Feedback Landowner and Community Consultation

Consultee	Key Response(s)	Key comments as addressed in this PECR
Clare County Council	A pre application meeting was held with Clare County Council on the 4th October 2019. The purpose of the meeting was to discuss the key information of the proposed development including setting out the proposed project need and outlining the main elements of the proposed development. Subsequent to this meeting a follow up letter was received from the Council in January 2020. Clare County Council requested that Shannon Dolphin and Wildlife Foundation and IFI are consulted with continuously throughout the project. the Planning Application should refer to and follow the planning hierarchy for the location namely the Regional Spatial and Economic Strategy (RSES), The Clare County Development Plan (CDP) and the SIFP for Shannon Estuary. Clare County Council noted that the Bird Usage Survey of the Estuary for the Strategic Integrated Framework plan (SIFP) for Shannon Estuary will be finalised in late July 2020. Further, that the route crosses through Area of Opportunity J – Moneypoint in the SIFP and it is critical that this be considered in the planning report in terms of compatibility. Clare County Council noted that the route should not prejudice future development in the location. Clare County Council advised to consult Volume I and associated volume of mitigation measures (Volume II) of the SIFP. Mitigation measures should be reviewed in terms of relevance and applicability to the proposed development. In particular, requirements of MMO and Ecological Clerk of Works on site and throughout project. Consideration should be given by EirGrid to facilitating spare capacity within the cable to avoid requirement for laying additional cables in the future.	Consultation with the Shannon Dolphin and Wildlife Foundation and IFI was carried out as part of the project development. The Planning and Policy considerations are addressed within Chapter 2 of this report. The project is consistent with the overall development strategy hierarchy for the location. Details regarding the land use considerations as set out in the SIFP are set out in Chapter 2 of this report. Following a review of the baseline information gathered including the Bird Usage Survey of the Estuary Interim Report (MKO, 2017)[9] as part of the project development, a programme of ecological surveys was compiled on the key ecological receptors within the project study area. This process ensured ecological constraints identified within the Step 4 project were considered in the selection of the best performing route. Details on the proposed ecological mitigation measures are set out in Chapter 7 *Biodiversity* of this PECR The project Natura Impact Statement has been produced and accompanies this application. The cumulative effects on the European Sites and appropriate mitigation measures where relevant are set out having regard to the SIFP. Details on the proposed capacity of the proposed development are set out in Chapter 4 of this report. An Environmental Clerk of Works (EnCoW) and MMO will be appointed during the construction phase further details are provided in an outline Construction Environmental Management plan this will accompany the consent applications and provided in Appendix A.
Kerry County Council	A pre application meeting was held with Kerry County Council on the 3rd October 2019. The purpose of the meeting was to discuss the key information of the proposed development including setting out the proposed project need and outlining the main elements that it would consist of. The following issues were noted;	The Planning and Policy considerations are addressed within Chapter 2 of this report. The project is consistent to the overall development strategy hierarchy for the location. Details regarding the land use considerations as set out in the SIFP are set out in Chapter 2 of this report.

[9] Waterfowl numbers, usage and distribution of the River Shannon and the River Fergus Estuaries, Interim Report, MKO 2017

Consultee	Key Response(s)	Key comments as addressed in this PECR
	• Queries relating to the proposed construction traffic management, potential for cumulative impact and details on the proposed construction methodologies in particular how the proposed submarine cable will be installed. T • The Council queried the continuity of the Foynes port and shipping channels. The Council noted that the Planning Application should refer to and follow the planning hierarchy for the location namely the Regional Spatial and Economic Strategy (RSES) and have regard to the Strategic Integrated Framework plan (SIFP) for Shannon Estuary. A wider discussion occurred in relation to energy and transmission issues in the area. • EirGrid provided an overview of other projects occurring in the area and answered questions in relation to the capacity at Moneypoint Station and possible scenarios when Moneypoint Thermal Station ceases operations. • The council noted potential of Neolithic Archaeology. Subsequent to this meeting a follow up environmental consultation letter was forwarded to the Authority in January 2020. The Planning Authority provided the following observations; A follow up call was placed on the in January 2020, the Council reviewed the documentation submitted and have no further comments to make further to those outlined at the initial meeting in October with EirGrid. The plot remains zoned Industrial and within an SPA & SAC. Full regard to same is required. The documentation received was forwarded to the Bio-Diversity Officer and County Archaeologist, KCC. The Biodiversity Officer also has no further comments to make at this stage. The County Archaeologist has made the following comments: "As stated at the meeting in October, there is significant land based archaeology in and around the Kilpaddoge site (much of the archaeological material was uncovered during previous works within the KIlpaddoge station site), including evidence for early prehistoric settlement, and this needs to be considered. We would be requesting archaeological testing of any areas of proposed development as part of the project. There is also the potential for underwater and intertidal archaeology, and this too will need to be addressed as part of the overall assessment of the project" Follow up consultation telecon was arranged on the 29th October 2019 with the National Monuments Unit to discuss the findings of the archaeological impact assessment. A copy the draft archaeological	Details on the proposed construction approach and sequence of installation, proposed construction traffic and details on the proposed construction access and laydown areas are set out in Chapter 4 of this report. Extensive consultation has been carried out since 2017 with the Shannon Foynes Port and further details on the potential impacts on the navigation shipping channel is set out in Chapter 8 and 13 of this Report. Archaeological Impact Assessment for the proposed development was carried by ADCO Ltd. A copy of this report is provided in Appendix D and summarised in Chapter Details on the proposed ecological mitigation measures are set out in Chapter 7 *Biodiversity* of this PECR The project Natura Impact Statement has been produced and accompanies this application. The cumulative effects on the European Sites and appropriate mitigation measures where relevant are set out having regard to the SIFP

Consultee	Key Response(s)	Key comments as addressed in this PECR
	strategy document was prepared was subsequently issued to the NMU. No further comment was received in advance of issuing this report.	
Strategic Integrated Framework Plan (SIFP) for Shannon Estuary	EirGrid is a member of the multi-agency steering group with an interest in the Estuary. EirGrid has actively engaged with the steering group throughout the project development.	N/A
The Southern and Eastern Regional Assembly	A pre-application consultation letter for the proposed development was issued to the assembly chairman in Jan 2020. No response was received	N/A
Inland Fisheries Ireland (IFI)	A meeting was held with the IFI on 22nd July 2019.The justification for the project and the progress to date was discussed. A discussion was also carried on the route options considered as part of the Step 4 Framework. IFI queried some technical issues regarding the terms of the activities proposed, it was confirmed that a number of techniques are likely to be employed including water jetting, ploughing and targeted rock placement where necessary. IFI noted the selected Best Performing Option is the most appropriate route and advised that key considerations should include sediment mobility, water quality and the zone of passage of migratory fish. It is noted that sediment modelling would be carried out to inform the assessments. IFI sought clarification on the proposed mitigation measures including consideration of biosecurity measures prior to launching the vessel within the Shannon and pollution preventative controls such as use of biodegradable hydraulic fluids and storage of oil spill accident Reponses to be included as mitigation. IFI also noted mitigation measures such as biosecurity measures are set out in the Conditions of construction Contracts. A pre application consultation letter was forward to the IFI in January 2020. No response was received with respect to the consultation letter	Details of the key elements of the proposed development including the proposed submarine installation technologies proposed and sequence of works are set out in Chapter 4 of this report. Details on the proposed ecological mitigation measures are set out in Chapter 7 of this PECR
Failte Ireland	A pre application consultation letter was forwarded to Failte Ireland in January 2020. No response was received with respect to the consultation letter	N/A
Coastal Zone Management Division of the Department of Agriculture, Fisheries and Food	Pre-Application Consultation document with respect to the proposed marine survey investigations was first issued 21st March 2017 and the foreshore licence application was submitted on 31st May 2017. On-going engagement has been undertaken as required through the foreshore licensing process. A pre application consultation letter was issued to the Department in January 2020. No response was received with respect to the consultation letter	N/A

Consultee	Key Response(s)	Key comments as addressed in this PECR
Shannon Foynes Port Authority	Ongoing consultation has been carried out since 2017 in advance of commencing the marine surveys within the proposed study area. A pre application consultation letter was issued to the authority in Jan 2020. The purpose of was to provide updated information on the project development and seek out observations on the potential planning and environmental considerations within the Shannon. The Authority noted the following; • "Buttressing on the Moneypoint shoreline where cable landing is located ensuring the longevity of the rock armours over the cable crossing the Estuary. The possible event of a vessel transiting up or down river having to drop anchor in emergency is a risk. Nearer the project commencement discussion required on navigational safety during the phases of preparation, running cable and backfilling armour • Nearer the project commencement discussion required on navigational safety during the phases of preparation, running cable and backfilling armour • Suggested meeting as project develops to construction phase and relevant permissions in place to identify any further issues Previous correspondence with the Authority regarding dredging activities within the project area, SFPC stated that they do not believe any such activities have been carried out and that a Disposal at Sea (DAS) licence is not held within the project area. SFPC stated that it is unlikely that there will be any future dredging requirements in the broader channel area, or adjacent to Moneypoint. SFPC believe that historical blasting activities may have been conducted as part of the Moneypoint construction project in the 1970s-1980s	Queries and comments on the installation of the submarine cable and appropriate mitigation measures are addressed in the overall construction approach as set out in Chapter 4 Project Description and Chapter 8 Marine Aspects. .
Development Applications Unit (DAU) on behalf of National Parks and Wildlife Services (NPWS)	A meeting was held on the 25th April 2017. EirGrid provided an overview of the intended marine surveys and advised that they would be subject to a Foreshore Licence Application. The Department advised that the Shannon Estuary was the 4th or 5th most important estuary in Europe for Bottlenose Dolphins and was internationally important. The Department advised that it would be prudent for a Stage 2 Appropriate Assessment to be completed. It was advised that the Stage 2 AA should commit to the full implementation of the NPWS Guidelines (2014) for the protection of marine mammals during survey works EirGrid queried that with the employment of a marine mammal observer on the marine survey vessel ensuring that no survey works commence if bottlenose dolphins were observed within the restriction zone whether this would provide adequate protection. The Department advised that this would provide	Direct consultation was carried out with the NPWS to discuss the proposed development process and the consultation process allowed the ecological constraints and sensitivities of the habitats and species in the area to be identified. . Biodiversity is addressed in Chapter 7 of this PECR.

Consultee	Key Response(s)	Key comments as addressed in this PECR
	adequate protection but the preference would be not to survey during the month of August. A pre application consultation letter with respect to the proposed development was forwarded to Department in January 2020. No response was received with respect to the consultation letter	
Development Applications Unit on behalf of National Monuments Service (NMU)-Underwater Archaeology Unit (UAU)	A meeting was arranged with NMU(UAU) on 29th October 2019, which was subsequently held by telecon, to discuss the findings of the Archaeological Impact Assessment Subsequent to this telecon a consultation letter was issued to the NMU(UAU) in January 2020. The following observations were received in Jan 2020. The Department noted that ADCO Ltd are preparing a proposal for the archaeological mitigation of the works. The Department are therefore awaiting this as a submission for consideration. Once this is received, the Underwater Archaeology Unit will comment further A copy a draft archaeological strategy document was prepared and forwarded the NMU No response was received in respect to this draft in advance of issuing this report.	A copy a draft archaeological strategy document was prepared and forwarded the NMU. No response was received in respect to this draft in advance of issuing this report. A copy of the AIA accompanying this PECR is included in Appendix D. As part of the project development process design mitigation measures place by way of avoidance of direct impact on known archaeological features have been put in place. The strategy sets out the post consent verification archaeological investigations proposed
Marine Institute (MI)	Pre application consultation was carried out with the Marine Institute in July 2019. The Marine institute queried whether there are dredging and / or dumping at sea elements to the proposed project. Mott MacDonald informed MI that cable design specialist has confirmed that there are no dredging or dumping at sea elements to project	Mott MacDonald advised the Marine Institute in Oct 2019, further to project development, that there are no planned dredging or dumping at sea elements to the project. Following this clarification, the Marine Institute noted no further need to discuss the project at the stage. Detail on the proposed submarine cable installation is set out in Chapter 4 of this report.
Health and Safety Authority (HSA)	A pre application consultation letter with respect to the proposed development was forwarded to the HAS in January 2020. No response was received with respect to the consultation letter.	N/A
Sea Fisheries Protection Authority (SFPA)	SFPA were contacted and they advised that the Cross-Shannon Cable project is not in their remit and directed the project team to IFI. Mott MacDonald advised that IFI are being consulted. On request, SFPA advised that they would review the brochure. Mott MacDonald followed up with a cover e-mail and a copy of the brochure	N/A
Irish Aviation Authority (IAA)	A pre application consultation letter with respect to the proposed development was forwarded to IAA in January 2020. No response was received with respect to the consultation letter	N/A
Atlantic Shellfish	Consultation with Atlantic Shellfish has been ongoing since 2017 with respect to the proposed development in the Shannon Estuary. Queries were raised in relation to routing of cables in licenced area held by Atlantic Shellfish Ltd and burial method/depth of cables. EirGrid confirmed that they would ensure engagement will be undertaken with Atlantic Shellfish as to the final proposed cables and the typical cable installation methodologies when these are confirmed along with further	N/A

Consultee	Key Response(s)	Key comments as addressed in this PECR
	design work requirements. A pre application consultation letter with respect to the proposed development was forwarded in January 2020. A representative acknowledged receipt of the correspondence and noted the following Thank you very much for continuing to keep us informed about the EirGrid Shannon crossing from Money Point. We would be grateful to be kept informed as to progress, though we do not see that it will cause any significant harm to our oyster beds in the area.	
Geological Society of Ireland	A pre application consultation letter with respect to the proposed development was forward to GSI in January 2020. No response was received with respect to the consultation letter	N/A
An Taisce	A pre application consultation letter with respect to the proposed development was forward to An Taisce in January 2020. No response was received with respect to the consultation letter	N/A
Shannon Ferry Group	Ongoing consultation has been carried out with the Shannon Ferry Group since May 2017 with respect to the proposed development in the Shannon Estuary. A meeting was held with the group in November 2017 to introduce the project and discuss the key elements of the project. A pre application consultation letter with respect to the proposed development was forwarded to Group in January 2020. A representative of the group noted that they do not any issues with proposed development	The amenity and local land use within the study area were considered throughout the project development. The proposed development will not impact on the ferry operation.
Shannon Whale and Dolphin Group	Ongoing consultation with the Shannon Whale and Dolphin Group has been carried out with the Group since 2017 with respect to the proposed development in the Shannon Estuary. A pre application consultation letter with respect to the proposed development was forwarded to Group in January 2020. A representative of the group advised" The Shannon Estuary is an extremely important habitat for bottlenose dolphins which is designated as an SAC to protect this population and their habitats. The Shannon dolphin population number around 100-140 individuals which are genetically discrete, are only known to occur in Shannon Estuary and neighbouring Tralee and Brandon Bays". Whilst the Group representative noted that no significant issues with proposed development with respect to the proposed route and marine installation approach, it would expect any impacts on the dolphins and their habitat to be considered. The group was subsequently contacted to discuss the availability of records and discuss the potential for any significant impacts and the appropriate mitigating to be engaged including the implementation of the NPWS Guidelines (2014) for the protection of marine mammals during works	Regard to the key ecological receptors within the project study are considered throughout the project development. Further details on the biodiversity within the study area is set out in Chapter 8 of the PECR. The potential for significant effect on the SAC dolphin population are addressed in the accompanying project NIS.

Consultee	Key Response(s)	Key comments as addressed in this PECR
Heritage Council	A pre application consultation letter with respect to the proposed development was forward to Heritage Council in January 2020. No response was received to date	N/A
Irish Water	A pre application consultation letter with respect to the proposed development was forward to IW in January 2020. IW noted that they do not provide comment on individual projects.	The proposed development is not an EIA development. The proposed development will not impact on IW services. . As part of the project development a search of the utilities within the study area was carried out. Underground services within Moneypoint have been identified. The proposed development will not impact on IW assets. Details on the proposed surface water drainage design for Kilpaddoge is set out in Chapter 10 of this Report. The potential for significant effect on the European Sites is addressed in the accompanying project NIS.
Marine Survey Office	Marine Survey Office was contacted and they advised that their remit of the Marine Survey Office relates to navigational safety for shipping and associated activities exclusively. They deal with each application presented to them by the relevant department.	N/A

Considerable effort has been made by EirGrid to provide relevant information to the public to ensure a thorough understanding of the project need and scope and an opportunity for meaningful comment during the project development.

EirGrid has dedicated Agricultural and Community Liaison Officers (ALOs and CLOs) who since early May 2017 have been talking and meeting with stakeholders and landowners within the initial project study area. The engagement typically involved door to door visits and follow up meetings as necessary. Public events were held at the key stage of the project to provide updates and seek feedback from the public to feed into the EirGrid project development process. The activities involved in the consultation process are described in more detail below.

Two public events were held in Tarbert Co. Kerry and Killimer Co. Clare in June 2019 to raise awareness of the project and seek feedback from the public to feed into the EirGrid project development process and to seek views on the Best Performing Option (as identified in the Step 4 Report).

These public events were held in Kirby's Lantern Hotel, Tarbert Co. Kerry on the 17th June 2019 and on the 18th June 2019 in Killimer Community Hall, Killimer Co. Clare. The events were advertised in the local newspapers (The Kerryman and the Clare Champion) prior to the event, and all those living within the study area were also advised of the upcoming events by the ALO/CLO's during any visit made at their property. Details of the meetings were also advertised in advance in the local media, and on social media. The purpose of the meetings was to consult with landowners, local communities, organisations and elected representatives to seek views on the Best Performing Option. A copy of the public brochures are provided in Appendix A.

Overall the feedback received at the events was generally positive and supportive of the Cross Shannon 400 kV Cable Project. The general themes within the feedback consisted of;

- General queries related to the continued operation of the Moneypoint Generating Station and the potential ongoing supply chain opportunities within the study area. It is noted that the general area of Tarbert and Killimer has a long history of accommodating energy infrastructure and the local population expressed concerns on the decline in the industry and potential adverse effects on the local economy and employment within the wider area.
- Queries were raised on the potential environmental impacts associated with the installation of the submarine cable within the Shannon Estuary and potential noise concerns associated with the proposed Kilpaddoge Substation. It was noted that the potential environmental impacts will be comprehensively assessed as part the next step in EirGrid Development Framework (i.e. as part of the planning approval).
- Potential impacts of construction phase traffic on the local road network, particularly with an underground cable solution in the existing public roads. It was noted during the consultation that, with the exception of a same area of land adjacent to the Moneypoint Generating Station, all underground cable will be wholly within ESB, no underground cables will be sited within the public road network.
- Operational noise increase associated the proposed AIS equipment and compound at Kilpaddoge. The potential for any operational noise are addressed in chapter 12 of this PECR.

The project team has also engaged in discussions with directly affected landowners to confirm land ownership, seek access for surveys, to discuss potential design and siting/routing options, and to record any issues raised in respect of the proposed development. The proposed design, siting and layout of the development, reflects significant and positive engagement with landowners.

6 Population and Human Beings

6.1 Introduction

This section of the report sets out to identify and assess potential social impacts of the proposed development and to provide mitigation and monitoring measures to offset same, where required.

The key issues in relation to population and human beings impact, in the context of the proposed development include land use and demographic profile; tourism, economic profile, recreation and amenities. Reference is made to environmental factors which are dealt with in other sections of this PECR namely:

- Archaeology and Cultural Heritage (Chapter 11);
- Noise and Air (Chapter 12);
- Landscape and Visual (Chapter 13); and
- Material Assets, including Traffic (Chapter 14).

6.2 Methodology

6.2.1 Publication and Guidance Resources

A desk-based study was carried out to assess information in relation to demographic profile; housing; land use recreation and amenities; tourism and economic activity. Consultation feedback collated during the prior stages of the project (i.e. EirGrid's Framework for Grid Development Step 4) was also consulted as part of this assessment, as described further below.

Publications and other data sources that guided the preparation of this Chapter are listed hereunder:

- Clare County Development Plan (2017 – 2023);
- Kerry County Development Plan (2015 – 2021);
- Regional Spatial and Economic Strategy for the Southern Region 2020;
- Strategic Integrated Framework Plan for the Shannon Estuary (2013 - 2020);
- Census 2016. Central Statistics Office www.cso.ie ; and
- Census 2011, Central Statistics Office www.cso.ie.

6.2.2 Stakeholder Consultation Feedback

As described within Chapter 5, public and stakeholder engagement is a key activity within EirGrid's development process. Consultation with prescribed statutory bodies, directly affected landowners and community stakeholders within the vicinity of the proposed development, was undertaken in part to facilitate meaningful discussion and to identify opinions and concerns in relation to the proposed development.

The following public consultation feedback is considered relevant to this section of the report;

- Continued operation of the Moneypoint Generating Station and the potential ongoing supply chain opportunities within the study area. It is noted that the general area of Tarbert and Killimer has a long history of accommodating energy infrastructure and the local population

expressed concerns on the decline in the industry and potential adverse effects on the local economy and employment within the wider area.

- Potential environmental impacts associated with the installation of the submarine cable within the Shannon Estuary and potential noise concerns associated with the proposed Kilpaddoge Substation;
- Potential impacts of construction phase traffic on the local road network, particularly with an underground cable solution in the existing public roads; and
- Operational noise increase associated the proposed AIS equipment and compound at Kilpaddoge.

6.3 Study Area

The proposed development is located within the townlands of Carrowdotia South County Clare and Kilpaddoge, in County Kerry. The study area for this assessment was developed on the basis of the application site boundary (i.e. red line boundary) and the wider environs including proximate townlands within Counties Clare and Kerry. The area of the application, and associated townlands and townlands in the wider vicinity are set out in Figure 6.1 below. Full details on the proposed development are set out in Chapter 4 of this PECR.

Figure 6.1: Townlands within and directly adjacent to the proposed development

The draft EPA Guidelines (2017)[10] and draft Advice Notes (2015)[11] identify "sensitive receptors" as neighbouring landowners, local communities and other parties which are likely to be directly affected by the proposed development. In particular homes, hospitals, hotels and holiday

[10] https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf

[11] http://www.epa.ie/pubs/advice/ea/guidelines/

accommodation, schools and rehabilitation workshops and commercial premises are noted. Regard is also given to transient populations including drivers, tourists and walkers.

The existing sensitive receptors considered within the study area include relevant residential dwellings, and recreation / amenity locations. There are numerous residential dwellings within agricultural holdings within 500m of the site boundary and surrounding townlands. The closest villages are Killimer (County Clare) and Tarbert (County Kerry) which contain the local cluster of dwellings. The Tarbert to Killimer Ferry route is located approximately 3km to the east of the site boundary.

A section of the Wild Atlantic Way traverses the northern extent of the study area along the N67 national secondary route connecting Kilrush and Killimer via the ferry route.

6.4 Baseline Environment

6.4.1 Demographic Profile

Demographics are used to study the characteristics at a specific point in time. Demographics such as population, housing, health and employment have been examined.

Table 6.1: County Population Profile

County	Population
Kerry	147,707
Clare	118,817

Source: CSO 2016

The proposed development is situated in a rural location with the key populations of settlements are highlighted in Table 6.2

Table 6.2: Key Settlements Population Profile

County	Population
Tarbert	540
Kilrush	2,719

Source: CSO 2016

With the exception of the northern landfall and approximately 278m of the Moneypoint underground cable connection, the proposed development will be predominately situated within ESB lands.

6.4.2 Housing

According to the Census (2016), there are 411 households within the Electoral Division of Tarbert, 319 within the Electoral Division of Kilrush Rural and 228 within the Electoral Division of Killimer.

There are a number of dwellings situated within 500m of the site boundary. On the northern side, there are 14 dwellings within 500m of the proposed boundary, the closest being approximately 60m to the east of the proposed site boundary. There is also a church situated approximately 400m to the north east in Killimer.

On the southern side of the proposed development there are no dwellings situated within 500m. The closest dwelling is situated approximately 650m south of the site boundary.

6.4.3 Land Use Facilities

Findings from EirGrid's evidence-based Environmental Study on settlement and land use (2016)[12] established that there is no evidence of any significant impact arising from the construction or existence of transmission infrastructure in terms of patterns of settlement and land use. Notwithstanding, the study concluded that transmission infrastructure can be a local physical constraint on subsequent development. As such, local land-use, communities and supporting social infrastructure within and linked to the study area were evaluated.

Land Use

With the exception of works on the northern landfall and approximately 278m of underground cable connection, the majority of the land-side works are located within ESB lands.

As noted in Chapter 2 of this PECR, both Planning Authorities (Clare and Kerry County Council) have granted statutory consent for a number of developments within and in close proximity to the development boundary. Notably, Kerry County Council granted permission to Kilpaddoge Energy Limited (planning register reference: 13/138) to construct an electricity generating station. In addition, Glencloosagh Energy Limited submitted a planning application (planning register reference: 19/115) to construct battery storage units and associated equipment in the townland of Kilpaddoge as an alternative to the permitted and under construction Kilpaddoge Peaking Plant (planning register reference 13/138, as extended by 13/138).

The predominant land use in study area and wider environs is pasture and arable lands and comprising open agricultural greenfield. There are a number of dwellings and agricultural structures located within these pasturelands.

As part of the Clare CDP 2017-2023, a Wind Energy Strategy has been prepared for the county. Given the wind resource in County Clare, the strategy identifies sites of strategic regional and national importance that have the potential to accommodate wind energy development. Kerry County Council adopted a variation in 2012 to the Kerry County Development Plan and updated their Renewable Energy Strategy that was in place from 2003. The 2012 Renewable Energy Strategy states "*The planning authority recognises the importance of exploiting renewable energy sources in order to contribute to achieving national targets in relation to reductions in fossil fuel dependency and greenhouse gas emissions"*. Kerry County Council are starting a review of their CDP. It is envisaged that an update to the Renewable Energy Strategy for Kerry will form part of this process. As noted in Chapter 1, the proposed development is required to facilitate a regional solution including the growing demand for wind energy. There are numerous wind farms located in both County Clare and County Kerry. Some of these include Leanamore Wind Farm, Grouselodge Wind Farm and Tullabrack Wind Farm. There are five wind turbines (Ref 11/538) located at various locations within Moneypoint Generating Station, Co. Clare.

Local Communities and Facilities

The proposed development extends over the administrative boundaries of Clare County Council and Kerry County Council. The closest settlement to the development boundary is Tarbert which is located approximately 1.3 kilometres south east of the existing Kilpaddoge substation. Tarbert is defined as a 'District Town' (*Towns that serve rural hinterland as service centres and market towns*) according to the Kerry County Development Plan 2015-2021.

Killimer is the closest settlement to the proposed Moneypoint Generating station, located approximately 2 kilometres to the east. According to the Clare County Development Plan 2017 -

[12] http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Evidence-Based-Environmental-Study-9-Settlement-and-Landuse.pdf

2023, Killimer is defined as a 'Small Village' with a predominately rural character. Both Tarbert and Killimer are served by the N67, a national secondary road that runs from Galway to Tarbert and by the Tarbert to Killimer ferry. The role of ferries in meeting the transport needs of the region is widely recognised, in particular the Tarbert – Killimer ferry between Kerry and Clare and the ferries for the inhabitants of the region's Island communities.

A desktop search of health care facilities and community and education facilities within the proposed development area and its wider environs was also carried out. Tarbert Comprehensive School and Tarbert Health Centre are located approximately 800m and 1km south east of the proposed development boundary respectively.

6.4.4 Economic Profile

The estuary is noted as Ireland's premier deep-water resource and an important shipping channel with approximately 12 million tonnes of cargo shipped to the six main facilities – the largest of which is Shannon Foynes Port. Significant natural capita is also generated from the tourism, fisheries and aquaculture industries in the area.

Table 6.3: Persons at Work by Industry per ED (Census, 2016)

Small Area	Kilrush Rural	Tarbert	Killimer	Total	*National Average (per Small Area)*
Agriculture	17	10	14	41	*5*
Building and construction	3	8	5	16	5
Manufacturing industries	12	16	10	38	12
Commerce and trade	17	11	8	36	26
Transport and communications	3	4	4	11	9
Public administration	4	2	4	10	6
Professional services	12	17	25	63	25
Other	15	13	13	41	19
Total	92	81	83	256	105

Source: CSO census

The ESB (Moneypoint Electricity Generating Station) is a key employer in the study area. In 2019, the government launched its climate action plan which included a commitment to end the burning of coal in Moneypoint by 2025 and to replace coal-fired generation with "low-carbon and renewable technologies". In 2019, ESB has set out as part of its "Brighter Future Strategy", its committed to moving to 40% renewable generation by 2030.

Other significant employers within the vicinity include SSE Electricity Generating Station at Tarbert. Agriculture and tourism industries are also significant employers in the wider region.

As noted in Chapter 2 above, T08/004BO is partially located within the study area directly adjacent to Moneypoint and relates to an Oyster Fishery Order issued in 1961 to SO Limited. It is understood that this area has not been cultivated to date and there are no known future plans to cultivate this area. Discussions have been ongoing with the owners of the Oyster Fishery Order and will continue in advance of and during construction works.

6.4.5 Tourism and Recreation

The Shannon Estuary is a strategic tourism asset. Sea angling and marine ecotourism are identified within the Strategic Integrated Framework Plan for the Shannon Estuary (2013-2020) SIFP as *thriving tourism industries within the Estuary and the West Clare Peninsula, with potential to grow further within the lifetime of the SIFP.*

The Wild Atlantic Way is a defined tourist route along the western coast of Ireland. A section of the Wild Atlantic Way passes through the northern extent of the proposed development area along the N67 national secondary route connecting Kilrush and Killimer in County Clare. The Wild Atlantic Way connects to the N67 at Tarbert in County Kerry via a passenger / vehicle ferry connection between Killimer and Tarbert (http://www.shannonferries.com/). Of particular relevance to the proposed development area, the strategy for Marine Tourism and Leisure as contained within the SIFP identifies Kilrush as a service town with well-developed marina facilities. It also identifies that tourism has the potential to contribute significantly to the economic success of Kilrush and its hinterland.

Sea angling and observational marine tourism are recognised to be of growing importance and Inland Fisheries Ireland are working to maximise the potential for sea angling and charter boat operations for angling tourism in the estuary.

Other significant tourism and recreational activities within the vicinity include, Dolphin Watching, RIB tours (rigid inflatable boats), Royal Western Yacht Club of Ireland (Kilrush), Kilrush Creek Adventure Centre, Scattery Island Ferries and Shore Angling.

6.4.6 Health and Wellbeing

EirGrid's EMF Policy

There are two distinct types of fields relevant to the proposed development, electric fields and magnetic fields which together are called an electromagnetic field (EMF). A field refers to the influence that an object (for example a magnet or a lamp) may exert on the space around it. For example, a gravitational field is used to describe the force of attraction that the Earth exerts on living beings and objects situated within its orbit.

EMFs surround any object that is generating, transmitting or using electricity, including appliances, wiring, office equipment, batteries and any other electrical devices. Therefore, electric and magnetic fields are common in modern life. EMFs are invisible and they cannot be felt or heard. In many cases, domestic electrical appliances and tools can generate much higher magnetic and electric fields, if in close proximity to a sensitive receptor, than transmission lines at standard separation distances.

Independent and authoritative international panels of scientific experts have reviewed studies on possible health effects from EMFs. These have concluded, based on the weight of the evidence available, that the power frequency electric and magnetic fields encountered in normal living and working conditions do not cause adverse health effects in humans when properly designed and constructed. These form the basis for guidelines published by the International Council on Non-Ionising Radiation Protection (ICNIRP) with regard to EMF, to which EirGrid and ESB Networks have strict regard in the design and operation of the transmission system.

Findings from EirGrid's evidence-based Environmental Study on EMF (2016)[13] established that;

The maximum magnetic field strength measured at all overhead lines, underground cables and substation perimeters surveyed was well below the ICNIRP public exposure reference level, set to protect public health. Based on the measured data, magnetic field strengths estimated for overhead power lines and underground cables using records of annual load are also well below the ICNIRP reference level to protect public health under typical (mean or median load) and high-power load (95th percentile) conditions. The maximum electric field strength measured at all overhead lines and substation perimeters surveyed was below the ICNIRP reference level to protect public health. Underground cables produce no electric field above ground.

In the context of the above evidence, the design of the transmission infrastructure has ensured that the strength of the electric and magnetic fields during operation of the proposed development will comply with the ICNIRP and EU guidelines on exposure of the general public to EMF.

Health and Safety Considerations

The proposed development comprises works within the Moneypoint Generating Station complex. The site is classified as an Upper Tier COMAH establishment under the Chemical Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (S.I 209 of 2015). The proposed development comprises the routing of underground 400 kV cable and onward connection into the existing Moneypoint GIS substation. The proposed development will not change the receiving environment in the context of the over ground activities within the Moneypoint Generating Station, neither will the proposed development interface with major accident scenarios for the site and the control measures associated with them.

A safety report to assess the consequences and risk arising from Major Accident Hazards associated with all operations on the campus in compliance with the requirements of the COMAH Regulations is prepared by ESB as part of their land use planning assessment. The Health and Safety Authority is the central competent authority for the purpose of the COMAH Regulations, and the details of the application and how it relates to the existing hazardous material at the establishment will be assessed. The updated report will be issued to the HSA and is a standard reporting mechanism for COMAH sites.

The operations at the Moneypoint Generating Station are also currently regulated by the Environmental Protection Agency under the existing Industrial Emissions Directive licence (register reference number P0605-04).

6.5 Potential Impacts

This section provides an assessment of likely significant social impacts of the proposed project. As previous noted the assessment of social impacts that might occur on air and water, noise and traffic, are addressed in the relevant environmental topic chapters in this report.

[13] http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Evidence-Based-Environmental-Study-1-EMF.pdf

6.5.1 Construction Phase

Population and Economic Profile

Construction is not expected to have a permanent impact on the population of the wider environs in terms of changes in population trends or density, or household size. There will be a temporary increase of 45 persons working in the area during the construction phase, those of which may commute or locate within the area or surrounding environs.

Housing, Land Use and Facilities

Land use sensitivity can be described as the degree to which land can accept change of a particular type and scale without adversely impacting on its functionality. It is not expected that the construction phase will result in a demand for housing (either purchase or lease), land use or facilities which would impact materially on the proposed development area and its environs.

The proposed development is predominately located within lands under the control of ESB however, acquisition of land to access the northern landfall and cable connection route will be required.

A minor temporary construction impact on marine traffic is anticipated, this is local to the ESB Moneypoint Electricity Generating Station jetty and along the proposed installation corridor only. No significant construction or operational phase impact on marine traffic elsewhere or to the existing ferry route between Tarbert and Killimer is anticipated to occur. Further details on the marine traffic is dealt with in Chapter 14 of this report.

Tourism, Recreation and Amenities

The proposed development has no potential to have long term direct or indirect impacts on tourism, recreation or amenities in the area due to the temporary nature of the works. Visually there will be no difference to the current location and there will be no impact on the Killimer – Tarbert Ferry route.

The proposed landfall works will be carried out on the intertidal zone both north and south of the Shannon Estuary. Access on the northern intertidal zone is currently limited and the shore is only accessed through private landowners and whereas access on the southern shore at Glencloosagh Bay is open to the public. Access to these areas will be restricted for the duration of the works. The works are limited to the discrete proposed development boundary, the works area will be clearly demarcated and restricted and following completion of the works access to the shore at Glencloosagh Bay will be retained.

As previously noted, there is no defined navigational channel for vessels along the section of the Shannon Estuary where the proposed development is located. Marine vessel movements are relatively sporadic, and the Shannon Estuary does not have a defined high season for vessel movements. It has been assumed that vessels will work up to 24/7 working hours during the submarine cable installation. As noted in Chapter 5, the installation period for each submarine cable is in the order of hours to days with the vessels moving along the cable route during installation. With approximately 900 vessel passages annually in the proposed development location (equates to less than three vessel daily passages) and a wide navigational channel, the potential impact on navigation is low.

Health and Wellbeing

The estimated project construction and commissioning schedule is 12 months. The works will result in temporary adverse nuisance to the closest sensitive receptors resulting from noise and

vibration and human presence within the works area. The potential construction phase impacts associated with the key construction activities and how these relate to traffic, noise, air quality and water impacts are discussed in the respective environmental chapters within this report. It is important to note that there will be no planned marine dredging or 'Dumping at Sea' element conducted throughout the construction phase of the proposed development.). Following the cable installation, the trenched route will fill in on itself through natural tidal activity.

ESB will appoint a Project Supervisor for the Construction Stage (PSCS) of the proposed development when they appoint contractors to carry out the works. The PSCS will be responsible for developing the construction stage Safety and Health Plan, co-ordinating the work of Contractors and providing the PSDP with information required in the Safety File. The project supervisor design process (PSDP) ensures coordination of the work of designers throughout the project. This is to ensure effectiveness in addressing and coordinating safety and health matters from the very early stages of the project.

The requirements of the Safety, Health and Welfare at Work (Construction) Regulations, 2006, as amended will be implemented and complied with in full during the construction phase of the development. However, as with any construction project, there is still potential for adverse impacts associated with the natural environment and nuisance (such as noise and dust emissions). Construction will be undertaken by a competent contractor. The potential for these effects is discussed separately within the respective chapters. The substation sites and any site where deep excavation is to be undertaken will be securely fenced from the public during the construction phase.

6.5.2 Operational Phase

Demographic Profile

Once constructed, the proposed development is not expected to have a permanent impact on the population of the application area and its wider environs in terms of social changes, population trends or density.

Housing, Land Use and Facilities

It is not expected that the proposed development will result in a demand for housing (either purchase or lease), land use or facilities which would impact materially on proposed development area and its environs.

Tourism, Recreation and Amenities

It is not expected that the proposed development will result in any significant adverse effect on tourism in the area nor its existing community and recreational amenity and facilities.

Health and Wellbeing

EirGrid regards the protection of health, safety and welfare of its staff and the general public as a core company value[14]. The Irish Transmission system is designed, constructed and operated in accordance with all national and EU Safety Regulation and in accordance with best international practice. Extensive studies have been undertaken on the health risks associated with high voltage circuits.

Guideline Reference levels for exposure to electro-magnetic fields (EMF) have been set by the International Commission on Non-Ionising Radiation Protection (ICNIRIP) who advise the World

[14] http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-The-Electricity-Grid-and-Your-Health.pdf

Health Organisation (WHO) on non-ionising radiation matters. EirGrid is satisfied that the proposed development will have no adverse impact on public health. EirGrid will adhere to international and national standards and guidelines - and will continue to base its EMF policy on the latest international scientific research and policy in this area. All HV cables will be XLPE type. These cable types use a solid polyethylene insulation material. They do not use oil as an insulating medium and do not pose any threat from leakages.

6.6 Mitigation Measures

6.6.1 Construction Phase

Construction activities have the potential to create a nuisance and cause disruption. All work will be carried out having regard to international and national legislation, and best practice guidance, including but not limited to guidance on preventing pollution from construction sites and pollution prevention guidance. There are no specific mitigation measures required to ameliorate the impacts on population and human health. Specific measures to mitigate potential significant impacts on human health (i.e. air, noise, dust, traffic are dealt with separately in the relevant chapters in this PECR). As noted in Chapter 4 of the PECR in order to minimise disruption a CEMP will be prepared and implemented by the Contractor. The Contractor will have regard to the outline CEMP which accompanies this application. The CEMP will be prepared during the pre-construction phase to ensure commitments included in this PECR in addition to specified conditions that may be prescribed by the consenting authority in relation to environmental protection associated with construction phase are implemented.

As part of the CEMP the Contractor will be required to develop and implement a Public and Stakeholder Management and Communication Plan which is to be agreed with the Planning Authorities prior to the construction phase. Navigational impacts will be minimised through consultation with the Shannon Foynes Port Company and other stakeholders as part of the Foreshore Licence process. These will be stipulated in the granted Foreshore Licence process. Access to the foreshore within the proposed development boundary will be temporarily restricted for the duration of the works. The vessels will be temporarily positioned within the proposed development boundary (as shown on the accompanying mapping). Mariners will be requested to stay a minimum of 500 metres radial distance from the project vessel. Vessels will require diversions to avoid the installation activity, however, individual occasions will be transient and temporary in nature. A comprehensive Health and Safety Programme will be put in place on the site prior to commencement of construction to minimise any risks to site personnel and visitors. The requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) will be compiled with at all times.

Oyster T08/004BO is partially located within the study area adjacent to Moneypoint and relates to an Oyster Fishery Order issued in 1961 to SO Limited. It is understood that this area has not been cultivated todate and there are no known future plans to cultivate this area. Discussions have been ongoing with the owners of the Oyster Fishery Order and will continue in advance of and during construction works.

6.6.2 Operational Phase

There will be no specific mitigation required in this instance.

6.7 Residual Impacts and Monitoring

There will be no significant residual impacts.

7 Biodiversity

7.1 Introduction

This chapter assesses the likely significant effects from the proposed development on biodiversity. Biodiversity (or "biological diversity"), as defined at the United Nations Convention on Biological Diversity (CBD), is '*the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes genetic diversity within species, between species and of ecosystems'*.

The potential effects on biodiversity from the proposed development are assessed. The rating and type of effect on the receiving biodiversity is determined.

Mitigation measures are provided to avoid / reduce significant effects on biodiversity receptors. An assessment of residual effects is also undertaken.

The survey work, laboratory analyses, data analyses and report writing were undertaken by Dr. Brendan O'Connor, Dr. Mark Costello, Dr. Edward McCormack and Dr. James Forde of AQUAFACT International Service Ltd (AQUAFACT). Dr O'Connor has 45 years field and laboratory work experience, 85 scientific publications and with regard to marine invertebrates, has either described new species, reinstated species that had been synonymised with other taxa and has recorded many species new to Ireland. Dr. Costello has a high level of expertise in marine ecological survey techniques and reporting, with over 35 years field and laboratory experience. Dr. McCormack, with 25 years field and laboratory experience, has an extensive knowledge of taxonomy and has published numerous articles on marine invertebrates in international journal. Dr. James Forde has a PhD in Marine Ecology and has over 20 years field and laboratory work experience. 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 has published a number of articles in international journals on survey techniques and impact assessment protocol used to meet environmental legislation. James is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

7.2 Methodology

7.2.1 Legislation and Best Practice Guidelines

In assessing the potential impacts on the prevailing biodiversity arising from construction and operation of the proposed development, due regard was had to relevant legislation and guidance including;

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (Chartered Institute of Ecology and Environmental Management (CIEEM, 2018 (updated September 2019));
- Ecology Guidelines for Electricity Transmission Projects, A Standard Approach to Ecological Impact Assessment of High Voltage Transmission Projects (EirGrid, 2012);
- Ireland's Marine Strategy Framework Directive Article 19 Report Initial Assessment, GES and Targets and Indicators (Marine Institute, October 2013);
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016); and

- Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters. (DAHG, January 2014).

Methods for the evaluation of ecological receptors and impact assessment were based on a number of documents including EIRGRID (2012), DAHG (2014) and CIEEM (2019).

In summary, the assessment of impact identifies the biological receptors (or features) sensitive to the pressures (impact mechanisms) associated with the development and implements a systematic approach to understand the level and significance of impact based on the following elements:

- Sensitivity of a receptor to the impact mechanism;
- Magnitude of impact to the feature;
- Likelihood of occurrence of impact; and
- Level of impact

The activities proposed for the development that have potential to effect biological features in the Shannon estuary area can be separated spatially into two work areas (or elements):

- onshore (terrestrial) activities - construction and civil works.
- marine activities - intertidal and subtidal cable installation.

Given the nature of the proposed onshore and marine activities, and the potential 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 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.

A key factor in the consideration as to whether or not a feature is likely to be affected by a proposed development is the ‘zone of influence’ (ZoI) of the project over which ecological features may be affected. The identification of the ZoI of a project considers the existence of connectivity (or interaction/ or impact pathway) between the feature and the impact mechanisms associated with the development that may result in biophysical change to the feature. The likely ZoI of the proposed development for ecological features was determined on the basis of published data and is discussed below as part of the Desktop Study.

7.2.2 Desktop Study

The study area comprises all marine waters and lands located within the zone of influence (ZoI) of the proposed development. The current guidance on ecological assessments (CIEEM, 2018) states that:

“*The ‘zone of influence’ for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries”* and that *“the zone of influence will vary for different ecological features depending on their sensitivity to an environmental change*.”

For the marine sections of the proposed development, the ZoI is estimated at approximately 4km upstream and downstream of the works site based on output from a sediment transport model that predicts the spatial extent that sediments suspended during trench construction for the placement of cables will extend up and downstream form the works area.

DAHG (2014) identifies hypothetical zones of impact on marine mammals and prescribes associated monitoring zones which are up to 1km radial distance from the noise source. The adopted ZoI for noise effects on marine mammals is therefore taken as 1km.

For the terrestrial elements of the proposed development, the ZoI varies depending on the construction activity and the sensitivity of the receptor to the effect *e.g.* habitats, flora, birds, terrestrial mammals encountered.

The ZoI for terrestrial habitats is taken as 20m either side of the cable route midline as this is the likely zone for physical and dust effects associated with the works.

With regard to birds, Cutts et. al (2013)[15] prescribes that, for sensitive wetland species e.g. Shelduck, consideration for disturbance effects should be given to birds within 500m of the works.

Badgers and otters shy away from human activities such as traffic and construction works. A precautionary ZoI of 200m for terrestrial mammals is adopted, having regard to Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes (NRA, 2005).

The desktop assessment was informed by an examination of aerial imagery and other available datasets to investigate the potential for connectivity to designated and ecologically sensitive areas, as well as a review of available literature *e.g.* NPWS data on European sites.

Data and mapping consulted for the purpose of this assessment included:

- Existing relevant mapping and databases i.e. species and habitat distribution *etc*. (sourced from the Environmental Protection Agency (EPA), the National Biodiversity Data Centre (NBDC) and the National Parks and Wildlife Services (NPWS);
- Published and unpublished NPWS reports on protected habitats and species including Irish Wildlife Manual reports, Species Action Plans and Conservation Management Plans;
- Conservation Objectives reports, Site Synopsis reports and Backing Documents and Maps prepared by the NPWS for the Lower River Shannon SAC (Site code: 002165) (NPWS 2012[16,] 2013[17], 2012[18)] and the River Shannon and River Fergus Estuaries Special Protection Area (SPA) (Site code 004077) (NPWS 2012[19], 2015[20,] 2012[21]) to inform national reporting[22] required under Article 17 of the Habitats Directive

[15] N Cutts, K Hemingway & J Spencer (2013) Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning & Construction Projects (Version 3.2)

[16] NPWS 2012 Conservation Objectives Series. Lower River Shannon SAC Site Code: 002165.

[17] NPWS 2013 Site Synopsis. Lower River Shannon SAC Site Code: 002165.

[18] NPWS 2012 Lower River Shannon SAC (site code: 2165) Conservation objectives supporting document marine habitats and species Version 1 March 2012

[19] NPWS 2012 Conservation Objectives Series. River Shannon and River Fergus Estuaries Special Protection Area Site Code: 004077.

[20] NPWS 2015 Site Synopsis. River Shannon and River Fergus Estuaries Special Protection Area Site Code:

[21] 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

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

- Site Synopsis Lower River Shannon SAC (site code: 2165), Backing Documents and Maps prepared in accordance with Article 17 of the Habitats Directive;
- Strategic Integrated Framework Plan for the Shannon Estuary (2013-2020) Strategic Environmental Assessment (SEA) environmental report and Natura Impact Statement; and
- Environmental assessment reports associated with various key developments in the locality, including within the Moneypoint Generating Station landholding and Kilpaddoge Substation.[23] [24] [25] [26]

Habitats within and/ or immediately adjacent to the development area which might be affected by the development were identified and their suitability to support sensitive, rare and protected species was assessed (having regard to the typical ranges of species known to occur in the locality and the ZoI of the works). These assessments were also informed by the geotechnical and environmental marine surveys carried out under the provisions of a Foreshore licence (FS 006760). This assessment followed a constraints study and route selection study carried out for the proposed development which fed into the consideration of alternatives and overall integrated Step 4 evaluation of the project under EirGrid's Framework for Grid Development and the subsequent identified route of the proposed development.

These assessments provided a comprehensive consideration of the biodiversity. They identified and communicated the potential impacts at the earliest opportunity to the design team and thus enabled the avoidance of significant biodiversity impacts, and a design mitigation strategy to be developed in sensitive areas in order to reduce significant negative impacts.

Regarding potential impact to conservation sites the assessment considers sites that form part of the Natura 2000 network. These sites include Special Areas of Conservation (SACs) designated under the Habitats Directive (92/43/EEC) due to their significant ecological importance for species and habitats protected under Annexes I and II respectively of the Habitats Directive, and Special Protection Areas (SPAs), designated for the protection of populations and habitats of bird species protected under the EU Birds Directive (Council Directive 2009/409/EEC). Given the nature of the proposed onshore and marine activities, and spatial extent of the ZoI of the impact mechanisms relevant to the biological receptors, the only receptors that have a viable source-pathway link to the proposed project are a number of Qualifying Interests (QIs) and Special Conservation Interests (SCIs) for which Lower River Shannon SAC (Site code 002165) and River Shannon and River Fergus Estuaries SPA (Site code 004077) are respectively designated. Summary assessments of potential impact to the SAC and SPA are presented in this report while detailed assessments are documented in the '*Screening for Appropriate Assessment and Natura Impact Statement*' report (*Screening Statement for AA and NIS*) that accompanies this report and the application of consent for the development

7.2.3 Consultations

Preapplication consultations were carried out with the prescribed bodies as detailed in Chapter 5 *Consultation*. A summary of all consultation is provided in Chapter 5 of this PECR. With respect to biodiversity, the following is noted.

Pre-application consultation meetings were held with each local Authority (Kerry and Clare). Representatives present included biodiversity officers and environmental assessment officers.

[23] Moneypoint Ash Storage Area Development Environmental impact statement Planning reference 14373 ESBI

[24] Glencloosagh Energy Liited for a grid stabilisation facility planning reference 19115

[25] Shannon Clean Tech Ltd for a Battery Energy Storage System (BESS) (planning reference 18878

[26] Moneypoint Generating Station complex, namely 7.5MW BESS (Ref: 18/520) and Synchronous Condenser (Ref: 19/746

Each Local Authority noted that the ecological designations associated with the Shannon Estuary. A meeting was held with the National Parks and Wildlife Services (NPWS) in April 2017. The proposed development was discussed with the authority. An overview of the intended marine surveys within the Shannon Estuary was also discussed. Key items and approaches addressed in the meeting was incorporated where necessary at each stage of the project development including regard to likely mitigation that would be suitable. Further details on this consultation is set summarised in Chapter 5 of this report.

Written correspondence was sent to the Development Application Unit (DAU) for the attention of NPWS in January 2020 providing an overview of the proposed development and requesting any additional information on nature conservation and biodiversity within the receiving environment. No response was received at the time of writing this report. Correspondence was also sent to the Irish Whale and Dolphin Group (IWDG), during follow up consultation with the group its representative noted no significant issues concerning the proposed development location or the installation proposal. He requested that ongoing consultation should be made with the group at the next stage of the proposed development in advance of construction (Berrow, pers.comm).

As the proposed cable route lies within a European site, permission was sought (and was granted, see Appendix C) from the NPWS to carry out the required field work.

A meeting was held with the Inland Fisheries Ireland in July 2019. A discussion was also carried on the route options considered as part of the Step 4 Framework. IFI queried some technical issues regarding the terms of the activities proposed, it was confirmed that a number of techniques are likely to be employed including water jetting, ploughing and targeted rock placement where necessary. IFI noted the selected Best Preforming Option is the most appropriate route and advised that key considerations should include sediment mobility, water quality and potential for biohazards and the zone of passage of migratory fish. It was noted that sediment modelling would be carried out to inform the assessments. Details of this modelling are discussed separately in Chapter 8 Marine Aspects in this report.

7.2.4 Field Surveys

A suite of ecological field surveys was carried out between 2017 and 2020 which have informed the determination of the baseline environment and against which impacts on biodiversity are assessed.

7.2.4.1 Terrestrial Surveys

Walkover surveys of the potential landfall sites and surrounding onshore habitats were carried out on the following dates: 15th February 2017, 24th April 2018 and 14th March 4th April and 30th September 2019 and June 19th 2020. These were undertaken to document flora and fauna (including amphibians, reptile, birds and mammals), to describe habitats present and to determine the potential for the lands to support protected or threatened species. Habitats and species were identified in the field either by eye or through the use of binoculars.

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.

Both onshore areas either side of the estuary were also examined for potential amphibian sites, birds, mammal tracks, otter sprainting sites and holts and badger setts.

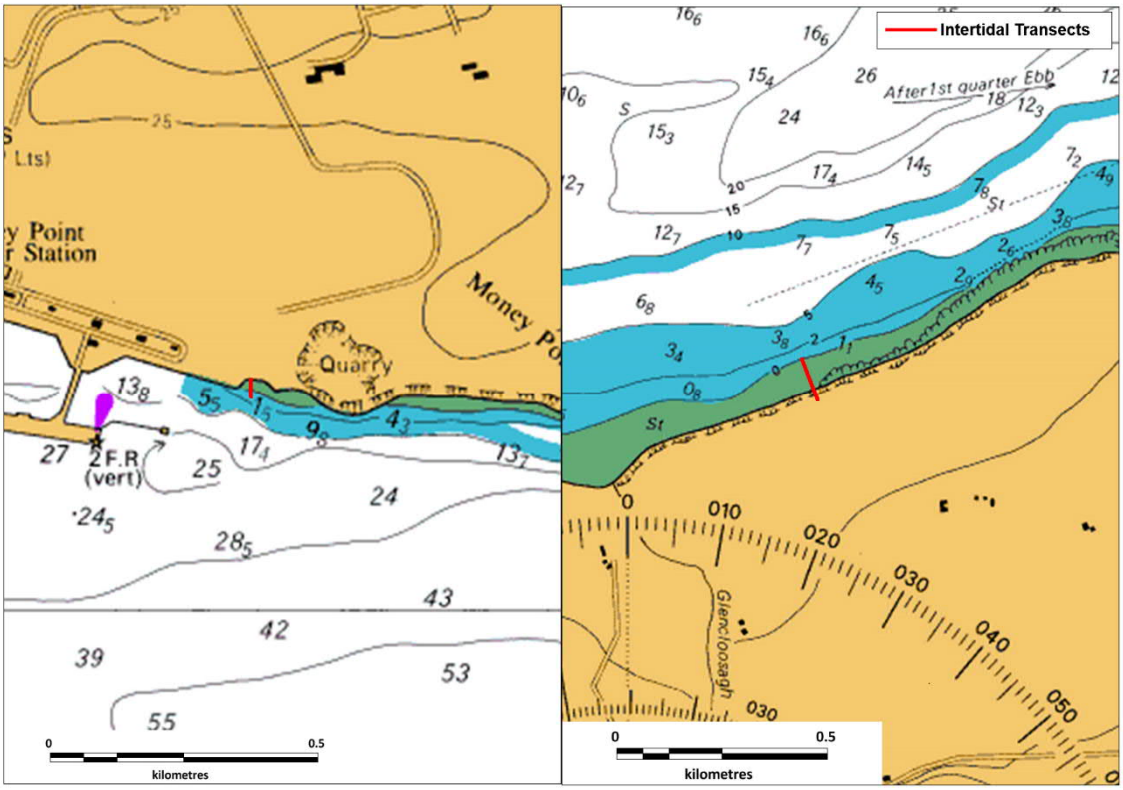
Habitat survey methods followed '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith *et al.,* Heritage Council, 2011) and habitat classification followed both Fossit (2000) and E.U. (2013).

7.2.4.2 Intertidal Surveys

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). These surveys were carried out under Spring tide conditions on September 29th and 30th, 2019.

Two transect lines (see Figure 7.1below) 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.

Figure 7.1: Location of two intertidal transect sites at Moneypoint (left) and Kilpaddoge (right), Shannon Estuary.



Source Aquafact Ltd (2020)

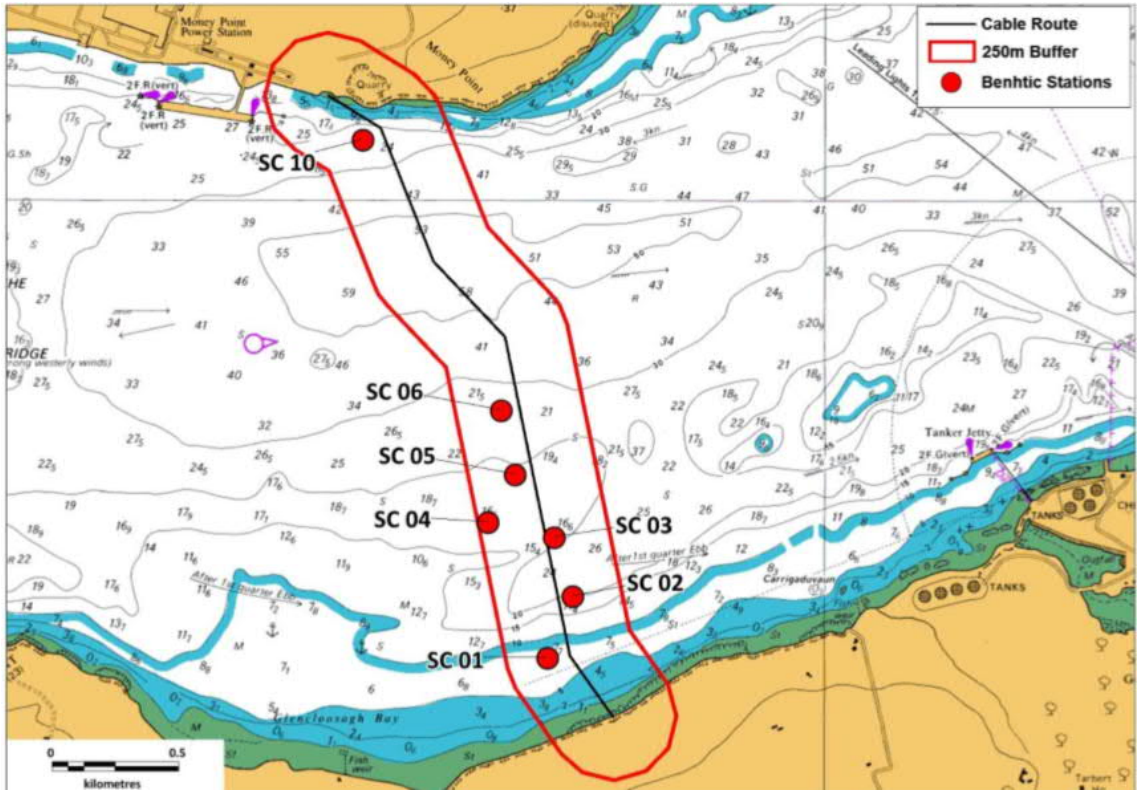
Where sediments were present, three core samples were taken for fauna and a 4th for sedimentary analyses. The same methodologies as described below for the subtidal survey was followed. Where hard substrates were encountered, taxa were identified *in situ* and their densities will be evaluated using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

7.2.4.3 Subtidal Surveys

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 7.2. The coordinates and depth of samples are set out in Table 7.1. 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 7.2: Location of the grab stations sampled in December 2019



Source Aquafact 2019

Table 7.1: Location of the subtidal benthic survey

Station	Latitude	Longitude	Depth (m)
SC1	52.58416	-9.40017	11
SC2s	52.58635	-9.39872	20.6
SC3	52.58843	-9.39981	19.7
SC4	52.58898	-9.40364	18.7
SC5	52.59068	-9.40208	20.1
SC6	52.59295	-9.40289	23.7
SC10	52.60254	-9.41097	18.9

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.

7.3 Baseline Environment

7.3.1 Designated Sites

Sites of International importance

The Birds Directive (2009/147/EC) and the Habitats Directive (92/42/EEC) put an obligation on EU Member States to establish the Natura 2000 network. The Natura 2000 network comprises sites of the highest biodiversity importance for rare and threatened habitats and species across the EU. In Ireland, the Natura 2000 network of European sites comprises Special Areas of Conservation (SAC) and Special Protection Areas (SPA). SACs are selected for the conservation of Annex I habitats (including priority types which are in danger of disappearance) and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and other regularly occurring migratory birds and their habitats.

The proposed development site overlaps the Shannon Estuary which has been designated as a Special Area of Conservation (Lower River Shannon SAC Site Code: 002165) and as a Special Protection Area (River Shannon and River Fergus Estuaries SPA Site Code: 004077).

Brief descriptions of the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA are presented below. The descriptions are based on Site Synopsis reports prepared for the sites (see NPWS 2013[27], 2015[28]):

The Lower River Shannon SAC features extensive expanses of intertidal mudflats, often fringed with saltmarsh vegetation. Plant species are typically scarce on the mudflats, although there are some eelgrass (Zostera spp.) beds and patches of green algae e.g. Ulva sp. The main macroinvertebrate community which has been recorded from the inner Shannon is a Macoma-Scrobicularia-Nereis community.

In the transition zone between mudflats and saltmarsh, specialised colonisers of mud e.g. Common Cord-grass (Spartina anglica) predominate. The dominant type of saltmarsh present is Atlantic salt meadow occurring over mud. Characteristic species occurring include Glasswort (Salicornia europaea), Common Saltmarsh-grass (Puccinellia maritima), Sea Aster (Aster tripolium), Thrift (Armeria maritima), Sea-milkwort (Glaux maritima), Sea Plantain (Plantago maritima), Red Fescue (Festuca rubra), Creeping Bent (Agrostis stolonifera), and Saltmarsh Rush (Juncus gerardi).

Most of the intertidal habitat west of Kilcredaun and Kilconly Points is bounded by rocky sea cliffs. The cliffs in the outer part of the site are sparsely vegetated with lichens, Red Fescue, Sea Beet (Beta vulgaris subsp. maritima), Sea Campion (Silene vulgaris subsp. maritima), Thrift and plantains (Plantago spp.).

The Shannon SAC represents an excellent example of a large shallow inlet and bay. 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.

The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and, as described above, are subject to strong tidal streams. The reefs are steeply sloping and show the classic algal and invertebrate zonation down to low water. Below low water, kelp (Laminaria spp) is common to depths of about 18 m. Deeper than this, it becomes rare and the

[27] NPWS 2013 Site Synopsis. Lower River Shannon SAC Site Code: 002165.

[28] NPWS 2015 Site Synopsis. River Shannon and River Fergus Estuaries Special Protection Area Site Code:

community is characterised by coralline crusts and red foliose algae. Other coastal habitats that occur within the estuary include stony beaches and bedrock shores (these support a typical zonation of seaweeds such as Fucus spp., Ascophyllum nodosum and kelps), shingle beaches, with species such as Sea Beet, Sea Mayweed - Matricaria maritima, Sea Campion and Curled Dock - Rumex crispus and sand dunes, a small area occurs at Beal Point, where Marram – Ammophila arenaria is the dominant species.

As noted for the intertidal reefs, the flora and fauna of the subtidal reefs and coarse sand are subject to high levels of sand scour and strong tidal flows and high levels of turbulence.

Regarding birds, the Shannon Estuary support the largest numbers of wintering waterfowl in Ireland. Species listed on Annex I of the E.U. Birds Directive which contributed to these totals include: Great Northern Diver, Whooper Swan, Brent Goose Golden Plover, and Bar tailed Godwit. In the past, three separate flocks of Greenland White fronted Goose were regularly found. Other wintering waders and wildfowl present include Greylag Goose Shelduck, Wigeon Teal, Mallard, Pintail, Shoveler, Tufted Duck, Scaup, Ringed Plover, Grey Plover, Lapwing, Knot, Dunlin, Snipe, Black-tailed Godwit, Curlew, Redshank, Greenshank and Turnstone).

A number of wintering gulls are also present, including Black-headed Gull, Common Gull and Lesser Black-backed Gull. This is the most important coastal area in Ireland for a number of the waders including Lapwing, Dunlin, Snipe and Redshank. It also provides an important staging ground for species such as Black-tailed Godwit and Greenshank.

A number of species listed on Annex I of the E.U. Birds Directive breed within the site. These include Peregrine Falcon, Sandwich Tern, Common Tern, Chough and Kingfisher.

There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary and this is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland. The population is estimated (in 2006) to be 140 ± 12 individuals. 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).

Otter, a species also listed on Annex II of this Directive, is commonly found in this part of the Shannon.

Five species of fish listed on Annex II of the E.U. Habitats Directive are found within the Shannon Estuary. These are Sea Lamprey (Petromyzon marinus), Brook Lamprey (Lampetra planeri), River Lamprey (Lampetra fluviatilis), Twaite Shad (Allosa fallax fallax) and Salmon (Salmo salar). The three lampreys and Salmon have all been observed spawning in the lower Shannon and in its tributaries. The lower reaches of the Fergus are important for spring salmon, while the Mulkear catchment has a grilse fishery, though spring fish are caught on the actual Mulkear River. The Feale/Cashen is also important for salmon.

Two additional fish species of note, listed in the Irish Red Data Book, also occur, namely Smelt (Osmerus eperlanus) and Pollan (Coregonus autumnalis), with only pollan having been observed spawning in the Shannon.

Because of the rich diversity of habitats (including priority habitat) and species that occur in the estuary, the Lower Shannon Estuary SAC is of very high conservation status and the fact that it supports a resident population of Bottle-nosed Dolphins gives it additional sensitivity.

The River Shannon and River Fergus Estuaries SPA - 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, e.g. Macoma-Scrobicularia-Nereis, 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, of special conservation interest 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. It 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 and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The site is the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl (57,133 - five year mean for the period 1995/96 to 1999/2000), a concentration easily of international importance. The site has internationally important populations of Light-bellied Brent Goose (494), Dunlin (15,131), Black-tailed Godwit (2,035) and Redshank (2,645). A further 17 species have populations of national importance, i.e. Cormorant (245), Whooper Swan (118), Shelduck (1,025), Wigeon (3,761), Teal (2,260), Pintail (62), Shoveler (107), Scaup (102), Ringed Plover (223), Golden Plover (5,664), Grey Plover (558), Lapwing (15,126), Knot (2,015), Bar-tailed Godwit (460), Curlew (2,396), Greenshank (61) and Black-headed Gull (2,681) - figures are five year mean peak counts for the period 1995/96 to 1999/2000. The site is among the most important in the country for several of these species, notably Dunlin (13 % of national total), Lapwing (6% of national total) and Redshank (9% of national total).

The site also supports a nationally important breeding population of Cormorant (93 pairs in 2010).

Other species that occur include Mute Swan (103), Mallard (441), Red-breasted Merganser (20), Great Crested Grebe (50), Grey Heron (38), Oystercatcher (551), Turnstone (124) and Common Gull (445) - figures are five year mean peak counts for the period 1995/96 to 1999/2000.

Apart from the wintering birds, large numbers of some species also pass through the site whilst on migration in spring and/or autumn. The River Shannon and River Fergus Estuaries SPA is an internationally important site that supports an assemblage of over 20,000 wintering waterbirds. It holds internationally important populations of four species, i.e. Light-bellied Brent Goose, Dunlin, Black-tailed Godwit and Redshank. In addition, there are 17 species that have wintering populations of national importance. The site also supports a nationally important breeding population of Cormorant. Of particular note is that three of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Golden Plover and Bar-tailed Godwit. Parts of the River Shannon and River Fergus Estuaries SPA are Wildfowl Sanctuaries.

With regard to other types of nature conservation sites in the area, it can be stated that in relation to the proposed development site:

- No National Parks occur within the proposed development boundary;
- No Natural Heritage Areas occur within the proposed development boundary (a proposed NHA at Tarbert is *approximately* 5km to the east of the site while any other NHA are *approximately* 20 km away from the area;

- No Nature Reserves occur within the proposed development boundary
- No Ramsar sites occur within the proposed development boundary;
- No Wildfowl Sanctuaries occur within the proposed development boundary; and
- No Biosphere Reserves occur within the proposed development boundary.

7.3.2 Records of Protected species and habitats

Records of rare or protected flora and fauna within 10km of the proposed development (Grid Squares R04 and R05) were obtained from NPWS, National Biodiversity Data Centre (NBDC) for bat species only and Botanical Society for Britain and Ireland (BSBI). In addition, the Irish Whale and Dolphin Group (IWDG) was contacted to determine which cetacean species occur in that part of the Shannon. Aquafact ltd has previously worked on a number of marine survey projects in the Shannon including the environmental marine surveys undertaken to information the route selection assessment and results from these was used to inform the assessment.

Flora

The Online Atlas of Vascular Plants 2012-2020[29] and the National Invasive Species Database show no protected or invasive plant species within the proposed development boundary (note however only limited spatial data are available).

Marine Invertebrates

The results of the surveys presented below and provide detailed lists of both intertidal and subtidal invertebrate species. None of these are protected species.

Vertebrates

Cartilaginous, agnathan and bony fish species and amphibian reptile species that occur in the Shannon their International Union for Conservation of Nature (IUCN) status in Ireland and Europe and by which legal instruments they are protected are set out below.

Table 7.2: Cartilaginous, agnathan and bony fish species and amphibian reptile species that occur in the Shannon

Species	IUCN Status	Legal Instruments
Lesser Spotted Dogfish (*Scyliorhinus canicula*)	None	None
Sea Lamprey (*Petromyzon marina)*	Ireland – Near threatened Europe – Least concern	Habitats Directive [92/42/EEC] Annex II Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix III The Convention for the Protection of the marine Environment of the North-East Atlantic (OSPAR Convention) Fisheries Acts 1959 to 2006 Foyle Fisheries Act (NI) 1952 Foyle and Carlingford Fisheries Act 2007
River Lamprey (*Lampetra fluviatilis*	Ireland Least concern Europe Least concern	EU Habitats Directive [92/43/EEC] Annex II and V. Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix III. Fisheries Acts 1959 to 2006. Foyle Fisheries Act (NI) 1952.

[29] (National Biodiversity Data Centre, Ireland, June 2020

Species	IUCN Status	Legal Instruments
		Foyle and Carlingford Fisheries Act 2007
Pollack (*Pollachius pollachius*	None	None
Butterfish (*Pholis gunnellus*)	None	None
Goby (*Gobius paganellus*)	None	None
Blennie species (*Blennius sp.*)	None	None
Wrasse species (*Labridae*)	None	None
Eel (*Anguilla Anguilla*)	Ireland critically endangered Europe critically endangered	Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel. The Regulation and Management of Eel Fishing Bye - Law No 752, 1998 which totally bans eels fishing in Ireland
Conger eel (*Conger conger*)	None	None
Lumpsucker (*Cyclopterus lumpus*)	None	None
Flounder (*Platichthys flesus*)	None	None
Twaite Shad (*Allosa fallax*)	Ireland – Vulnerable Europe – Least concern	EU Habitats Directive [92/43/EEC] Annex II and V. Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix III. Fisheries Acts 1959 to 2006. Foyle Fisheries Act (NI) 1952. Foyle and Carlingford Fisheries Act 2007
Smelt (*Osmerus eperlanus*)	Ireland – Least concern (Red list 2011) Europe – Least concern	Foyle Fisheries Act (NI) 1952 Foyle and Carlingford Fisheries Act 2007
Pollan (*Coregonus autumnalis*)	Ireland - Vulnerable Europe - Endangered	Habitats Directive Annex V Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix III Fisheries Acts 1959 to 2006
Salmon (*Salmo salar*)	Ireland - Vulnerable Europe – Vulnerable	Habitats Directive [92/42/EEC] Annex II, Annex V Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix III (in freshwater only) Fisheries Acts 1959 to 2006 The Convention for the Protection of the marine Environment of the North-East Atlantic (OSPAR) Fisheries Acts 1959 to 2006 Fisheries Act (Northern Ireland) 1966 Foyle Fisheries Act (NI) 1952 Foyle and Carlingford Fisheries Act 2007
Common frog (Rana temporaria	Ireland – Least concern (Ireland Red list 2011)	EU Habitats Directive [92/43/EEC] Annex V Wildlife Act, 1976

Species	IUCN Status	Legal Instruments
	Europe – Least concern	Wildlife Amendment Act, 2000
Newt (Lissotriton vulgaris	Ireland – Least concern (Ireland Red list 2011) Europe – Least concern	Wildlife Act, 1976 Wildlife Amendment Act, 2000
Viviparous lizard (Zootoca vivipara) (previously Lacerta vivipara	Ireland – Least concern (Ireland Red list 2011) Europe – Least concern	Wildlife Act, 1976 Wildlife Amendment Act, 2000
Leatherback turtle (Dermochelys coriacea) may also occur in the outer parts of the SAC	Ireland - Least Concern Northwest Atlantic sub-population - Least Concern Southeast Atlantic sub-population - Data deficient	Habitats Directive (92/43/EEC), Annex II, Annex IV Convention on the International Trade in Endangered Species of Flora and Fauna Appendix I Convention of the Conservation of Migratory Species of Wild Animals Appendix I Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix II The Convention for the Protection of the marine Environment of the North-East Atlantic (OSPAR Convention) Wildlife Act (1976), as amended Wildlife (Amendment) Act, 2000

Birds

The proposed submarine development area lies within the River Shannon and River Fergus Estuaries SPA (IE004077). The SCIs for which the River Shannon and River Fergus Estuaries SPA is designated are listed in Table 7.3 alongside conservation objectives set for the features. Table 7.3 also outlines the broad ecological groups to which the SCIs are assigned

As described above, a *Screening Statement for AA and NIS* that has been prepared for the applications of consent for the proposed development considered potential impact to SCIs for which the River Shannon and River Fergus Estuaries SPA is designated. The assessment of potential impact to SCIs considers the typical foraging behaviour of the SCI species and the location of the proposed development relative to SCI habitats.

Light-bellied Brent Goose, a feature for which the River Shannon and River Fergus Estuaries SPA is designated, utilise intertidal areas to feed. Suitable intertidal foraging habitat for the species are not found within or immediately adjacent to the proposed development. Consequently, it can be concluded that the species is unlikely to occur near the proposed development. The Screening for AA concluded that there is no potential pathway for significant effects as there is no viable pathway for effects to habitats used for foraging by the species; consequently potential effects to Light-bellied Brent Goose were screened out.

In contrast, given the deep diving, shallow diving and/ or dabbling marine foraging behaviour of the following SCI bird species, the Screening for AA identified potential pathways for effects to Bar-tailed Godwit, Black-headed Gull, Black-tailed Godwit, Cormorant, Curlew, Dunlin, Golden Plover, Greenshank, Grey Plover, Knot, Lapwing, Pintail, Redshank, Ringed Plover, Scaup, Shelduck, Shoveler, Teal, Whooper Swan, Wigeon. In addition, the Screening for AA concluded that there is also potential for effects to the SCI habitat Wetland [A999]. Assessment of the potential effects to these SCI species and habitat were undertaken. The assessments which are provided in full in Section 3 of the *Screening Statement for AA and NIS* report are summarised below.

Table 7.3: Special Conservation Interests of River Shannon and River Fergus Estuaries SPA (NPWS 2012[3], 2013[4]).

SCI Ecological Group	Special Conservation Interest	Conservation Objective
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
	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/ utilise intertidal areas to feed. Non-diving.	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]	To maintain the favourable conservation condition
Habitat	Wetland [A999]	To maintain the favourable conservation condition

As the low lying terrestrial habitats on both sides of the Shannon in the vicinity of Moneypoint and Kilpaddoge are agricultural in nature and there are no wetlands or water ways, indigenous bird species are restricted to the commoner species such as listed in Table 7.4 below.

Table 7.4: NBDC records of Indigenous Bird Species within the wider area

Species
Kestrel (Falco tinnunculus, Amber)
Sparrowhawk (Accipiter nisus
Pheasant (Phaisanus colchicus
Wood Pigeon (Columba polumbus
Collard Dove (Streptopelia risoria
Meadow Pipit (Anthus praetensis
Pied Wagtail (Motacilla alba)
Wren (Troglodytes troglodytes
Hedge Sparrow (Prunella modularis
Blackbird (Turdus merula
Song Thrush (Turdus philomelos,)
Mistle Thrush (Turdus viscivorus)
Robin (Erithacus rubecula
Stonechat (Saxicola torquatus)
Blue Tit (Cyanistes caeruleus)
Great Tit (Parus major)
Grey Crow (Corvus cornix),
Rook (Corvus frugilegus)
Jackdaw (Corvus monedula),
Magpie (Pica pica)
Starling (Sturnus vulgaris)
House Sparrow (Passer domsesticus, Amber)
Chaffinch (Fringilla coelebs)
Bullfinch (Pyrrhula pyrrhula),
Linnet (Carduelis cannabina),
Goldfinch (Carduelis Carduelis)
Greenfinch (Chloris chloris)

However, it is possible that Peregrine Falcons (*Falco peregrinus*, Green) would hunt over the area and both Barn (*Tyto alba,* Red) and Long Eared Owls (*Asio otis*, Green) have also been recorded in the general area. Ravens (*Corvus corax*, Green) most likely occur sporadically at the location. Summer visitors include Terns (*Sterna* spp) Swallow (*Hirundo rustica*), House Martin (*Delichon urbicum*), Swift (*Apus apus*), Chiffchaff (*Phylloscopus collibita*), Willow Warbler (*Phylloscopus trochilus*), Sedge Warbler (*Acrocephalus sheonobanus*) and Spotted Flycatcher (*Muscicapa* striata) while winter visitors include Redwing (*Turdus iliacus*) and Fieldfare (*Turdus pilaris*). Snipe (*Gallinago* gallinago) and Woodcock (*Scolopax rusticola*) may also be present in the early Autumn and Snipe may occur throughout the Winter. The Birds of Conservation Concern in Ireland (BoCCI[30]) conservation status of these species are presented in Table 7.6.

[30] Colhoun, K and Cummins, S., 2013. Birds of Conservation Concern in Ireland 2014–2019. Irish Birds 9: 523-544 (2013). https://birdwatchireland.ie/birds-of-conservation-concern-in-ireland-2014-2019/

Table 7.5: Common Birds Species.

Common Name [Scientific Name, Conservation Status (i.e. BoCCI conservation list)]	
Barn (*Tyto alba,* Red)	Long Eared Owls (*Asio otis*, Green)
Blackbird (*Turdus merula*, Green)	Magpie (*Pica pica*, Green)
Blue Tit (*Cyanistes caeruleus*, Green)	Meadow Pipit (*Anthus praetensis*, Red)
Bullfinch (*Pyrrhula pyrrhula*, Green)	Mistle Thrush (*Turdus viscivorus*, Amber)
Chaffinch (*Fringilla coelebs*, Green)	Pheasant (*Phaisanus colchicus*, not listed)
Collard Dove (*Streptopelia risoria,* Green)	Pied Wagtail (*Motacilla alba,* Green)
Peregrine Falcons (*Falco peregrinus*, Green)	Ravens (*Corvus corax*, Green)
Goldfinch (*Carduelis Carduelis*, Green)	Robin (*Erithacus rubecula,* Amber)
Great Tit (*Parus major*, Green)	Rook (*Corvus frugilegus*, Green)
Greenfinch (*Chloris chloris*, Amber)	Song Thrush (*Turdus philomelos*, Green)
Grey Crow (*Corvus cornix*, Green)	Sparrowhawk (*Accipiter nisus*, Amber)
Hedge Sparrow (*Prunella modularis*, Green)	Starling (*Sturnus vulgaris*, Amber)
House Sparrow (*Passer domsesticus*, Amber)	Stonechat (*Saxicola torquatus*, Amber)
Jackdaw (*Corvus monedula*, Green)	Wood Pigeon (*Columba polumbus,* Green)
Kestrel (*Falco tinnunculus*, Amber)	Wren (*Troglodytes troglodytes*, Green)
Linnet (*Carduelis cannabina*, Amber)	

Table 7.6: Summer, Autumn and Winter Visitor Birds Species

Common Name [Scientific Name, Conservation Status (*i.e.* BoCCI conservation list)]	
Chiffchaff (*Phylloscopus collibita*, Green)	Swift (*Apus apus,* Amber)
Fieldfare (*Turdus pilaris*, Green)	Sandwich Tern (Sterna *sandvicensis*, Amber)
House Martin (*Delichon urbicum,* Amber)	Roseate Tern (*Sterna dougallii*, Amber)
Redwing (*Turdus iliacus*, Green)	Common Tern (Sterna hirundo, Amber)
Sedge Warbler (*Acrocephalus sheonobanus*, Green)	Arctic Tern (Sterna paradisaea, Amber)
Snipe (*Gallinago gallinago*, Green)	Willow Warbler (*Phylloscopus trochilus*, Green)
Spotted Flycatcher (*Muscicapa striata,* Amber)	Woodcock (*Scolopax rusticola*, Amber)
Swallow (*Hirundo rustica,* Amber)	

Mammals

NBDC records the following two species of marine mammal: Bottle-nosed Dolphin (*Tursiops truncatus*) and Common Dolphin (*Delphinus delphis*). Porpoises (*Phocoena phocoena*), although rare, are also present in the area (Berrow, pers.comm.). The IUCN status in Ireland and Europe for Bottle-nosed Dolphin, Common Dolphin and Common Porpoise are listed below alongside the legal instruments under which the species are protected.

Table 7.7: NBDC records of Mammals and IUCN Status and Legal Protection

Species	Status	Legal Protection
Bottle nose Dolphin (Tursiops truncatus	Ireland Not Evaluated – no Irish red list for marine mammals Europe Data Deficien	Habitats Directive (92/43/EEC), Annex II, Annex IV Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix II Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) Appendix II Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II The Convention for the Protection of the marine Environment of the North-East Atlantic (OSPAR) Council Regulation (EC) No. 812/2004 Wildlife Act (1976) Wildlife (Amendment) Act (2000) Whale Fisheries Act 1937 *Only particular populations are protected by this Convention, but individuals of some of those populations may occur in Irish waters
Common Dolphin (Delphinus delphis)	Ireland – Not Evaluated – no Irish red list for marine mammals Europe – Data Deficient	Habitats Directive (92/43/EEC), Annex II, Annex IV Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix II Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) Appendix II* Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II Council Regulation (EC) No. 812/2004 Wildlife Act (1976) Wildlife (Amendment) Act (2000) Whale Fisheries Act 1937 *Only particular populations are protected by this Convention, but individuals of some of those populations may occur in Irish waters.
Common porpoise (Phocoena phocoena)	Ireland – Not Evaluated – no Irish red list for marine mammals Europe – Least concern	Habitats Directive (92/43/EEC), Annex II, Annex IV Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix II Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) Appendix II Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II The Convention for the Protection of the marine Environment of the North-East Atlantic (OSPAR) Council Regulation (EC) No. 812/2004 Wildlife Act (1976) Wildlife (Amendment) Act (2000) Whale Fisheries Act 1937 *Only particular populations are protected by this Convention, but individuals of some of those populations may occur in Irish waters

In Ireland, five SACs including the Lower River Shannon SAC (002165) have been designated for the Bottle-nosed Dolphin while no SAC have been designated for Common Dolphin. Three SACs have been designated for Common Porpoise. With the exception of the Lower River Shannon SAC which coincides with the proposed development, the SACs designated for Common bottle-nosed Dolphin and Common Porpoise are not near enough to the development to be of relevance.

Table 7.8: SACs designated for Common Bottle-nosed Dolphins

Site Name (Site Code)
Duvillaun Islands SAC (000495)
Lower River Shannon SAC (002165)
Slyne Head Islands SAC (000328)
Slyne Head Peninsula SAC (002074)
West Connacht Coast SAC (002998)

Table 7.9: SACs designated for Common Porpoise

Site Name (Site Code)
Blasket Islands SAC (002172)
Roaringwater Bay and Islands SAC (000101)
Rockabill to Dalkey Island SAC (003000)

Non-chiropteran terrestrial mammals recorded in the general area are noted in Table 7.10 The IUCN status in Ireland and Europe for each are summarised in Table 7.10 alongside the legal instruments under which the species are protected.

Table 7.10: NBDC records of Non-Chiropteran Terrestrial Mammal and IUCN Status and Legal Protection

Species	Status	Legal Protection
European rabbit (Oryctolagus caniculus)	Ireland - Near Threatened (Mammal red list 2019) Europe – Near threatened	No protection - Invasive species
Brown Hare (Lepus europaeus)	Ireland – Least concern Europe – Least concern	Ireland – Least concern Europe – Least concern
Red Fox (Vulpes vulpes)	Ireland – Least concern (Mammal red list 2019) Europe – Least concern	Not protected
Brown Rat (Rattus norvegicus	Ireland – Least concern (Mammal red list 2019) Europe – Least concern	No protection - Invasive species
Pygmy Shrew (Sorex minutus	Ireland – Least concern (Mammal red list 2019) Europe – Least concern	Wildlife Act, 1976 Wildlife (Amendment) Act, 2000
Irish stoat (Mustela erminea hibernica	Ireland – Least concern (Mammal red list 2019) Europe – Least concern	Wildlife Act, 1976 Wildlife (Amendment) Act, 2000
Badger (Meles meles	Ireland – Least concern (Mammal red list 2019) Europe – Least concern	Wildlife Act, 1976 Wildlife (Amendment) Act, 2000
Red Squirrel (Sciurus vulgaris	Ireland – Least concern (Mammal red list 2019) Europe – Least concern	Wildlife Act, 1976 Wildlife (Amendment) Act, 2000
Otter (Lutra lutra)	Ireland – Least concern (Mammal red list 2019) Europe – Near threatened	EU Habitats Directive [92/43/EEC] Annex II & IV Nine SACs listed for otter in N.I., 47 listed in RoI. Wildlife Act, 1976;

Species	Status	Legal Protection
		Wildlife (Amendment) Act, 2000; CITES Appendix 1
Hedgehog (Erinaceus europaeus	Ireland – Least concern (Mammal red list 2019) Europe – Least concern	Wildlife Act, 1976 Wildlife (Amendment) Act, 2000

Bat species recorded on either side of the Shannon in the Moneypoint – Kilpaddoge area include Common and Soprano Pipistrelle (*Pipistrellus pipistrellus* and *P. pygmaeus*), Daubenton's (*Myotis daubentoni*), Whiskered (*Myotis mystacinus*), Long eared (*Plecotus auritus*) and Leisler's Bat (*Nyctalus leisleri*). Lesser Horseshoe Bats (*Rhinolophus hipposideros*) have been recorded just north of Moneypoint, (approximately 500m north of the existing GIS substation) and near Kilrush, Co. Clare (*approximately* 7km West of Moneypoint) and East of Tarbert, Co. Kerry (*approximately* 8 km East of Moneypoint. All bat species are protected under the EU Habitats Directive 92/43.

The Lesser horseshoe bat (*Rhinolophus hipposideros* Bechstein) (EU Habitats Directive species code 1303) is protected by European legislation through its listing on Annex II and Annex IV of the EU Habitats Directive (Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora). In Ireland, the species is also protected under the Wildlife (Amendment) Act, 2000. In Ireland it can be found in six west coast counties: Mayo, Galway, Clare, Limerick, Cork and Kerry (McAney, 1994).

With regard to foraging distances, some researchers have found that Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Bontadina *et al*., 2002); thus, for each roost, a 2.5km zone is considered an appropriate distance to foraging areas for the purpose of the current SSCO targets. The 2.5km zone around each known roost is mapped and potential foraging grounds within the zone are identified and mapped for each SAC. There are no SACs for *Rhinolophus hipposideros* within ~20km of the proposed develoment.

No terrestrial invasive plant species, as listed in the Birds and Habitats Regulations, were recorded within either site. The non-native Pacific Oyster (*Crassostrea gigas*) has been recorded near Tarbert (Marine Institute, 2016) and it has the potential to successfully compete for space both intertidally and subtidally with the native epibionts.

7.3.3 Results of field surveys

Onshore Habitats and flora

The proposed Kilpaddoge AIS extension and associated underground cable connection is predominately located in agricultural grasslands parts of which are heavily poached by stock (see Figure 7.3 for evidence of use by horses).

Plant species recorded included Gorse (*Ulex europaeus*), Nettle *(Urtica dioica*), Ox eye daisy (*Chrysanthemum leucanthemum*), Bracken (*Pteridium aquilinium*), Red and White Clover (*Trifolium pratense* and *T. repens*), Vetch (*Vecia cracca),* Holly (*Ilex aquifolium)*, Hawthorn (*Crategus monogyna)*¸ Blackthorn (*Prunus spinosa*), Daisy (*Belis perennis*), Spanish Chestnut (*Castanea sativa)*(non-Native), Honeysuckle (*Lonicera* spp). Bird's foot trefoil (*Lotus corniculatus),* Dock *(Rumex* spp), Thistle (*Cirsium),* Cleavers*, (Geum urbanum)*, Iris (*Iris pseudacorus*) Ivy (*Hedera helix)*, Perennial rye grass (*Lolium perenne*), Cock's foot (*Dactylus glomerata*), Oat grass (*Arrenatherum elatius*), Dandelion (*Taraxacrum* spp), Knapweed

(*Centaurea nigra*), Meadow sweet (*Filipendula ulmaria)*¸Rush (*Juncus effusus)* and Willow (*Salix* spp).

Figure 7.3: Evidence of use by Horses at Kilpaddoge.

Source Aquafact Ltd 2020

Figure 7.4: Gorse, Ox eye daisy, Bracken and Bramble at the Kilpaddoge site

Source Aquafact Ltd 2020

Figure 7.5: Spanish Chestnut at the Kilpaddoge site.

Source Aquafact Ltd 2020

Figure 7.6: General view of the terrestrial habitat at the Kilpaddoge site with grasses, gorse and hedgerow

Source Aquafact Ltd 2020

The habitats fall into the following as described by Fossit (2000): improved grassland habitat (GA1) and dry meadow with grassy verges (GS2). Both of the grassland types are separated by hedgerow (WL1).

None of these habitats are Qualifying Interest or Annex 1 habitats for the Lower Shannon SAC. The agricultural grassland was considered as having local low value as the habitat is common throughout the wider environs and contains a low diversity of species.

At the Moneypoint site, the terrestrial habitat is dominated by Gorse, Blackthorn and Ivy with some bracken see Figure 7.7.

Figure 7.7: Scrub habitat at Moneypoint site with Gorse, Ivy, Blackthorn and Bramble Insert Figure Caption - Update fields via ribbon

Approximately 280m of the proposed underground cable connection will be routed through a private landholding located directly north of the proposed landfall location. These lands are predominately agricultural grasslands and scrub, including some gorse with some hedgerow through which agricultural road tracks pass. There is also a disused quarry (*approx* 200m to the east) and a cattle shed (*approx* 350m) further to the east of the landfall site.

The proposed underground cable connection will run along an existing internal track located east of the existing 220 kV Cable connection and north of the existing an extensive coal yard

and ash storage area located within the existing Moneypoint Generating Station Complex. Recolonising bare ground habitat is present in a patchy mosaic with the dry grassland. The cables connects into the existing Moneypoint GIS substation.

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. However Aquafact has determined this does not qualify as 1230 Vegetated sea cliff habitat, due to the absence of characteristic maritime plant communities there.

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 7.8: QI Sea Cliff Habitat of the Lower River Shannon, east of the Moneypoint site showing Thrift and Samphire

. Source: Aquafact Ltd 2020

Figure 7.9: Sea Plantain and Thrift on the sea cliff habitat east of the Moneypoint site

Protected and Rare Plant Species

No species listed under the Flora Protection Order (Flora (Protection) Order (2015). S.I. No. 356/2015) or habitats protected under the Habitat Directive were recorded within the footprint of the proposed development site during the surveys undertaken on the survey dates listed above and no protected or vulnerable species have previously been recorded within the area.

Invasive Plant Species

No terrestrial invasive plant species as listed in the Birds and Habitats Regulations were recorded at either site.

Other Marine/Intertidal QI Habitats

The Conservation Objectives report (NPWS 2012[31]) and the Conservation Objectives Backing Document (NPWS, 2012[32]) prepared by NPWS for the Lower River Shannon SAC (Site code: 002165) maps the intertidal area at the Killpaddoge landfall as the marine community type (MCT) Fucoid-dominated intertidal reef community complex within the Qualifying Interest habitats of Estuaries (1130) and Reef (1170). The spatial of the MCT within the Qualifying Interest habitats Estuaries (1130) and Reef (1170) is 678ha and 1,294ha respectively. The MCT is recorded intertidally in the western reaches of the SAC from Kerry Head to Tarbert in the south and from Ross Bay to Kilkerin Point in the north. Where the MCT occurs in the outer more exposed shores, north of Kerry Head and south of Loop Head, the substrate is predominantly bedrock, while elsewhere the substrate is cobbles or boulders or bedrock or a combination of these. The biota of this MCT community is dominated by the fucoid algae *Fucus vesiculosus*, *F. spiralis* and *F. serratus*. The associated flora includes *Ulva* sp., *Porphyra umbilicalis*, *Ralfsia* sp., *Corallina officinalis* and encrusting red algae. The associated fauna includes the gastropods *Patella* sp., *Littorina saxatilis*, *Melarhaphe neritoides* and *Nucella* sp., the polychaetes *Pomatoceros* sp. and *Spirorbid* spp. and barnacles including *Elminius modestus*, *Chthamalus montagui* and *C. stellatus.*

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. However, Aquafact has determined this does not qualify as 1230 Vegetated sea cliff habitat, due to the absence of characteristic maritime plant communities there.

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.

[31] NPWS 2012 Conservation Objectives Series. Lower River Shannon SAC Site Code: 002165.

[32] NPWS 2012 Lower River Shannon SAC (site code: 2165) Conservation objectives supporting document marine habitats and species Version 1 March 2012

Figure 7.10: Northern termination of the cable route showing boulders, stones, exposed bedrock and vertical cliff habitat.

Source Aquafact Ltd, 2017

Figure 7.11: Intertidal habitat at Kilpaddoge showing boulders, stones and gravels and a thin band of *Pelvetia canaliculate*

Source Aquafact Ltd, 2017

Figure 7.12: Intertidal habitat at Kilpaddoge showing stones with *Fucus vesiculosus*, *Ascophyllum nodosum*, littorinids and cirripedes

Source Aquafact Ltd, 2017

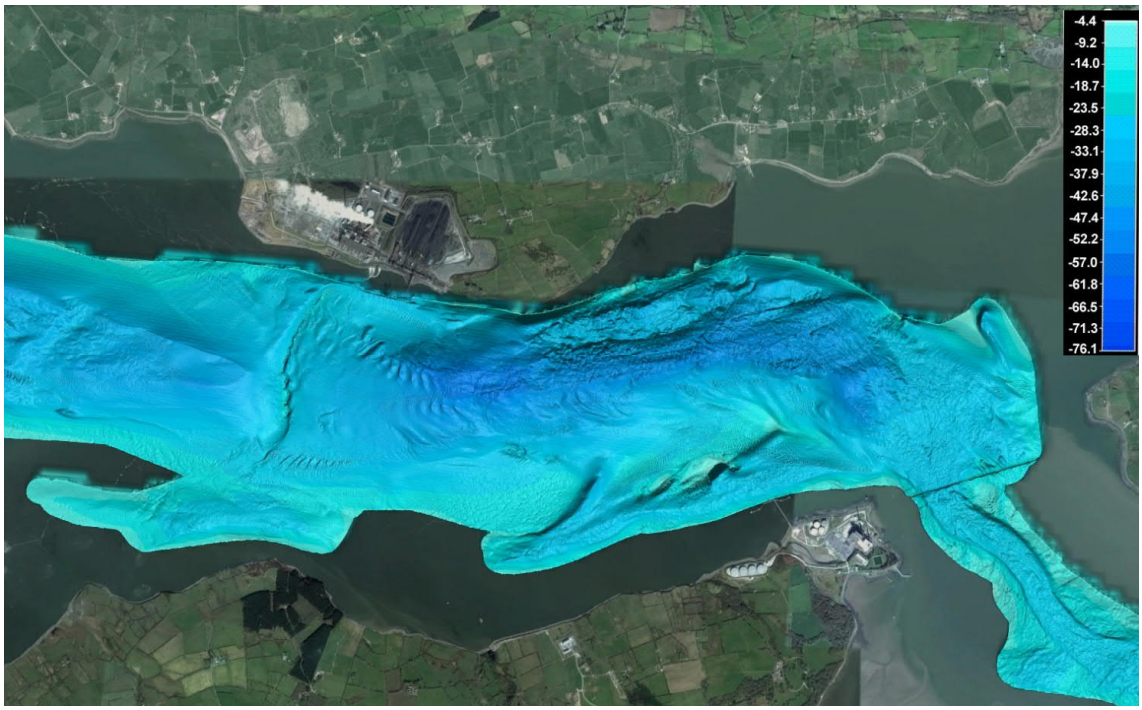
Figure 7.13: Intertidal habitat at Kilpaddoge showing exposed bed rock and fucoids

Source: Aquafact 2017

7.3.3.1 Subtidal habitats

The proposed submarine cable route will run from the high water mark across the estuary in waters with a maximum depth of approx. 60m. 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 7.14 shows multibeam data of the seabed in the cable laying area indicating seabed topography and bathymetry

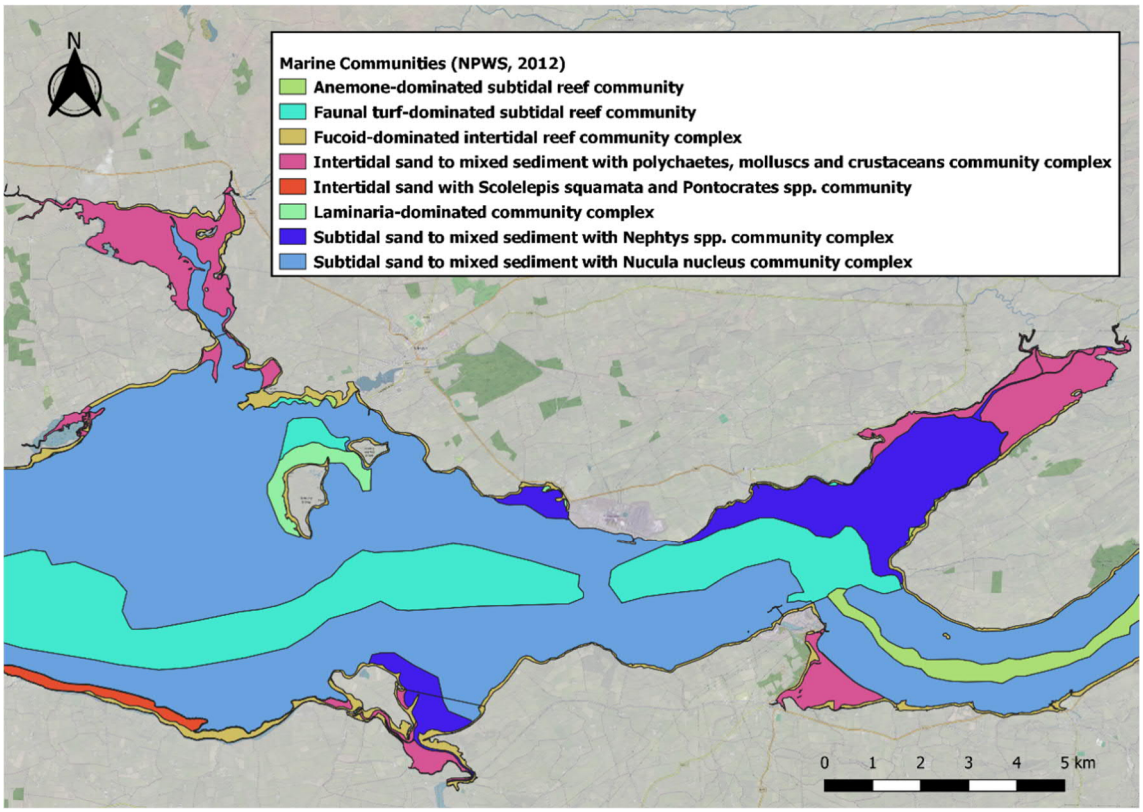
Figure 7.14: Multibeam data of the cable laying area



Source: INFOMAR & Google Earth

Figure 7.15 shows the marine habitats in the cable laying area derived from NPWS Conservation Objective mapping for Lower River Shannon cSAC (IE002165). 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’.

Figure 7.15: Subtidal marine habitats in the cable laying area (NPWS, 2012).



Historically surveys previously carried out within the estuary undertaken by AQUAFACT (2008; 2009) recorded the following species from the 'subtidal sand to mixed sediment with *Nucula nucleus* community complex' an assemblage that that occurs within both Large Shallow Bay and Inlet and Estuary that are Qualifying Interests for the Lower Shannon SAC: 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' an assemblage that that occurs within both Large Shallow Bay and Inlet and Estuary that are Qualifying Interests for the Lower Shannon SAC: 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' an assemblage which occurs within Reef habitat that is a Qualifying Interest for the Lower Shannon SAC, 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 7.16 shows some images from the rocky seabed.

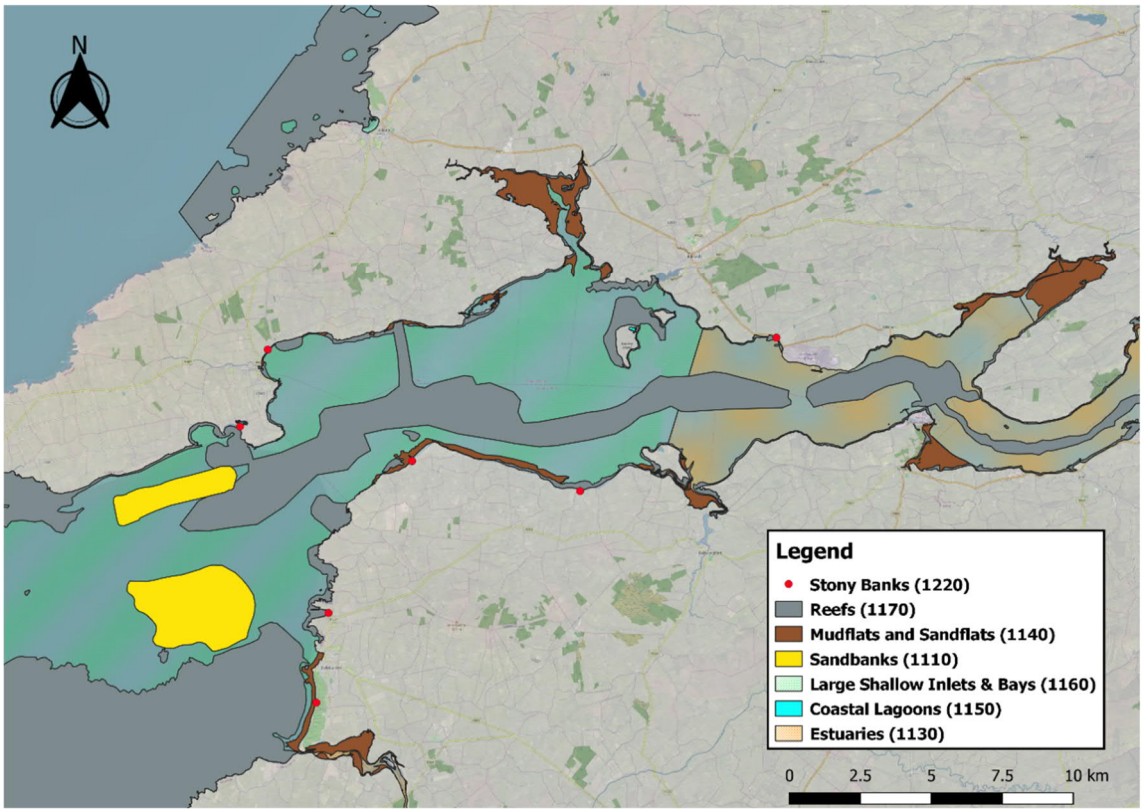
Figure 7.16: Representative images from rocky seabed within the cable laying area

Source: AQUAFACT, 2008

The 'fucoid dominated intertidal reef' which occurs within Reef habitat that is a Qualifying Interest for the Lower Shannon SAC, 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. None of these species are rare in Irish coastal seas.

Figure 7.17 shows the Annex 1 habitats and Qualifying Interest habitats for the Lower Shannon SAC in the vicinity of the proposed development site boundary. The submarine installation area overlaps the reef (1170) and estuary (1130) habitats. The stony bank (1220) habitat is located above the high-water mark and proposed development will not encroach on this.

Figure 7.17: Annex 1 habitats within the proposed development area (NPWS,2012).



7.3.3.2 Fauna

Dolphins

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 five 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) 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). 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 development is located in an area of the Lower River Shannon SAC identified as important for bottlenose dolphin (NPWS, 2012). Specifically, the proposed development is located in a critical habitat area identified for the species (NPWS, 2012[1]). Critical habitat areas are preferentially used by the species. Furthermore, the proposed development is located in an area identified by Berrow *et al*. (2012) as having high habitat suitability for the species (see Figure 7.20). Surveys reported by Rogan *et al*. (2018) indicated relatively high counts of the species in the vicinity of the proposed development area.

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

Figure 7.18 shows monthly sightings data throughout the Estuary over a 2-year period from 1996-1997. In 2012, as part of the Strategic Integrated Framework Plan for the Shannon Estuary, Berrow *et al.* (2012a) attempted to identify and rate the important areas for bottle-nosed dolphins in the Shannon Estuary. Figure 7.19 shows the effort corrected encounter rate of bottle-nosed dolphins from Shannon dolphin tour boat data between 2000 - 2010 (Berrow *et al.,* 2012a).

Figure 7.18: Location of sightings of dolphin groups encountered during boat surveys between 1996 and 1997 (length of line denotes group size) (Rogan *et al.,* 2000).

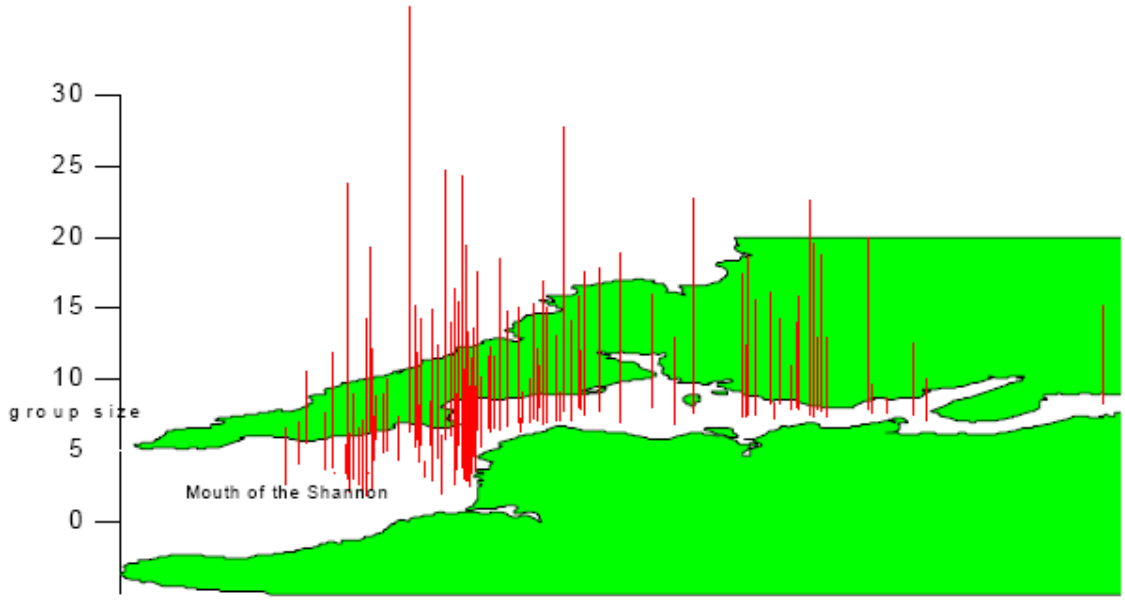


Figure 7.19: Location of sightings of dolphin groups encountered during boat surveys between 1996 and 1997 (length of line denotes group size) (Rogan *et al.*, 2000).

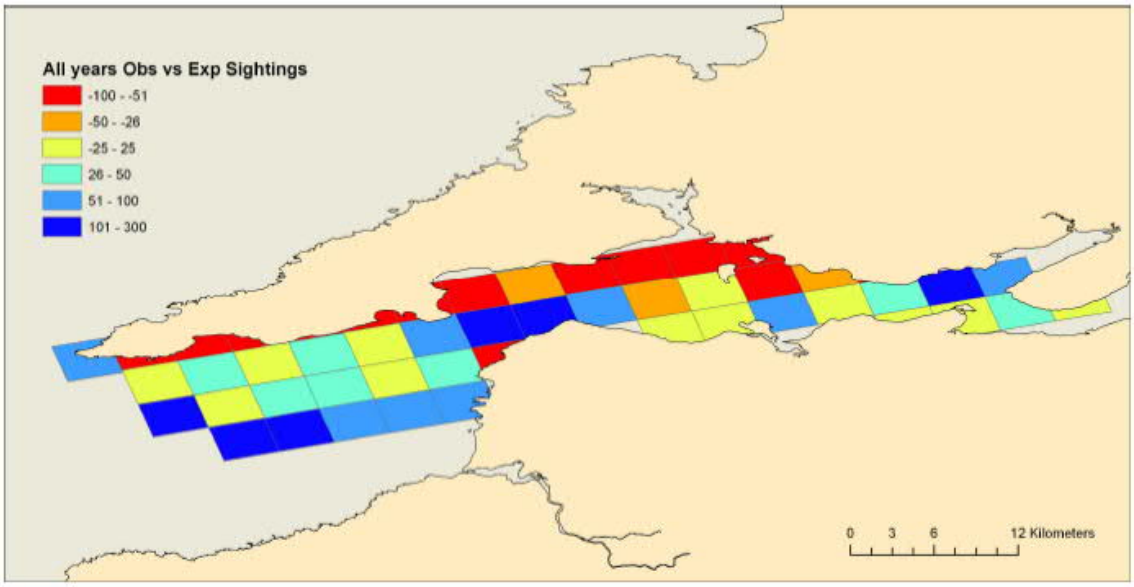


Figure 7.20: Effort corrected encounter rate of Bottle-nosed Dolphins from Shannon dolphin tour boat data between 2000-2010 (Berrow *et al.*, 2012a).

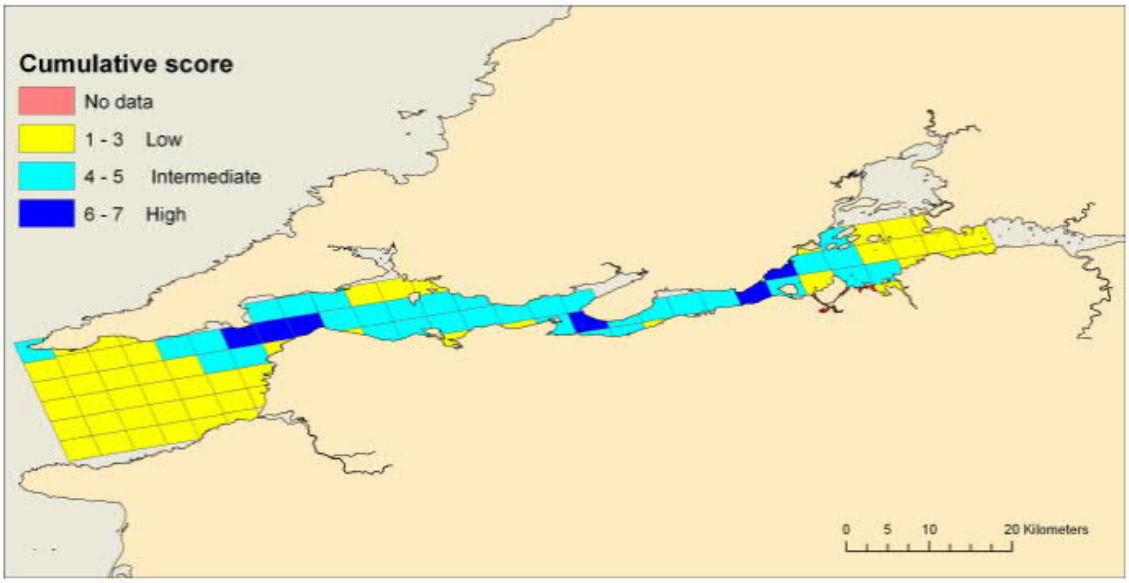
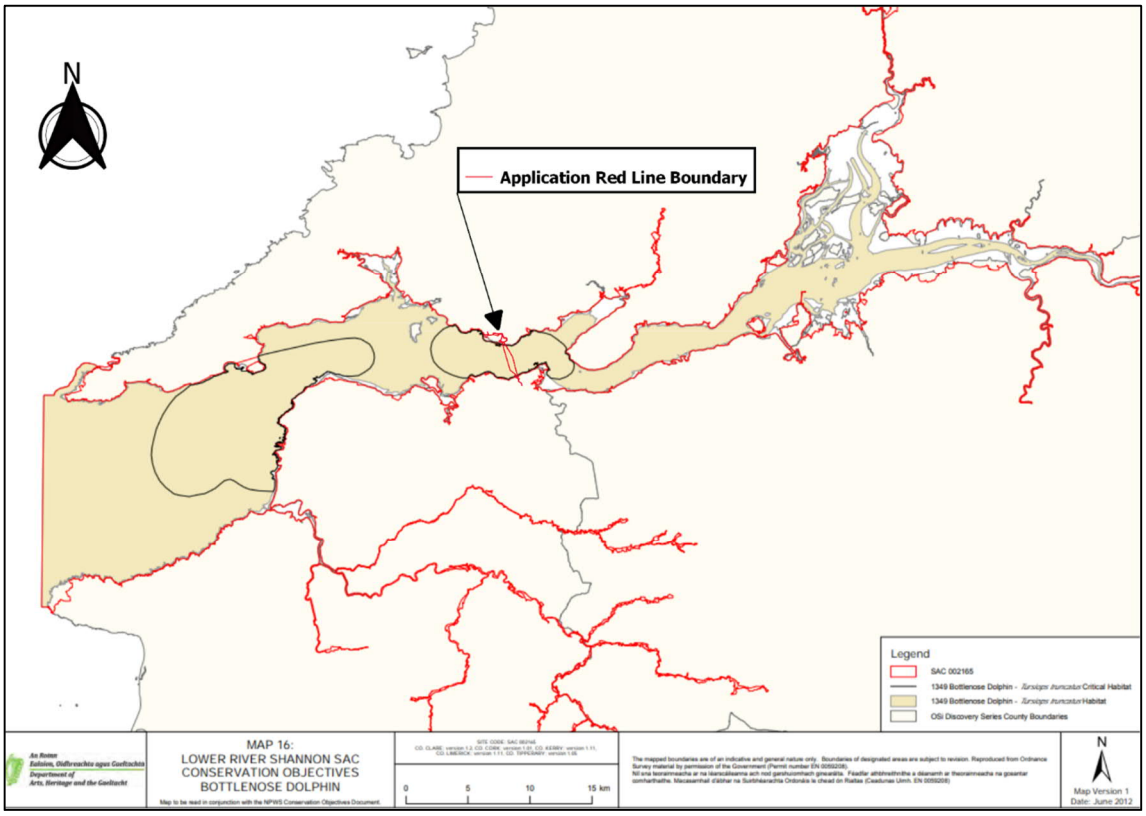


Figure 7.21: Bottlenose dolphin critical areas, representing habitat used preferentially by the species (adapted from NPWS 2012[1]



7.3.3.3 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 occur within the project area.

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 hours of 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, the River Mulchair, the River Maigue, the River Deel and the River Feale/Cashen.

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 below.

Otters

Otters and their breeding and resting places are protected under the Wildlife Act (Amendment Act, 2000) and under EU Habitats Directive. Otters typically forage within 80m of the coastline but can transverse distances of up to 500m between islands and between the mainland and islands. Their habitat overlaps the coastal section of the cable laying area. Bailey & Rochford (2006) revealed that otters are present throughout the Shannon Estuary. The sightings reported through the National Biodiversity Data Centre identify areas where freshwater enters the estuary as being more typical of otter usage *e.g.* Ballylongford Bay, Tarbert Bay, Kilrush (Data from the *Lutra lutra* database held by the National Biodiversity Data Centre www.biodiversityireland.ie, 05/04/2017). No evidence of otter holts or resting sites were observed within the proposed development site. That being said, otters do have the potential to occur within the proposed development area for periods of time.

Amphibians and Reptiles

As no ponds or pools were present at either landfall site location, no amphibians were recorded, no lizards were noted on site.

7.4 Potential Impacts

7.4.1 Designated Sites European Sites

A screening for Appropriate Assessment report (which accompanies this application) investigates the potential for the proposed development to have significant effects on European Site(s) either alone or in combination with other plans or projects. The Screening for Appropriate Assessment identified a source-pathway-receptor link between the proposed development and the Lower River Shannon SAC Site Code: 002165) and as a Special Protection Area (River Shannon and River Fergus Estuaries SPA Site Code: 004077). The screening assessment concluded, in light of best available scientific data, that there is potential for significant effects on the qualifying interests designated within the SAC and SPA.

A Natura Impact Statement (NIS) was therefore prepared to assess the potential for the proposed development to result in an adverse effect on the integrity of European sites. The NIS concludes that following implementation of mitigation measures, the proposed development either alone or in combination with other plans and projects, would have no adverse effects on the site's integrity, in view of the site's conservation objectives. The NIS will inform the AA determination of the competent authority.

7.4.2 Offshore Activities During the Construction Phase

Construction noise disturbance associated with trench excavation and cable laying activities.

Bottlenose dolphin

Bottlenose dolphins 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 (Potter and Delroy, 1998; Ansmann, 2005; Weilgart, 2007). 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 113m 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 (Richardson *et al*., 1995; Wright *et al*., 2007). 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. 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]) is assessed below. there will be no potential for significant adverse effects.

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 juvenile fish 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 the ability of fish 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.

Birds

As noted previously, the proposed submarine development boundary also overlaps the River Shannon and River Fergus Estuaries SPA (IE004077). Of the 21 SCIs, only 2, cormorant and black-headed gull, are open water species that have the potential to occur within the cable laying area. All the other species are either waders, duck or geese and these will be found only on mud flats or wading/dabbling in shallow water, a habitat that is not present at the site. There will be no potential for significant adverse effects.

Vessel Noise

It is expected that a cable laying barge or vessel of *approx.* 125m in length will be employed to carry out cable laying. Other vessels that will be required 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, while noise from engines originates inside the vessel and reaches the water through the hull of the vessel. Noise from shipping is roughly related to vessel size with larger ships having larger, slower rotating propellers. These 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 (DAHG, 2014). Dolphins, salmon and lamprey would hear such vessel noise.

EMODnet vessel density mapping indicates that shipping activity occurs in the vicinity of the cable laying project throughout the year with average monthly vessel density in 2017 and 2018 exceeding 100+ hours per km^2.

The presence of the project vessels noted above will not significantly increase the level of overall vessel activity or vessel engine noise in the area. As marine invertebrates have no auditory receptors, they will not be able to perceive noise from vessels and therefore will not be impacted.

No indirect impacts from vessel noise on marine invertebrates are predicted.

Glencloosagh Energy Limited (planning reference 19115A) locateda *approx.* 100m to the east of the Kilpaddoge substation for a land-based wind farm was granted planning permission from Kerry County Council for a grid stabilisation facility comprising the construction of up to four rotating stabilisers and five battery storage containers. Shannon Clean Tech Ltd for a Battery Energy Storage System (BESS) (planning reference 18878) was also granted consent from

Kerry County Council. As neither of these developments has a marine element to them, there will be no in-combination effects between them and the proposed development with regard to vessel noise.

As noted above, potential pathways for effects of the development were identified for SCI bird species of the River Shannon and River Fergus Estuaries SPA that exhibit deep diving, shallow diving and/ or dabbling foraging behaviour; the Special Conservation Interest species of concern are Bar-tailed Godwit, Black-headed Gull, Black-tailed Godwit, Cormorant, Curlew, Dunlin, Golden Plover, Greenshank, Grey Plover, Knot, Lapwing, Pintail, Redshank, Ringed Plover, Scaup, Shelduck, Shoveler, Teal, Whooper Swan, Wigeon. For these Special Conservation Interest species a NIS was prepared to assess the significance of effect to the species. The NIS concluded that of the Special Conservation Interest 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 NIS outlined that in the national Irish Offshore Strategic Environment Assessment 5 (IOSEA5 5; PAD, 2015[33]) 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 nesting sites (PAD, 2015a). As such, the IOSEA 5 assesses impact of seismic surveys on seabirds as 'Neutral'. The NIS concluded, however, that as the noise emissions anticipated from the proposed project are significantly less than that produced by large scale seismic surveys it is reasonable to conclude that construction noise arising from the proposed excavation and cable laying activities will have no significant adverse effects on the Special Conservation Interest species or on the Conservation Objectives of the River Shannon and River Fergus Estuaries SPA. .

It is understood that EirGrid is also proposing to undertake marine surveys to examine the need to repair or replace an existing underwater cable pipeline that crosses the Shannon from Tarbert power station, Co. Kerry to Prospect, Co. Clare. The survey is expected to be undertaken in 2020 in advance of the proposed development construction programme. This survey would also generate underwater noise. However, as the proposed development and survey will not occur concurrently, there will be no in-combination effects arising to affect either SCI.

Construction Noise

Construction activities such as cable burial, pre-lay grapnel clearance and the mass flow excavation will all generate some level of submarine noise. It is possible to calculate the sound level at different distances from a sound source. Many studies (*inter alia* National Marine Fisheries Service, 2016) have defined the sound level of 180 dB re 1µPa as "harassment" and 160 dB re 1µPa is the level likely to cause "behavioural response" *e.g.* avoidance.

Installation vessels (ships and barges, although more powerful than survey vessel, move at far slower speeds, typically 1 to 6 knots (~½ to 3 m/s). Sound source levels for these kinds of vessels are typically 155 to 170 dB re 1µPa m. For comparison, large commercial ships

[33] 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

(tankers, bulk carriers, container ships) at their normal working speed generate sound levels ~180 dB re 1µPa m. (Greene *at al*., 1995).

A published value for cable trenching operations gave a sound source level of 178 dB re 1µPa m. (Nedwell *at al*., 2003). Nedwell *et al*. (2012) in assessing the impact of noise during the installation of export power cables from an offshore wind farm in the UK concluded that the impact range of such activities is far less than for other activities such as piling or seismic of piling operations.

Unpublished information for cable jetting operations indicate a comparable sound source level, concentrated in the frequency range of 1 kHz to 15 kHz. The sounds of cable burial were attributed to cavitation bubbles as the water jets passed through the leading edge of the burial plough. Apart from the cable vessel itself, cables laid on the seabed (mostly water depths >1,000m) do not generate any sound (see Hale).

Potential injury zones around installation vessels range between less than 5m up to 50m for marine mammals, although this is based on a number of conservative assumptions, including the assumption of an animal staying within range of the vessels for 24 hours at a time.

The effect of noise generated by the cable laying activity could therefore have a significant effect on dolphins.

As marine invertebrates have no auditory receptors, they will not be able to perceive any construction noise and therefore will not be impacted. They do however have sensory receptors and for mobile species, they will migrate away from the vibrations caused by the construction noises. This represents a displacement impact. For sessile species *e.g.* sea anemones, tubiculous worms, bivalves such as mussels, they will either retract or close their shells. No significant or indirect impacts from noise construction are predicted.

With regard to noise arising from the opening of the cable route in the intertidal and terrestrial habitats, as the duration of the noise arising from such works is expected to be short term and reversible.

The two SCI bird species *i.e.* Cormorant and Blackheaded gull, that are likely to occur at the site, it is only the Cormorant that might be affected by construction noise as it dives under water to forage for fish – the Blackheaded gull feeds on the surface of the sea. With regard to the Cormorant, if the bird is on the sea surface, will be disturbed and it will fly away if the construction vessel comes to close to it. If it is underwater, it will swim to the surface and then fly away from the vessel. This represents a displacement impact. As the duration is temporary and reversible. No significant direct or indirect impacts from construction noise on either SCI are predicted.

Habitat Disturbance

Construction activities as noted above such as cable burial, pre-lay grapnel clearance and the mass flow excavator will all cause disturbance to the habitats along the route between Moneypoint and Kilpaddoge. This bottom sampling work will occur within the estuary habitat and some may also occur within the reef habitat, both of which are Qualifying Interest habitats for the SAC.

Construction activities as noted above such as cable burial, pre-lay grapnel clearance and the mass flow excavator will all cause disturbance to the habitats along the route between Moneypoint and Kilpaddoge. This will have a temporary impact on marine habitats, *i.e.* post-completion, the trenched route will be re-colonised by bottom dwelling marine invertebrates.

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 for this marine habitat. 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. Consequently, it can be concluded that any effects will be temporary and there will be no significant adverse effects.. No indirect impacts arising from marine habitat disturbance are predicted.

There will be temporary loss of terrestrial habitat at each of the proposed landfall locations. However, post-construction, the terrestrial plant species recorded in the base line survey will re-colonise along the route and there will be no net loss therefore of habitats. It should also be noted however that the terrestrial habitats and species present at both sites are not QIs for the Shannon SAC and that they are also of low conservation value.

Studies on electromagnetic fields (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.

Bottle-nosed Dolphins will not be impacted by sediment resuspension caused by cable laying as these species are adapted to living in the highly turbid estuarine waters of the Shannon Estuary.

Pollution/Biohazards

As with any construction activity, there are potential pollution risks associated with the construction of the proposed development. The most significant of these would be oil/diesel spillages on land or at sea. With proper attention to re-fuelling events and checking of hydraulic systems, the possibility of such event occurring can be minimised.

There is a risk that non-native species or pathogens could be translocated machinery and personnel during construction activities. It is an offence under Regulation 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) (S.I. No. 477 of 2011) to plant, disperse, allow, or cause to disperse, spread or otherwise cause to grow any plant species specified in the Third Schedule of the Regulation. The biosecurity measures will prevent the transfer of invasive species from the other waterbodies to Shannon Estuary by ensuring that plant, personnel, and equipment used and landfall works are appropriately inspected and sterilised before use beyond those sites.

7.4.3 Onshore activities During the Construction Phase

Construction noise disturbance associated with trench excavation and cable laying activities.

Noise will be generated during the construction of the launch and landing pits by machines used to excavate the pits and the channels into which the cables will be placed. However, as the temporal and spatial extent of the work areas on both sides of the river are relatively brief in

terms of numbers of days and not extensive spatially, their impacts are considered to be not significant.

Bottlenose dolphin

Bottlenose dolphins 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 (Potter and Delroy, 1998; Ansmann, 2005; Weilgart, 2007). 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 113m 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 (Richardson *et al*., 1995; Wright *et al*., 2007). 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. Potential adverse effects on site integrity with respect to the attributes and targets defined for the species in the site Conservation Objectives (NPWS, 2012) is assessed below. Mitigation measures required to avoid significant noise impact are summarised below.

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 juvenile fish 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 the ability of fish 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.

Otters

Despite the lack of evidence of otter or holts, it is likely that they occur within the proposed development area. The noise associated with the onshore construction are likely to result in disturbance to otter which may forage or commute. The disturbance of otter will be a temporary effect during the works which is likely to have a short term moderate negative effect on the local otter population.

Birds

The construction works are likely to temporarily disturb birds within the works area. These birds are likely to move to alternative sites during the works. Areas of agricultural grassland and scrub will be temporary removed to facilitate the works. This temporary loss of habitat and coupled with the availability of alternative suitable habitat within the surrounding habitat, it does not have a potential to result in a significant negative impact on bird species.

Amphibians and Reptiles

As no ponds or pools were present were observed on site, no amphibians were recorded and given that only grassland and hedgerows were recorded, no lizards were noted on site.

Habitat Disturbance

Some habitat clearance will be required to facilitate the construction of the onshore works *i.e.* underground cable connection and the proposed extension at the existing Kilpaddoge substation. This will involve the cutting or stripping back of vegetation. The proposed underground cable connection comprises a land side trench. The trench will be approximately 1.55m wide and 1.34m deep and 1.650m wide, which is based on an EirGrid standard trench profile. Approximately 5,500 m^2 of brown field areas both within the Moneypoint generating site and the Kilpaddoge substation and agricultural grasslands will be removed within the proposed development site boundary to facilitate the works.

Approximately 100m of the proposed underground cable connection will be routed through private property located directly north of the proposed landfall location at Moneypoint. These lands are predominately scrub (Gorse, Blackthorn, Ivy and Bracken) and some agricultural grasslands with agricultural access routes.

Within the Moneypoint Generating Station complex, the proposed underground cable connection will run along an existing internal track located east of the existing 220 kV Cable connection and north of the existing an extensive coal yard and ash storage area before connection into the existing Moneypoint GIS substation. The proposed works will be limited to within the existing fence that runs parallel to the track. No works will occur north of this fence and it will not impact on the woodland habitat located the north. No works will occur within the drainage ditch that runs parallel to the fence line. The proposed temporary laydown areas will be sited within bare made ground previously used for similar activities. Construction access to the landfall will be provided along existing established internal track which runs adjacent to the coal field/ash storage area. This access track is approximately 5m wide and mostly made ground with rock and gravel fill.

During the construction phase, it is proposed that temporary construction laydown facilities (comprising of dedicated laydown and storage areas) will be provided for construction plant/equipment. The proposed location of these areas is shown within the existing red line boundary and situated within available lands at within the existing Moneypoint Generation Station and the existing Kilpaddoge substation. These lands currently comprise of disturbed bare ground and agricultural grassland.

Some habitat loss and/or degradation may occur during the construction phase arising from the construction activity itself and from runoff of sediments and settlement of dust on land and sediment suspension in the sea. However, as these effects are spatially small *i.e.* m^2 and short in duration *i.e.* months and the habitats will recolonise, they are not significant at a broad geographical scale.

During the construction phase there is potential for spills and leaks of oils, fuels and chemicals from storage areas, plant, and equipment used during construction to impact on the surrounding habitats. Accidental spills of fuels, oils and construction materials (*e.g.* concrete), if not appropriately managed can affect habitat quality through deposition of materials in the environment. Excavation activities also have the potential to result in the runoff of sediment

Due to the proximity or the works area to the European sites, there is potential that the invasive species may be transferred close to the SAC/SPA's site boundary.

Slope stability

In order to reduce the vulnerability of the cable as a consequence of the installation in areas with steep slopes, Micro routing will be carried out at detailed design stage, all micro routing will be carried out within the proposed red line boundary as shown in Figure 4.8. As noted above, at an early stage of the project development survey data was used to inform and reduce risk of the selected route. Design of slopes are subject to further design work at detailed design stage. Slope stability of proposed ramp and side slopes are based on conservative slope angles for the materials observed from preliminary site surveys. Trench and excavation depths have been minimised where possible to limit excavations and the need for material disposal.

7.4.4 Operational Phase

7.4.4.1 Onshore

Once the proposed development has been completed, there will be no significant impacts arising from the cables at either landfall site.

7.4.4.2 Offshore

The cables will give rise to a permanent electromagnetic field (EMF) being generated along its length. As noted above, some marine invertebrate and vertebrate taxa are attracted to such fields, but significant negative impacts have not been recorded on any species.

7.5 Mitigation Measures

7.5.1 Construction Phase

As noted in Chapter 4 of this PECR, a detailed CEMP and a Construction Method Statement (CMS) will be prepared and implemented by the Contractor. The CEMP will also be prepared in consultation with Kerry and Clare County Councils and the DHPLG and the Department of Communications, Climate Action and Environment and other relevant consultees including the NPWS and IFI and IWDG. The CEMP will be reviewed regularly by the appointed Contractor and revised as necessary to ensure that the measures implemented are effective. Good site practice as per the CIRIA C741 Environmental good practice on site guide (fourth edition) will be implemented on site at all times An Outline CEMP accompanies the application for consent and sets out the mitigation measures required to ensure no significant effects on the receiving environment.

All pollution control measures will be designed, installed and maintained in accordance with CIRIA guidance for ‘Environmental Good Practice on Site’ (C741), ‘Control of water pollution from linear construction projects. Technical guidance’ (C648) and with regard to IFI guidance Guidelines on the Protection Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (2016) to ensure the protection of the Lower Shannon catchment and the fishery habitat and species it supports.

All mitigation will be implemented under the supervision of an Environmental Clerk of Works (EnCoW) whom will be appointed by the Contractor.

7.5.1.1 Offshore Mitigation

Immediately following the cable laying, the void on the seabed will fill in on itself through tidal activity. The vibrations caused by cable laying will cause infaunal or tube dwelling species such as anemones, annelids, crustaceans, molluscs or echinoderms to react by retracting into the river bed or tube. This reaction will be temporary and will cease once the activities cease. The minor disturbances to the seabed will have no measurable impacts on this habitat and no mitigation measures are required.

The works will commence with a ‘soft-start’ procedure to allow lamprey, salmon and marine mammals to vacate the works area.

Bottle-nosed dolphins hear in the mid frequency range (0.15 kHz to 160 kHz) (DAHG, 2014), with the highest sensitivity between 10 kHz and 60 kHz (Johnson, 1967; Ljungblad *et al.,* 1982; Au, 1993). The greatest impact on the resident population of dolphins from the cable laying would be from vessel noise and cable laying activities. There is potential to be within the hearing threshold of Bottle-nosed Dolphins; however, to mitigate any potential impact to marine mammal

species. EirGrid and the cable laying operators will implement 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, 201423).

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 installation of sub-seabed cables are not listed above, EirGrid and the survey operators will adhere to DAHG (2014) guidance on mitigation measures and monitoring to be implemented for geophysical acoustic surveys and will consult with IWDG. This includes the use of marine mammal observers (MMOs) and operational protocols. The implementation of these measures will minimise potential impacts to marine mammals from the proposed development.

Specifically, the contractor will implement the measures and protocols described in Section 4.3.4 of the guidance. In summary, trenching and cable laying activity will 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. In addition, having regard to consultation with the NPWS advised that this would provide adequate protection, but in addition no works will occur during the month of August which coincides with the peak calving/breeding period for the species. The works will commence with a ‘soft-start’ procedure to allow lamprey, salmon and marine mammals to vacate the works area.

Biosecurity measures must be employed during the construction phase. 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.

7.5.1.2 Onshore Mitigation

All construction work areas will be demarcated prior to the construction works commencing. With the exception of the crossing points and landfall activities no construction works will be undertaken within 10m of any drainage ditch, and this will be subject to careful control. During the installation of the underground cable connections across drainage ditches, the works area will be completely isolated from the drain and any water present will be over pumped via appropriate sediment control *i.e.* filter bag and released to the downstream section of the drainage ditch. Any contaminated water will be removed and disposed in accordance with Waste Legislation.

In addition to the above, the contractor will be required to implement measures to control the emission of dust and air-borne pollutants due to construction activities; these measures include:

- Control of vehicle access,
- Vehicle speed restrictions, Bed of gravel at site exit points to remove caked on dirt from tyres and tracks,
- Washing of equipment at the end of each work-day,
- Prevention of on-site burning,
- Hard surface roads should be wet swept to remove any deposited materials,
- Unsurfaced roads should be restricted to essential site traffic only, and
- Wheel-washing facilities should be located at all exits from the construction site

All machinery used in proximity to the drainage ditches at Moneypoint will be stored in bunded areas during the works.

Silt fences will be installed along the length of the works for the underground cable connections located adjacent to the Shannon. The silt fences will be set back a minimum of 10m from all watercourses. The posts will be either erected by hand or by machine. Silt fences will also be installed around the proposed landfall locations and should be positioned around stockpiles of excavated material to ensure no runoff from the stored material discharges into watercourses.

The geotextile fabric must be entrenched at least 10cm into the ground with the ends upturned. The fence posts will have a maximum spacing of 2m to prevent sag on the fence, and the geotextile fabric will be anchored to the fence posts as opposed to wrapped. The alignment of silt fences will be identified by the EnCoW and installed under EnCoW supervision. The silt fences must be positioned to allow an appropriate working area within the site while also ensuring that they are located above areas prone to flooding (to ensure the silt fences are not inundated by water). Silt fences will be installed in advance of any ground disturbance. Daily inspection of silt fences will be carried out by the EnCoW to assess the effectiveness of the measures, to carry out maintenance, and to determine if there has been any damage / breach to the control measures. The EnCoW shall have regard inter alia guidance set out in CIRIA guidance. The silt fences will also be inspected immediately following heavy rainfall or strong winds (equating to a yellow weather warning). Where repair is necessary, this will be carried out immediately and may require replacement of any damaged / degraded material. All accumulated silt from silt fences will be removed and disposed of in line with Waste Legislation. The fences should be removed under the instruction and supervision of the project ecologist.

The pouring of concrete will be required along the length of the underground cable connections route. No on-site batching will be undertaken 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 in designated wash down areas. The wash down area will be located within the construction compound and not within 50m of any watercourse or drainage ditch.

No chemical and/or hydrocarbons will be stored on site during the construction phase. Instead, fuel tankers will be brought to site when required and will refuel within a designated impermeable, bunded area, within the construction compound and located a minimum of 50m from all watercourses. All hand-held equipment and generators will be stored on site in appropriately sized bunds when not in use.

Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and at the site compound, and operators will be fully trained in the use of this equipment. All waste oil,

empty oil containers and other hazardous wastes will be disposed of in conjunction with the requirements of the Waste Management Acts 1996, as amended.

The appointed Contractor will prepare and implement a Dust Management Plan (DMP) and a Noise Management Plan as part of the CEMP. Mitigation measures which will be implemented on site are outlined in the relevant chapters in this PECR.

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, resting and important foraging sites. All lighting will be positioned away from all ecological sensitive area such as bat roosts, badger setts and the River Shannon. Lighting will be cowled and directional to reduce light splay 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.

Following engagement with landowners, the siting of the proposed development and the alignment of the underground cable route were optimised to minimise habitat loss. In addition, existing agricultural access tracks will be utilised where possible.

Where the clearance of vegetation cannot be avoided, vegetation removal will be kept to a minimum as far as possible. The proposed works area will be defined at the outset by the erection of temporary fencing to define the limits of site works under the supervision of a qualified ecologist. The demarcation of the works area will ensure no vegetation clearance will occur outside the proposed development site boundary.

Planting of any type of vegetation will not occur along the permanent underground cable circuits. Disturbed areas of ground will be reinstated by planting the same types of vegetation that were lost *e.g.* removed sections of hedgerow will be replanted using the same species such as Gorse, Blackthorn, Ivy and Bracken composition as recorded in the base line survey. This will ensure that following a re-establishment period, baseline vegetation patterns are substantially restored. The same approach will be applied to land cover by replacing agricultural grassland and scrubland on a like-for-like basis.

In accordance with Section 40 of the Wildlife (Amendment) Act, all vegetation clearance within the footprint of the proposed development will be undertaken outside of the birds nesting season (1st March to 31st August inclusive) to ensure there are no impacts to protected breeding birds. However, if such periods cannot be avoided, nesting bird surveys should be carried out by a suitably experienced ecologist over a sufficient duration, and in suitable weather conditions, to provide confidence in the findings. Where no nests are recorded, the area may be cleared. Where nests are recorded, these areas (plus a precautionary buffer) should be excluded from disturbance until after birds have fledged as determined by further monitoring by the ecologist.

In the event that the construction phase of the development is delayed more than 12 months after the initial surveys, a post consent verification otter survey will be undertaken within the ZoI of the proposed development site to establish the presence of any new habitats or species.

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.

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.

7.5.1.3 Consultation

The CEMP will be prepared in consultation with Kerry and Clare County Councils and the DHPLG and other relevant consultees including the NPWS and IFI and IWDG and Department of Communications, Climate Action and Environment and Department of Housing, Planning and Local Government. EirGrid and the survey operators will adhere to DAHG (2014) guidance on mitigation measures and monitoring to be implemented for geophysical acoustic surveys and will consult with IWDG and NPWS.

7.6 Residual Impacts and Monitoring

As there will be no significant residual impacts, there are no requirements for a monitoring programme post-completion of the works.

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 will ensure that the population of bottle-nosed dolphins and lamprey and salmon species are not adversely affected.

8 Marine Aspects

8.1 Introduction

This chapter provides the baseline environment in relation to the marine environment and the potential impacts associated with both construction and operation phases of the proposed development. The following marine factors have been assessed:

- Soil and geology; and
- Hydrodynamics, coastal processes and bathymetry.

The potential impacts have been assessed based on the magnitude of the impact and the sensitivity of the receptors. Mitigation and monitoring measures are proposed, where appropriate, to address the likely impacts associated with the project and to reduce any adverse impacts.

This chapter assess the offshore marine impacts only. Additional marine impacts associated with the proposed development are presented in the following chapters:

- Biodiversity (Chapter 7 – Biodiversity/Natural Heritage);
- Contamination (Chapter 10 – Water, including Flood Risk);
- Archaeology (Chapter 11 – Archaeology and Cultural Heritage); and
- Marine Traffic (Chapter 14 – Material Assets, including Traffic).

8.2 Methodology

In assessing the potential impacts on the marine environment arising from the installation and operation of the proposed development a methodology was developed having regard to the draft Environmental Protection Agency (EPA) *Guidance on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2017) and Directive 2014/52/EU (EU, 2014). The methodology includes the following stages:

- Establishment of baseline conditions based on literature review, previous studies carried out by the team on the area, ground investigations and a sediment modelling study;
- Identification and characterisation of potential impacts; and
- Assessment of the required mitigation and monitoring actions.

8.2.1 Study Area

The location of the study area for this marine aspect chapter is presented in Figure 8.1. The study area has been split into two sections, the first being the area for the sediment dispersion modelling (shown in blue) and the second area for the marine geology and geomorphology (shown in red).

Figure 8.1: Marine aspects boundaries within the project location

Source: Mott MacDonald, 2020

8.2.2 Desktop Assessment

The desktop study to determine the baseline marine aspects chapter for offshore geology, soils, hydrodynamics and coastal processes has reviewed the following sources of information, which include non-intrusive and intrusive ground investigations:

- EirGrid Moneypoint Cable 220 kV Project - Glencloosagh Bay Submarine Cable Project - Environmental Report. Mott MacDonald, April 2010.
- EirGrid Cross Shannon Cable 400 kV Project – Development Options Report – Step 4 Report. Mott MacDonald, 2019a
- EirGrid Cross Shannon Cable 400 kV Project – Sediment Modelling Report. Mott MacDonald, 2019b.
- Geological Survey of Ireland 1:100,000 scale Bedrock Geology Map Series, Sheet 17.
- Irish Hydrodata Ltd, 2007. Preliminary geophysical survey draft report - Tarbert to Moneypoint, Shannon Estuary
- National Parks and Wildlife Service – Lower River Shannon SAC (https://www.npws.ie/protected-sites/sac/002165)
- Office of Public Works Irish Coastal Protection Strategy Study – Phase 4 – south West Coast: (https://www.gov.ie/en/collection/572115-irish-coastal-protection-strategy-study-phase-4-south-west-coast/)
- PELORUS Geophysical and Geotechnical Datasets - Overwater surveys completed during 2007 for the existing 220 kV cables.

  - The information was used to understand temporal changes of the seabed, mainly changes in dynamic sand waves. The information further supplemented the existing information and the latest geophysical and geotechnical datasets. The borehole information was further used to ground truth geophysical information and to identify its congruency with the 2018 geotechnical borehole information.
- RINA, 2018a. Cross-Shannon Cable 400 kV Project – Phase 1 Non-Intrusive Geophysical and Hydrographical Marine Survey – Factual Report, Vol 1. Doc. No. P0009436-1-P8 Vol.1.
- RINA, 2018b. Cross-Shannon Cable 400 kV Project – Phase 2 Intrusive Geotechnical Marine Survey – Factual Report, Vol 2. Doc. No. P0009436-1-P8 Vol.2.
- Sleeman, A. G. and Pracht, M., 1999. Geology of The Shannon Estuary: A Geological Description of The Shannon Estuary Region including parts of Clare, Limerick and Kerry with accompanying bedrock geology. Geological Survey of Ireland. 77pp.
- Soil Mechanics, various years – Pelorus Surveys. Moneypoint to Tarbert submarine cable route survey – Interpretative report on site investigation:
  - Part 1 – Desk Study (2008a)
  - Part 2 – Factual report on oceanographic, hydrographic and marine geophysical survey (2009a)
  - Part 3 – Geotechnical and geoenvironmental report (2008b)
  - Part 4 – Interpretative report (2009b).

8.3 Baseline Environment

8.3.1 Soils and Geology

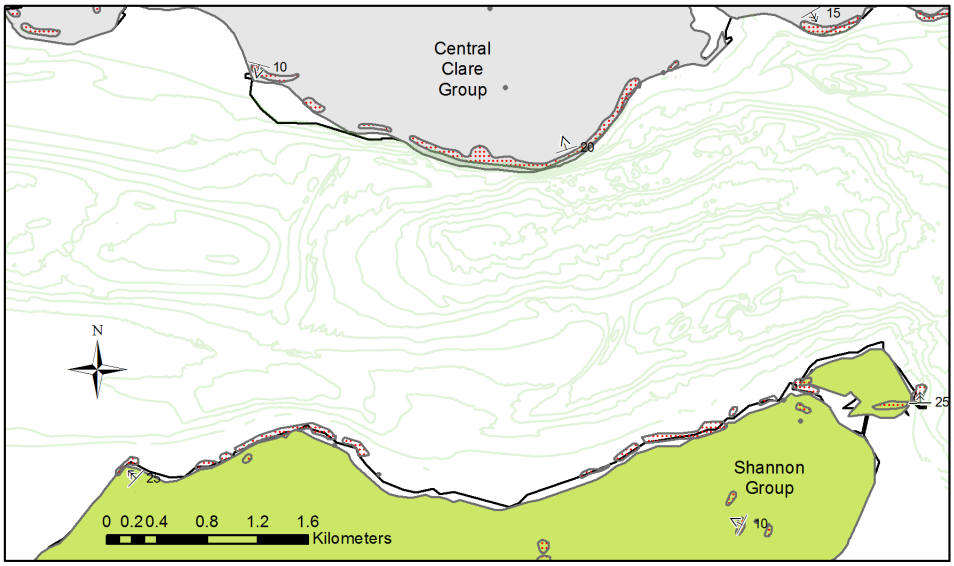
Superficial deposits and bedrock

The superficial deposits along the proposed development route vary in thickness from 0.2 m – 30 m (Mott MacDonald, 2019a). The greatest depths of these superficial deposits are found in the middle of the estuary and the smallest depths are located along the northern section of the route.

Sediment and associated current landscape morphology were formed during the late Quaternary glaciation period and post glacial processes. The main geological features along the western section of the Shannon Estuary are major folds within the Namurian (Upper Carboniferous) bedrock trending east-west and east-northeast to west-southwest (Figure 8.2). The Namurian sediments comprise two groups; the Central Clare Group to the north and the Shannon Group on the southern shores. These lithologies are described by Sleeman and Pracht (1999) as:

- Central Clare Group – Cyclotherm-controlled prograding deltaic deposits. The deposits usually comprise some or all of the following lithologies; basal marine band overlain by laminated shales, massive grey siltstones and a thick upper unit dominated by laminated sandstone, sometimes capped by coal and rootlets. Syn-sedimentary features are common (e.g. slumping, faulting, flow-folding, ball and pillow structures, sand volcanoes) and channel features/point-bar deposits may also be found.
- Shannon Group (undifferentiated) – unit dominated by turbidite sandstones, i.e. most likely to comprise a mixture of grain sizes in generally fining-upward successions.

Figure 8.2: Bedrock geology in the Shannon Estuary area



Source: reproduced from Mott MacDonald, 2019a

Note: Structural symbols indicated dip and dip-direction of bedding in degrees.

Two type of tills have been identified in the proposed development area reflecting glacial erosion of different bedrocks types (Mott MacDonald, 2019a):

- A limestone dominated till with a sand and/or silt matrix; and
- A shale dominated till with a clay or silty clay matrix.

Post-glacial Alluvium was identified both onshore and offshore and the composition is variable.

Table 8.1: Summary of strata encountered and typical descriptions. Full details of the materials encountered in the intrusive investigation including the geotechnical properties derived from the in-situ and lab testing can be found in the Phase 2 Factual Report (Perolus, 2009).

Stratum no.	Strata	Typical description
1	Fine to coarse gravelly **SAND**	Medium dense to dense yellowish-brown, slightly silty, gravelly medium to coarse SAND, with abundant medium sand sized shell fragments.
2	Dark grey fine to medium **SAND**	Very loose to medium dense dark grey slightly silty fine to medium sand with frequent shell fragments (decrease in abundance with depth) with interbedded clay bands
3	Brownish-grey **SILT – CLAY**	Low to medium strength brownish-grey SILT Or Low to medium strength brownish-grey silty CLAY
4	Grey **CLAY**	Low strength greenish-grey CLAY with occasional laminations of fine sand
5	Slightly sandy gravelly **CLAY**	Grey slightly sandy gravelly CLAY. Gravel is fine to coarse sub rounded of mudstone and sandstone.
6	Clayey sandy **GRAVEL**	Fine to coarse clayey sandy GRAVEL. Gravel is sub angular to surrounded of mudstone and sandstone.

Mott MacDonald, 2019a.

No surface faults have been mapped on the Geological Survey of Ireland 1:100,000 scale map for the area, although brittle Variscan deformation features have been identified by Sleeman and Pracht, 1999 and that the Nvan-Silvermines fault lies beneath the carboniferous bedrock,

which may have had a role in the location of the estuary. In general, the area has been described as seismo-tectonically stable.

From the beach at Moneypoint the foreshore gently slopes into the channel (south) before it slopes at a 70º angle for a distance of approximately 25m, to reach a depth of 22m (Mott MacDonald, 2019a). The gently sloping foreshore area is composed of flat, sub-angular, mudstone boulders interspersed with angular rocks and pebbles. From the base of the slope continuing south across the estuary bed to the southern shoreline, the mudstone boulders become less prevalent and pockets of silty-clay become more widespread covering approximetely 70% of the sub-tidal survey area.

8.3.2 Shoreline

A combination between historical shoreline maps from the Ordnance Survey Ireland (1893-1913), aerial imagery provided by RINA (2018a) and coastal erosion maps from the Irish Coastal Protection Strategy Study Phase 4 (Mott MacDonald, 2019a) revealed that the coastline is stable with a moderately exposed rocky coast comprising boulders, rocks, stones and pebbles.

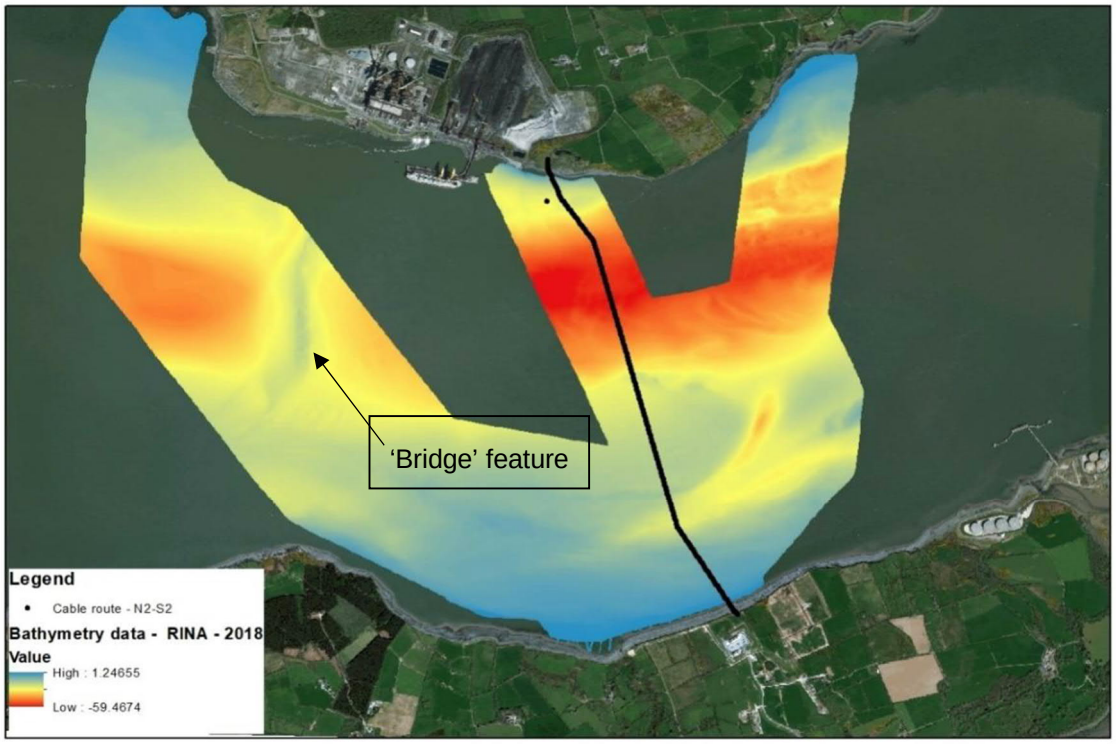
8.3.3 Bathymetry

The evaluation of bathymetry, seabed features was undertaken using the results from the recent marine survey campaign completed for the proposed development (RINA, 2018a and 2018b).

Figure 8.3 and Figure 8.4 show the seabed levels and seabed features across the proposed development cable route. Shallow and deep waters areas are present with maximum water depth reaching 58 m CD at the centre of the Shannon Estuary. Maximum slope angles are up to 15 degrees, with the steepest slopes identified at the approach to the northern landfall at Moneypoint.

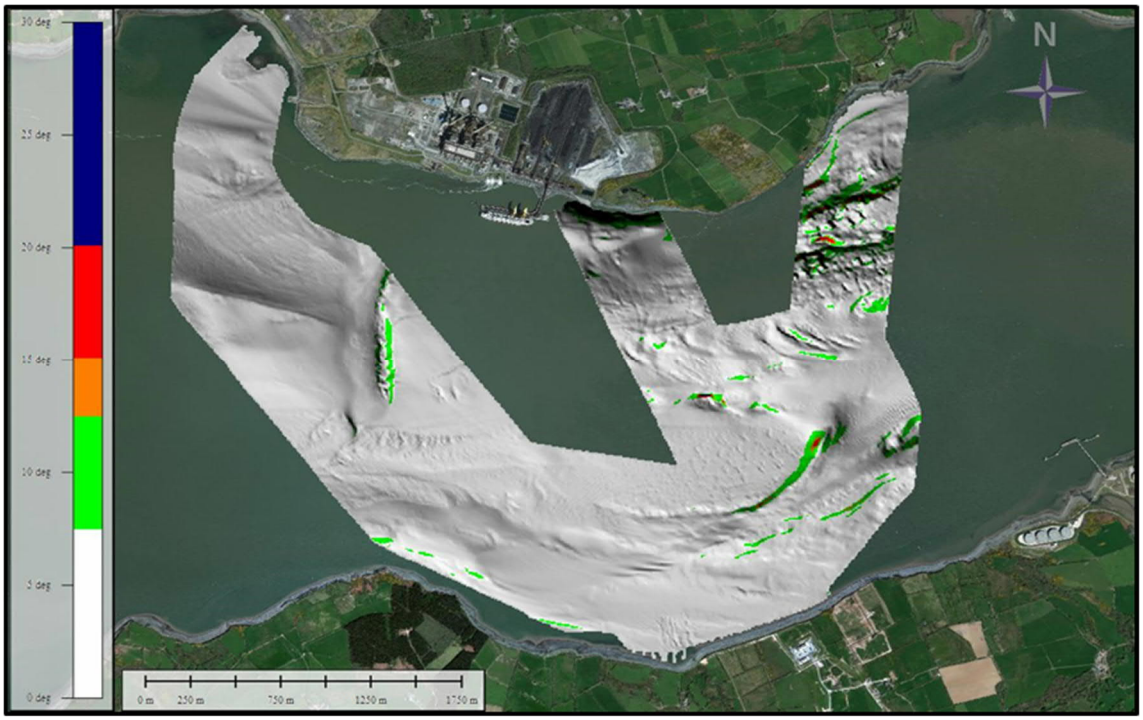
Areas of sand waves seabed features across the marine survey area, in particular on the southern slopes of the main channel. Further details on the sand wave features is provided in a later section.

Figure 8.3: Bathymetry data. The black line indicates the proposed development cable route (centreline).



Source: Mott MacDonald, 2019a. Contains RINA data, 2018a.

Figure 8.4: Bathymetry data showing areas of steep slope



Source: Mott MacDonald, 2019a

8.3.4 Hydrodynamics

The Shannon Estuary is approximately 100km in length and has a tidal range of approximately 5m during spring tides. Tide levels for the project area are provided in Table 8.2

Table 8.2: Tide Level measurements at study area

Tide	Level (m above Chart Datum)
Highest astronomical tide (HAT)[34]	5.5
Mean High Water Springs (MHWS)	5.0
Mean High Water Neaps (MHWN)	3.8
Mean Low Springs (MSL)	2.77
Mean Low Water Neaps (MLWN)	1.7
Mean Low Water Springs (MLWS)	0.5
Lowest Astronomical Tide (LAT)	-0.2

Source: Tarbert Island Admiralty Tide Tables, 2016

An increase in tidal range occurs from the mouth of the estuary at Kibaha Bay (4.45m) towards the upper estuary, at Limerick (6.25m) during spring tides.

Tidal flows in the estuary are influenced by freshwater inputs from the fluvial network. In the estuary, freshwater discharges from the fluvial network are less dense than the saline estuarine water which leads to stratification. During the ebb tide, freshwater and saltwater flows in the same direction, however, during the flood tide, the freshwater will remain above the incoming flow of denser saltwater.

Tidal currents were measured using an Acoustic Doppler Current Profiler (ADCP) in April 2008 (Soil Mechanics, 2009a) and confirmed the following statements:

- The flood tide propagates up the estuary, mainly flowing through the deeper section of the estuary channel, with faster velocities measured at greater depth; and
- Higher current velocities at the surface are observed during ebb tides.

During the ebb tide the fresh and saline water move in the same direction, and higher current speeds are observed in the upper water column.

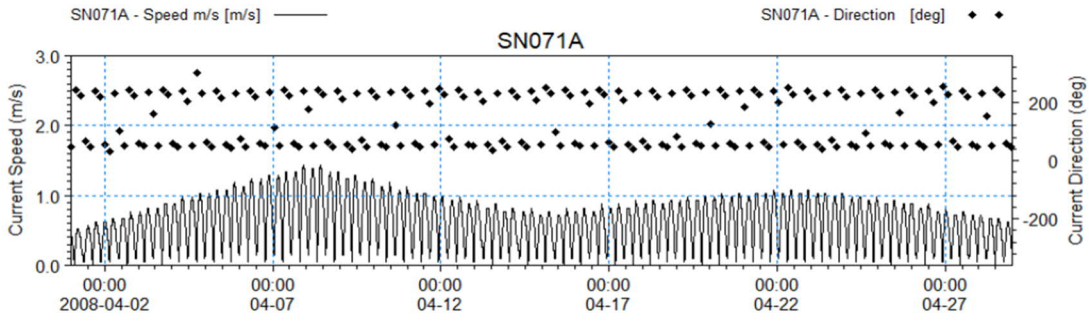
It is noted that the tide flowing in and the ebb cause different flow characteristics during the spring tides. The flood tide propagates up the estuary (propagating east), with velocities up to 120-150cm/s measured at approximately 30m water depth within the main channel (see Figure 8.5). During the flood tide, current velocities close to the northern shoreline and shallower southern regions are relatively benign.

The ebb tide has noticeably different behavioural patterns compared to the flood tide. The most significant tidal velocities are observed approximately 1.25km south of the northern shoreline. From the start of the ebb tide, to approximately +1.5 hours after high water the velocities typically reach speeds of 120-180cm/s. These velocities are predominantly observed as surface currents and do not penetrate to a significant water depth. Velocities at or near the seabed are observed to be relatively benign at this point of the tide. A lack of deeper flow is likely due to bottom friction preventing the water mass initially moving, with the surface water not feeling the effects of bottom friction. In addition, the surface flow is likely combining with the natural flow of

[34] Highest astronomical tide (HAT) is the highest level, and Lowest astronomical tide (LAT) the lowest level that can be expected to occur under average meteorological conditions and under any combination of astronomical conditions. HAT and LAT are not extreme levels, as certain meteorological conditions can cause a higher or lower level, respectively

the River Shannon. Between +3.5 and 5 hours after the high water, peak current velocities reach speeds of up to 240-260cm/s (~5 knots).

Figure 8.5: Total tide current speed and direction at one of the available location points in the estuary. This data corresponds to April 2008



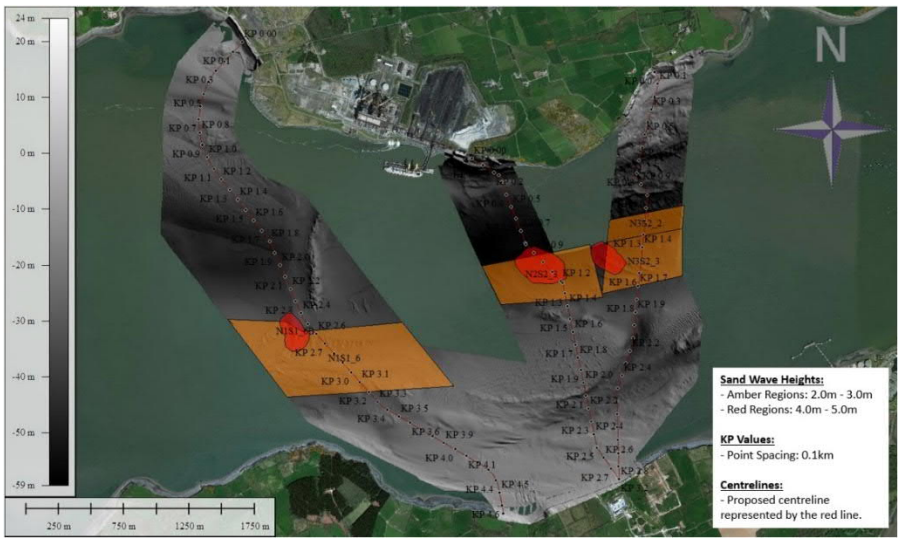
Source: Mott MacDonald, 2019b. Contains UKHO Total tide data

Sand waves

Current speed influences sediment particles and as a consequence of gravity they are lifted/moved in the direction of the flowing current originating seabed features such as ripples and sand waves. These features are dynamic in nature. Sand waves in the proposed development area are generally 1m in amplitude, however there are some areas where they exceed 2-3m and localised locations where sand waves of 4-5m amplitude have been identified.

Sand wave mobility surveys carried out in 2018 (RINA, 2018a) identified that there is no significant movement of sand in a single tidal cycle (12h), however, in some areas between the spring and neap tides (approximately 7 days) a migration of approximately 5m horizontally can occur.

Figure 8.6: Areas of significant sediment mobility and identified sand wave features. Orange regions represent locations where 2-3 m sand waves were identified, and red circles represent locations where 4-5 m sand waves were identified.



Source: Mott MacDonald, 2019a

8.4 Potential Impacts

8.4.1 Construction Phase

Sand waves

Large sand wave amplitudes and their mobility (migration) have the potential to impact the complexity of the submarine cable installation. Large amplitude sand waves result in steep slopes and rapid changes in slope angle over relatively short distances. Cable installation tools will have a maximum slope angle that they can operate, and the submarine cable has a maximum bending radius. Therefore, areas of large amplitude sand waves and high mobility will be avoided or otherwise mitigation measures such as pre-installation clearance or seabed flattening will be necessary.

Seabed slopes

Steep seabed slopes are considered a potential hazard for submarine cable installation. Cable installation tools will have a maximum slope angle that they can operate. The impact on the cable laying is dependent on several factors such as the orientation of the slope to the cable alignment, water depth, sediment type and cable installation technique. Installing a cable in an area with steep slope will expose the cable to be more vulnerable to damage as it may be suspended above the seabed.

Therefore, steep slopes will be avoided where possible or otherwise mitigation measures such as pre-installation clearance or seabed flattening will be necessary. The potential construction impact is not likely to be significant.

Geology and sediments

At the landfalls the bedrock geology and superficial sediment will be locally disturbed. Excavation works using traditional excavation methods will take place to create the foundation of the landfall structure. Where possible existing bedrock and sediment will be reused in the construction works of the landfalls. There is a potential of collapse of excavations and failing material and unstable construction slopes. Slope stability of proposed ramp and side slopes are based on conservative slope angles for the materials observed from preliminary site investigations. Trench and excavation depths have been minimised where possible to limit excavations and the need for material disposal.

For areas of exposed bedrock, the submarine cable is proposed to be installed on the seabed and protected with additional cable protection. Therefore, the geology and sediment are not likely to be impacted. Where the submarine cable is proposed to be buried below the seabed in superficial sediment, a cable burial technique is proposed. This technique is not likely to significantly impact the sediment as sediment is only temporarily disturbed and not permanently removed.

Pre-installation clearance of sand wave features is proposed. These activities and installation of the cable during the construction phase are likely to result in a short-term direct impact to the seabed sediments. The potential construction impact is not likely to be significant.

Shoreline erosion

The existing environment has shown that shoreline erosion is negligible. The submarine cable installation and landfall construction phase is anticipated to be in the order of weeks to a few months. Due to the short-term duration and geology at the landfall locations, the potential impact of shoreline erosion over this timescale are likely to be negligible.

Sediment dispersion

For areas of exposed bedrock, the submarine cable is proposed to be installed on the seabed and protected with additional cable protection. Therefore, sediment dispersion is not likely to be impacted. Where the submarine cable is proposed to be buried below the seabed in superficial sediment, a cable burial technique is proposed. This technique is not likely to significantly impact the sediment dispersion.

Pre-installation clearance of sand wave features is proposed. These activities during the construction process will disturb the surface sediments, leading to the creation of a plume of suspended sediment that moves according to local water currents. To assess the impacts of the pre-installation clearance construction phase, sediment dispersion modelling was undertaken (Mott MacDonald, 2019b). The Total Suspended Sediment Concentration (TSSC) analysis showed that there is expected to be accretion at a small bay in Tarbert (refer to Figure 8.7) due to the relatively high concentration of sediments during the tidal cycle and the sheltered nature of the small bay, shallow waters and low current speeds.

The displacement of sediment within the water column will result in an increase of turbidity and suspended sediment concentrations. Immediately post installation of the cable the sediment dispersion modelling identified a high concentration of suspended sediment in the middle of the estuary as highlighted in Figure 8.8.

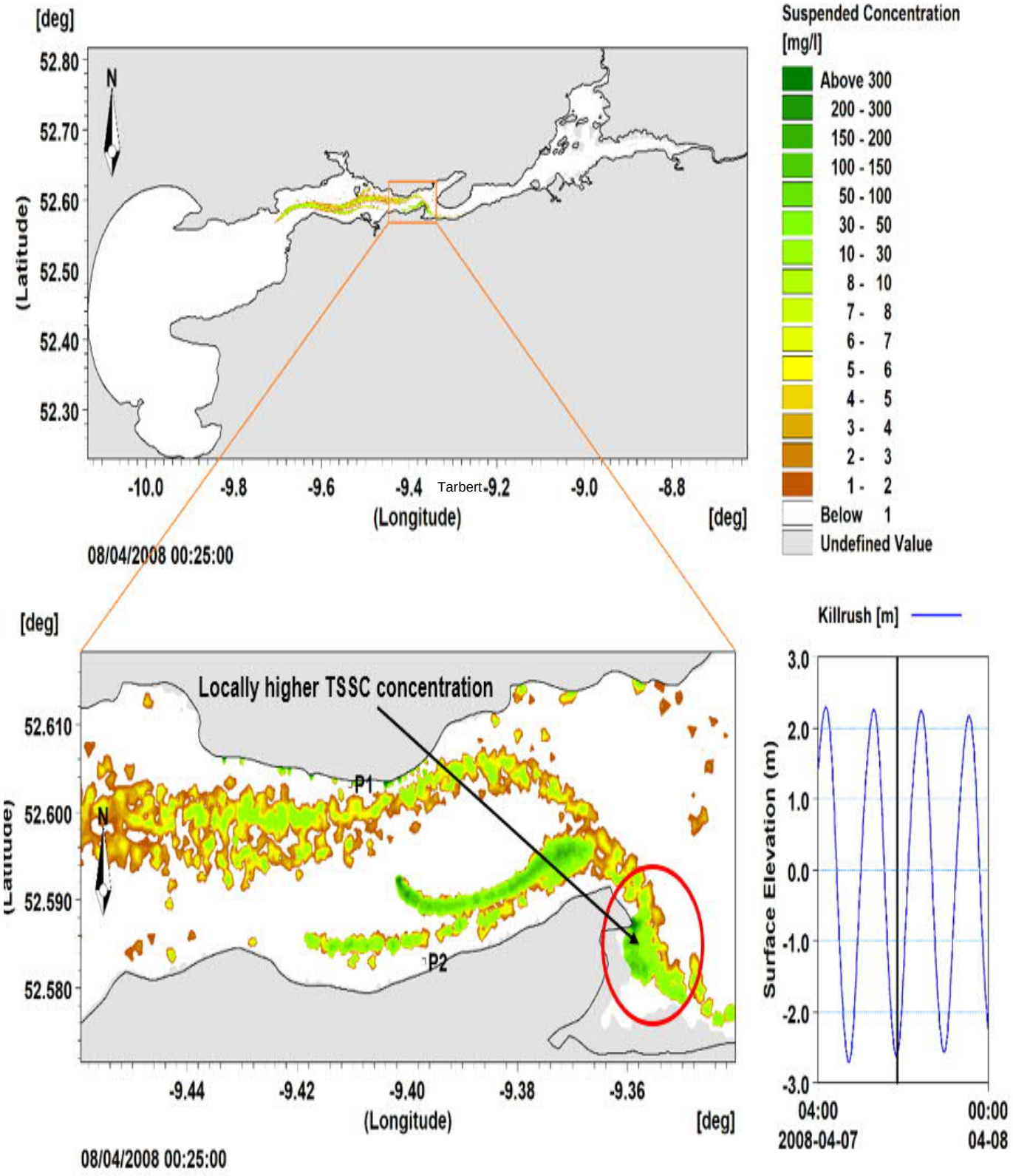
A worst-case scenario was modelled considering the duration of the proposed installation techniques, depth of potential suspended sediment and tidal currents (see Mott MacDonald, 2019b for more details about the scenario modelled and assumptions / limitations). The sediment modelling results present the worst-case scenario for the sediment released.

Sediment deposition

At the end of cable installation there is expected to be sediment deposition at the proposed development location. A simulation of the behaviour of the sediment released in the water column during cable installation called Particle Tracking (PT) was carried to assess the severity of this risk. Due to the low spatial impacts, sediment deposition is not expected to be significant. The overall construction phase impact is not expected to be significant. The simulation was analysed and showed the likely sediment depositions depth (Figure 8.9):

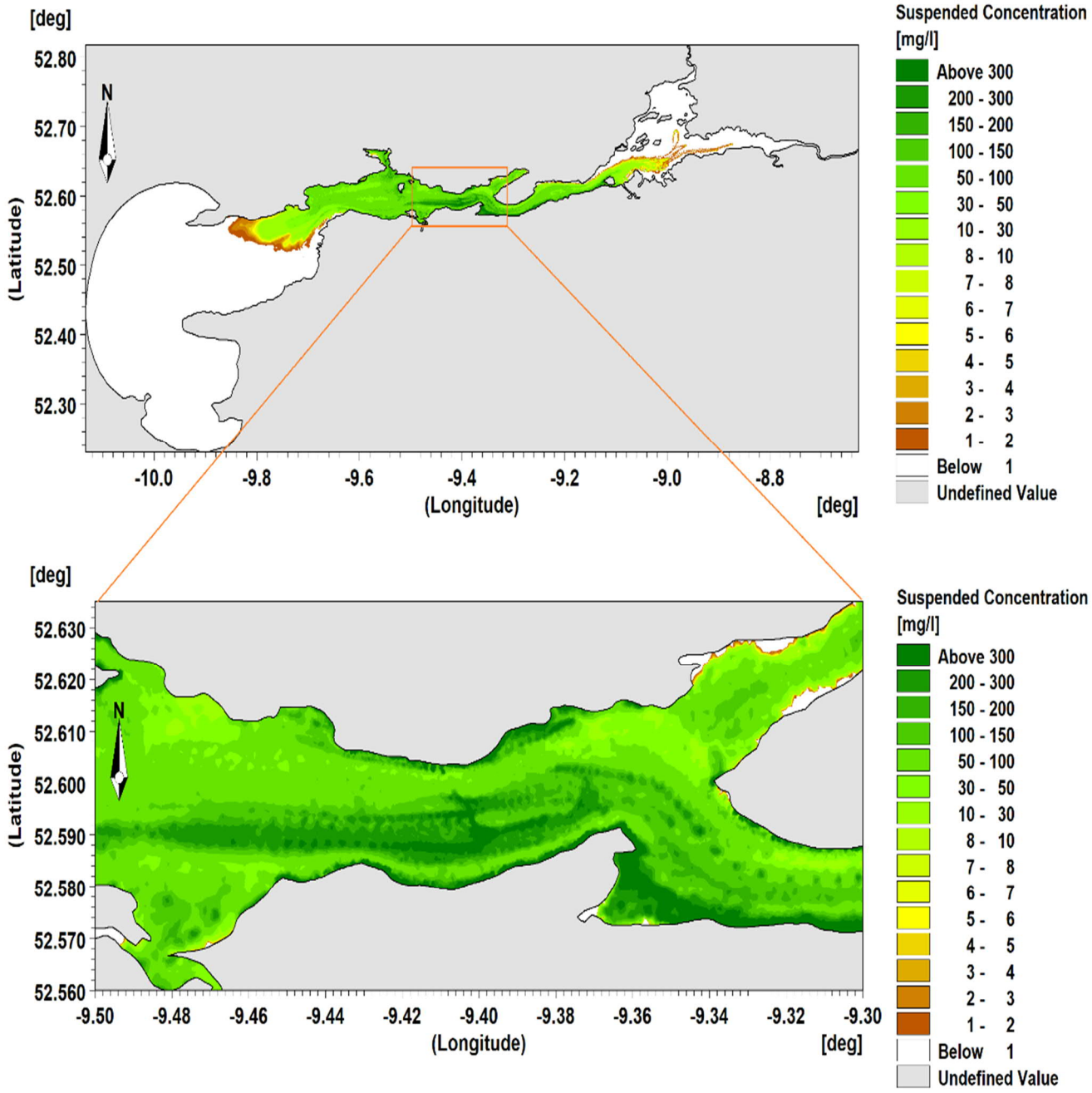
- Up to 2mm of sediment deposition towards the south of the cable route;
- Mainly less than 1mm and located towards the shoreline where flow speeds are lower than in the central part of the estuary; and
- Up to 20mm inside the small bay to the south east of the cable route.

Figure 8.7: Suspended concentration at low water (ebb flow)



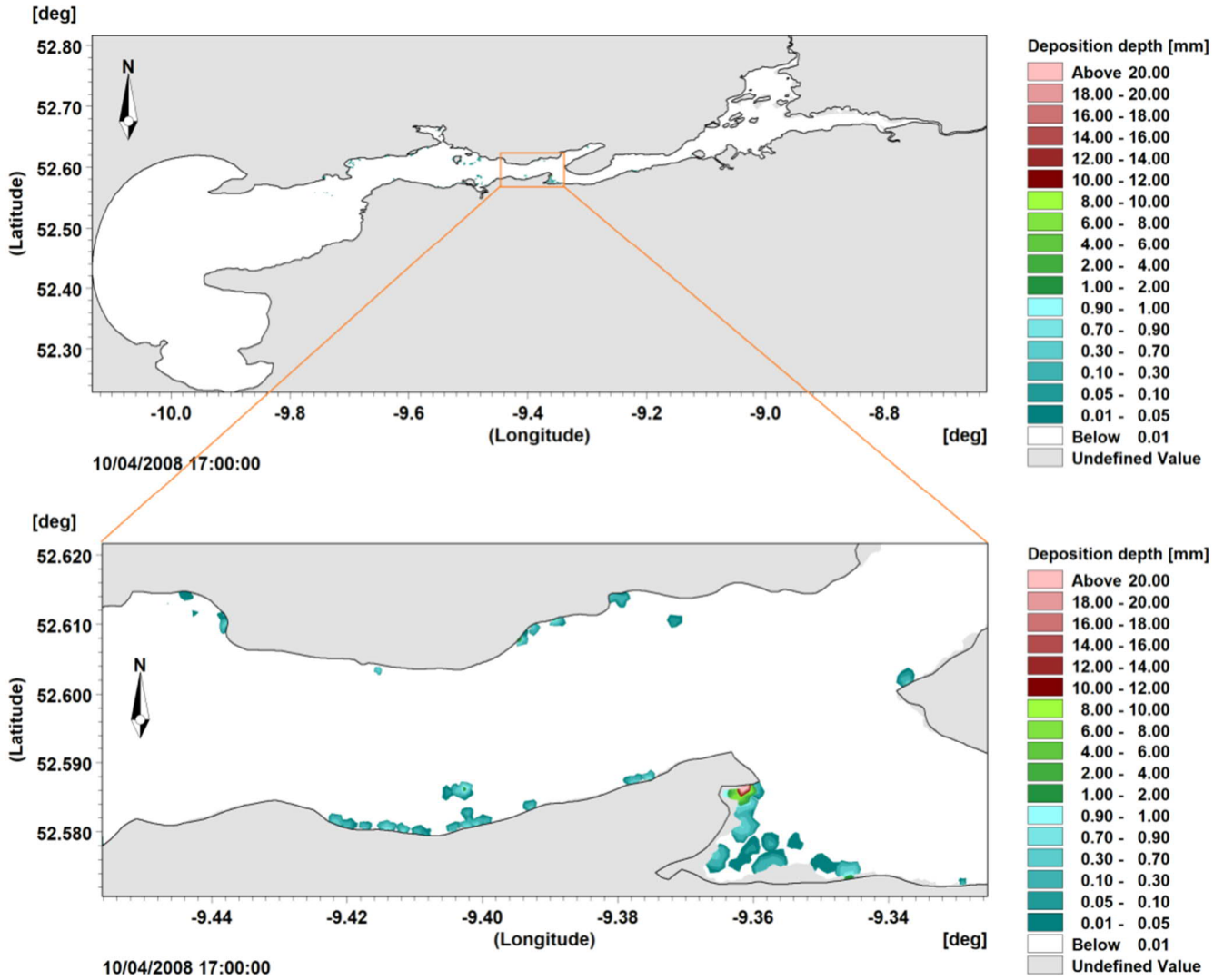
Mott MacDonald, 2019b

Figure 8.8: Maximum short-term suspended sediment concentration



Source: Mott MacDonald, 2019b

Figure 8.9: Total deposition depth at the end of cable installation



Source: Mott MacDonald, 2019b.

8.4.2 Operational Phase

Shoreline erosion

The existing environment has shown that shoreline erosion is negligible. The geology at the northern landfall is bedrock and at the southern landfall is glacial till. Rock armour protection is proposed at the toe of both landfall location to manage the risk of shoreline erosion from wave action.

Sediment mobility

Mobile sediment features are considered a constraint due to their potential impact on cable performance (ratings) and maintenance. Mobile sediments within the Shannon Estuary have been identified as ripples and sand waves. These features are dynamic in nature and are observed (with limited datasets) to migrate along the seabed. Although most of the route has relatively benign sediment mobile features (less than 1m in amplitude), a region has been identified from survey data as higher risk with sand waves of up to 2-3m amplitude across the

region and one localised area within this region with sand waves potentially up to of 4-5m amplitude . The migration of these features may lead to a change in the cable burial depth during the operation phase of the cable's life. An increase in the burial depth has the potential to impact on the cable rating, as it becomes more difficult for heat to dissipate away from the cable. If this reaches a level above that which is allowed for, this could lead to performance issues on the voltage. A reduction in burial depth increases the risk of cable damage as the target (design) burial depth is changed. If significant reduction in burial depth occurs this could result in exposure and sections of free spanning of the cable. The former increases the likelihood of impacts by human factors such as anchor strike. The latter would result in additional tension in the cable system above which have been allowed for.

8.5 Mitigation Measures

As noted previously in this report in Section 1.3.1, substantial mitigation by avoidance and reduction has been achieved through the consideration of alternatives in the design phase carried out as part of the EirGrid's Framework for Grid Development. These embedded measures resulting in the selection of the Best Performing route alignment also provides the detail designer and contractor flexibility in the micro-routing of one or more cables should this be necessary to avoid areas of significant risk. Additional mitigation measures in respect to the offshore elements are set out in the subsequent sections.

8.5.1 Construction phase

Sand waves

A follow up survey will be carried out at the detailed design phase in order to locate sediment features and design the cable route to avoid those areas. Prior to cable installation it is recommended to carry out another survey as these features are dynamic in nature.

A pre-installation clearance technique, proposed as a mass flow excavation (MFE) tool, will be deployed during the construction phase along the cable in order to flatten sand waves with amplitudes of more than 0.5m. This activity will reduce the risk of sand waves re-establishing after the cable installation. In areas where it is not possible to avoid these features, it is recommended to bury the cable deeper in order to avoid the cable damage.

Seabed slopes

In order to reduce the vulnerability of the cable as a consequence of the installation in areas with steep slopes, Micro routing will be carried out at detailed design stage, all micro routing will be carried out within the proposed red line boundary as shown in Figure 4.8. As noted above, at an early stage of the project development survey data was used to inform and reduce risk of the selected route.

The use of rock filled bags in areas where the steep slope can't be avoided is recommended at construction phase.

Sediment dispersion

Construction activities such as trenching, and cable installation will release sediment and they will be dispersed in the area due to currents. Best practice guidelines will be adopted by the Contractor to avoid unnecessary sediment dispersion during the submarine cable installation. Mitigation measures to control sediment dispersion for impact on ecology, are detailed in Chapter 7 of this report.

Installation of the cable will be programmed to avoid periods of peak spring tidal currents. For example, this will consider submarine cable installation during slack states of the tide to reduce the risk of strong tidal currents.

Sediment deposition

The quantities of sediments being bought into suspension can be considered small given the dimensions of the cable trenches and the level of disturbance expected arising from the water jetting. This has been verified by the TDDS and PT modelling. The results of the modelling show that an increase in the suspended sediment concentrations are only significant, when the suspended sediment concentration will exceed 50mg/litre above the background, along and close to the cable installation route. The depth of sediment deposition expected following each cable installation is minimal, with depths typically remaining below a fraction of a millimetre. Background suspended sediment concentrations in the Shannon Estuary are relatively high and regularly fluctuate, as is typical of a dynamic estuary. The additional increase in suspended concentrations is not expected to be significant when compared to background levels.

Installation of the cable will be programmed in advance to avoid spring tides. Undertaking the cable installation during neap tides when the tidal flows are smaller is likely to result in the settling of sediment more rapidly and less dispersion of suspended sediment.

Shoreline erosion

Design of slopes are subject to further design work at detailed design stage. Slope stability of proposed ramp and side slopes are based on conservative slope angles for the materials observed from preliminary site surveys. Trench and excavation depths have been minimised where possible to limit excavations and the need for material disposal.

8.5.2 Operational phase

Shoreline erosion

As a prevention to avoid shoreline erosion a rock revetment is designed to be installed at the toe of the concrete slipway structure. This rock revetment will limit the amount of erosion and the potential of landslides at the cliff.

Monitoring of the structure is recommended on a yearly basis in order to assess any early erosion signs and prevent the potential collapse of the structure.

Sediment mobility

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 operation 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, the mitigation for the proposed development includes:

- Full cable burial risk assessment to be completed at the detailed design stage; and
- Post construction monitoring. A campaign of periodic marine survey inspections over the as built location of the cables to monitor the movement of sand waves and determine cable burial depth. Ongoing monitoring allows the cable operator with the data necessary to mitigate the long-term risk of cable burial and exposure of the cable by way of early intervention. The specification of the types of marine survey techniques and frequency of the

surveys will be confirmed prior to completion of the cable installation works. This enables the construction survey data to be part of the assessment.

8.6 Residual Impacts and Monitoring

It should be noted that due to the implementation of mitigation techniques and the best construction practices, it is expected to not have a future residual impact as a consequence of the proposed development in the area. There are no likely impacts that can happen during the project's life.

9 Land, Sediment and Geology

9.1 Introduction

This chapter examines the baseline environment in terms of land and soils in relation to the onshore elements and assesses the potential impact of the proposed works associated with the development. Mitigation and monitoring measures are also proposed, where appropriate, to address the likely impacts associated with the proposed development in order to minimise any significant adverse impacts to the onshore environment. This chapter examines the onshore elements of the proposed development only. Details on the proposed marine submarine and foreshore area are set out in Chapter 8.

9.2 Methodology

In assessing the potential impacts on the prevailing land, sediment and geology arising from construction and operation of the proposed development a methodology was developed having due regard to the relevant guidance as such;

- Institute of Geologists of Ireland, Geology in Environmental Impact Statements – A Guide (2013);
- Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports [Environmental Protection Agency (EPA), August 2017]; and
- Construction Industry Research and Information Association (CIRIA) Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, (2001)

This assessment involved desktop research supported by a review of geotechnical investigations carried out in March 2018 by Apex Surveyors within the proposed development at Moneypoint.

9.2.1 Desktop Research

Desktop Assessment

A desktop study was undertaken to establish the baseline land and soils of the proposed onshore development and its surrounding area.

The EPA and Geological Survey of Ireland (GSI) quaternary geological databases and maps were reviewed to determine the context of the study area in terms of soils, geology, aquifer classification and vulnerability, including geohazards and radon. The following publicly available information was reviewed and referenced on the 27th March 2020 from the GSI website (www.gsi.ie/mapping) and EPA website (www.epa.ie]

- National Draft Generalised Bedrock Mapping;
- Soils and Subsoils Mapping;
- Aquifer Mapping; and
- Interim Vulnerability Mapping;

The EPA map Viewer and Geological Surveys Ireland (GSI) mapping were also referenced in regard to their data on the area's drift geology; specifically, soil composition of the area.

Apex Surveyors conducted a preliminary site investigation in March 2018, which consisted of trial pit excavations, targeted ground penetrating radar (GPR Survey) and Thermal Resistivity (TR) survey and Soil Resistivity Testing and topographical surveys.

9.3 Baseline Environment

9.3.1 Site Location and Description

The proposed development is located within the townlands of Carrowdotia South County Clare and Kilpaddoge, in County Kerry.

Moneypoint Generating Station is located across the Shannon Estuary to the north-west. The complex is located in the townland of Carrowdotia South, County Clare. The immediate area surrounding Moneypoint Generating Station is rural agriculture. Kilpaddoge townland is located on the northern side of a ridge running parallel to the Shannon Estuary. The townland is subdivided into medium sized grazing fields, bounded by ditches and high hedges. The existing Kilpaddoge Substation site rises approximately 20 metres in level from the cliff edge at the coast to the north to its southern extent.

9.3.2 Geology and Soils

The EPA Mapping of subsoils and Teagasc online database classified the existing Moneypoint Generating Station as manmade hardstanding (urban) and the proposed development site at the northern side as both Other deposit type (exposed bedrock) and Till type. the sub-soil at Kilpaddoge is also noted as Till type which is described as fine loamy drift with siliceous stones.

Bedrock

The bedrock along the shores of the Shannon Estuary adjacent to the proposed cable routes has been mapped as Namurian (Upper Carboniferous) sediments. these comprise two groups; the Central Clare Group to the north and the Shannon Group on the southern shores. These lithologies are described by Sleeman and Pracht (1999) as:

- Central Clare Group – Cyclotherm-controlled prograding deltaic deposits. The sediments usually comprise some or all of the following lithologies; basal marine band overlain by laminated shales, massive grey siltstones and a thick upper unit dominated by laminated sandstone, sometimes capped by coal and rootlets. Syn-sedimentary features are common (e.g. slumping, faulting, flow-folding, ball and pillow structures, sand volcanoes) and channel features/point-bar deposits may also be found.
- Shannon Group (undifferentiated) – unit dominated by turbidite sandstones, i.e. most likely to comprise a mixture of grain sizes in generally fining-upward successions.

Soils Geology

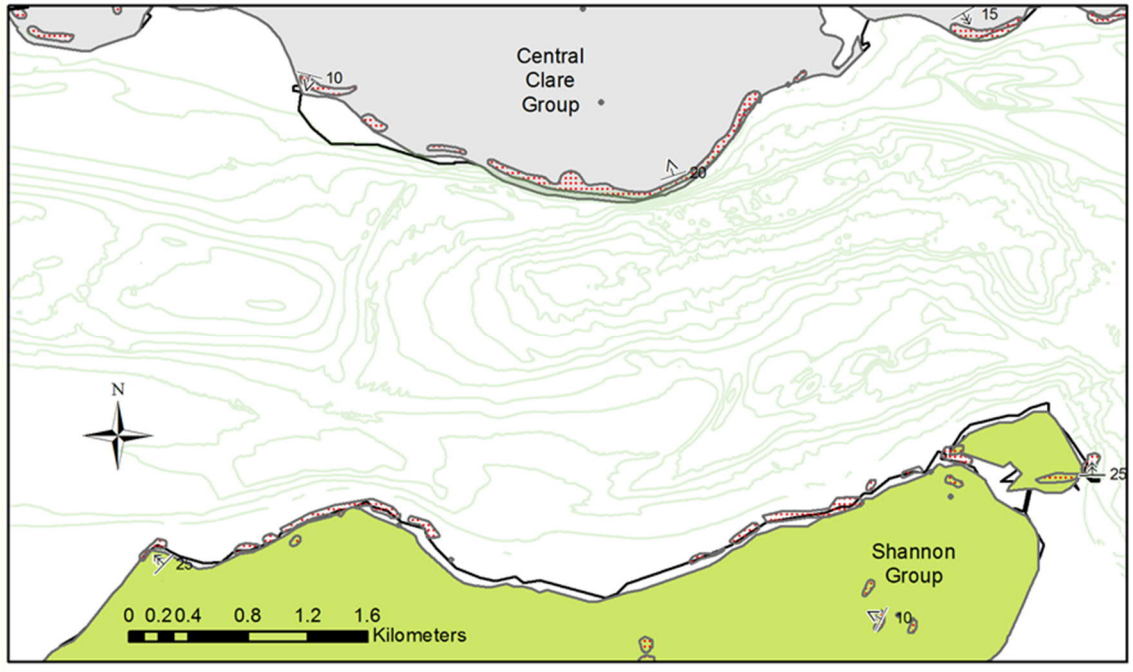
The EPA subsoil mapping database indicates that the majority of the works area comprise till type (shales and sandstone till numurian). A parcel of land at the northern extent of the proposed development adjacent to the proposed northern landfall is noted as Other deposit type (Bedrock at Surface). To the west of this area is the Moneypoint Generating Station which is noted Made Ground.

9.3.3 Hydrogeology

GSI web-mapping has classified the groundwater vulnerability as ranging from ‘High’ Vulnerability to ‘Extreme’ Vulnerability at both Moneypoint and Kilpaddoge onshore sites. A

parcel of land at the northern extent of the proposed development adjacent to the proposed northern landfall is noted as 'Rock near the surface'. 'Extreme' groundwater vulnerability means water and contaminants can easily move from the subsurface materials into groundwater.

Figure 9.1: Onshore Bedrock Geology in Shannon Estuary area (Shannon group is indicated in green, Bedrock group is shown as dashed red and Central Clare Group shown in grey



Source: Structural symbols indicated dip and dip-direction of bedding in degrees.

Geological Heritage Areas

A Geological Heritage Area is one which contains geological or geomorphological features considered to be of national interest and recommended for Natural Heritage Area (NHA) designation by the GSI under the Wildlife (Amendment) Act 2000.

Desk-based research utilising GSI databases indicated that there are no NHAs (or proposed NHAs) within one kilometre of the proposed development sites; the most proximate NHAs are as follows:

Table 9.1: Geological Heritage Areas within the General Vicinity of the Proposed Development Site

Site Name	Summary Description	Approx. distance from the proposed development site
Scattery Island	Composite ice pushed ridges that form the island in Shannon	5.7km
The Shannon Estuary	N. shore of estuary Corlis Point a spit. Cammoge Point marks entrance to Poulnasherry Bay, has salt marshes & mudflats. Weichsel moraine crosses Shannon estuary at Scattery	8.3km

Geohazards

Geohazards are in essence, natural Earth processes that pose a risk to human life. They can range from naturally occurring radioactive gases such as radon to geological hazards such as landslides, bog-bursts, coastal erosion or subsidence to hydro-meteorological hazards like floods and high tides.

Landslides

A review of the GSI National Landslide Database for Ireland found no recorded landslides within the area.

Geohazards are in essence, natural Earth processes that pose a risk to human life. They can range from naturally occurring radioactive gases such as radon to geological hazards such as landslides, bog-bursts, coastal erosion or subsidence to hydro-meteorological hazards like floods and high tides.

9.3.4 Onshore Geotechnical Investigation Summary

Ground Investigation works were undertaken by Apex Surveys in 2018 to determine the general ground conditions, soil electrical and thermal resistivity of the onshore grid connection route within the proposed development boundary located within Moneypoint Electricity Generating Station. During this survey, 12 trial pits were excavated. Six trial pits were excavated in the elevated access road which borders the coal yard and ash repository. Three of these trial holes towards the western end of Moneypoint internal access road consisted of sandy and clayey gravel with a high cobble and medium to high boulder content at approximately 1.25m depth. It appeared to be mostly backfilled material in this area.

Two of the trial pits approaching the estuary encountered dense brown/grey cobbles and boulders at a depth of 1.25 m. A trial pit close to the estuary encountered fine to coarse sandy gravel with a high cobble and boulder content. There appeared to be larger boulders in this area.

A further six trial pits were excavated to the east of the power station beginning just above the foreshore within the power station property. The first four trial pits along the N67 public road and one within the power station encountered firm to stiff brown/grey sandy and gravelly clay with low cobble and boulder content with the trial pit within the power station showing a siltier make-up. A trial pit excavated in the internal access road approaching the substation compound encountered a service at less than 1m depth, the make-up of the ground up to that point was dense grey sandy gravel with high cobble content. The final trial pit excavated in front of the substation encountered firm brown/grey sandy and gravely clay with high cobble and boulder content at 1.25m deep. The results of the survey were used to inform the preliminary design of the onshore grid connection work.

9.4 Potential Impacts

9.4.1 Construction Phase

The construction phase of the proposed development includes three general areas of construction;

- Cable connection at Moneypoint 400 kV GIS substation;
- Cable connection at Kilpaddoge 220 kV GIS substation; and
- Submarine / River Shannon Crossing.

Full details of the description of the project are set out in Chapter 4. Further details on the potential offshore impacts within the River Shannon Crossing are dealt with in Chapter 8 *Marine Aspects* of the report.

The potential impacts on land and soils from these construction activities are set out below. Overall, construction phase activities will result in temporary impacts which, without the implementation of mitigation measures, would potentially result in significant effects on the receiving environment.

- Excavations increase the vulnerability of groundwater to exposure to spills/leaks of potentially polluting substances (chemicals, oils, paints, and sanitary waste). The proposed onshore trenching and excavations depths have been minimised where possible. The entire site will be subject to the general mitigation methods for storage of chemicals, fuel etc;
- The potential discharge of cement or uncured concrete;
- At the landfalls the bedrock geology and superficial sediment will be locally disturbed. There is a potential of collapse of excavations and failing material and unstable construction slopes. Slope stability of proposed ramp and side slopes are based on conservative slope angles for the materials observed from preliminary site investigations. 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. Trench and excavation depths have been minimised where possible to limit excavations and the need for material disposal;
- The onshore connection between the two existing substations will be achieved by means of an underground cable connection. The 400 kV underground trenches are approximately 1,650mm 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. Being less than 1.3m deep, significant seepage is not anticipated;
- The proposed development will result in the temporary loss of agricultural land to facilitate the construction. It is expected that a construction zone up to 20m wide will be required along the onshore underground grid connections route and between 28297m^2 and 10436m^2 temporary laydown areas for the duration of the works;
- Permanent loss of green field land at the proposed extension at the existing Kilpaddoge site;
- There are risks associated with all excavation works. Some soil and rock types are particularly susceptible to uncontrolled movement, whether triggered by human disturbance, or affected by natural phenomena such as prolonged rain, changes in vegetation and / or erosion. In the case of risks associated with human disturbance, the level of risk increases with the extent and depth of the excavation particularly in the context of the site's water table and high/extreme aquifer vulnerability;
- Soil compaction due to traffic and storage or excessively high stockpiles of soil, and silt laden run off in heavy rain or wheel-washing activities; and
- Hydrocarbons will be stored and used on site to refuel earthmoving machinery in addition to existing operational chemical storage. There is potential for spills and leakage to occur either through discharge of on-site hydrocarbons or accidental damage to outside bunds via human fault (i.e. on-site vehicle movement) with subsequent localised contamination of the soil and groundwater.

9.4.2 Operational Phase

During the operational phase of the proposed development there is limited potential for site activities to impact on the geological and hydrogeological environment of the area due to the type of development.

9.5 Mitigation Measures

The following sections set out the mitigation methods that could be used during construction for the onshore components of the proposed development.

9.5.1 Construction Phase

- In order to minimise disruption, a Construction Environmental Management Plan (CEMP) will be developed and implemented by the Contractor during the construction phase of development. The CEMP will be reviewed regularly and revised as necessary to ensure that the measures implemented are effective;
- 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. 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 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;
- 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.

9.5.2 Operational Phase

There will be no specific mitigation required in this instance.

9.6 Residual Impacts and Monitoring

There are no likely significant impacts on the land, geological or hydrogeological environment associated with the proposed operational development of the site based on the location of the development, the construction techniques being proposed, and the implementation of the mitigation measures as set out.

10 Water, including Flood Risk

10.1 Introduction

This chapter provides a baseline evaluation of the existing surface water environment and the potential impacts associated with both the construction and operation of the proposed development. The potential impacts on various water aspects have been identified and assessed in relation to water quality and flood risk:

Mitigation measures are proposed, where appropriate, to address the likely impacts associated with the proposed development. This chapter deals specifically with surface water related impacts. Coastal and hydrodynamic processes and effects are dealt with separately in Chapter 8 *Marine Aspects* of this report.

10.2 Methodology

A desktop appraisal was undertaken to identify the baseline characteristics relating to the hydrology and local flood risk of proximate surface waterbodies, specifically the Lower Shannon Estuary. The key resources used for the purpose of this appraisal were as follows;

- EPA (Water Framework Ireland Map viewer) databases for information on surface water features within and adjacent to the project study area and designated sites within and adjacent to the study area;
- The Planning System and Flood Risk Management -Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government, November 2009
- Water Quality in Ireland 2010-2015 (2017);
- Clare County Development Plan Strategic Flood Risk Assessment 2017-2023;
- Kerry County Development Plan Strategic Flood Risk Assessment 2015-2021; and
- Office of Public Works (OPW) Flood Risk Maps. (www.floodinfo.ie).

10.3 Baseline Environment

The main surface water bodies within the study area flow into the Lower Shannon Estuary. The Shannon is Ireland's largest estuary, comprising an area of approximately 150km^2. The Lower Shannon Estuary is designated as a candidate Special Area of Conservation (SAC) and a Special Area of Protection (SPA). Details on the ecological designation are set out in Chapter 7 *Biodiversity* above.

The Burane lower drains into the Bay between Kilmer and Moneypoint. The Burane lower has unassigned water quality in the latest Water Framework Directive (WFD) Status (2013-2018) by the Environmental Protection Agency (EPA). The Glencorby and Tarbert rivers drain into the Estuary on the southern side around Tarbert generating plant. The Glencorby drains to the east of Tarbert, and Tarbert stream drains into the estuary at Tarbert Bay. Both of these rivers are assigned a good status.

The Lower Shannon Estuary transitional waterbody has been identified as having Good status by the EPA (2013-2018), however, the transitional waterbody is noted as 'At Risk due to fish status'.

10.3.1 Water Framework Directive – Register of Protected Areas

While the overall objective of the Water Framework Directive is to achieve good status for all waterbodies, some waterbodies require extra protection by virtue of their location in a protected area or their function as a drinking water or bathing water. In accordance with the requirements of the Water Framework Directive and the associated national regulations a register of protected areas has been set out for each River Basin Districts in Ireland.

The protected areas are identified as those requiring special protection under existing National or European legislation, either to protect the surface water resource, or to conserve habitats or species that directly depend on those waters. The different protected areas included in this register are:

- Drinking waters;
- Nutrient Sensitive Areas (including areas designated as Vulnerable Zones); and
- Water Dependent Habitats and Species (SAC, SPA and Salmonid Water).

A desktop review of the existing services was undertaken within direct proximity of the proposed boundary area. There are a number of private wells scattered within the wider area.

There are no nutrient sensitive areas located within the project study area.

Water dependent habitats and areas of ecological significance within the proposed development boundary including all internationally designated habitats, are discussed in detail in the Chapter 7 *Biodiversity* of this report.

10.3.2 Aquaculture

The estuary is an important area for commercial aquaculture, the majority of current licensed activities focus on the cultivation of shellfish (in particular Pacific oysters) centred in locations outside of the project area in / near Rinvella, Carrigaholt, Poulnasherry Bay, Ballylongford Bay, Bunnaclugga Bay and adjacent to Aughinish Island. The only licensed site within the wider study area is held by Atlantic Shellfish Limited this is partially located within the proposed development boundary at Moneypoint.

All marine waters within the proposed development site are considered to be of high importance and sensitivity.

10.3.3 Industry

Operations at the Moneypoint Generating Station are currently regulated by the EPA under the existing IED licence (Ref No. P0605-04). All emissions produced are subject to the criteria set out within the IED licence issued and regulated by the EPA.

10.3.4 Storm Water Drainage Design

10.3.4.1 Kilpaddoge Substation

Kilpaddoge station is a newly constructed 220/110 kV GIS substation to the south of the Shannon Estuary in County Kerry. The intention for Kilpaddoge has always been to reserve space for possible future development or extension of the substation. 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 within the site are approximately between 6m to 17m AOD. It is expected that the site will be elevated to between 17m and 10.0m AOD.

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

Surface water runoff will be generated from all surfaces within the facility which are exposed to rainwater, or to which water is applied in order to clean. This includes all hardstanding surfaces, roofs and other impermeable surfaces. Surface water generated on permeable areas will infiltrate to the ground as per the greenfield conditions.

There is an existing stormwater network on site which will be required to be rearranged in order to accommodate the proposed substation layout. The existing drainage network discharges directly into the Shannon via an outfall pipe.

The proposed main drainage network will consist of a new collection system designed in accordance with IS EN 752 Drain and Sewer systems outside building. The pipes will be compliant with the requirements of the Greater Dublin Regional Code of Practice for Drainage Works and be designed in accordance with the principles of Sustainable Drainage Systems (SuDS) and full bore self-cleansing velocities of 1.0m/s will be achieved throughout the main network. The drainage network will have pipes with a maximum diameter of 225mm and a minimum diameter of 150mm and will generally consist of PVC (to IS 123) or concrete socket and spigot pipes (to IS 6).

The proposed site drainage layout is provided in the accompanying planning drawings Ref; 229379408-MMD-00-XX-DR-E-1200. The drainage proposal is divided into Area 1 and Area 2, as detailed below, to reflect the changes in ground levels between the eastern and western section of the site.

No changes to the existing drainage network are proposed existing Moneypoint Generating Station.

Area 1

This area services the lower portion of the substation site. The existing ground level is between 6m to 17m AOD. This area also redirects and services existing land drains on the site. All new surface water runoff created in this area will infiltrate to ground. This solution will incorporate a proposed soakaway pit with an upstream Class II petrol interceptor and associated silt trap. This proposal is in line with best SuDS practice and negates the need for a formal discharge licence into the Shannon River.

As the proposed soakaway pit will be constructed within made ground raised as part of the construction of the proposed extension, it is assumed that this made ground can be specified in such a manner to allow for the required permeability of the soakaway design. The composition of this soil build up is to be confirmed in the detail design stage.

Area 2

The ground levels of this area of the Kilpaddoge site allow for a direct gravity feed into an existing surface water network on the site. It is therefore proposed to service this area with a direct discharge in the existing sewer via a Class I full retention petrol interceptor.

10.3.4.2 Moneypoint

No changes to the existing drainage network are proposed existing Moneypoint Generating Station

It is noted that the proposed underground cable ducting from the northern landfall will cross a number of field drains along the route before connecting into the Moneypoint GIS substation. It is proposed that culverts will be installed to facilitate the ducting to cross these drains. The culverts will be designed to allow the 1% AEP (1 in 100 year) flood flow to pass.

It is not proposed to construct any foul water drainage for the proposed development as there are no proposals to include any additional welfare facilities, neither are water proposals for the proposed development.

Any increase in runoff resulting from the replacement of permeable greenfield area with impermeable surfaces associated with the development will be mitigated by the proposed site drainage and SuDS features therefore, the proposed development will not result in an increase of flood risk.

10.3.5 Flooding and Coastal Erosion

Potential flood risk from the proposed development has been considered in accordance with the Planning System and Flood Risk Management -Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government, November 2009.

The core objectives of the Guidelines are to;

- Avoid inappropriate development in areas at risk from flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface run-off;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

The Guidelines note that a precautionary approach should be applied, where necessary to reflect uncertainties in flooding datasets and risk assessment techniques and the ability to predict future climate and performance of existing flood defences. Development should be designed with careful consideration to possible future changes in flood risk including the effects of climate change so that future occupants are not subject to unacceptable risks.

Flooding in the general study area was assessed by accessing the Office of Public Works data portal (www.floodinfo.ie) and the Flood Risk Management Plans for (i) Shannon Estuary South and (ii) Shannon Estuary North & Mal Bay (OPW, 2018). On the southern side of the Shannon Estuary historical flood events and future coastal flood risk has identified Tarbert Island [and its approach road from the south (N67)] as being at risk of flooding in addition to the Ballylongford catchment. On the northern side of the Shannon Estuary historical flood events have been recorded at Kilrush and Cappagh.

The Irish Coastal Protection Strategy Study for the South West Coast under the most conservative modelling assumptions have identified areas at potential risk from tidal flooding. These locations are generally located in the immediate environs of the shoreline with the exception of Tarbert Island which is considered to be most vulnerable under the ‘high end

scenario'. The assessment of coastal erosion risk completed by the OPW did not identify the study area as being at significant risk of erosion.

According to the predicative flood maps (www.CFRAMS.ie) the proposed onshore development is located outside of the predicted flood extents associated with the Lower River Shannon Estuary for medium or high probability scenario. This indicates that the proposed development is located in "Flood Zone C" where there is a low probability of flooding, and development is considered appropriate in line with the "Planning System and Flood Risk Management - Guidelines for Planning Authorities" (OPW and DEHLG, 2009). There is no record of pluvial flooding within the existing Moneypoint Generating Station Complex or the Kilpaddoge substation.

Any increase in runoff resulting from the replacement of permeable greenfield area with impermeable surfaces associated with the development will be mitigated by the proposed site drainage and SuDS features therefore, the proposed development will not result in an increase of flood risk.

10.4 Potential Impacts

10.4.1 Construction phase

The potential construction phase impacts associated with the installation of the submarine cable crossing within the Shannon Estuary and works on the foreshore are dealt with separately in Chapter 8 *Marine Aspects* of this PECR.

The potential construction phase impacts associated with the grid side connection and substation works are typical of those associated with the proposed project activity and mainly relate to contamination of waterbodies. With the exception of minor field drain crossings, there will be no instream works carried out as part of the onshore grid side connection and substation works and therefore there will be no changes to the morphology of the existing onshore surface water network. Construction phase activities may result in short term indirect impacts on the waterbodies which, without the implementation of appropriate mitigation measures, could have significant effects on the receiving environment and areas that are hydrologically connected. Further details on the assessment of potential impacts on the surface water quality and associated habitats is carried out in Chapter 7 *Biodiversity* of this PECR. The potential impacts on the protected habitats and species associated with the Lower Shannon Estuary SAC and River Shannon and River Fergus SPA are set out in the accompanying NIS.

All onshore construction works (i.e. grid side connection and substation works) are located outside of predicted flood extents associated with the Lower Shannon.

Approximately 1.8 kilometres of the onshore grid side route will traverse agricultural land, and existing hardstanding areas. The trench will be excavated by a mechanical excavator Being less than 1.5m deep, significant landslide or sediment runoff is not anticipated.

10.4.2 Operational Phase

As noted previously, the proposed development boundary is located in 'Flood Zone C' as defined by *'The Planning System and Flood Risk Management Guidelines for Planning Authorities'*. Given that the proposed collection system will discharge to ground, the operation of the proposed extension at the existing Kilpaddoge substation will not increase the level of flood risk elsewhere within the catchment.

All collected storm water runoff will be directed through a silt trap and a full retention oil interceptor which will remove any silt or hydrocarbons which may have become entrained in runoff from hardstanding surfaces within the compound. As such, it is considered highly unlikely that contaminated surface water run-off would discharge to ground.

There is, however, a possibility of uncontained spillage or leaks associated with equipment malfunctions, i.e. fuel spillage giving rise to hydrocarbons outside of the substation compounds. These pollution events, in the absence of mitigating controls, have the potential to impact the River Shannon via natural drainage pathways. The design includes an emergency shut-off valve in a manhole chamber just upstream of the infiltration which can be closed in the event of a major spill to prevent runoff discharging to ground.

Cable trenches for the grid side connection are approximately 1,550mm 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 cables will be installed in ducts encased in concrete. The trench will then be backfilled with excavated material to minimise impacts on local hydrology. A schematic of a typical 400 kV Cable Trench Arrangement is provided in Chapter 4 *Description of Project* of this PECR. Joint bays will also be required, at intervals of approximately 700 metres along the cable routes.

10.5 Mitigation Measures

10.5.1 Construction Phase

- The appointed Contractor will be required to develop a Construction Environmental Management Plan (CEMP) which will include a comprehensive and integrated plan for erosion and sediment control measures as set out in this PECR. The CEMP will document all relevant legal obligations for construction sites in terms of water quality control in Ireland in addition to setting out recommended best practice including mitigation measures in respect of trenching and trenchless techniques. The CEMP will be reviewed regularly and modified as necessary. A copy of the Outline Construction Environmental Management Plan (OCEMP) accompanies this application for statutory approval. This will form the basis for the CEMP when, assuming SID Approval is given by ABP and Foreshore Licence approval is given by the DHPLG, all conditions of the Approvals can be included in the CEMP;
- 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 onshore 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 soil arisings 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, non-hazardous, 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[35]. 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 the drainage ditch crossing points and should be positioned 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. Further details on the silt/sediment control measures and water quality control measures are as set out in Chapter 7 of this PECR.

10.5.2 Operational Phase

No specific mitigation measures are required.

10.6 Residual Impacts and Monitoring

It is predicted that subject to the mitigation and monitoring measures identified above being adhered to there will be no significant residual impact on surface water or flood risk in the vicinity of the proposed development during construction and operational phases.

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

11 Archaeology and Cultural Heritage

11.1 Introduction

This chapter assesses impacts of the proposed works associated with the Cross Shannon Cable project on the archaeological heritage, and cultural heritage environment. Mitigation and monitoring measures are also proposed, where appropriate, to address the likely impacts associated with the proposed development in order to minimise any significant adverse impacts.

The assessment included the intertidal foreshore in anticipation of cable landfall locations in counties Clare and Kerry, and marine geophysical survey data interpretation of a comprehensive dataset acquired across the marine survey area. The assessment work was completed under licence from the National Monuments Service, Department of Culture, Heritage and the Gaeltacht, 17D0070 and 17R0164 for intertidal elements, and 17R0168 for marine geophysical survey.

11.2 Methodology

11.2.1 Assessment

A sequence of work has been completed to ensure that the archaeological and cultural heritage assessment has been comprehensive and robust. The work has included a desktop study of known archaeological sources, a review of site investigations conducted for the wider project, and on-site inspections and surveys which have included walkover surveys of the intertidal and upper foreshore and comprehensive archaeological interpretation of marine geophysical survey extended over a wider study area.

The existing 220 kV cable installation (Foreshore Licence Ref: FS005791) has been the subject of archaeological assessment and this report draws on that work to provide background insight.[36] Additional work has also been carried out for the proposed project. The marine survey (RINA, 2018a) comprised multibeam bathymetry, side-scan sonar, magnetometry and sub-bottom profile data sets.

A comprehensive report, detailing the above licenced archaeological work, was presented to the Department in advance of the Foreshore consent application being sought to undertake intrusive marine site investigation works (vibrocoring / cone penetration tests); this work was required to assist in the identification of a preferred route. A programme of vibrocoring and cone penetration testing (CPT) was subsequently carried out in November/ December 2019. The vibrocore / CPT locations avoided any of the acoustic anomalies identified. The vibrocore logs were presented for archaeological review.

Following the site investigation work, an emerging Best Preforming Option was selected. The selection of the Best Preforming Option is considered optimal from a cultural heritage perspective. No further marine geophysical survey was required, while archaeological field

[36] Niall Brady, 'Archaeological Interpretation of Marine Geophysical Survey Data, Tarbert-Moneypoint Cable Route. 07R2258', unpublished report of ADCO for Mott MacDonald and EirGrid, 2009; Rex Bangerter, 'Underwater and Intertidal Archaeological Assessment, Cable Landfall Locations, River Shannon, Carrowdotia South Td, Co. Clare, Kilpaddoge and Cloonanoonagh Td, Co. Kerry. Tarbert to Moneypoint 220kV Submarine Cable Project. 09D061, 09R155', unpublished report of ADCO for Mott MacDonald and EirGrid, 2009; Julianna O'Donohue, 'Licence 15E0477, summary results', no date, pdf file received 2017.

survey of the upper foreshore/ adjacent land areas at the two associated landfall locations was carried out on 11th December 2019.

This chapter summarises the findings from the corpus of archaeological data previously gathered and presents the additional work undertaken on confirmation of the preferred cable route. It includes an impact assessment and a set of specific mitigation measures relating to the pre-construction and construction phases of the proposed project. The full archaeological report prepared by ADCO is provided in Appendix D of this report.

11.2.2 Consultations

Consultation was carried out with the National Monuments Unit and the Underwater Archaeology Unit with respect to the potential archaeological receptors and scoping of the archaeological studies as part of the Step 4 options evaluation and the assessment of the proposed development.

11.2.3 Guidance and Legislation

The following legislation, standards and guidelines with particular reference to Archaeology were consulted for the purposes of this evaluation:

- National Monuments Acts,1930-2004;
- The Heritage Act, 1995;
- Guidelines on the information to be contained in Environmental Impact Statements, 2002, EPA;
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements), 2003, EPA;
- Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes, no date, NRA;
- Frameworks and Principles for the Protection of the Archaeological Heritage, 1999, Department of Arts, Heritage, Gaeltacht and Islands (now the DCHG);
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 2000 and the Local Government (Planning and Development) Act 2000;
- EirGrid ‘Cultural Heritage Guidelines for Electricity Transmission Projects’ (EirGrid 2015); and
- The Code of Practice between the Minister of EHLG (now CHG) & EirGrid in relation to Archaeological Heritage’ (2009).

11.3 Baseline Environment

The Shannon Estuary is the largest inlet located along the Irish coastline and constitutes an exposed inter-tidal zone around 200km in length (combined length of both sides of the river). The estuary is part of a dynamic landscape that includes raised bogland, freshwater fens, salt marshes and intertidal mudflats. Research conducted in the 1990s highlighted the archaeological importance of the Shannon estuary since earliest times.[37] The work conducted by the Discovery Programme focused attention on the role that the estuary played in providing economic potential in terms of coastal exploitation for fishing and communications since the later Mesolithic period, before people exploited the landscape directly for agrarian production. The study area was concentrated on the intertidal mudflats on the Fergus and Meelick rivers

[37] Aidan O'Sullivan, *Foragers, farmers and fishers in a coastal landscape. An intertidal archaeological survey of the Shannon estuary*, Discovery Programme Monograph 5 (Dublin, 2001).

and around Carrigdirty, County Limerick, upriver from the present survey area. The work brought attention to the archaeological potential of the larger estuary area. Estuarine environments are sensitive to sea-level change and large areas of prehistoric foreshore have been submerged by relatively small fluctuations in that level. The inter-tidal environment provides for an extremely rich archaeological holding content and archaeological / palaeoenvironmental evidence of Mesolithic, Neolithic, Bronze Age and post-medieval date has been recovered. Large sections of the estuary provide suitable environmental conditions for the preservation of archaeological material along its intertidal zone, where deep deposits of estuarine mud provide an anaerobic environment within which archaeological material is preserved. Areas of submerged Neolithic forest have been identified, buried deep within the estuarine clays. The distribution of known medieval and early modern/nineteenth-century fortifications along the estuary was well known, but the new work highlighted the as-yet undocumented foreshore areas with relict fish weirs and old piers as features that can retain significant and early phases of use.

In the area between Moneypoint and Kilpaddoge, the Shannon estuary is approximately 2.5km wide and begins to broaden gently on its west side as it starts its approach to the Atlantic Ocean. The waters run swiftly across the deep depths of the main channel. The estuarine topography differs from that further east and in the most part does not provide for the form of preservation seen to the east of Kilkerrin Point. The upper foreshore and inter-tidal zones on the north side around Moneypoint are predominantly composed of shelving bedrock, shingle, and rock deposits, with small areas of sand and silt in natural inlets, while Glencoosagh Bay on the south side provides a narrow band of sand and silt deposits inshore

The Step 4 evaluation process provided the baseline character, context and significance of the archaeological and cultural heritage in the wider environs of the proposed development. As noted above a series of pre-construction surveys were carried out to locate a suitable route that would permit suitable conditions for the installation of the proposed development. A summary of the Step 4 evaluation and description of the options considered is set out the Step 4 report, a copy of which is provided in Appendix A of this report.

A description of the proposed development is set out in Chapter 4 of this report. The estimated overall length of the submarine route is approximately 2.8km. The north landfall is located at a point approximately 112m to the east of Moneypoint Generating Station, within the townland of Carrowdotia South. The southern landfall will link the cable to the existing Kilpaddoge Substation, located in Kilpaddoge townland.

The proposed cable configuration within the submarine area will comprise 4 no. cables, spaced up to 60m apart. At a point approximately 500m from the Low Water Mark (LWM) at each landfall, the cable spacing will gradually reduce downwards until equidistantly spaced approximately 4m apart. Where the river/estuary bed is soft, the cables are to be buried to a depth between 1m and 3m. This will be achieved using water jetting and/or a cable trenching machine. Where the river / estuary bed is too hard to allow for burial to be achieved, the cables are to be covered with a layer of protective rock; the preferred protection measure being the use of rock-filter bags. The submarine installation process does not require the deliberate dredging or disposal of material within the maritime area. Further details on the proposed construction of the proposed landfalls are set out in Section 4.2 *Onshore Activities*. The proposed submarine cable installation process is detailed in Section 4.3 Submarine / River Shannon Crossing of this report.

11.3.1 Outputs of Desktop Studies

Cartographic Information

Examination of the OS historic mapping gives insight to land-use and foreshore adaptation over time. The structures that are typically included on the OS mapping include slipways, jetties, quays, harbours, boathouses, flood embankments, fish-traps, and fish weirs. Topographic indicators are also shown that include areas of shingle, shelving bedrock and intertidal mudflats.[38] The historic mapping relating to each of the two landfall areas under assessment is described below.

Northern Landfall (Foreshore east of Moneypoint Generating Station)

The OS First Edition (1842) map of the shoreline to the east of Moneypoint depicts a rocky, narrow foreshore extending a maximum of approximately 30m from the High Water Mark (HWM). A cliff-face delineates the HWM and is shown as irregularly-shaped spurs of bedrock that protrude in a northwest direction from the upper foreshore. A large quarry, located immediately adjacent to the shoreline, presents the most noteworthy cartographic feature within this map area. The feature measures approximately 100m in length (east-west) approximately 90m in width (north-south) and is annotated 'Flag Slate Quarry' (Map Item 12). A laneway provides access to a number of buildings located on the west side of the quarry and the upper foreshore further to the west; adjacent to the western limit of the foreshore assessment area. Another much smaller quarry is also indicated at a location approximately 170m northwest of Moneypoint (Map Item 13).

Given the reference to 'Flag Slate', the quarry was probably a source of flag stones for use in the construction of roofs and as a flooring medium. Indeed, reference from 1838 notes that:

Moneypoint Quarry produces a fine, hard, close grained gritty flag, varying from 1 ½ to 4 inches thick from 10 to 20 superficial feet...[and that the flags]… are shipped from the quarry.[39]

Despite this contemporary reference to the shipping of quarried stone direct from Moneypoint, no slipway of jetty structure is shown on the Frist Edition Map. In contrast, the OS 25-inch (1888-1913) map records a small 'Quay' and associated 'Slip' (Figure 11.2Map Items 14-15). The quay measures approximately 15m in length along its seaward façade. It is shown extending roughly one quarter of the way down the intertidal foreshore, presumably allowing boat access to the quay structure between mid-water and high tide. The quarry is now recorded as 'Money Point Quarry' and is mapped in some detail, showing the various quarry faces, access paths, steps, and associated buildings. It also notes the presence of two 'Cranes'. The smaller quarry located closer to Moneypoint (Map Item 13) is now referred to as 'Quarry (Disused)'.

Landfall Survey Area S1 (foreshore Glencloosagh Bay)

The First Edition Map (1837) map of Glencloosagh Bay depicts a shingle beach forming an intertidal zone that extends up to approx. 90m from a low-lying cliff that delineates much of the upper foreshore (Figure 11.1). Exposed section of shelving bedrock is shown towards the east of the foreshore assessment area, forming fingers of bedrock that are orientated northeast-

[38] ADCO carried out a study of the cartographic indicators along the full estuary as part of the Shannon Integrated Framework Project: Niall Brady, Shannon Integrated Framework Project. Cultural Heritage Assessment' unpublished report for RPS consulting engineers, 2012.

[39] *Second Report from the Commissionaires appointed to consider and recommend a general system of Railways for Ireland*, Alexander Thom, 86 Abbey Street, Dublin 1838; *Mines and Quarries worked by other parties than the mining company*, p. 67.

southwest (Map Item 24). A stream (annotated 'Glencloosagh') drains onto the foreshore at the innermost point along the bay's extent and forms the townland boundary between Coolnanoonagh Td. and Kilpaddoge Td (Map Item 25). There is no indication on the First Edition map of the presence of any foreshore structures or landing places, although the map does note that there is 'Good Anchorage' off Glencloosagh Bay, annotated a point *approximately* 260m from the shoreline (Map Item 26).

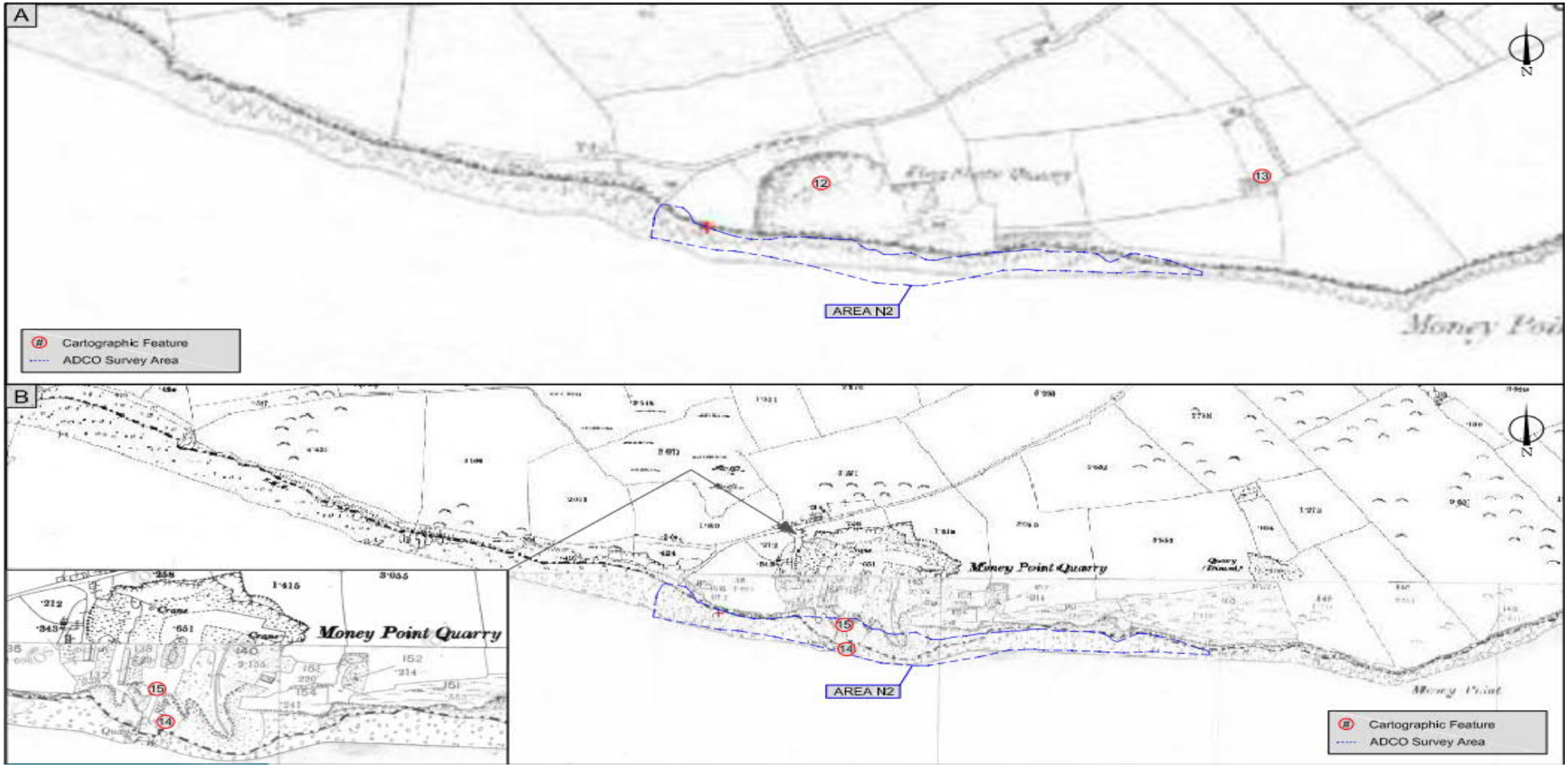
The OS 25-inch (1890) map of the bay depicts a foreshore topography that remains largely unchanged (Figure 11.3), however, there are a number of structures located within the foreshore assessment area that are now recorded. These include a salmon weir, an associated building (probable boathouse), a lime kiln, and a gravel pit (Map Items 27-30).

The salmon weir extends northwards across the intertidal foreshore for a distance of approximately 62m, before continuing a further approximately 36m m into the subtidal zone (Map Item 27). A square building is located in proximity to the fish-trap, positioned on the upper foreshore at a point approximately 20m to the west (Map Item 28). The structure measures approximately 10m x 10m and appears to be sub-divided into two rooms/areas. The building's north façade provides access to the foreshore, a short distance above the HWM. It is likely that this structure is associated with the nearby salmon weir and may have been also used for the storage of small boats fishing in the bay.

Moving eastwards along the shoreline, a 'Lime Kiln (Disused)' is located on the upper foreshore, approximately 14m from the HWM (Map Item 29). The kiln chimney measures approximately 5m x 5m and has walls that extend a further 5m from either side of the kiln's entrance; located on the south side of the structure. Another rectangular structure is depicted a short distance (*approx* 15m) west of the lime kiln. This structure is not named, and its purpose remains unclear.

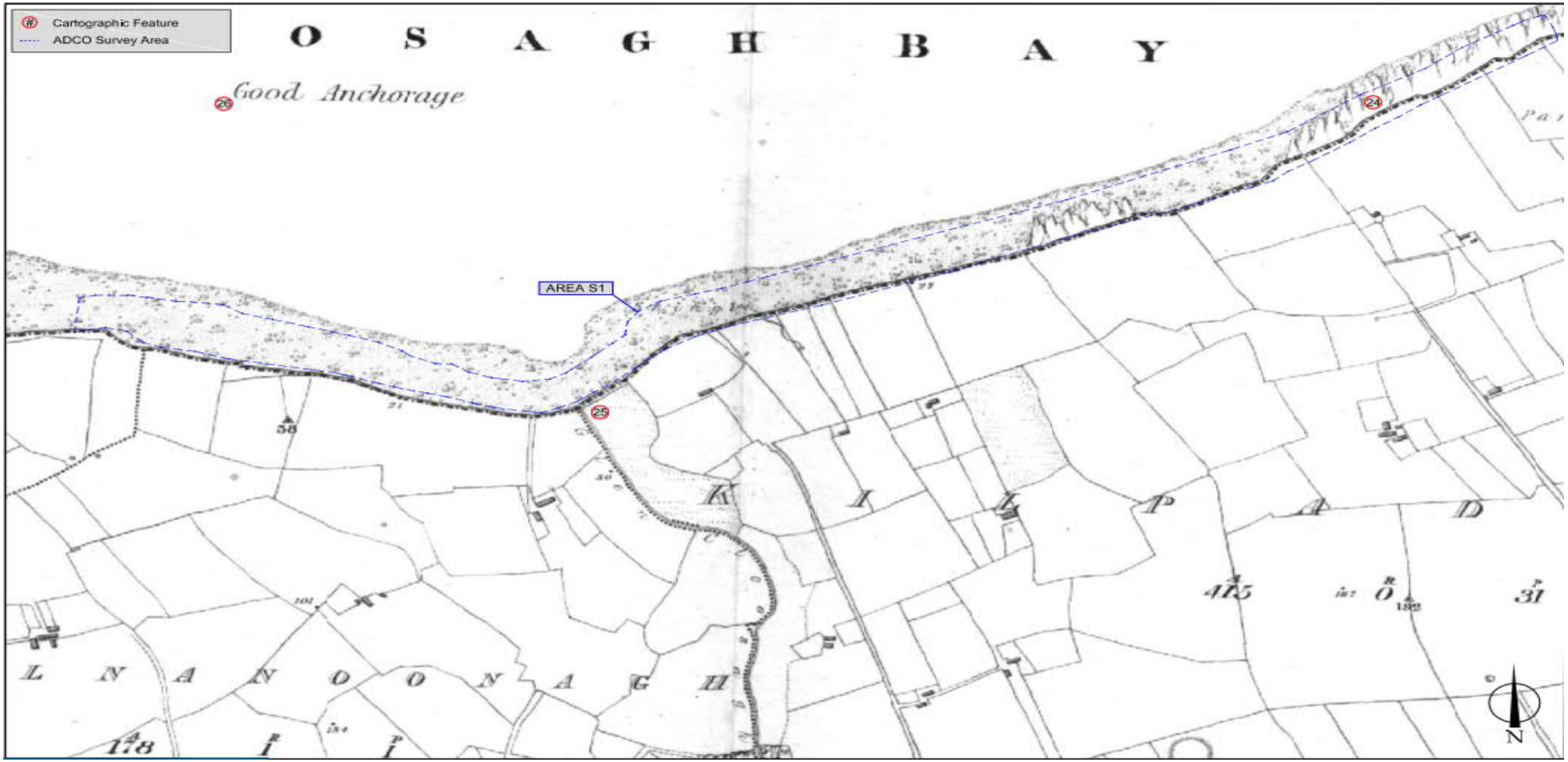
A '*Gravel Pit (Disused)*' is located on the upper foreshore towards the eastern extent of the foreshore assessment area (Map Item 30). The pit is located in the northwest corner of a field that bounds the shoreline. The features west side is defined by a field boundary and a bedrock cliff, which delineates the upper foreshore, to its north. The mapped extent of gravel extraction at this location covers an area approximately 40m x 30m in size.

Figure 11.1: Extracts from OS First Edition (1842) and [B] 25-inch Edition (188-1913) maps showing estuary coastline at northern landfall survey area



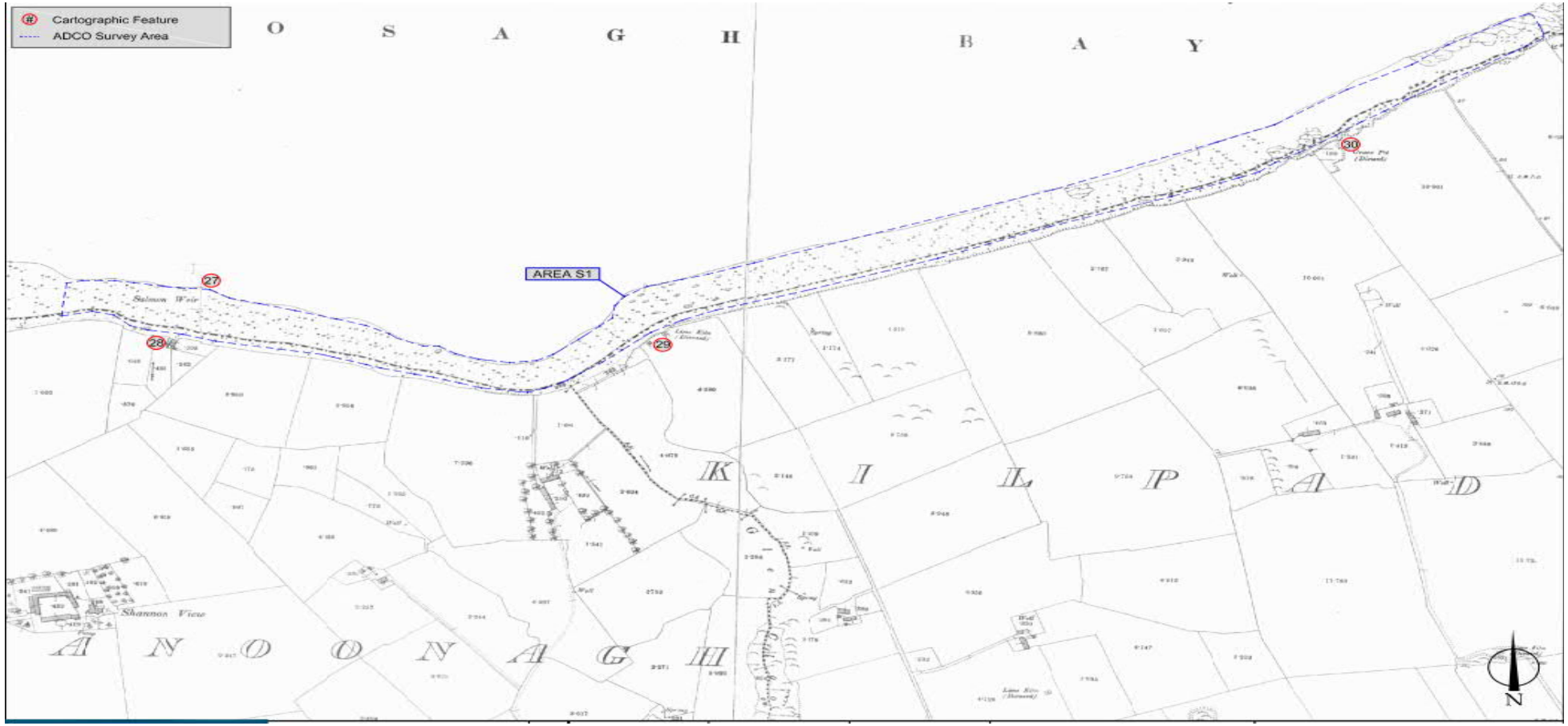
Source: ADCO Archaeological Impact Assessment and Marine Geophysical data Review- Emerging Preferred Route-Figure 7 (2020)

Figure 11.2: Extract from OS (1837) First Edition map showing estuary coastline at the southern landfall survey area



Source: ADCO Archaeological Impact Assessment and Marine Geophysical data Review- Emerging Preferred Route-Figure 9 (2020)

Figure 11.3: Extract from OS 25 inch (1890) Edition Map showing Estuary Coastline at southern landfall survey area



Source: ADCO Archaeological Impact Assessment and Marine Geophysical data Review- Emerging Preferred Route-Figure 10 (2020)

Sites and Monuments Record

The Record of Monuments and Places (RMP) is a list of archaeological sites based on the Sites and Monuments Record (SMR) files, maintained by the National Monuments Service at the DCHG.[40] SMR entries include detailed descriptions of archaeological sites based on site visits and historic studies and associated mapping where available. The SMR focuses on sites that are pre-1700AD in date, and so includes the ringforts and associated features recorded on the OS maps, however later buildings, including the fishtraps and historic house and foreshore buildings are not typically included in the archive, yet all structures that are more than 100 years old are considered as archaeological sites today.

Thirty-nine (39) RMP sites are listed in the vicinity of the foreshore areas under assessment for the wider environs[41]. Remote from the shoreline, but within 1.5km radius of the coastline, is a series of other archaeological sites that provide clear evidence of the early medieval settlement of the townlands located on either side of the estuary. A number of souterrains and a ringfort in Kilpaddoge townland, County Kerry, attest to this occupation. The picture is mirrored on the north side of the estuary with ringforts and associated structures located in the townlands of Carrowdotia North and Carrowdotia South.

Table 11.1: Known sites and monuments listed in the RMP within a 1.5km radius of foreshore areas under archaeological assessment (Landfall Areas)

RMP Number	Coordinates (ITM)	Townland	Site Type	Proximity to nearest assessment area
CL067-38	503749E, 652938N	Carrowdotia North	Rath	1.8km northwest of landfall survey area N2.
CL067-39-001	503823E, 652848N	Carrowdotia North	Souterrain	1.6km northwest of landfall survey area N2.
CL067-39-002	503823E, 652848N	Carrowdotia North	Cashel	1.6km northwest of landfall survey area N2.
CL067-40	503663E, 652377N	Carrowdotia North	Hut Site	1.4km northwest of landfall survey area N2.
CL067-41	503794E, 652241N	Carrowdotia South	Rath	1.25km northwest of landfall survey area N2.
CL067-42	503873E, 652293N	Carrowdotia South	Rath	1.24km northwest of landfall survey area N2.
CL067-43	504011E, 652166N	Carrowdotia South	Rath	1.08km northwest of landfall survey area N2.

[40] Accessible online via www.archaeology.ie

[41] Survey Areas N1- N3 are the three optional northern landfall locations considered during the route optioneering stage of the project development. Area N1 is located west of Moneypoint at Ballymacrinan Bay, Area N2 is located east of Moneypoint Power station, and Area N3 occurs further east of Moneypoint

RMP Number	Coordinates (ITM)	Townland	Site Type	Proximity to nearest assessment area
CL067-45	504194E, 652388N	Carrowdotia North	Rath	1.16km northwest of landfall survey area N2.
CL067-48	504728E, 652642N	Doonagurroge	Rath	1.1km northwest of landfall survey area N2.
CL067-50	504709E, 651742N	Carrowdotia South	Rath	483m north of landfall survey area N2.
KE003-01	506954E, 649254N	Tarbert	Bastioned Fort	1.2km east of landfall survey area S1.
KE003-02	507616E, 649525N	Tarbert Island	Battery	1.95km northeast of landfall survey area S1.
KE003-03	506080E, 647848N	Kilpaddoge	Holy Well	1.2km northwest of landfall survey area S1.
KE003-04	502946E, 649234N	Carhoonakineely	Rath	1.3km west of landfall survey area S1.
KE003-05	502881E, 648348N	Carhoonakineely	Earthwork	1.2km west of landfall survey area S1.
KE003-06	503249E, 648266N	Carhoonakineely	Rath	1km southwest of landfall survey area S1.
KE003-07	503696E, 647845N	Coolnanoonagh	Rath	572m southwest of landfall survey area S1.
KE003-08-000	503610E, 647639N	Carhoona	Church	1.1km southwest of landfall survey area S1.
KE003-08-001	503610E, 647639N	Carhoona	Graveyard	1.1km southwest of landfall survey area S1.
KE003-09	504979E, 647858N	Kilpaddoge	Rath	742m south of landfall survey area S1.
KE003-10	505373E, 648004N	Kilpaddoge	Rath	730m south of landfall survey area S1.
KE003-11	505852E, 647977N	Kilpaddoge	Rath	1.1km south of landfall survey area S1.

RMP Number	Coordinates (ITM)	Townland	Site Type	Proximity to nearest assessment area
KE003-12	506723E, 647988N	Tarbert	Moated Site	1.4km southeast of landfall survey area S1.
KE003-13	506910E, 648012N	Tarbert	Cashel	1.5km southeast of landfall survey area S1.
KE003-18	503804E, 647334N	Cockhill	Holy Well	1.35km south of landfall survey area S1.
KE003-121	505037E, 647533N	Farranwana	Rath	1km south of landfall survey area S1.

Source: Extract from ADCO Archaeological Impact Assessment and Marine Geophysical data Review- Emerging Preferred Route-Report

National Inventory of Architectural Heritage

The National Inventory of Architectural Heritage (NIAH) is a county-by-county database that identifies, records, and evaluates the post-1700 architectural heritage of Ireland as an aid to the protection and conservation of the nations' built heritage.[42] The NIAH surveys provide the basis for the recommendations of the Minister for the Department of Culture, Heritage and the Gaeltacht (DCHG) to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS). There are no entries listed in the NIAH for the townlands under assessment.

Topographical archive

The topographical files held at the National Museum of Ireland record objects that have been reported to the Museum or form part of its national collections. The records have been catalogued according to county and townland. There are currently no entries in the Topographic Archive relating to the area under assessment.

Historic Shipwreck Inventory

The Historic Shipwreck Inventory at the DCHG is a national archive that seeks to include all shipwreck events recorded in Ireland since records began to be made systematically in approximately 1750 AD.[43] It does not claim to represent a systematic record of wrecking prior to this date. The Inventory is made up principally of recorded incidents of wrecking. The locations of these wrecking incidents are not absolute and refer to the nearest headland or other known topographic feature. There are far fewer known locations of shipwreck, where wreckage has been identified on the seabed from sources such as marine geophysical survey, diver-truthing, fishermen's records or combinations of these and related sources.

In relation to the survey area, the headlands considered for the assessment include Moneypoint, Burrane Point, Clonderalaw Bay, Kilkerin Point, Bolands Rocks and Colman's Point on the Clare side, and Ballydonohue Point, Tarbert, Carrigaduaun, and Ardmore Point on the

[42] Online via http://www.buildingsofireland.ie/

[43] Online via https://dahg.maps.arcgis.com/apps/webappviewer

Limerick / Kerry side. The Inventory records only ten wrecking events, and none of these have been confirmed in terms of specific coordinates for actual wreckage surviving *in situ* (Table 11.2).[44] It should also be noted that despite comprehensive marine geophysical survey conducted in 2008 for a previous cable lay between Tarbert and Moneypoint, there were no observations made of shipwreck material.[45] There are significantly more events of historic wrecking recorded downriver at Scattery Island and upriver at Foynes. Tarbert is a difficult anchorage and suffers from a strong ebb-tide. This may explain the absence of shipwrecking incidents noted in the Tarbert and Moneypoint area

Table 11.2: Instances of shipwrecking within general area based of the DCHG shipwreck Inventory

Vessel Name	Date	Location	Description
Aid	December 1852	Tarbert Road, Shannon	Vessel was stranded in Force 10 wind. Was got off and taken to Limerick.
Britannia or Liverpool	November 1825	Rocks between Tarbert and Glynn	Went onto rocks, spars and rigging saved.
Diana	February 1820	Rock near Tarbert	Vessel lost while *en route* from London to Limerick.
Mary of Millford	1875	Boland Rocks, Kilrush	75-tonne schooner, wrecked.
Osprey	September 1851	Between Tarbert and Glyn	Went ashore.
Topaz	December 1900	1 mile below Glin Pier	Wooden Brigantine, 196 tonnes, with cargo of wood. Stranded and total loss.
Unknown	November 1839	The Beeves, near Tarbert	----------
Unknown	*November* 1850	Between Kilrush and Tarbert	Ferry boat operating between Kilrush and Tarbert was caught in a gale and sank.
Unknown	August 1892	Off Tarbert	18-foot rowing vessel, travelling to Kilrush and onward to Kilkee.
Unknown	October 1896	Tarbert Roads	12-tonne iron lighter, moored at Tarbert with a general cargo, founded in SW Force 1 and became a total loss.

11.3.1.1 Excavations Bulletin

The excavations bulletin provides an annual published and online summary of accounts of archaeological excavations undertaken throughout Ireland.[46] Summaries may also be submitted for inter-tidal survey, underwater assessments, and the archaeological monitoring of marine/ riverine dredging works. Archaeological monitoring for the previous cable-lay between Tarbert and Moneypoint did observe two series of timber posts or stakes in the nearshore sands off Kilpaddoge, County Kerry (see Table 11.3).[47] Four stakes were considered to be associated with a previously unrecorded nineteenth-century salmon weir, and three other stakes may have been associated with a weir and part of a rope fragment recovered from excavations associated with this second set of stakes was dated to the Bronze Age, at 1815+/- 55CAL BC.

[44] The online web viewer indicates additional recorded wreckings in the wider area, highlighting the broad area of Moneypoint as a reference for wreckage in 57 instances; while three events are associated with Ardmore Point and two with the west side of Tarbert Island. These numbers do no alter the findings being described above.

[45] Brady, 'Archaeological interpretation of marine geophysical survey data'.

[46] Accessed online via www.excavations.ie

[47] O'Donoghue, 'Licence 15E0477'.

Table 11.3: Locations of stakes associated with fish weirs recorded as part of 15E0477

Ref	Easting	Northing	Detail
Stake	504661	648551	One of four wooden stakes recovered in excavator bucket associated with Cable 6. Stakes are eroded at one end and are 300-500mm long, rectangular in profile (80x40mm) and taper to a point.
Stake	504623	648589	One of four wooden stakes recovered in excavator bucket associated with Cable 6. Stakes are eroded at one end and are 300-500mm long, rectangular in profile (80x40mm) and taper to a point.
Stake	504603	648608	One of four wooden stakes recovered in excavator bucket associated with Cable 6. Stakes are eroded at one end and are 300-500mm long, rectangular in profile (80x40mm) and taper to a point.
Stake	504733	648619	One of three wooden stakes observed in Trench 1 and left *in situ*. Withy rope associated and recovered from spoil.
Stake	504741	648610	One of three wooden stakes observed in Trench 1 and left *in situ*. Withy rope associated and recovered from spoil.
Stake	504739	648607	One of three wooden stakes observed in Trench 1 and left *in situ*. Withy rope associated and recovered from spoil.

Summary of Desktop Studies

The archaeological potential within the study area, based on existing data, highlights the two shorelines as locations that retain historic structures such as simple quays and former fish traps. Equally, there are no known archaeological or historic features within the corridor of the proposed development.

Intertidal archaeology is still a young discipline and much of the material remains tends to belong to the recent past, which has not been the focus of more traditional archaeological approaches. Moreover, as demonstrated during the archaeological monitoring of the previous cable-lay across the estuary in 2012, the potential to observe new material during construction remains high. The inshore environment retains expanses of soft sediment, and features such as buried fishtraps remain invisible to marine geophysical prospection.

11.3.2 Outputs of the Field Studies

Intertidal Survey

The primary onsite assessment, focusing on the three pre-selection route options (undertaken as part of the Step 4 options evaluation), was carried out by ADCO Archaeologist Ltd on the 7th and 8th June 2018 under licence from the DCHG, licence numbers 17D0070, 17R0164. Large areas of the foreshore at each landfall option location were inspected. This archaeological assessment, combined with the 2018 intertidal survey, provides a detailed account of the foreshore and wider coastal environment at the two landfall sites for the proposed development.

The section of the report presented below focuses on the landfalls associated with the proposed development study area only and the results of the route options elements detailed in the accompanying technical report provided in Appendix D. The work recorded topography and related features to provide a detailed account of the existing intertidal environment. Systematic non-disturbance walkover included inspection of both the intertidal zone (undertaken during Low Water Springs) and the adjacent lands extending above the HWM.

A DGPS unit was available to position-fix any features encountered and a Fisher *Aquanaut* 1280U and Tesoro *Compadre* metal detectors were used for the magnetometer surveys. A

photographic and written record was made including use of a drone to gather aerial views of the shoreline and features present. A finds retrieval strategy dealing with conservation issues, cataloguing, and locational recording was also in place to deal with any artefacts recovered during the survey.

Table 11.4: Extent of intertidal assessment across Landfall Survey Areas (June 2018)

Landfall survey Area	Coordinates of onsite Survey (ITM)	Survey Extent
Northern landfall (N2)	504266E, 651251E [western extent] – 504743E, 651194N [eastern extent]	485m of intertidal foreshore inspected
Southern Landfall (SI)	504174E, 648602 [western extent] –505733E, 648998N [eastern extent]	1.7km of intertidal foreshore inspected

Eight features of archaeological / historical interest were encountered as part of the intertidal inspection carried out in 2018. The majority are related to the nineteenth-century exploitation of the estuary while a section of submerged woodland and peat-saltmarsh (adjacent to the inter-tidal area east of the existing Moneypoint Electricity Generating Station) is likely to date back to prehistory, and a souterrain (on the intertidal area associated with the southern-shoreline west of the existing Kilpaddoge 220 kV substation) on the southern shore would date to the Early Medieval period (approx 500-1100 AD). There was no indication of the wooden posts/stakes identified during archaeological monitoring work completed during the 220 kV cable installation project.

The Shannon coastline was revisited on the 11th December 2019 in order to re-assess the location of the two landfall sites associated with the proposed development. The recent archaeological assessment, combined with the 2018 intertidal survey, provides a detailed account of the foreshore and wider coastal environment at the two landfall sites for the proposed development. No surface features or deposits of archaeological / historic interest were encountered within the footprint of the proposed landfall works corridor. The selection of the two landfall locations are considered optimal from a cultural heritage perspective; the chosen locations avoids all known and recently discovered archaeological features recorded within the various foreshore areas (Survey Areas N1-N3, S1/S2) and their adjoining literal zones.

Table 11.5: Extent of field assessment across upper foreshore/ adjacent land areas at Landfall Sites associated with the proposed development.

Landfall	Grid reference	Location
Northern landfall (N2)	504266E, 651251E [western extent] –504743E, 651194N [eastern extent]	485m of upper foreshore and adjacent land area inspected
Southern Landfall (SI)	505178E, 648717E [western extent] –505492E, 648841N [eastern extent]	330m of upper foreshore and adjacent land area inspected

Terminology

When referring to the degree of compaction observed for foreshore deposits under inspection, the terms loose, medium, and hard are relative and do not relate to the measured properties of these deposits. All dimensions in this report are provided in either millimetres or meters according to scale. When referring to sediment grain size, the Wentworth scale has been adopted, as detailed in Table 11.6

Table 11.6: Sediment grain size categories as applied to the seabed/riverbed deposits discussed in this report.

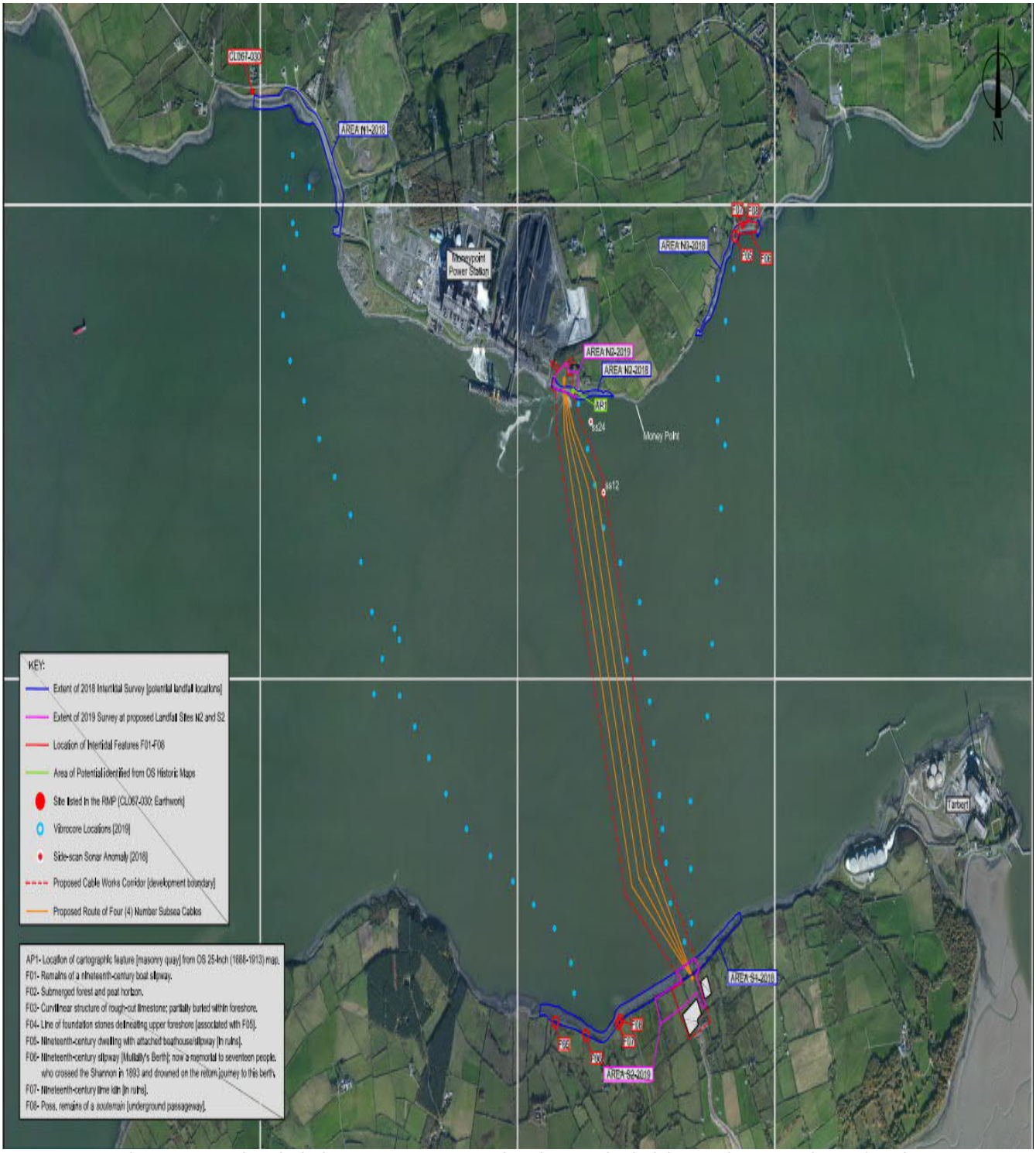
Size (mm)	Grade
>256	Boulder
>64	Cobble
>4	Pebble
>2	Granule (gravel)
>1	Very coarse sand
>1/2	Coarse sand
>1/4	Medium sand
>1/8	Fine sand
>1/16	Very fine sand
>1/32	Coarse silt
>1/64	Medium silt
>1/128	Fine silt
>1/256	Very fine silt
<1/256	Clay

Figure 11.4: Distribution Map of sites listed in the RMP/NIAH shown in relation to the proposed development(Scale 1:30000)[48]

Source: Extract from ADCO Archaeological Impact Assessment and Marine Geophysical data Review- Emerging Preferred Route-Report

[48] Red dots refer to Site listed in the DCHG Record of Monuments and Places (RMP), Blue Dot refer to the National Inventory of Architectural Heritage (NIAH)

Figure 11.5: Location and extent of Archaeological/Historical Features (F01-F08) identified as part of the Intertidal Survey undertaken by ADCO in 2018



Source: Extract from ADCO Archaeological Impact Assessment and Marine Geophysical data Review- Emerging Preferred Route-Report

Northern Survey Area

As noted above, Step 4 evaluation was carried out having regard to the findings from the desktop assessment and intertidal surveys previously undertaken by ADCO (2018); as detailed in Sections 11.3 of this report. As such, the proposed landfalls sites do not impact upon any known or newly discovered cultural heritage sites arising from that work.

Additional archaeological surveys were subsequently carried out in 2019 to assess the upper foreshore / land areas that lie within the proposed development corridor at each landfall. The findings from the latest onsite assessment have been combined with the information gathered as part of the 2018 surveys to provide the fullest picture of the existing foreshore environment present at the two proposed landfalls sites.

The northern landfall survey area occurs within the townland of Carrowdotia South (Moneypoint). An aerial image of the proposed foreshore is provided in Figure 11.6 below .Figure 11.5 illustrates the location and extents of archaeological historical features (F01-F08) identified as part of the overall intertidal survey undertaken by ADCO in 2018. Figure 11.7 illustrates the location of the features in proximity to the proposed landfall and submarine cable route corridor at Moneypoint.

Table 11.7: Northern Landfall Features

Townland	Carrowdotia South (Moneypoint)
ITM	504266E, 651251E - 504743E, 651194N
Extent	485m section of upper foreshore/ adjacent land area inspected
Feature(s)	F09-F011, Area of Potential AP1; cartographic feature

Topographic Summary

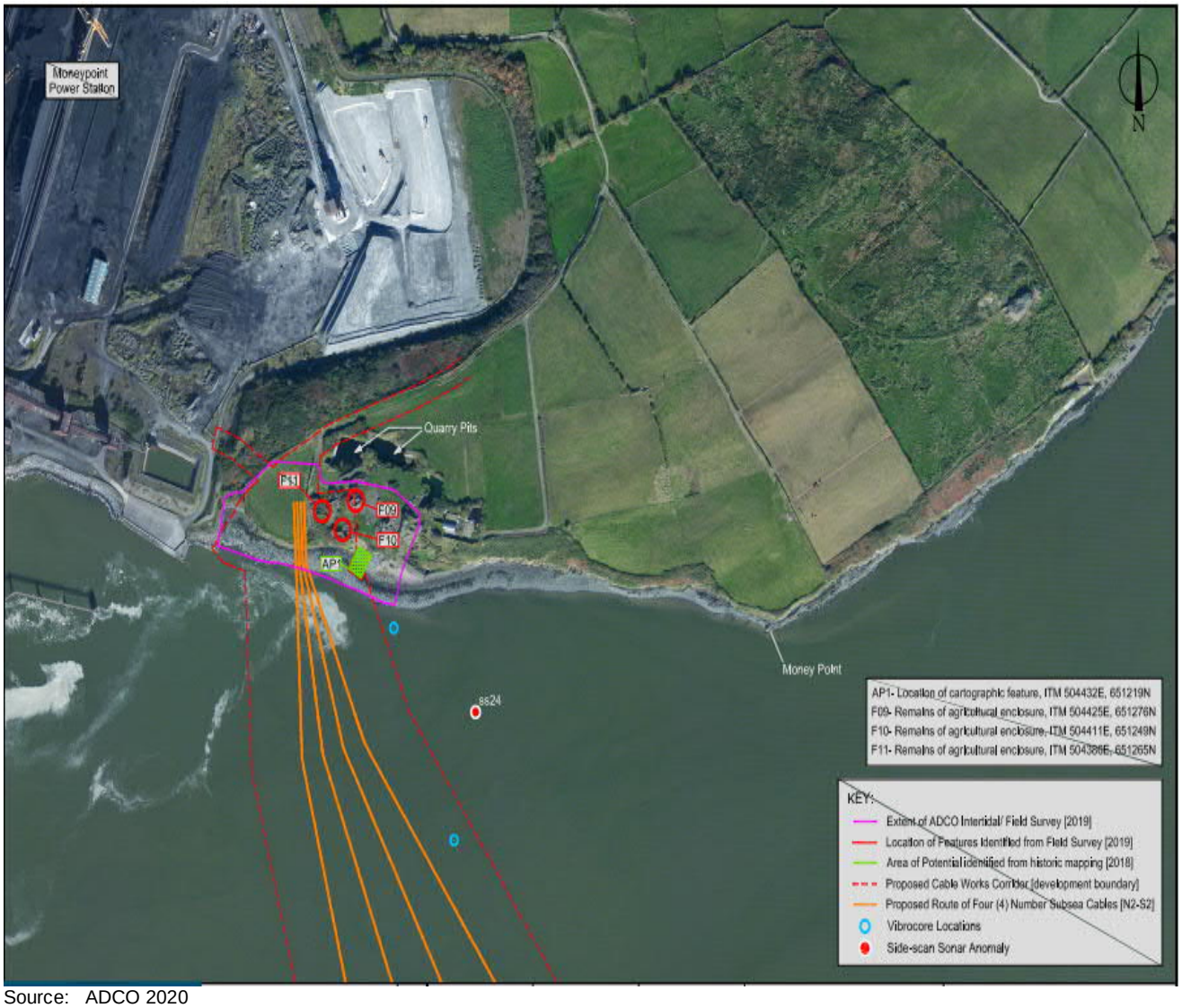
The submarine cables will make landfall on the northern side of the Shannon Estuary at ITM 504361E, 651219N (centre point). The intertidal zone is composed of shale cobbles, lying alongside large, sub-angular, mudstone flags with an average size of 500mm x 300mm x 120mm (Figure 11.8 and Figure 11.9). These flagstones comprise roughly approximately. 30% of the foreshore, with angular rocks and pebbles forming approximately. 18%, and smaller clasts forming the remaining approximately. 2%. Clast-size increases towards the LWM, reflecting the strong currents and high-energy environment present across this particular foreshore location. A substratum of compact clay is also exposed in a number of places (Figure 11.10). This deposit, which resembles glacial till, is present within the many fissures in the shelving bedrock that extends across this section of foreshore. The inter-tidal zone slopes at an average 30º angle across the foreshore.

The upper foreshore is delineated by a by a steep-sided, gorse-covered, cliff composed of shelving-bedrock of shale composition, measuring 7-8m in height (Figure 11.11 to Figure 11.13). Occasional large boulders, measuring up to 1.1m length x 700mm width x 300mm depth, are visible along the base of the cliff-face; representing collapsed material from the cliff structure. Evidence of fossilized seabed rippling was evident on the upper face of a number of these erratic boulders.

Figure 11.6: Aerial of Northern Survey Area

Source: ADCO 2020

Figure 11.7: Location and Extent of Archaeological features identified as part of the intertidal survey undertaken by ADCO at the northern landfall location and submarine route



Source: ADCO 2020

Figure 11.8: Southeast -facing view along intertidal foreshore at centreline of proposed northern landfall

Source: ADCO 2020

Figure 11.9: Example shot of the composition for intertidal foreshore at the proposed northern landfall (150mm scale)

Source: ADCO 2020

Figure 11.10: Detail shot showing exposed Clay (Glacial Till) located below the foreshore deposits at the proposed northern landfall (150mm scale)

Source: ADCO 2020

Figure 11.11: West facing view of intertidal foreshore taken from the centreline of the proposed Northern landfall

Source: ADCO 2020

Figure 11.12: North-facing view of upper foreshore and cliff face at centreline of proposed northern landfall (1m scale)

Source: ADCO 2020

Figure 11.13: Detail shot showing composition of cliff face that delineates the upper foreshore at the proposed northern landfall (150mm scale)

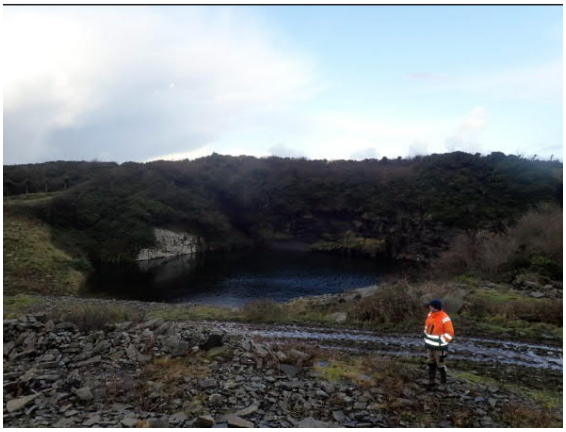
Source: ADCO 2020

A small, irregular-shaped (roughly triangular), field extends landward (north) from the edge of the cliff (Figure 11.14). The field comprises rough pastureland and measures approximately. 83m (east-west) by *c.*100m (north-south). It is bound along its west and northwest sides by a gorse-topped earthen bank which provides a buffer between the pasture field and the eastern boundary of Moneypoint Generating Station. The land immediately to the west is also elevated, giving the field a slightly sunken appearance. This is in part due to the natural topography present but is also a result of historic quarrying activity from the adjacent quarry (Moneypoint Quarry); a mass of quarried stone/flag slate off cuts having artificially raised the surrounding ground levels.

Figure 11.14: South facing view of rough pasture field located immediately to the north of proposed landfall

Source: ADCO 2020

Figure 11.15: North facing view of the larger of the two disused quarry pits that comprise Moneypoint Quarry



Source: ADCO 2020

The remains of the quarry, as depicted on the OS historic mapping are located a short distance inshore (approximately. 80m northeast) of the proposed landfall location; Figure 11.15). As previously identified as part of the 2018 assessment, a large quantity of semi-dressed flagstones form a steep sided pile (8m+ in height) of quarried stone that overspills the quarry area on its southern side (Figure 11.16 to Figure 11.17). The pile of stone/offcuts is located at the point where a nineteenth-century quay structure is thought to have once stood, as indicated on the OS 25-Inch mapping. It is possible that the full or partial remains of that quay structure, originally used to facilitate the seaward transportation of the quarried stone, may still remain buried here. As such, this area of foreshore is included in the mapping as an Area of Potential (AP1).

Figure 11.16: East facing view of quarried stone overspill

Source: ADCO 2020

Figure 11.17: North Facing view of quarried overspill at Area AP1, located to the east of proposed northern landfall (1m scale)

Source: ADCO 2020

Figure 11.18: south facing view cliff top area to east of adjacent pasture field and proposed northern landfall. Note remains of drystone walls which once formed animals' enclosures.

Source: ADCO 2020

Figure 11.19: south facing showing well preserved rounded corner from the remains of one of the animal enclosures (Feature F10). Located west of the northern landfall.

Source: ADCO 2020

A series of rambling, low-slung, wall structures of dry-stone construction are also present across this area (Features F09-F11); located to the east of the landfall corridor, positioned between the cliff edge to the south, and the remnants of the quarry to the north (Figure 11.18 and Figure 11.19). These features have been neatly constructed using the abundance of flag stone off-cuts that surround the quarry area. They are thought to comprise the remnants of rudimentary animal enclosures / shelters of early-mid twentieth century date.

Visual Survey and Assessment

As noted above, no features of archaeological of historic interest were encountered as part of the field-walking. However, an area of potential (Area AP1) has been identified where a mound of quarried stone overspills onto the foreshore from an abandoned nineteenth century quarry (Moneypoint Quarry). The debris occupies the position of a cartographic feature (Map Item 14) recorded on the OS 25-inch map; a structure that comprised a masonry quay that once facilitated the shipment of flagstones from the quarry. The potential for remains of the quay structure to lie buried beneath the area of quarry debris is likely and an area of potential is assigned to this location.

Southern Landfall

The southern landfall occurs within the townland of Kilpaddoge (Glencloosagh Bay). The proposed 400 kV cable circuit will run south from landfall location 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.

Figure 11.20: Aerial of proposed southern landfall position

Source: ADCO 2020

Table 11.8: Southern Landfall S2

Name	Southern Landfall S2
Townland	Kilpaddoge (Glencloosagh Bay)
ITM	505492E, 648717N - 505492E, 648841N
Survey Extent	330m section of upper foreshore/ adjacent pastureland inspected
Feature(s)	None

Topographic Summary

The cables will make landfall on the southern side of the Shannon Estuary at ITM 505339E, 648758N (centrepoint). The intertidal zone at the proposed landfall extends approximately. 43m between the LWM and the HWM (Plate 82-84). The foreshore is composed of a high-density deposit of carboniferous limestone and shale cobbles/boulders (Figure 11.21); forming a shingle beach. Sub-angular cobbles are predominant (*approx.* 60% of deposit) along the foreshore, measuring <200mm in size, and frequent sub-rounded boulders (<400mm) are also present (approximately 30% of deposit). Occasional large boulders were also noted (>600mm), most situated above the HWM. Patches of finer material (approximately 10% of deposit) were also noted above and below the HWM (Figure 11.22). These comprise pebbles (<50mm) and small cobbles (<80mm), interspersed with angular gravel (>4mm). The shingle deposit is of limited depth, with an average thickness of 150mm, that overlies a compact sub-stratum of glacial till (boulder clay) of light grey to orange colour.

Bladderwrack (*Fucus vesiculosus*) seaweed is sporadically present across the intertidal zone, concentrated towards the LWM.

Figure 11.21: Example shot showing composition of the intertidal foreshore at proposed southern landfall (150mm scale)

Source: ADCO 2020

Figure 11.22: Example shot showing finer deposits (cobbles/pebbles) located along the HWM at the site of the southern landfall

Source: ADCO ltd

A low berm or cliff-face, measuring 3m-4m in height, delineates the upper foreshore across the east-west extent of landfall works corridor (Figure 11.23). The cliff-top is lined with low-lying vegetation, including gorse and brambles bushes. A compact silty-clay, dark grey / brown in colour, comprises the upper approximately 300mm of the structure. Below this, the main body of the cliff structure is composed of a glacial till (boulder clay) with pebble, cobble, and boulder sized inclusions (Figure 11.24). Towards the east side of the works corridor, bedrock is visible extending from the base of the cliff (Figure 11.25). Moving further east, bedrock becomes

frequently visible across the intertidal zone, with bedrock fissures extending the full extent of the foreshore area.

Figure 11.23: South-facing view of small cliff face the delineates the upper extent of the foreshore at the Southern landfall at Kilpaddoge (Scale 1m)

Source: ADCO ltd

Figure 11.24: Detail shot showing the composition of the small cliff delineates the upper extent of the foreshore at Kilpaddoge (150mm scale)

Source: ADCO ltd

Figure 11.25: south facing view of exposed bedrock protruding from the base of the small cliff delineates the upper extent of the foreshore at the southern landfall (1m scale)

Source: ADCO ltd

Figure 11.26: East facing view of agricultural trackway providing access through pasture fields surrounding the ESB substation at the southern landfall.

Source: ADCO ltd

An agricultural track is located to the west of the ESB sub-station and the proposed landfall location (Figure 11.26). The trackway provides access to a series of small pasture fields that bound this section of the estuary coastline. An L-shaped tract of boggy land (used for rough-pasture) is located within the landfall corridor itself, situated on the approach to the proposed location of a proposed cable transition joint bay, a structure that is to be built close to the two existing ESB substations. These structures appear slightly sunken within the surrounding landscape, field clearance/ rock-breaking having been required to create a suitable (level) platform upon which the substation could be built. This appearance has been accentuated with the insertion of low-lying bunds that surround each of the structures.

Outside the curtilage of the existing substation, the surrounding topography undulates to follow the rise and fall of the underlying bedrock present. A thin (<300mm) layer of silty-clay soil supports the growth of flora that is typical of a costal environment, including: moss and liverwort species, tufted-grasses, brambles, and gorse bushes.

Visual Survey and Assessment

As per the Northern Landfall, the development boundary associated with the proposed Southern Landfall site will avoid any archaeological features previously identified as part of the survey undertaken in 2018; the nearest features being situated 520m and 486m to the west (F07 and F08 respectively).The foreshore is composed of a shallow single beach deposit, overlying a substratum of glacial till. Exposed sections of shelving bedrock are also visible. In addition, archaeological inspection of the pastureland adjoining the upper foreshore did not reveal any surface features of archaeological or historic interest. Moreover, the paucity of the topsoil present and shallow nature of the underlying strata (glacial till and bedrock) does not provide conditions particularity suitable for the retention of archaeological material, features, or deposits. As such, a relatively poor holding-content can be ascribed to the intertidal foreshore and adjacent pasturelands that are located within the proposed landfall corridor.

Geophysical Survey

As part of the assessment undertaken to date, a marine geophysical survey was undertaken under archaeological licence held by ADCO. The survey vessel was Dulra na Mara and the survey was conducted from Kilrush Marina between 27th July 2018 and 24th August 2018. Full details on the archaeological assessment is set out in Appendix D of this report. The finding of the assessment is summarised below.

There are no clearly defined features associated with shipwreck, and while most of the anomalies identified may be considered to be either natural items such as rocks or modern debris, the data does highlight two areas that could be of further interest. Side scan sonar anomaly ss18 in the southern sector of the survey area, off Carhoonakineely townland in Glencoosagh Bay is a stone alignment that lies close to a former fishtrap and may be related to it. Secondly, the magnetometer data highlights the inshore area at the north side of the survey area in the vicinity of the alternative landfalls locations (east and west of Moneypoint) as a busy sea area that can be expected with the presence of the former quarry sites and quays to the east of the existing Moneypoint Electricity Generating Station).

Three recorded side scan sonar anomalies (namely ss4, ss12 and ss24) were noted within the proposed route corridor. None of these features correspond with detections in the magnetometry survey. The proposed Cross Shannon 400 kV submarine cable route corridor sought to avoid all impacts with recorded marine geophysical survey anomalies. The findings from the geophysical data however, highlighted the need for the project development process to be mindful of the archaeological risk associated with the Shannon Estuary.

Marine Site Investigation

A programme of vibrocoring and cone penetration testing (CPT) was carried out to further inform the design and route selection process. This work was carried out by RINA Consulting (2019). Further details on the scope of marine site investigations carried out and a summary of the findings are set out in Section 8 of this report and Appendix D of this report. The results of the investigation works were subject to archaeological review.

No deposits or inclusions were encountered as part of the marine SI works that would suggest the presence of buried in situ archaeological material.

11.3.3 Baseline Conclusion

Recent archaeological assessment, combined with the 2018 intertidal survey, provides a detailed account of the foreshore and wider coastal environment at the two landfall sites for the proposed development. No surface features or deposits of archaeological / historic interest were encountered within the footprint of the proposed landfall works corridor. The selection of sites N2 and S2 as preferred landfall locations is considered optimal from a cultural heritage perspective; the chosen sites avoiding all known and recently discovered archaeological features recorded within the various foreshore areas (Survey Areas N1-N3, S1/S2) and their adjoining literal zones.

11.4 Potential Impacts

Details on the proposed installation approach are set out in Chapter 4 of this report. The process is summarised below.

Environmental constraints including the archaeological potential within the study area were considered in parallel with the design optioneering process. The results of the optioneering process along with the other criteria examined ensured that the best performing option was selected. As part of the project development process, design mitigation measures have been put in place in order to design out significant impacts at the earliest stages.

The proposed development will avoid impact with any recorded marine anomalies and known archaeological features. Direct impacts to the intertidal and seabed areas within the proposed route corridor will however occur. These have the potential to expose new (sub surface) material of archaeological interest. Table 11.9 below details the proposed impacts and where appropriate mitigation measures have been set out.

Table 11.9: Proposed impacts and archaeological mitigation identified for the proposed project.

Installation process	Nature of Impact	Mitigation
Landfall preparatory works	Foreshore trenching Topsoil stripping Construction of cable transition joint bay Construction of concrete slipway at the northern landfall	Pre construction archaeological investigations (test trenches) across foreshore impact area at each landfall location and adjacent lands at the Kilpaddoge substation Archaeological monitoring during the construction phase
Seabed disturbance along the submarine cable route corridor	Pre lay grapnel runs across seabed	Archaeological monitoring

Installation process	Nature of Impact	Mitigation
Seabed preparation works	Installation of rock filter bags or similar on seabed slopes	None required
Submarine works along the proposed cable alignments	Use of Mass flow excavation (MFE) tool to remove sand waves/ripples above 0.5m height	Archaeological monitoring during the use of the MFE and cable jetting works
Pre lay burial of cables	Burial of cables using plough/jetting machine along approximately 600m section [KP 2.2 to KP 2.8]	Archaeological monitoring during the cable burial process
Additional cable protection (as required)	Installation of rock filter bags or similar	None required
Post construction surveys	None	Marine geophysical data subject to archaeological review

11.5 Mitigation Measures

11.5.1 Construction Phase

The principal archaeological mitigation measure identified for the proposed development is archaeological monitoring during construction, with the proviso to resolve fully any archaeological material observed at that point. Archaeological monitoring is recommended for all ground and seabed disturbances. This is to include, as / when feasible, items such as the Pre-lay Grapnel Runs (Item 2) and the use of the Mass-flow Excavation (Item 4); items which from part of the seabed clearance and preparation works. Monitoring of the Pre-lay Grapnel Runs provides the opportunity to inspect any debris recovered as part the clearance works. In addition, use of a Mass-flow Excavator may provide the opportunity to view live images of the seabed along the cable route; this equipment often having the capability to provide real-time sonar and camera imaging of the seabed during the excavation process. However, it was found during the laying of the 220 kV cables that the underwater visibility from the camera was ineffective.

As noted in Table 11.8 above, archaeological test excavation at the two landfall sites in addition to the adjacent land to the existing Kilpaddoge substation is proposed. As part of the pre application consultation process a meeting was held with the National Monuments Unit-Underwater unit, the outcome of this meeting was that a draft strategy of post consent archaeological investigations was set out. Comments on this draft from the Department were not received in advance of issuing this report. The post consent pre-construction testing will take place under licence by the National Monuments Service. Geotechnical investigations will be programmed to coincide with the above foreshore testing and will be undertaken under archaeological supervision. Further consultation will occur with the Department of Regional Development, Rural Affairs, Arts and the Gaeltacht following completion of the pre-construction phase archaeological measures. Should any archaeological findings be observed, additional pre-construction mitigation may be necessary.

11.5.2 Operational Phase

No specific mitigation measures are required.

11.6 Residual Impacts and Monitoring

All physical archaeological, architectural and cultural heritage impact issues will be resolved at the pre-construction stage of the development and therefore no potential impacts are envisioned at the operation stage of the proposed development.

12 Noise and Air

12.1 Introduction

This chapter provides a desktop analysis of potential impacts arising from the proposed development on the closest sensitive receptors. The potential impacts on sensitive receptors during the construction and operational phases of development have been identified and assessed. Mitigation measures are proposed, where appropriate, to address the likely significant impacts associated with the proposed development.

The closest sensitive receptor is approximately 520 metres from the northern landfall position adjacent to Moneypoint Generating Station and approximately 60m from the underground cable route connecting to Moneypoint GIS substation. The closest receptors on the County Kerry side are 700 metres from the southern landfall at Glencloosagh Bay. As such there is no potential for significant impacts from the construction of the southern landfall and for the purpose of this assessment it is not considered further. The potential impacts on the ecological receptors are considered within Chapter 7 *Biodiversity* of this PECR. This assessment considers the potential impacts associated with the construction of the extension and operation of the Kilpaddoge AIS transformer bay and construction related traffic only.

12.2 Methodology

A desktop study was undertaken to identify sensitive receptors within proximity of the proposed development. The potential for noise and air quality impacts resulting from the proposed development on sensitive receptors are assessed having regard to the following standards and best practice guidance documents;

- British Standard (BS) 5228 Code of Practice for Noise control on construction and open sites- Part 1 Noise;
- BS4142: 2014 Methods for rating and assessing industrial and commercial sound;
- Transport Research Laboratory Calculation of Road Traffic Noise
- Air Quality Standards Regulations 2011 (S.I. 180 of 2011); and
- Institute of Air Quality Management Guidance on the assessment of dust from demolition and construction (2014).

Given the nature of the site plant, effects on plant emissions on local air quality are considered of negligible significance to surrounding road traffic contributions on the local road network. Construction plant emissions have therefore not been assessed further, however, mitigation measures to reduce the impacts on local air quality are presented in Section 12.5.

IAQM guidance indicate that an assessment of traffic emissions is only likely to be required for large, long term construction sites that will generate an additional annual average flow of greater than 100 Heavy Duty Vehicles [(HDVs) greater than 3.5 tonnes] per day or greater than 500 Light Duty Vehicles [(LDV's) less than 3.5 tonnes] per day. Based on experience from previous projects of a similar nature, it is unlikely that either the HDV or LDV flow will exceed these thresholds at any point during the construction phase. On this basis, no further considerations have been given to the effects of construction road traffic on ambient air quality.

Significant operational phase air quality impacts are not anticipated to arise and have therefore not been assessed further.

12.3 Baseline Environment

12.3.1 Study area

The wider environs predominantly comprise a combination of rural settlements (Killimer, County Clare and Tarbert in County Kerry), agricultural pasturelands and industrial sites. The ESB Moneypoint Electricity Generating Station (County Clare) and the SSE Tarbert Electricity Generating Station (County Kerry) are noteworthy facilities to reference due to their environmental emissions that are licenced by the Environmental Protection Agency under Industrial Emissions Directive Licences register references (PO-605-04 and PO-607-02 respectively).

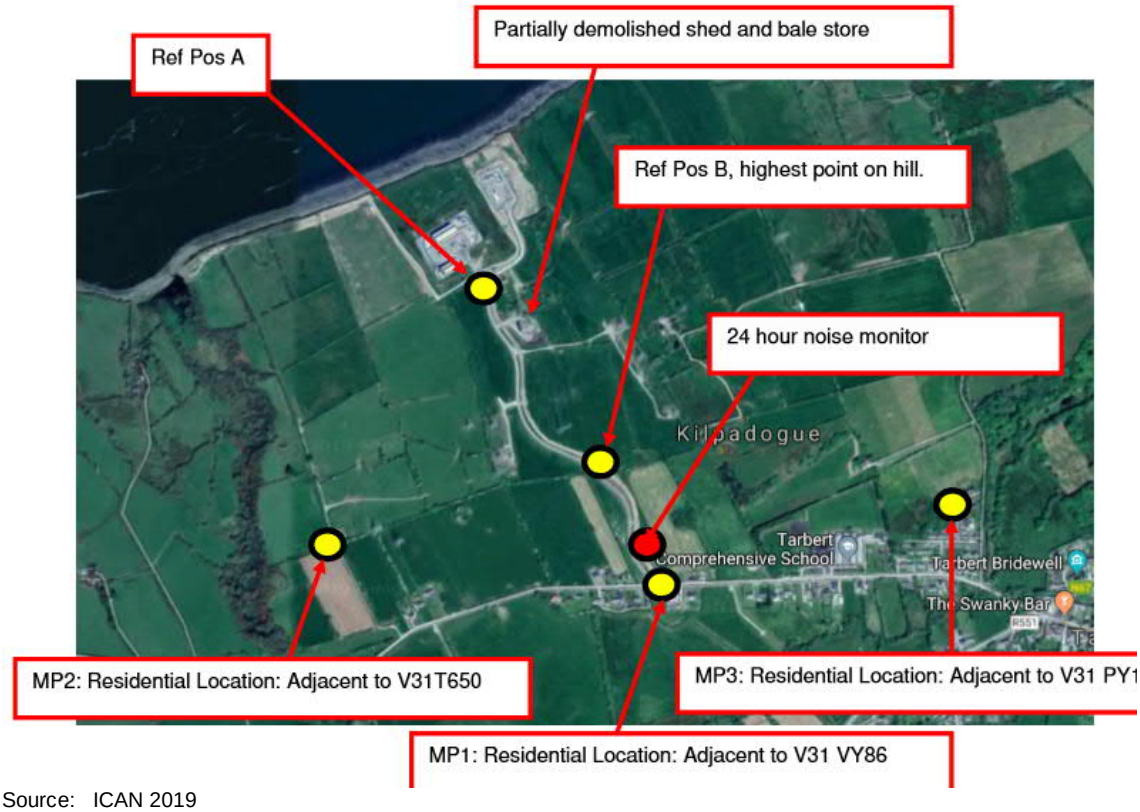
There are a number of scattered agricultural holdings and associated residential dwellings. In addition, a number of one-off residential dwellings occur particularly adjacent the N69 between the Moneypoint Electricity Generating Station and Killimer (County Clare) and along the L1010 Tarbert Coast Road south of the Kilpaddoge 220 / 110 kV substation on the approaches to Tarbert (County Kerry).

There is also a national school (Tarbert National School) and a secondary school (Tarbert Comprehensive School) within or in close proximity to the study area in County Kerry. There are no schools within the study area in County Clare. According the Health Service Executive website, the closest medical centre is located in Tarbert village (County Kerry) and none are known to occur within proximity to the study area in County Clare.

This assessment considers the sensitive receptors within approximately 500 metres of the proposed development site boundary.

Figure 12.1 illustrates the location of the proposed development site and the position of sensitive locations in its vicinity.

Figure 12.1: An aerial view of the site showing both attended and unattended noise monitoring locations and weather station placement



Source: ICAN 2019

12.3.2 Noise Environment

A baseline noise survey was carried out in 2019 (ICAN, 2019) in the area surrounding the existing Kilpaddoge Substation. The baseline survey includes a combination of attended monitoring positions at selected representative sensitive receptors. A 24hr unattended monitoring position at a fixed location was also carried out. Local weather was monitored and reported throughout the noise survey. All measurements were carried out in accordance with guidance in ISO 1996-Part 1, *Acoustics-Description, measurements and assessment of environmental noise*. Type 1/Class 1 measurement instrumentation was used throughout. Figure 12.1 shows noise monitoring locations used and the weather station location.

Noise instrumentation was field calibrated prior to the measurement survey and directly afterwards to ensure that there was no significant drift in the instrumentation over the measurement period. The measurement results have been tabulated in Table 12.1 and Table 12.2 and Table 12.3 below.

Two reference positions (Ref Position A and B) were also used to determine existing noise environment noise levels within the vicinity of the Kilpaddoge 220 kV substation. There is also a Glencloosagh Grid Stabilisation Facility directly adjacent to Kilpaddoge 220kV substation (reference 19115). It should be noted that there were no apparent residential properties within the vicinity of these measurement locations

Table 12.1: Attended measurements show the LAeq,30min measured at locations MP1, MP2 and MP3

Attended Location)	Daytime (LAeq,30min)[49]	Evening (LAeq,30min)	Night (LAeq,30min)
MP1	48 dB	44 dB	36 dB
MP2	54 dB	41-46 dB	33 dB
MP3	46-47 dB	31-36 dB	32-37 dB
Ref Position A	55-57 dB	56-57 dB	53 dB
Ref Position B	48-52 dB	39-41 dB	34 dB

Table 12.2: Attended measurements show the LA90,30min measured at locations MP1, MP2 and MP3

Attended Location)	Daytime (LA90,[50]30min)	Evening (LA90,30min)	Night (LA90,30min)
MP1	36 dB	31-33 dB	28
MP2	50 dB	35-40 dB	30
MP3	40-42 dB	28-30 dB	28
Ref Position A	52-54 dB	52-53-dB	
Ref Position B	43-46 dB	37-38 dB	

Table 12.3: Summary of Unattended day time measurements at 24hr monitoring location

	Daytime (LA90,	Daytime (LAeq),	Daytime (LA10)
Unattended location	37 dB	42.-50 dB	45 dB

Typical noise sources that were noted during the survey were local and distant road traffic, high altitude passenger aircraft flyovers, domestic dogs barking and noise from livestock. From the results report in Table 12.1 and 12.2, the noise levels are typical of a rural environment. With the exception of the fixed position A (directly adjacent to the Kilpaddoge substation) the minimum LAeq levels were below 55 dB during the day, 50 dB during the evening and 40 dB at night. On a similar basis, the minimum LA90 at each of the representative sensitive receptors were all well below the 50 dB during the evening and 40 dB during the night-time.

Ref Position A are B are located directly adjacent to the Kilpaddoge substation, there are no known sensitive receptors in proximity to this location. Typical noise sources noted in this position include birdsong and distant traffic and transformer noise was audible. It is also noted that there is a power plant operating in Tarbert and at Moneypoint Generating Plant.

Weather Monitoring

Weather data was captured and logged at 10min intervals throughout the noise survey for both attended and unattended measurements. Measurements would indicate that winds were elevated at the initial part of the survey as shown in the data. It is important to note that the

[49] LAeq This can be regarded as a notional level, which would, in the course of the measuring period (T), cause the same (A) weighted sound energy to be received as that due to the actual sound over the actual measuring period

[50] LA90 The percentile sound pressure level exceeded for 90% of the measurement period with 'A' frequency weighting calculated by statistical analysis. This is term used to measure the background noise level in an area

weather station was mounted at an elevated location to ensure that accurate wind direction could be ascertained and unobstructed measurements of wind speed. When a weather station is placed at an elevated and exposed open location, it reports significantly higher wind speeds than those realised lower noise measurement locations, with measurement locations being 9~34m lower in height. The weather station height and noise monitoring location heights have been set out in Table 12.4 below.

Table 12.4: Showing the heights above sea level of the weather station relative to attended noise monitoring location

Item	Height ASL
Weather station	48m
MP1	26m
MP2	39m
MP3	14m

By the evening on the 9th Sept 2019 winds had fallen considerably at the site at the wind speed monitoring location presenting ideal wind conditions for the latter part of the evening and night survey and into the daytime survey the following day. Additionally, to compensate for any potential wind effects, measurements were conducted away from sources that were likely to give rise to wind generated noise. Additionally, all outdoor measurements used a microphone (class 1 in accordance with IEC 61672) fitted with a 90mm microphone and all recordings have been post-analysed to ensure that the effects of wind did not adversely impact on the measured levels. In the audio playback for the unattended measurements high altitude passenger aircraft events and commercial / industrial noise can be clearly heard without any adverse impact from winds.

12.3.3 Air Quality

The Air Quality Standards (AQS) currently applicable in Ireland are sourced from the Ambient Air Quality Directive (2008/50/EC) as implemented by the Air Quality Standards Regulations 2011 (S.I. 180 of 2011). The pollutants identified under the AQS which are considered relevant to this development are outlined below;

- Particulate matter (PM_{10}) and
- Particulate matter ($PM_{2.5}$).

It should be noted that dust is a generic term which typically refers to a Particulate Matter (PM_{10} / $PM_{2.5}$) in the size range of 1-75 microns in diameter. The most common impacts from dust emissions are soiling and increased ambient PM_{10} concentrations. Dust can arise from numerous construction activities such as wind erosion on material stockpiles and earth moving. It can be mechanically transported either via wind or through the movements of vehicles onto public roads

Guidance from the institute of Air Quality Management recommends splitting the construction activities into four separate source categorises and determining the dust risk associated with each of these individually. This assessment has determined the risk of each of the following categories;

- Earthworks;
- Construction and Track out.

The risk of each source for dust effects can be described as negligible, low risk, medium risk and high risk depending on the nature and scale of the construction activities and the proximity

of sensitive receptors to the construction activity or site boundary. the assessment is used to identify the mitigation measures proportional to the level of risk to reduce the effects such that they are not significant.

12.4 Potential Impacts

The proposed development at Kilpaddoge includes for the installation of a new power transformer. There are currently two existing kVA power transformers operating at the Kilpaddoge. The proposed development also includes for a new instrument transformer, these will not generate any additional noise to the substation.

12.4.1 Construction Noise

Site development work i.e. site clearance, will be carried out at the commencement of the project. It is proposed that the excavation of the site would be carried out by using excavators only. Piling or blasting is not proposed. The electrical assembly work will be undertaken in a number of stages. This will result in minor temporary noise impacts on the local environment. There are no statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. In the absence of specific noise limits, appropriate emission criteria relating to the permissible construction noise levels for a development of this scale may be found in BS5228 Code of Practice for Noise and Vibration on Construction and Open Sites – Part 1: Noise' (2009+A1:2014. BS 5228 does not define strict criteria to determine the significance of noise impacts although examples of how limits of acceptability have been applied historically.

Normal working hours during the construction phase are expected. During certain stages of the construction phase it may be the case that some work will have to be carried out outside of normal working hours, however, this will be kept to a minimum. Construction works with a significant noise impact will be avoided outside of normal working hours.

In order to quantify the likely noise from the proposed development in accordance with the methods and guidance in BS5228, it is necessary to define the various activities to be undertaken and the equipment to be used, based upon the anticipated programme of works. The temporary and transient nature of the construction works is not predicted to give rise to excessive and sustained construction noise levels at individual receptors. Specifically, construction activities will gradually phase out from pre-construction to predominately civil activities followed by commissioning and testing of the substation and equipment in Kilpaddoge AIS Bay. It is important that whilst a Contractor has not yet been appointed on the project an indicative programme of works is set out in Chapter 4 of this PECR. Table 12.5 and Table 12.6 sets out an typical inventory of plant to inform the prediction of noise impacts over the construction phase at each representative noise sensitive receptor. The locations of the representative selected receptors are shown in Figure 12.2 and Figure 12.3.

The prediction follows the procedures of the 'Method for Activity $L_{Aeq,T}$' described in Annex F.2.2 of the British Standard 5228. The average of the hard and soft ground distance adjustment factors has been used to represent partially soft ground. The noise emission levels of construction plant are also adjusted to account for the assumed utilisation (percentage 'on-time') and quantity of items used simultaneously. The received noise levels are corrected by +3 dB to account for reflection from the façade of the representative noise sensitive receptor locations.

Figure 12.2: Site location plan for construction noise assessment at Moneypoint Substation (County Clare)- Representative distances

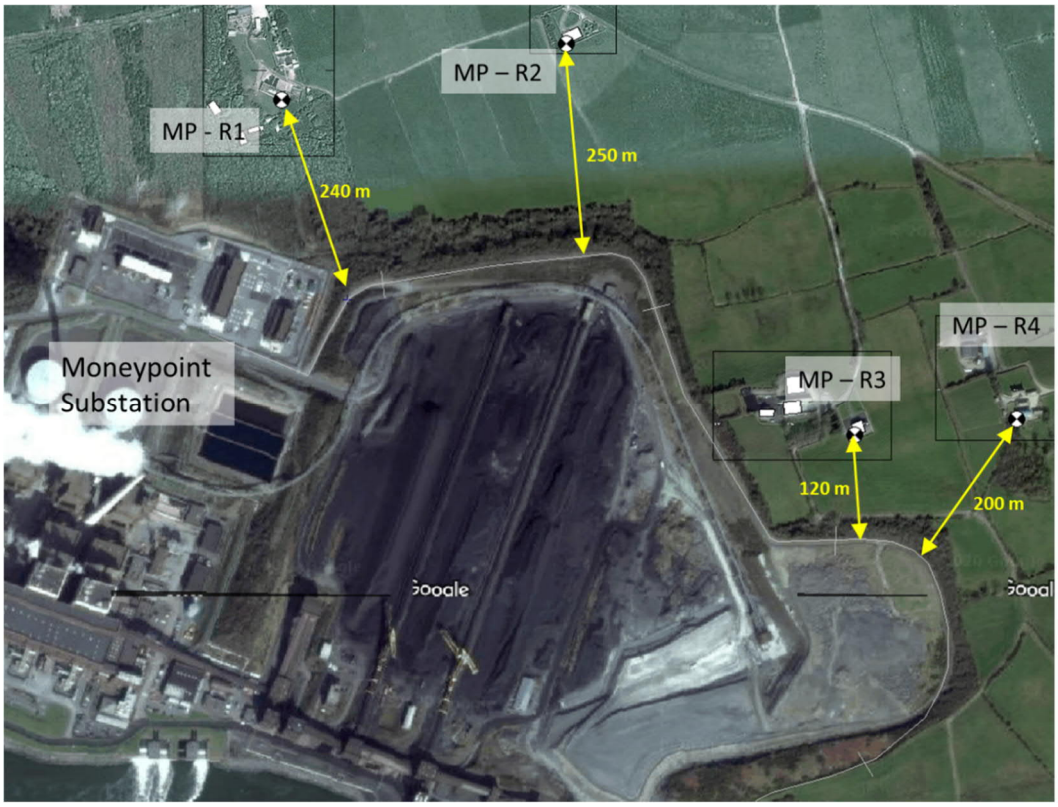


Figure 12.3: Site location plan for construction noise assessment at Kilpaddoge Substation (County Kerry) Representative distances

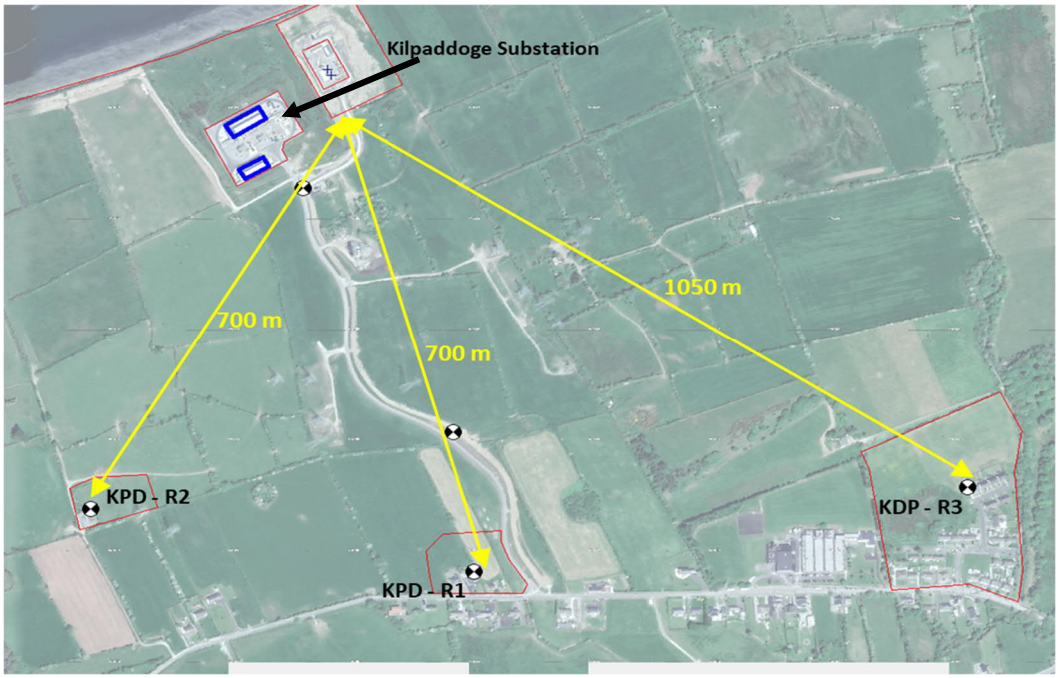


Table 12.5: Plant Inventory for construction phase Moneypoint 400 kV compound and cable ducting

Phase	Activity	BS5228 Activity	BS5228 Ref	Item	Number	%on time	LAeq 10mDB	Corrected	Activity LAeq
Cable trench and duct installation on shore Moneypoint)	Removal of excavated material	Breaking up concrete	C.1.4	Pulveriser mounted on excavator, 30t	2	10	76	72.0	83.3
		Dumping brick rubble	C.1.11	Articulated dump truck (dumping rubble)	2	50	80	83.0	
	Delivery of Cable ducts Concrete backfill	Distribution of materials	C.4.3	Dumper, 7t	2	50	76	79.0	80.9
		Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	2	25	75	75.0	
		Concreting other	C.4.36	Pump boom + vibrating poker	2	25	71	71.0	
	Delivery of Type 1 Fill for cable route access road	Distribution of materials	C.4.3	Dumper, 7t	2	50	76	79.0	80.9
		Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	2	25	75	75.0	
		Concreting other	C.4.36	Pump boom + vibrating poker	2	25	71	71.0	
	Miscellaneous (delivery of cable, ducts and accessories)	Distribution of materials	C.4.3	Dumper, 7t	2	50	76	79.0	81.9
		Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	2	25	75	75.0	
		Concreting other	C.4.36	Pump boom + vibrating poker	2	25	71	71.0	
		Cutting concrete block	C.4.72	Hand-held circular saw	2	10	79	75.0	
Cable pulling and jointing	Cable pulling and jointing	Lifting	C.4.41	Mobile telescopic crane, 100t	1	50	71	71.0	75.6

Phase	Activity	BS5228 Activity	BS5228 Ref	Item	Number	%on time	LAeq 10mDB	Corrected	Activity LAeq
		Trenching	C.4.64	Tracked excavator, 22t	1	25	75	72.0	
		Power for site cabins	C.4.78	Diesel generator	1	100	66	69.0	
Electrical installation	Electrical installation	Lifting	C.4.41	Mobile telescopic crane, 100t	1	50	71	71.0	75.6
		Trenching	C.4.64	Tracked excavator, 22t	1	25	75	72.0	
		Power for site cabins	C.4.78	Diesel generator	1	100	66	69.0	
		Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	2	25	75	75.0	

Table 12.6: Plant Inventory for construction phase Kilpaddoge 400 kV compound and cable ducting

Activity	BS5228 Activity	BS5228 Ref	Item	%on time	LAeq 10mDB	Corrected	Activity LAeq
Breaking up concrete	C.1.1	Breaker mounted on wheeled backhoe loader	1	50	92	92.0	92.8
Dumping brick rubble	C.1.10	Tracked excavator loading dump truck	1	50	85	85.0	
Distribution of materials	C.4.3	Dumper, 7t	2	50	76	79.0	81.9
Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	2	50	75	78.0	
Concreting other	C.4.36	Pump boom + vibrating poker	2	25	71	71.0	
Road planing	C.5.9	Mini planer	1	50	68	68.0	87.3
Spreading chipping/fill	C.5.12	Dozer	2	50	77	80.0	
Earthworks	C.5.18	Tracked excavator	2	50	80	83.0	
Rolling and compaction	C.5.19	Road roller	2	50	80	83.0	

Activity	BS5228 Activity	BS5228 Ref	Item	%on time	LAeq 10mDB	Corrected	Activity LAeq
Paving	C.5.30	Asphalt paver (+tipper lorry)	1	50	75	75.0	
Distribution of materials	C.4.3	Dumper, 7t	1	50	76	76.0	82.0
Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	1	50	75	75.0	
Concreting other	C.4.36	Pump boom + vibrating poker	1	25	71	68.0	
Cutting concrete block	C.4.72	Hand-held circular saw	1	50	79	79.0	
Breaking up concrete	C.1.1	Breaker mounted on wheeled backhoe loader	1	75	92	93.8	94.5
Dumping brick rubble	C.1.10	Tracked excavator loading dump truck	1	75	85	86.8	
Distribution of materials	C.4.3	Dumper, 7t	1	75	76	77.8	80.5
Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	1	75	75	76.8	
Concreting other	C.4.36	Pump boom + vibrating poker	1	25	71	68.0	
Distribution of materials	C.4.3	Dumper, 7t	2	75	76	80.8	86.0
Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	2	75	75	79.8	
Concreting other	C.4.33	Poker vibrator	2	75	78	82.8	
Distribution of materials	C.4.3	Dumper, 7t	1	75	76	77.8	85.1
Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	1	75	75	76.8	
Concreting other	C.4.33	Poker vibrator	1	75	78	79.8	
Cutting concrete block	C.4.72	Hand-held circular saw	1	75	79	80.8	
Breaking up concrete	C.1.1	Breaker mounted on wheeled backhoe loader	1	25	92	89.0	89.8
Dumping brick rubble	C.1.10	Tracked excavator loading dump truck	1	25	85	82.0	

Activity	BS5228 Activity	BS5228 Ref	Item	%on time	LAeq 10mDB	Corrected	Activity LAeq
Distribution of materials	C.4.3	Dumper, 7t	1	25	76	73.0	76.2
Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	1	25	75	72.0	
Concreting other	C.4.36	Pump boom + vibrating poker	1	25	71	68.0	
Distribution of materials	C.4.3	Dumper, 7t	1	25	76	73.0	76.2
Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	1	25	75	72.0	
Concreting other	C.4.36	Pump boom + vibrating poker	1	25	71	68.0	
Distribution of materials	C.4.3	Dumper, 7t	1	25	76	73.0	80.3
Pumping concrete	C.4.28	Concrete mixer truck (discharging) and concrete pump (pumping), 26t	1	25	75	72.0	
Concreting other	C.4.33	Poker vibrator	1	25	78	75.0	
Cutting concrete block	C.4.72	Hand-held circular saw	1	25	79	76.0	
Lifting	C.4.41	Mobile telescopic crane, 100t	1	50	71	71.0	75.6
Trenching	C.4.64	Tracked excavator, 22t	1	25	75	72.0	
Power for site cabins	C.4.78	Diesel generator	1	100	66	69.0	
Lifting	C.4.41	Mobile telescopic crane, 100t	1	50	71	71.0	75.6
Trenching	C.4.64	Tracked excavator, 22t	1	25	75	72.0	
Power for site cabins	C.4.78	Diesel generator	1	100	66	69.0	

Table 12.7: Predicted Monthly Construction Noise Impact

Representative Noise Sensitive Receptor	Estimated Distance to site work (m)	1	2	3	4	5	6	7	8	9	10
Moneypoint - R1	240	52	52	52	52	52	55	55	55	44	44
Moneypoint - R2	250	52	52	52	52	52	55	55	55	44	44
Moneypoint - R3	120	59	59	59	59	59	63	63	63	51	51
Moneypoint - R4	200	54	54	54	54	54	57	57	57	46	46
Kilpaddoge - R1	700	52	54	55	55	53	53	33	33		
Kilpaddoge - R2	700	52	54	55	55	53	53	33	33		
Kilpaddoge - R3	1050	48	49	50	50	49	49	29	29		

The footprint of the proposed extension at Kilpaddoge will require clearing and levelling. It is expected that the site will be elevated to between 17m and 10.0m AOD. Reprofiling works will also be required at the proposed landfall locations and landfalls. There are no sensitive receptors within 500m of the proposed works. The predicted construction noise levels are estimated to be less than 65dB for daytime periods.

All construction traffic will access the site via the existing entrance via the L1010 Coast Road / N69 road (County Kerry) and N67 Road (County Clare). It is considered that the construction phase will result in a temporary increase of traffic along the local road L1010 Tarbert Coast Road and regional road network. However, it is not anticipated to result in a discernible increase in road traffic noise as an increase of at least 20% in traffic volumes is required for there to be a 1dB increase in traffic noise [51].

12.4.2 Construction Air Quality

During the construction phase, the proposed development has limited potential to impact on air factors. The majority of the works associated with the 400 kV cables will occur at the intertidal and submarine area. There are no sensitive receptors within 200m of the proposed landfalls or the proposed Kilpaddoge substation location. The construction compounds are shown on the accompanying planning drawings. Access to the compounds and works areas will be required via existing entrance to the Kilpaddoge substation (County Kerry) and Moneypoint Generating Station (County Clare).

No sensitive human receptors are located within 120 metres of the proposed development site. There are a number of one-off residential properties within track-out access routes, a conservative approach was considered to classify the site track-out as large. Overall, conservative approach to dust raising on potential receptors sensitivity is likely to be low. ‘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 onshore grid connection works are transient in nature and temporary. The proposed development is likely to represent an overall minor risk of causing dust effects during the construction phase. It should be noted however that the construction of the proposed landfalls (both north and south of the Shannon Estuary) and extension at Kilpaddoge plus the associated underground cable trenches will access along the existing local road network in close proximity to existing residential dwellings and this is the location at which there is the greatest risk of likely nuisance being generated.

12.4.3 Operational Noise

A three-dimensional acoustic model was developed within DataKustik GmbH CadnaA software[52] which implements the procedures of the International Standard ISO 9613 ‘Acoustics Attenuation of Sound during Propagation Outdoors Part 2 General Method of Calculation’ (1996)[53].

Which the selection of the actual equipment will be developed at the next stage of the project development. Typical sound power levels for the noise emitting items of plant to be installed at the Kilpaddoge substation are given as follows:

[51] Calculation of Road Traffic Noise, Department of Transport UK, 1988.

[52] DataKustik GmbH CadnaA v4.3.143

[53] International Standards Organization (1996). ISO 9613 ‘Acoustics Attenuation of Sound during Propagation Outdoors Part 2 General Method of Calculation’.

- Traffo – 91 dB(A)
- Cooler – 87 dB(A)

The prediction takes a precautionary approach to consider a reasonable worst case, specifically:

- A ground absorption coefficient of G = 0.5 (partially soft ground) has been assumed although the area is rural and ground absorption may be higher;
- A correction for calculation uncertainty of 3 dB has been included, which effectively assumes twice the number of installed plant items are operating; and
- Receptor levels include a +3dB correction to account for reflection from the receptor façade. The location of the closest representative noise sensitive receptors are shown in Figure 12.3.

The predicted noise level is below the lowest background noise level (LA90) at all locations except at MP1 (KPD R1) where it exceeds it by 1 dB.

The predicted noise levels during the operational phase are set out in Table 12.8. Having regard to BS4142 and the representative background levels noted above in Section 12.3. "*Where the rating level does not exceed the background level, this is an indication of specific sound source having a low impact, depending on context*", based on the predicted operational noise levels it is considered that there will be no impacts arising from the operational noise within the Kilpaddoge Substation. The worst case predicted level at MP1 exceeds the background by 1 dB during the night-time only, however, the absolute noise level at the receptor is relatively low such that it is not expected to result in disturbance at receptors associated with the measurement position MP1.

Table 12.8: Operational noise impact at receptors

Representative Noise Receptor	Distance (m)	Predicted Noise Rating level at Façade LAeq dB
KPD - R1	780	29
KPD - R2	830	30
KPD - R3	1060	24

Table 12.9: Predicted noise levels at closest representative noise sensitive receptor

Monitoring Position	Measured Baseline Lowest LAeq, 30 min dB	Predicted Noise Rating level of the project façade	Change
MP1	31	29	-2
MP2	30	30	0
MP3	31	27	-4

12.5 Mitigation Measures

12.5.1 Construction Phase

The contractor will be obliged to give due regard to BS5228:2009:A1:2014 Part 1 and Part 2, which offers detailed guidance on the control of noise and vibration from construction activities. The proposed development will implement best practice means (BPM) as defined by BS5228 standard to all on site activities.

All reasonable measures will be implemented to ensure that the construction phase of the project does not cause a significant nuisance at the nearest sensitive receptors. The appointed Contractor will prepare and implement a Dust Management Plan (DMP) and Noise Management Plan (NMP) as part of the project Construction Environmental Management Plan (CEMP). As part of the CEMP, the Contractor will also develop and implement a stakeholder communication plan, which will facilitate community engagement prior to the commencement of construction.

It is also recommended that a comprehensive noise monitoring protocol will be set out within the Noise Construction Management Plan. Construction noise levels will be monitored and assessed;

- On a continuous basis throughout construction, and frequently reviewed by the Environmental Clerk of Works (EnCoW);
- As and when required, during critical phases of construction;
- In response to the receipt of reasonable complaints investigated by the EnCoW;
- At locations representative of sensitive receptors in the vicinity of the works typically at the agreed locations closest to the works

Dust emissions from the proposed development will only occur during the construction phase of development, therefore all effects from dust emissions are described as temporary.

The proactive control of fugitive dust and noise will ensure that the prevention of emissions rather than potential ineffective attempt to control them once they have been released, will contribute towards the satisfactory performance of the construction works.

The outline dust management plan, as set out below, has been formulated by drawing on best practice guidance.

Communication

- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary
- Display the head or regional office contact information
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents.

Site Management

- Record all dust and air quality complaints, identify causes and take appropriate measures to reduce emissions in a timely manner and record the measures taken
- Make a complaint log available to the local authority, when asked
- Record any exceptional incidents that cause dust and or air emissions, either on or off site, and the action taken to resolve the situation in the log book

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period
- Avoid site runoff of water or mud

- Keep site fencing, barriers and scaffolding clean using wet methods
- Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site; if they are being reused on site cover as described below
- Cover seed or fence stockpiles to prevent wind whipping
- Operating vehicles/ machinery and sustainable travel
- Ensure all vehicles switch off engines when stationary – no idling vehicles
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable
- Impose and signpost a maximum-speed limit of 15mph on surfaced and 10mph on unpaved surface haul roads and work areas

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction
- Ensure an adequate water supply on the site for effective dust/ particulate matter suppression/ mitigation using non-potable water where possible and appropriate
- Use enclosed chutes and conveyors and covered skips
- Minimise drop heights from conveyors loading shovels hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever available
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods

Measures specific to construction

Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process in which case ensure that appropriate additional controls measures are in place

Measures specific to trackout

- Use water-assisted dust sweepers on the access and local roads, to remove as necessary any material tracked out of site
- Avoid dry sweeping of large areas
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable
- Record all inspections of haul routes
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable)
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit and layout permits.

12.5.2 Operational Phase

There are no predicted impacts from dust during operation, and therefore, no mitigation proposed in relation to potential operational effects on air quality. The proposed development is not an activity which is licensable under the Industrial Emissions Directive.

12.6 Residual Impacts and Monitoring

The application of noise and dust limits along with the implementation of appropriate noise and dust control measures, will ensure that noise and dust impacts will be reduced. The resultant noise and dust impacts will be of negative short-term impact. As such they will not have a significant adverse impact on human health.

13 Landscape and Visual

13.1 Introduction

This chapter describes the landscape context and assesses the likely landscape and visual effects of the proposed development on the receiving environment. Although closely linked, landscape and visual effects are assessed separately.

Landscape Impact Assessment (LIA) relates to assessing effects of a development on the landscape as a resource in its own right and is concerned with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

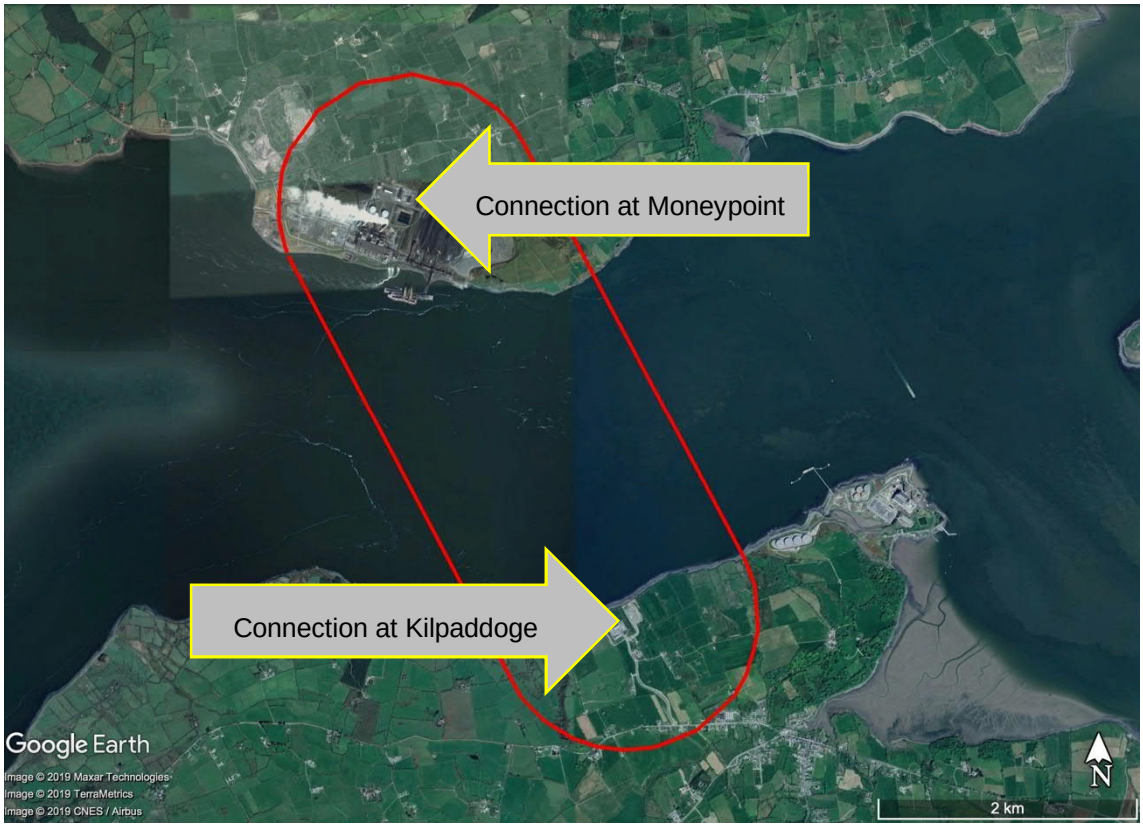
Visual Impact Assessment (VIA) relates to assessing effects of a development on specific views and on the general visual amenity experienced by people. This deals with how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements. Visual impacts may occur from; Visual Obstruction (blocking of a view, be it full, partial or intermittent) or; Visual Intrusion (interruption of a view without blocking).

13.1.1 Landscape and Visual Study Area

Given the scale and nature of the proposed development, it is highly unlikely that any significant landscape or visual impacts could occur beyond a distance of approx. 1 km of any aspect of it. Thus, a 1km radius / buffer from the development defines the study area in this instance. Figure 13.1 illustrates the extent of the study area. There are three aspects to the proposed development that have determined the shape and extent of the study area:

- Connection at Kilpaddoge 220 kV GIS Station (County Clare);
- Connection at Kilpaddoge 220 kV GIS Station (County Kerry). and
- Submarine/River Shannon Crossing.

Figure 13.1: Landscape and Visual Study Area.



Source: Google Earth Pro

13.2 Methodology

Production of this Landscape and Visual Impact appraisal involved

- A desktop study to establish an appropriate study area, relevant landscape and visual designations in the Clare and Kerry County Development Plans as well as other sensitive visual receptors.
- Assessment of the significance of the landscape impact of the proposed development as a function of landscape sensitivity weighed against the magnitude of the landscape impact; and
- Assessment of the significance of the visual impact of the proposed development as a function of visual receptor sensitivity weighed against the magnitude of the visual impact. This aspect of the assessment is supported by photomontages prepared in respect of the selected viewpoints.

13.2.1 Assessment Criteria

13.2.1.1 Landscape Impact Assessment Criteria

Landscape Value and Sensitivity is classified using the following criteria set out in Table 13.1.

Table 13.1: Landscape Value and Sensitivity

Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an international or national level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level (Area of Outstanding Natural Beauty), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes, which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use.
Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically, this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include, enhancement, repair and restoration.
Negligible	Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the proposed development. The magnitude considers whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the site boundary that may have an effect on the landscape character of the area. Table 13.2 refers.

Table 13.2: Magnitude of Landscape Impacts

Impact	Description
Very High	Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
High	Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
Medium	Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to changes in landscape character, and quality. Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements.
Low	Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements.
Negligible	Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the following matrix set out in Table 13.3.

Table 13.3: Impact Significance Matrix

	Sensitivity of Receptor				
Scale/Magnitude	*Very High*	*High*	*Medium*	*Low*	*Negligible*
Very High	Profound	Profound-substantial	Substantial	Moderate	Minor
High	Profound-substantial	Substantial	Substantial-moderate	Moderate-slight	Slight-imperceptible
Medium	Substantial	Substantial-moderate	Moderate	Slight	Imperceptible
Low	Moderate	Moderate-slight	Slight	Slight-imperceptible	Imperceptible
Negligible	Slight	Slight-imperceptible	Imperceptible	Imperceptible	Imperceptible

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity they are engaged in and whether this heightens their awareness of the surrounding landscape. A list of the factors considered in this assessment in estimating the level of sensitivity for a particular visual receptor is outlined below and used in Table 13.1: Landscape Value and Sensitivity to establish visual receptor sensitivity at each VRP:

1. **Susceptibility of Receptors** - In accordance with the Institute of Environmental Management and Assessment (IEMA) Guidelines for Landscape and Visual Assessment (3rd edition 2013) visual receptors most susceptible to changes in views and visual amenity are;
   - "Residents at home;
   - People, whether residents or visitors, who are engaged in outdoor recreation, including use of public rights of way, whose attention or interest is likely to be focussed on the landscape and on particular views;
   - Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience;
   - Communities where views contribute to the landscape setting enjoyed by residents in the area; and
   - Travellers on road rail or other transport routes where such travel involves recognised scenic routes and awareness of views is likely to be heightened".

Visual receptors that are less susceptible to changes in views and visual amenity include;

   - "People engaged in outdoor sport or recreation, which does not involve or depend upon appreciation of views of the landscape; and
   - People at their place of work whose attention may be focussed on their work or activity, not their surroundings and where the setting is not important to the quality of working life".

2. **Recognised scenic value of the view** (County Development Plan designations, guidebooks, touring maps, postcards etc). These represent a consensus in terms of which scenic views and routes within an area are strongly valued by the population because in the case of County Developments Plans, for example, a public consultation process is required;
3. **Views from within highly sensitive landscape areas**. Again, highly sensitive landscape designations are usually part of a county's Landscape Character Assessment, which is then

incorporated within the County Development Plan and is therefore subject to the public consultation process. Viewers within such areas are likely to be highly attuned to the landscape around them;

4. **Primary views from dwellings**. A proposed development might be seen from anywhere within a particular residential property with varying degrees of sensitivity. Therefore, this category is reserved for those instances in which the design of dwellings or housing estates, has been influenced by the desire to take in a particular view. This might involve the use of a slope or the specific orientation of a house and/or its internal social rooms and exterior spaces;
5. **Intensity of use, popularity**. This relates to the number of viewers likely to experience a view on a regular basis and whether this is significant at county or regional scale;
6. **Connection with the landscape**. This considers whether or not receptors are likely to be highly attuned to views of the landscape i.e. commuters hurriedly driving on busy national route versus hill walkers directly engaged with the landscape enjoying changing sequential views over it;
7. **Provision of elevated panoramic views**. This relates to the extent of the view on offer and the tendency for receptors to become more attuned to the surrounding landscape at locations that afford broad vistas;
8. **Sense of remoteness and/or tranquillity.** Receptors taking in a remote and tranquil scene, which is likely to be fairly static, are likely to be more receptive to changes in the view than those taking in the view of a busy street scene, for example;
9. **Degree of perceived naturalness**. Where a view is valued for the sense of naturalness of the surrounding landscape it is likely to be highly sensitive to visual intrusion by distinctly manmade features;
10. **Presence of striking or noteworthy features.** A view might be strongly valued because it contains a distinctive and memorable landscape feature such as a promontory headland, lough or castle;
11. **Historical, cultural and / or spiritual significance.** Such attributes may be evident or sensed by receptors at certain viewing locations, which may attract visitors for the purposes of contemplation or reflection heightening the sense of their surroundings;
12. **Rarity or uniqueness of the view**. This might include the noteworthy representativeness of a certain landscape type and considers whether the receptor could take in similar views anywhere in the broader region or the country;
13. **Integrity of the landscape character**. This looks at the condition and intactness of the landscape in view and whether the landscape pattern is a regular one of few strongly related components or an irregular one containing a variety of disparate components;
14. **Sense of place**. This considers whether there is special sense of wholeness and harmony at the viewing location; and
15. **Sense of awe**. This considers whether the view inspires an overwhelming sense of scale or the power of nature.

Those locations which are deemed to satisfy many of the above criteria are likely to be of higher sensitivity. No relative importance is inferred by the order of listing in the **Table 13-5** below. Overall sensitivity may be a result of a number of these factors or, alternatively, a strong association with one or two in particular.

13.2.1.2 Visual Impact Magnitude

The magnitude of visual effects is determined on the basis of two factors; the visual presence (relative visual dominance) of the proposal and its effect on visual amenity.

The magnitude of visual impacts is classified in **Table 13-4**.

Table 13.4: Magnitude of Visual Impact

Impact	Description
Very High	The proposal intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. A high degree of visual clutter or disharmony is also generated, strongly reducing the visual amenity of the scene
High	The proposal intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual clutter or disharmony is also likely to be generated, appreciably reducing the visual amenity of the scene
Medium	The proposal represents a moderate intrusion into the available vista, is a readily noticeable element and/or it may generate a degree of visual clutter or disharmony, thereby reducing the visual amenity of the scene. Alternatively, it may represent a balance of higher and lower order estimates in relation to visual presence and visual amenity
Low	The proposal intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene
Negligible	The proposal would be barely discernible within the available vista and/or it would not detract from, and may even enhance, the visual amenity of the scene

13.2.1.3 Visual Impact Significance

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the same significance matrix and applies the same EPA definitions of significance as used earlier in respect of landscape impacts (Table 13.2 refers).

13.2.2 Relevant Legislation and Guidelines

This Landscape and Visual Impact Assessment was undertaken having regard to the following guidelines;

- Landscape Institute and the Institute of Environmental Management and Assessment publication entitled Guidelines for Landscape and Visual Impact Assessment – 3rd Edition (2013).

13.3 Baseline Environment

The existing environment will be addressed in relation to both the Landscape Baseline and Visual Baseline. The proposed development occurs in the functional areas of both Clare County Council (northern side of the Shannon) and Kerry County Council (southern side of the Shannon). As a result, the landscape and visual baseline includes a review of the County Development Plans of both planning authorities.

13.3.1 Landscape Baseline

13.3.1.1 Description of the Receiving Landscape / Seascape

On the northern side of the River Shannon, the study area is dominated by the substantial Moneypoint Generating Station complex, which fronts onto the River and consists of large and bulky buildings and storage structures. It also includes iconic twin chimney stacks that rise to approximately 218m tall – the tallest freestanding structures in the country. The power plant is surrounded by docking and coal storage facilities as well as considerable electrical infrastructure, which serves as a hub for the numerous high voltage overhead lines (OHLs) that converge on the complex. Immediately surrounding the Moneypoint Generating Station complex are bands of peripheral woodland that serve to screen the lower portions of the site and associated activity from view. These bands of woodland also separate the industrial site from the predominantly agricultural farmland that makes up the remainder of the study area.

The landform slopes gently towards the River from the N67 national secondary road, which traverses the northern portion if the study area in an east-west direction. There is a scattering of farmsteads and rural dwellings within the rural landscape surrounding the power station and most of these occur to the east and north-east of the site.

The River Shannon itself is very broad at this point (approx. 2.6km) near is seaward western end where it as much a deep and fast-moving estuary defined by shores could be considered coastline or river bank. Although outside of the study area to the east, the Kilimer – Tarbert car ferry traverses the Shannon approximately every half hour. The ferry route is approximately 3km to the east of the proposed development boundary and forms part of the Wild Atlantic Way tourist driving route.

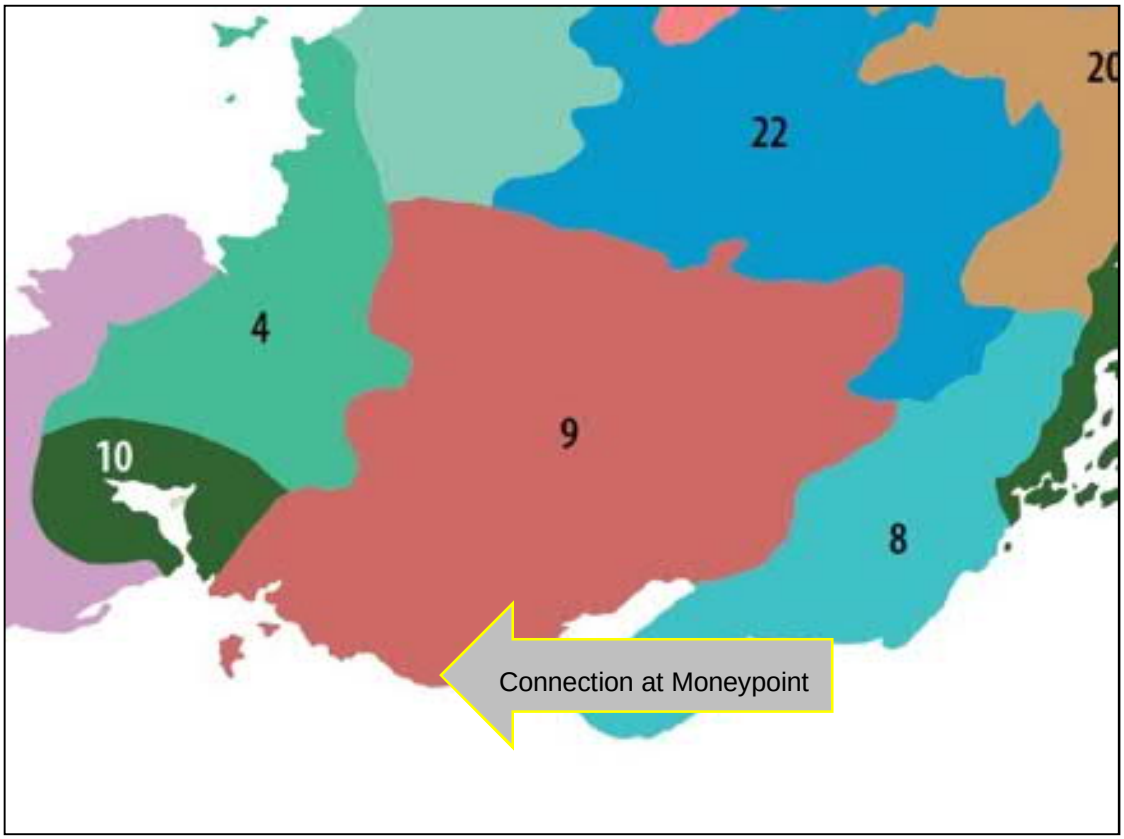
The Wild Atlantic Way also follows the N67 national secondary road that passes to the north of Money Point Power station in the northern portion of the study area. However, it does not enter into the study area on the southern shores of the Shannon where it heads southwest from Tarbert.

The focus of the southern end of the study area is the existing Kilpaddoge substation, which is divided between two main parts separated by around 60m. It lies just above the southern banks of the Shannon around 1.4km northeast of the centre of the settlement of Tarbert. The remainder of the southern portion of the study area is contained in gently sloping coastal farmland with a low ridge running parallel to the river, which separates the dwelling lined L1010 Tarbert Coast Road from the substation. Similar to the northern land-based end of the study area, tall high voltage pylons are a familiar feature of this landscape as they transport OHLs to the existing Kilpaddoge substation and Tarbert Power Station approximately 1.7km to the east at Tarbert Island.

13.3.1.2 Policy Context and Designations - Clare County Development Plan

A Landscape Character Assessment has been prepared for County Clare and this is incorporated into Volume 1 of the current Clare County Development Plan 2017 – 2023 (CCDP). This identifies 26 separate Landscape Character Types (LCT). As Illustrated on Figure 13.2 the proposed development occurs within LCT 9: ‘Farmed Rolling Hills’.

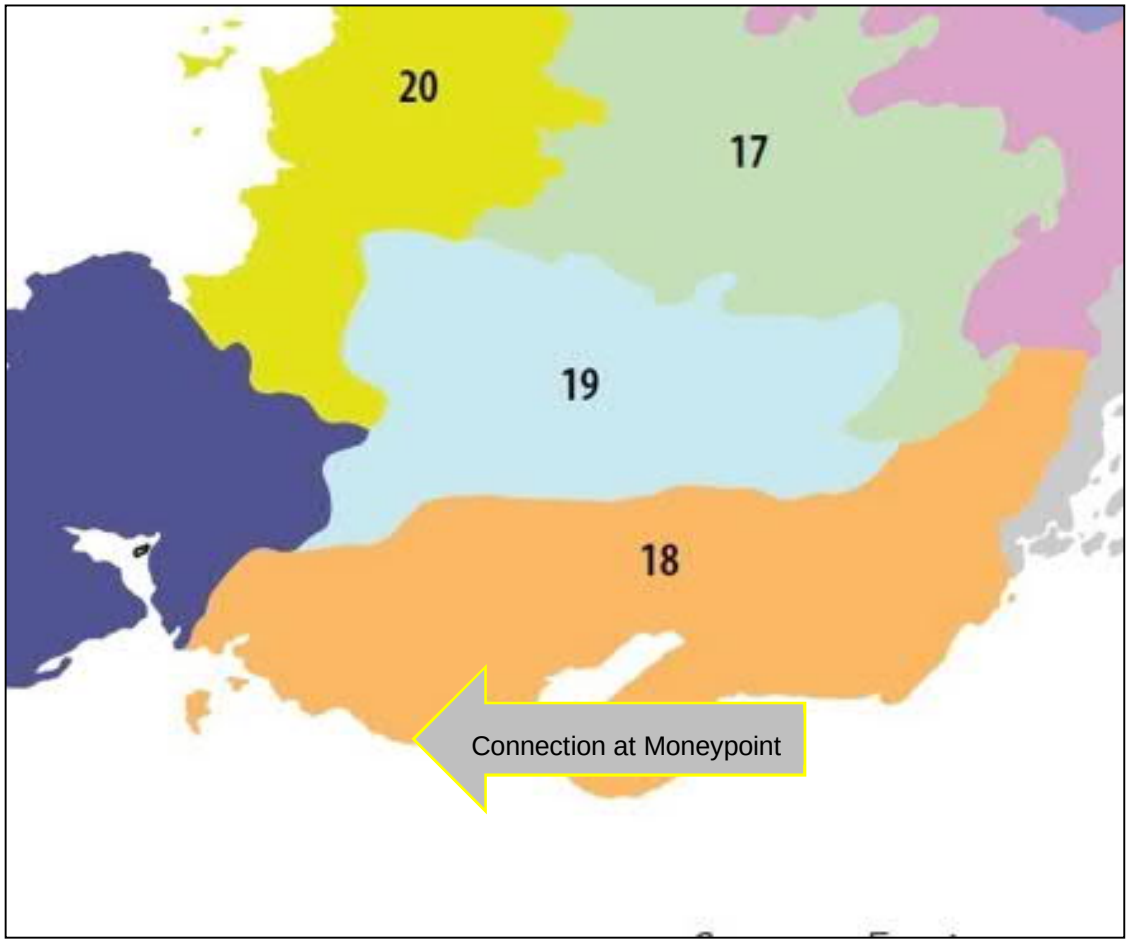
Figure 13.2: Approximate location of the proposed development, overlaid on an excerpt from Figure 13.1 of the Clare County Development Plan – Landscape Character Types



Source: Clare County Development Plan 2017-2023 (Clare County Council 2017)

The LCTs are then amalgamated into 21 Landscape Character Areas (LCA) which are indicated in Figure 13.2 of the CCDP and the proposed development occurs within LCA 18: 'Shannon Estuary Farmland' (Figure 13.3).

Figure 13.3: Showing the study area of the proposed development overlaid on an excerpt from Figure 13.2 of the Clare County Development Plan which illustrates the Landscape Character Areas within the County



Source: Clare County Development Plan 2017-2023 (Clare County Council 2017)

LCT 9 'Farmed Rolling Hills' is described in the Clare Landscape Character Assessment as:

> *"Very varied, complex landscape incorporating many elements with a rolling landform that is very uneven. Land cover reflects this complexity with a mosaic of lowland blanket bog, improved and semi-improved pasture and blocks of commercial forest (coniferous). Varied enclosures including post and wire and hedgerows. Farms, houses and villages are quite frequent though dispersed throughout the area and there are distinct 'corridors' along major transport routes, where settlement is concentrated. Condition is also variable, with some areas more intact than others. The presence of bog and forestry also creates the impression of being in a more upland area in places. Views are afforded from more elevated hills across the surrounding areas and to the Shannon estuary."*

LCA18 – Shannon Estuary Farmland is composed of a prominently ridged landscape, with linear hills aligned south-west to north-east. The coastal fringe is flatter and slopes towards the Shannon. According to the Landscape Character Assessment, the key characteristics of this LCA are as follows:

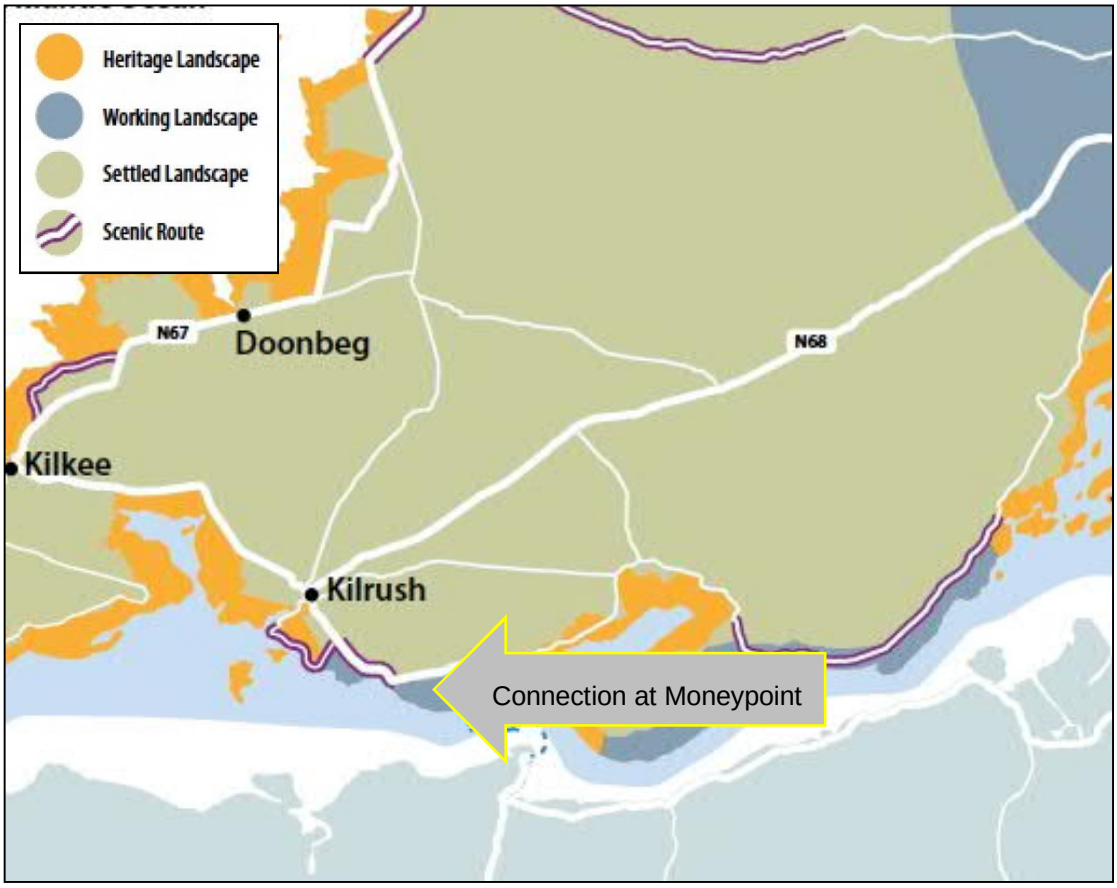
- *Prominently ridged landscape, with linear hills aligned south-west to north-east.*

- *Secluded areas interspersed with more open views. Views are afforded across the Shannon estuary and across to Limerick from elevated areas and on the estuary shores.*
- *Coastal fringe is flatter and slopes down towards the sea.*
- *Diverse habitat and land cover.*
- *Scattery Island is an important historical and focal feature.*
- *Complex patterns of pasture, woodland and scrub habitats.*
- *Old Vandeleur Estate plantations, gardens and restored woodland recreation area.*

Using the LCAs from the Landscape Character Assessment as a basis, Clare County Council has identified three types of landscape for the purposes of developing and implementing landscape policy. These include ‘Settled Landscapes’, ‘Working Landscapes’ and ‘Heritage Landscapes’. Map 13a of the Clare County Development Plan 2017 – 2023 (Clare County Council 2017) and Map C in Volume 2 of same, identifies where these various landscapes occur.

Figure 13.4 indicates that the study area is contained within the ‘Working Landscape’ zoning. Working Landscapes are divided in to the ‘Western Corridor Working Landscape’ and the ‘Shannon Estuary Working Landscape’ with the latter being the one relevant to the proposed development.

Figure 13.4: Showing the approximate location of the proposed development overlaid on an excerpt from Map 13A of the Clare County Development Plan which illustrates the landscape and scenic designations within the County.



Source: Clare County Development Plan 2017-2023 (Clare County Council 2017)

The objectives of the Clare County Development Plan 2017-2023 (Clare County Council 2017) relating specifically to the Shannon Estuary Working Landscape are;

CPD13.3:

A) To permit development in these areas that will sustain economic activity, and enhance social well-being and quality of life - subject to conformity with all other relevant provisions of the Plan and the availability and protection of resources;

B) That selection of appropriate sites in the first instance within this landscape, together with consideration of the details of siting and design, are directed towards minimising visual impact;

C) That particular regard should be given to avoiding intrusions on scenic routes and on ridges or shorelines. Developments in these areas will be required to demonstrate:

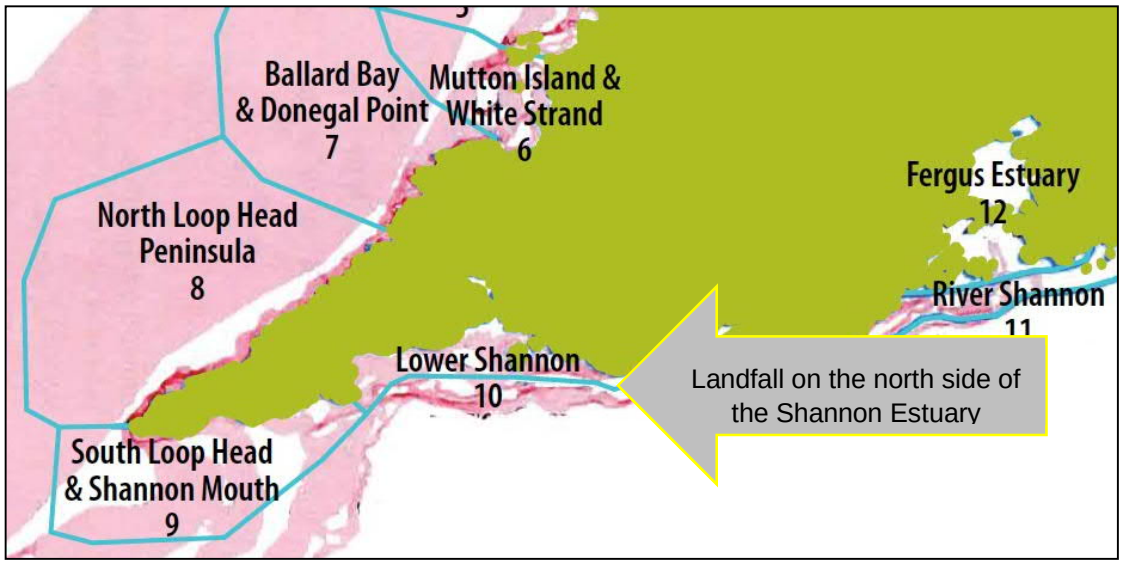
i. That the site has been selected to avoid visually prominent locations;

ii. That site layouts avail of existing topography and vegetation to reduce visibility from scenic routes, walking trails, public amenities and roads;

iii. That design for buildings and structures reduce visual impact through careful choice of form, finishes and colours and that any site works seek to reduce visual impact of the development.

A Seascape Character Assessment was included within the Landscape Character Assessment that was carried out for County Clare. It identified 12 individual Seascape Character Areas (SCA) in County Clare which are indicated on Figure 13.3 in the CCDP. An extract from this is include in Figure 13.5 which indicates that the Connection at Moneypoint is in Area 10 - 'Lower Shannon'.

Figure 13.5: Seascape Character Areas.



Source: Clare County Development Plan 2017-2023 (Clare County Council 2017)

The condition of the seascape SCA 10 – Lower Shannon is described as 'moderate becoming poorer closer to the River Shannon SCA.' According to the Seascape Character Assessment, the key characteristics of Area 10 are as follows:

- *The River Shannon in this area is wide, creating a greater coastal than estuarine sense.*
- *Views from Kilrush to Scattery Island and Hog Island.*
- *Settlement is concentrated around Kilrush including caravan parks and golf club.*
- *Pylons and Money Point Power Station are prominent features.*
- *Kilrush is a designated Heritage Town and Sea Angling Centre.*
- *Kilrush Marina is a major infrastructure providing 120 berths at all stages of the tide. It has been awarded Blue Flag status.*
- *Scattery Island is a designated ACA (Architectural Conservation Area).*
- *There are views across to Ballylongford and County Kerry.*

The objectives of the Clare County Development Plan 2017-2023 (Clare County Council 2017) relating specifically to the Seascape Character Areas are;

CDP13.6:

A) To require all proposed developments within Seascape Character Areas to demonstrate that every effort has been made to reduce the visual impact of the

development. This must be demonstrated by assessing the proposal in relation to:

• Views from land to sea;

• Views from sea to land;

• Views along the coastline.

B) To ensure that appropriate standards of location, siting, design, finishing and landscaping are achieved.

13.3.1.3 Policy Context and Designations - Kerry County Development Plan

The current Kerry County Development Plan (2015 - 2021) contains one objective under the heading 'Landscape Protection'.

ZL-1: Protect the landscape of the County as a major economic asset and an invaluable amenity which contributes to the quality of people's lives.

Although Kerry does not currently have a Landscape Character Assessment of the county, there is an objective in the Kerry County Development Plan (ZL2) to undertake this prescribed process once the National Landscape Strategy has been published. This was published in mid-2015, but the considerable process of generating a national landscape character assessment, which is one of its key objectives, has only recently begun. In lieu of a county landscape character assessment, the Kerry County Development Plan utilises zoning mechanisms to protect sensitive landscapes in accordance with the following objective:

ZL-3: Determine the zoning of lands in rural areas having regard to the sensitivity of the landscape as well as its capacity to absorb further development.

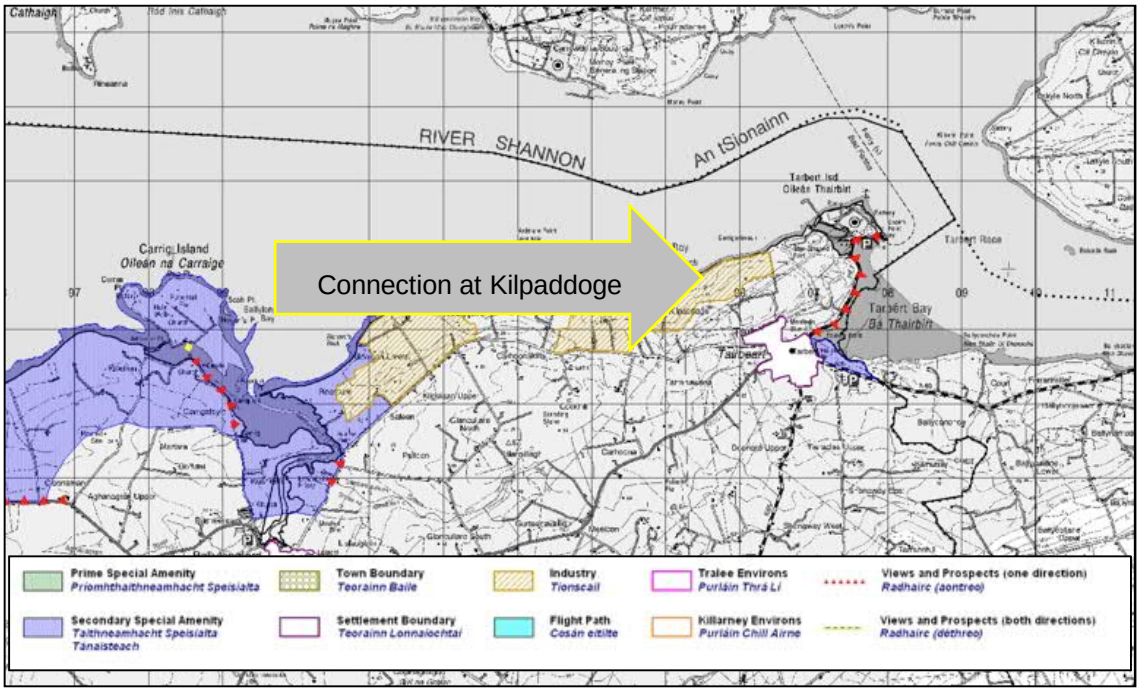
Consequently, there six zoning designations in County Kerry:

- *Urban*
- *Rural Prime Special Amenity*
- *Rural Secondary Special Amenity*
- *Rural General*
- *Tarbert/Ballylongford Landbank (Industrial)*
- *Shannon Estuary (Land and Marine Based Development)*

The location of the proposed development in relation to the zoning designations within Kerry are indicated in Figure 13.6. The proposed development is contained within an area zoned as 'Industry' (Tarbert/Ballylongford Landbank), where the following considerations are highlighted in the Kerry CDP:

"Land known as the Tarbert/Ballylongford Land Bank comprises 390 hectares of land and is zoned for development as set out in S4.7 of this Plan."

Figure 13.6: Extract of Zoning and Landscape Map 12.1a from Kerry County Development Plan.



Source: Kerry County Development Plan (2015 - 2021)

13.3.2 Visual Baseline

Establishing the visual baseline requires an analysis to determine if there are any particularly sensitive visual receptors. Visual receptors are people or groups of people at particular locations or engaged in particular activities that may have a view of the proposed development. Views of recognised scenic value are primarily indicated within County Development Plans in the context of scenic views/routes designations, but they might also be indicated on touring maps, guidebooks, roadside rest stops or on post cards that represent the area.

Within the study area there are no views or prospects designated in the county development plans for either County Clare or County Kerry, however, the Wild Atlantic Way tourist driving route passes to the north of the Connection at Moneypoint 400 kV GIS Station, in an east – west orientation on the N67 national secondary road.

13.4 Potential Impacts

13.4.1 Landscape Impacts

13.4.1.1 Landscape Sensitivity

Northern Land-based Section of Study Area at Moneypoint

There is reasonable landscape integrity in the riverine farmland that slopes down to the shores of the Shannon and there is also some scenic quality relating to broad views across the Shannon Estuary. However, the northern portion of the study area, and particularly that aspect encompassing the site, is strongly dominated by the industrial imprint of Moneypoint Power Station and its attendant land uses. The study area is contained within LCA18 – Shannon Estuary Farmland, but the section between the N67 National secondary road and the Shannon

is zoned as a 'Working Landscape', which acknowledges its distinction from most of the remainder of this LCA, which is zoned as a more sensitive 'Settled Landscape'.

Overall, it is considered that the northern land-based section of the study area is of **Low** landscape sensitivity.

Central River Shannon Section of Study Area

As one of the broadest sections of Irelands largest and longest river, this general portion of the Shannon is a distinctive and iconic natural feature familiar to many who have travelled across it on the Kilimer – Tarbert car ferry. This tidal lower section of the River is also used as a shipping channel by freighters carrying materials to Moneypoint Generating Station Complex as well as Foynes Port and Aughinish Alumina Plant further upstream. At a more localised level, the section of the river contained within the study area also links between the overt electrical infrastructure at Kilpaddoge and the dominating industrial Moneypoint Generating Station Complex.

Though not wholly related to landscape / seascape character, but with some connection to naturalistic landscape value, there are two conservation interests relating to this portion of the River Shannon;

- Special Protection Areas: River Shannon and River Fergus Estuaries SPA (Site Code: 004077); and
- Special Area of Conservation: Lower River Shannon SAC (Site Code: 002165).

On balance of the factors outlined above it is considered that the section of the River Shannon contained within the study area id of **Medium** Landscape / Seascape sensitivity.

Southern Land-based Section of Study Area at Kilpaddoge

Although the land-based southern portion of the study area is centred around the Kilpaddoge 220 kV GIS substation and there is also a considerable number of 220 kV overhead power lines traversing the landscape, it is also a lightly populated gently sloping area of riverine farmland. There is some scenic quality associated with broad northerly views across the Shannon as well as some naturalistic value, also associated with the river corridor.

On balance of the factors outlined above it is considered that the section of the River Shannon contained within the study area id of **Medium-low** Landscape sensitivity.

13.4.1.2 Magnitude of Landscape Impacts

There will be construction stage physical impacts on the landcover of site at Kilpaddoge substation in order to clear and form the building pad for the new substation extension and associated compound area. This relates to a small patch of modified grassland between existing compound areas of the substation where it will effectively serve as infill development. There will be trenching required for the land-based sections of the cable route. These will be through a combination of open ground and shoreline between the Kilpaddoge substation and the River Shannon and then again for the initial section of cable route from the Moneypoint cable reception pit until it coincides with an existing track that circulates to the east of the Moneypoint coal yard. Thereafter, it follows the line of the existing track the remainder of the way to the Moneypoint GIS substation. Immediately prior to its convergence with the existing access track the cable trending will pass through a narrow band of woodland scrub. For the submarine sections of the cable route across the river, the cable duct will be laid on the bed of the river where it will be held in place by bags of aggregate.

Trenching works will be temporary and side cast material will be backfilled into the trench and prevailing land cover reinstated. However, it is understood that the section of cable route through third party lands on the northern side of the river will have a permanent maintenance access track constructed above. For maintenance reasons the section of woodland scrub intersected by the cable route will also not be reinstated.

The physical landscape impacts described above will be at their greatest during the construction phase and there will be some permanent new features such as the substation extension, and sections of access track. However, these are very minor in the context of this already highly modified landscape setting. Similarly, the effect of these modest additional elements within this landscape will, for the most part, have no material effect on the prevailing landscape character. Only the proposed substation extension represents a noticeable addition and this in the context of a substantial existing GIS substation where it will add slightly to the intensity of electrical infrastructure at the facility but without increasing its envelope.

For the reasons outlined above it is considered that the landscape impact of the proposed development will be **Negligible**.

13.4.1.3 Significance of Landscape Impacts

None of the land-based or marine sections of the study area are considered to have a sensitivity of greater than Medium and the magnitude of Landscape /Seascape effects is Negligible for all aspects of the development. Consequently, the significance of landscape impact is deemed to be **Imperceptible**.

13.4.2 Visual Impacts

The visual impacts of the proposed Cross Shannon Cable are closely related to the impacts on landscape character in this instance. There will be some minor visual impacts associated with the movement of machinery and materials during the construction stage, but these will be modest in scale and extent and temporary in duration. Permanent visual changes will be difficult to discern within the industrial context of Moneypoint Power station, particularly from surrounding receptor locations and there will be no operation stage visual effects associated with the submarine section of cable route along the bed of the Shannon. For these sections the of the proposed project the visual impact will be **Negligible**.

The only aspect of the proposed development with any potential for noticeable visual effects is the substation extension at Kilpaddoge. Again, this will present as a modest increase in the intensity of the electrical infrastructure at this existing substation facility rather than an increase in the overall visual envelope. In terms of receptors, there are almost no rural dwellings within the southern land-based portion of the study area where the proposed visual change could have a material impact on visual amenity. Only in relatively close proximity from the river itself, which represents a very small number of recreational users in this area, is the substation extension likely to be discernible amongst the existing GIS substation facilities. In such a context, the visual impact will **Low-negligible** at worst.

13.4.2.1 Significance of Visual Impact

For the northern land-based section of the study area centred on Moneypoint and the marine section across the Shannon there will be Negligible visual impacts. When combined with visual receptor sensitivity that does not exceed Medium in the context of the study area, the significance of visual impacts will be Imperceptible. Whereas for the portions of the study area (terrestrial and marine based) surrounding the proposed substation extension the magnitude of

visual impact is likely to be Low-negligible and the resultant significance of impact is **Slight-imperceptible**.

13.5 Mitigation Measures

Given the very low order of landscape and visual impacts arising for the proposed development it is not considered that any specific mitigation measures are required in this instance.

13.6 Residual Impacts and Monitoring

Mitigation measures are not deemed to be required due to the assessed low order of landscape and visual effects. Thus, the impacts described under Section 13.4 are equivalent to the residual impacts of the proposed development.

14 Material Assets, including Traffic

14.1 Introduction

This chapter presents an assessment of impacts on material assets and traffic arising from the proposed development. Material assets are defined by the EPA[54] "to mean built services and infrastructure".

The assessment predicts the potential impacts on the surrounding environment arising from the construction and operation of the proposed development and, where appropriate, specifies mitigation measures to reduce potential impacts. The chapter covers three separate aspects; Traffic and Transport, Utility Services and Waste Management. In terms of traffic and transport, activity from the construction phase of the proposed development has a potential to impact through elevated traffic levels, particularly those which are HGVs delivering components and material to the site. The operational phase impact is negligible in respect of this topic given the limited staff and maintenance required during its lifetime.

14.2 Baseline Environment

A desktop review was carried out with a specific focus on built services, infrastructure and management of waste;

- Built Services Infrastructure; and
- Traffic and Transport.

This section of the document has been prepared with reference to the specific criteria set out within the following guidance documents:

- Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2017); and
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA, 2015).

14.2.1 Utility Services

Mott MacDonald Ireland contacted and/or downloaded data from various utility bodies to determine if there are any known existing utilities in the area of the project application site. These utility bodies include the following:

- Irish Water (for foul and water networks);
- Gas Networks Ireland (formally known as Bord Gáis);
- Telecommunication networks (e.g. Eir, Virgin Media etc.);
- Internal communication with ESB (underground cable, low, medium and high voltage overhead line);
- Transport Infrastructure Ireland (TII); https://www.tii.ie/;
- National Roads Authority Traffic and Transport Guidelines; and
- Shannon Foynes Port Company https://www.sfpc.ie/

In addition, a Ground Penetrating Radar (GPR) and utility survey in October 2019 to establish the extent of existing utility services was carried within the Moneypoint GIS substation compound. The objective of the survey was to locate the position and depth of existing

[54] https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf

underground utilities using a combination of non-intrusive survey techniques with findings based on indirect measurements and the interpretation of acoustic, electrical and electromagnetic signals.

The survey identified foul sewer and storm water networks, water mains and electricity cables within the Moneypoint Generating station complex. These are all located within ESB lands. There was no evidence of gas pipes found within the survey area and GNI service records drawing did not indicate any connections within this site.

Generally, depth of investigation from GPR does not exceed 1.5 metres in this area. The survey results also show unidentified utility services shown as GPR Anomalies. These features may be the result of services which are running through the sites, abandoned services, natural geological features or land drains amongst other features.

The only utility services which were recorded within the proposed development site are the cable circuits associated with the existing Moneypoint / Kilpaddoge 220 kV Cable. The proposed new cables will cross the Moneypoint / Kilpaddoge 220 kV circuit cables immediately south of the Moneypoint substation. There are minimal services within the elevated access road within the Moneypoint Generating Station Complex.

14.2.2 Traffic and Transport

The general area surrounding the proposed development is not served by a motorway. The closest national road is the N67 which runs from Talbert to Galway. The N67 is a national secondary road with a contraflow carriageway and is located approximately 225m north of the Moneypoint Generating Station. The N67 provides the main access into Moneypoint. The N69 serves Tarbert from the south and east and is a national secondary road connecting to the N67 in Tarbert town.

A review of the TTI Traffic Count Data indicates that traffic counts are currently being undertaken on the N67 between Kilrush Ferry and Kilrush at Moyne Court and a summary is provided below in Table 14.1.

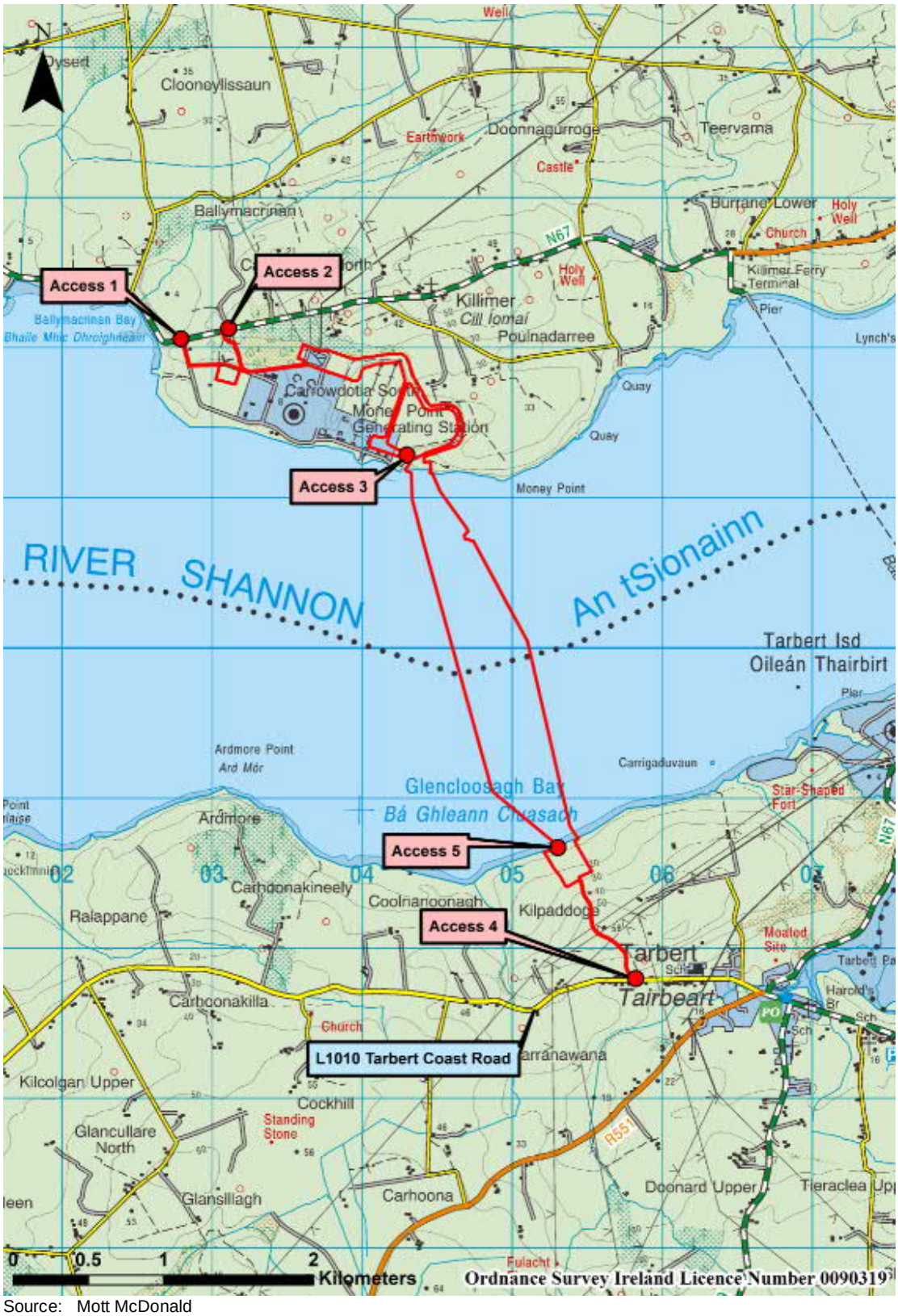
Table 14.1: Summary Traffic Data

	2020	2019	2018	2017	2016
AADT	852	1241	1544	1409	1450
%HGV	0.9%	3%	3.4%	4.4%	5%
Coverage	1.7%	99.7%	99.7%	99.7%	99.7%

Source: Traffic Infrastructure Ireland (accessed on 7 January 2020)

The Kilpaddoge substation is located off the L1010 Tarbert Coast Road located approximately 1.2km north-west of Tarbert Village, Co. Kerry. The L1010 links to the Regional Road network via a priority junction with the R551 in Tarbert village. The R551 in-turn forms a link to the national road network via priority junction with the N67 in Tarbert village. The N67 in-turn forms another key local junction with the N69 also via a priority junction in Tarbert Village. The speed limit in this section of the road is 50 kph. However, most of the L1010 west of the school along Ballylongford is narrow and consists of a two-lane single carriageway. The proposed site entrance is well established and provides adequate visibility in both directions for both construction and existing road users.

Figure 14.1: Local Road Network



Source: Mott McDonald

14.2.2.1 Marine Traffic

The Shannon Estuary is a deep-water estuary and therefore can facilitate all vessel sizes. Currently the estuary is commercially active, with vessels travelling to Moneypoint Generating Station, Foynes Harbour, Aughinish, Limerick and Tarbert. 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.

Based on records maintained by the SFPC and consultation with SFPC, this value is believed to stay consistent year on year even as vessel tonnage is forecast to increase.

It has been confirmed by SFPC that there is no defined navigational channel for vessels along the section of the Shannon Estuary where the proposed development is located. Based on advice from local vessel owners, the experience from the marine survey campaign and analysing freely available marine traffic information the largest vessels tend to use the centre and northern part of the Shannon Estuary to navigate upstream and downstream of the proposed development area. It should be assumed that vessels may travel anywhere that is practically feasible at any time of the day/night. SFPC also state that vessel movements are relatively sporadic, and the Shannon Estuary does not have a defined high season for vessel movements. Marine traffic records provided by SFPC including Dead Weight Tonnage (DWT), vessel dimensions, and port of call. This data was referred to in order to inform the potential impacts on the prevailing marine traffic from the construction of the proposed development.

The following subsections have been informed by data sources provided by the SFPC and the Marine Traffic Online database. It should be noted that the vessels tracked by the data sources are only vessels with AIS available on board, and therefore, typically smaller vessels (often pleasure crafts) are not tracked and accounted. Smaller vessels are considered to have less significance compared to larger vessels as they are less likely to directly impact cable burial or risk due to their relatively small DWT and dimensions.

Commercial and Recreational

Within the Shannon Estuary, the majority of the 900 vessels passing annually are bulk carriers, cargo ships or chemical/oil tankers. Many of these journeys berth at Aughinish and Foynes Harbour. The largest DWT vessels that were recorded, berth at Moneypoint Generating Station.

Table 14.2: Records of the 10 largest vessels within the Project Area and their Berth Location

Vessel Name	Vessel Type	Berth	Dead Weight Tonnage (t)	Length (m)	Draught (m)
Cape Amanda	Bulk Carrier	Moneypoint	182,741	292	12.6
Frontier Queen	Bulk Carrier	Moneypoint	182,663	292	17
Sea Triumph	Bulk Carrier	Moneypoint	181,415	292	18.1
Herun Global	Bulk Carrier	Moneypoint	181,056	292	18.2
KSL Sapporo	Bulk Carrier	Moneypoint	180,960	292	15.2
Anangel Horizon	Bulk Carrier	Moneypoint	180,940	292	18.2
Xin Jin Hai	Bulk Carrier	Moneypoint	180,406	295	11.1
Mineral Kyoto	Bulk Carrier	Moneypoint	180,310	289	8.2
Sandra	Bulk Carrier	Moneypoint	180,274	288	18.2
Saiko	Bulk Carrier	Moneypoint	180,178	288	10.5

Vessel Name	Vessel Type	Berth	Dead Weight Tonnage (t)	Length (m)	Draught (m)
Marivictoria	Bulk Carrier	Moneypoint	179,759	292	17.8

Source: Shannon Foynes Port Company (SFPC, 2019)

A minority of vessels passing within the Shannon Estuary and the project area are fishing vessels, tug-boats or passenger ferries. These vessels generally have smaller DWTs and dimensions and are therefore less significant when compared to the bulk carriers, cargo ships and tankers.

The Shannon Estuary is predominantly a commercial estuary, with little recreational boats accessing the estuary. The largest recreational marina within the proximity of the proposed development is Kilrush Marina, with 120 fully serviced berths accommodating vessels with a maximum length of 30 m, a beam of 8 m and draft of 3 m.

Ferry Terminals

Shannon Ferry operate a ferry service from Killimer Ferry Terminal located on the northern bank of the River Shannon to Tarbert Ferry Terminal located directly opposite on the southern bank of the River Shannon. The Killimer to Tarbert Ferry connects County Clare and County Kerry and is an is a significant local transport and tourism asset operated by Shannon Ferry Group Limited, being the only vehicle ferry trip on the main spine of the Wild Atlantic Way. The ferry operates all year round with varied schedules throughout the year. The construction of the cable will have no significant effect on the ferry schedule.

14.3 Potential Impacts

14.3.1 Construction Phase

14.3.1.1 Onshore Construction Traffic

The proposed development will result in an increase in traffic within the surrounding area. The construction phase is estimated to take approximately 12 months.

Construction traffic associated with the proposed works at Moneypoint will utilise the N67 and main entrance to access the construction works area. Construction traffic associated with works at Kilpaddoge will access the site via the L1010 Tarbert Coast Road.

During the construction phase it is expected that approximately 30 HGV movements per day will be required. The number of construction workers required during the construction phase is expected to peak at approximately 45 persons. No abnormal loads are required. The daily traffic on the road network in the vicinity of the proposed development however is low.

14.3.1.2 Offshore Construction Traffic

Several different submarine cable installation vessels are required for the proposed development. This will likely include a cable laying barge or cable laying vessel, a launce vessel for the pre-lay grapnel runs and mass flow excavation, cable protection installation vessel as well as support/guard vessels. It has been assumed that vessels will work up to 24/7 working hours during the submarine cable installation.

Both the temporary construction and operational access will be provided via the existing Moneypoint Electricity Generating Station. Ancillary car parking will be provided within the GIS compound area.

Access to the proposed works, during construction and operation phases at Kilpaddoge will be provided along the existing established access road. This access road connects to the L1010 Tarbert Coast Road.

Vessels will be required in different positions across the Shannon Estuary during the cable installation works and move up and down the estuary as required to facilitate safe and efficient installation of the submarine cables. The installation period for each submarine cable is in the order of hours to days with the vessels moving along the cable route during installation. With approximately 900 vessel passages annually in the proposed development location (equates to less than three vessel daily passages) and a wide navigational channel, the impact on navigation is considered low.

During the construction phase, ESB services will be temporarily disrupted. The surrounding residential and community properties will not be disrupted, and activities associated with the connection to the Moneypoint and Kilpaddoge substations will be carried out in line with ESB's scheduled outage programme.

Water will be tankered onto site as required during the construction phase and portable chemical toilets will be provided and all waste material will be removed from site and disposed of to an appropriately licensed facility. No construction phase impacts on water mains in the area are likely.

Activities associated with the connection to the Moneypoint and Kilpaddoge substations will be planned in line with ESB's scheduled outage programme.

14.3.1.3 Waste Management

As with any project, there is potential for generated waste to result in adverse impacts in the absence of mitigation.

14.3.2 Operational Phase

14.3.2.1 Traffic

Operations at both the Moneypoint GIS substation and Kilpaddoge 110 kV/220 kV substation will continue to have routine maintenance visits made by ESB personnel. Operational vehicular access will be required to gain access to all joint bays along the connection route; however, this will be extremely infrequent. The number of traffic movements is so low a typical distribution could not be applied and there is no impact on the road network during the operational phase.

No significant impact is considered on marine traffic for the proposed development.

14.4 Mitigation Measures

14.4.1 Construction Phase

14.4.1.1 Traffic

Prior to commencement of the development, a Construction Traffic Management Plan (CTMP) will be prepared in consultation with Clare County Council and Kerry County Council.

The CTMP will identify the safety measures required at access and egress locations and will take into consideration the following guidelines, as appropriate;

- Department of Transport “Guidance for the Control and Management of Traffic at Road Works”, (2010); and
- Department of Transport “Chapter 8: Temporary Traffic Measures and Signs for Roadworks”, (November 2010).

Parking during the construction phase will be provided within existing ESB compounds at both Moneypoint and Kilpaddoge Substations.

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. These will be stipulated in the granted Foreshore Licence process.

14.4.1.2 Utility Services

All reasonable measures will be taken to avoid unplanned disruptions to any services during the proposed works. This will include thorough investigations to identify and reconfirm the location of all utility infrastructure within the works areas, and the implementation of robust procedures when undertaking works around known infrastructure services. 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.

ESB services will be temporarily disrupted during the construction phase by the proposed onshore works. Service disruptions impacting the surrounding residential, social and commercial properties shall be kept to a minimum, only occurring where unavoidable. Prior notification of disruptions shall be given to all impacted properties. This shall include information on when disruptions are scheduled to occur and the duration of the disruption. Consultation with relevant neighbouring parties shall be undertaken prior to any proposed disruptions.

14.4.1.3 Waste Management

A Construction Waste Management Plan (as part of the CEMP) will be prepared prior to commencement of development. The plan 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) and Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, Department of the Environment, Heritage and Local Government (DoEHLG), June 2006.

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.

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. All employees will be made aware of their obligations under the Plan.

The Plan will be available for inspection at the site of the both substation locations at all reasonable times for examination by the Local Authority. All waste generated during the operational phase will be managed in accordance with the relevant provisions of the Waste Management Act 1996 and associated amendments and regulations, particularly with regard to the use of appropriately permitted waste contractors and destinations for waste materials.

14.4.2 Operational Phase

No specific mitigation measures are required.

14.5 Residual Impacts and Monitoring

Once construction is complete it is considered that there is no likely potential for significant residual impact on traffic associated with the proposed development.

The above mitigation measures will reduce the environmental impact of the proposed development, but certain impacts cannot be avoided in the short-term such as relocation of utilities and disruption to traffic. Residents will experience short-term inconvenience due to traffic disruption during the construction phase due to an increase in traffic. Affected residents and local businesses will receive prior notice of these disruptions. No significant impacts are anticipated provided the mitigation described herein are implemented.

15 Summary of Mitigation Measures

Mitigation measures are the measures proposed in order to avoid, reduce or, where possible, remedy significant adverse environmental effects of the proposed development. Mitigation measures have been incorporated into the development design and will be applied during both construction and operation phase where they have been assessed as required.

This chapter provides a summary of the mitigation measures for the proposed development as contained in this PECR. This is a summarised version stating only the measure to be provided and does not provide the detail on the mitigation measures required. The reader is referred to the appropriate environmental chapter for full details on the measures.

All work will be carried out having regard to international and national legislation, and best practice guidance, including but not limited to guidance on preventing pollution from construction sites and pollution prevention guidance.

Table 15.1: Summary of Mitigation Measures

Reference	Mitigation Measure
	General Mitigation Measures
Construction 1.1	The Project Construction Environmental Management Plan CEMP to be prepared by the appointed Contractor will incorporate the control measures detailed in the Outline CEMP in addition to specified conditions that may be prescribed in any grant of planning consent for the project, measures outlined in the Natura Impact Statement and the Planning and Environmental Considerations Report and any commitments given by EirGrid/ESB in relation to environmental protection associated with the activities outlined in the Outline CEMP. The proposed works area will be demarcated and pollution prevention measures will be implemented prior to commencement of construction works. Prior to commencement of development, the Contractor will prepare a Construction Waste Management Plan (as part of the Project 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 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, the appropriate mitigation for the proposed development includes full cable risk assessment to be carried out at the next stage as a post consent verification survey and post construction monitoring protocol will also be implemented.
	Population and Social Impact
Construction 2.1	As part of the CEMP the Contractor will be required to develop and implement a Public and Stakeholder Management and Communication Plan which is to be agreed with the Planning Authorities prior to the construction phase. Navigational impacts will be minimised through consultation with the Shannon Foynes Port Company and other stakeholders as part of the Foreshore Licence process. These will be stipulated in the granted Foreshore Licence process. Access to the foreshore within the proposed development boundary will be temporarily restricted for the duration of the works. The vessels will be temporarily positioned within the proposed development boundary (as shown on the accompanying mapping). Mariners will be requested to stay a minimum of 500 metres radial distance from the project vessel. Vessels will require diversions to avoid the installation activity, however, individual occasions will be transient and temporary in nature. A comprehensive Health and Safety Programme will be put in place on the site prior to commencement of construction to minimise any risks to site personnel and visitors. The requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) will be compiled with at all times. Oyster T08/004BO is partially located within the study area adjacent to Moneypoint and relates to an Oyster Fishery Order issued in 1961 to SO Limited. It is understood that this area has not been cultivated todate and there are no known future plans to cultivate this area. Discussions

	have been ongoing with the owners of the Oyster Fishery Order and will continue in advance of and during construction works
Operation 2.1	There will be no specific mitigation required in this instance.
	Biodiversity
Construction 3.1	A detailed CEMP and Contractor Method Statement (CMP) will be prepared and implemented by the Contractor. The CEMP will also be prepared in consultation with Kerry and Clare County Councils and other relevant consultees including the NPWS and IFI and IWDG and Department of Communications, Climate Action and Environment and Department of Housing, Planning and Local Government. The CEMP will be reviewed regularly by the appointed Contractor and revised as necessary to ensure that the measures implemented are effective. Good site practice as per the *CIRIA C741 Environmental good practice on site guide (fourth edition)* will be implemented on site at all times. An Outline CEMP accompanies this application and sets out the mitigation measures required to ensure no significant effects on the receiving environment. All pollution control measures will be designed, installed and maintained in accordance with CIRIA guidance for 'Environmental Good Practice on Site' (C741), 'Control of water pollution from linear construction projects. Technical guidance' (C648) and with regard to IFI guidance Guidelines on the Protection Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (2016) to ensure the protection of the Lower Shannon catchment and the fishery habitat and species it supports. All mitigation will be implemented under the supervision of an Environmental Clerk of Works (EnCoW) whom will be appointed by the Contractor.
Construction 3.2	The cable laying operators will implement 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, 201423). Specifically, the contractor will implement the measures and protocols described in Section 4.3.4 of the guidance. In summary, trenching and cable laying activity will 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 works will commence with a 'soft-start' procedure to allow lamprey, salmon and marine mammals to vacate the works area. In addition, having regard to consultation with the NPWS advised that this would provide adequate protection, but in addition no works will occur during the month of August which coincides with the peak calving/breeding period for the species. .
Construction 3.3	An Environmental Clerk of Works will be appointed by the Contractor to oversee and monitor the implementation of biosecurity protocols Biosecurity measures must be employed during the construction phase. 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) In addition to the above, the contractor will be required to implement measures to control the emission of dust and air-borne pollutants due to construction activities; these measures include: • Control of vehicle access, • Vehicle speed restrictions, Bed of gravel at site exit points to remove caked on dirt from tyres and tracks, • Washing of equipment at the end of each work day, • Prevention of on-site burning, • Hard surface roads should be wet swept to remove any deposited materials, • Unsurfaced roads should be restricted to essential site traffic only, and • Wheel-washing facilities should be located at all exits from the construction site
Construction 3.4	All construction work areas will be demarcated prior to the construction works commencing. With the exception of the crossing points and landfall activities no construction works will be

	undertaken within 10m of any drainage ditch, and this will be subject to careful control. During the installation of the underground cable connections, the works area will be completely isolated and any water present will be over pumped via appropriate sediment control i.e. filter bag and released to the sea. Any contaminated water will be removed and disposed in accordance with Waste Legislation. All machinery used at Moneypoint will be stored in bunded areas during the works
Construction 3.5	Silt fences will be installed along the length of the works for the underground cable connections located adjacent to the Shannon. The silt fences will be set back a minimum of 10m from all watercourses. The posts will be either erected by hand or by machine. Silt fences will also be installed around the proposed landfall locations and should be positioned around stockpiles of excavated material to ensure no runoff from the stored material discharges into watercourses. The geotextile fabric must be entrenched at least 10cm into the ground with the ends upturned. The fence posts will have a maximum spacing of 2m to prevent sag on the fence, and the geotextile fabric will be anchored to the fence posts as opposed to wrapped. The alignment of silt fences will be identified by the EnCoW and installed under EnCoW supervision. The silt fences must be positioned to allow an appropriate working area within the site while also ensuring that they are located above areas prone to flooding (to ensure the silt fences are not inundated by water). Silt fences will be installed in advance of any ground disturbance. Daily inspection of silt fences will be carried out by the EnCoW to assess the effectiveness of the measures, to carry out maintenance, and to determine if there has been any damage / breach to the control measures. The EnCoW shall have regard inter alia guidance set out in CIRIA guidance. The silt fences will also be inspected immediately following heavy rainfall or strong winds (equating to a yellow weather warning). Where repair is necessary, this will be carried out immediately and may require replacement of any damaged / degraded material. All accumulated silt from silt fences will be removed and disposed of in line with Waste Legislation. The fences should be removed under the instruction and supervision of the project ecologist. The pouring of concrete will be required along the length of the underground cable connections route. No on-site batching will be undertaken 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 in designated wash down areas. The wash down area will be located within the construction compound and not within 50m of any watercourse or drainage ditch. No chemical and/or hydrocarbons will be stored on site during the construction phase. Instead, fuel tankers will be brought to site when required and will refuel within a designated impermeable, bunded area, within the construction compound and located a minimum of 50m from all watercourses. All hand-held equipment and generators will be stored on site in appropriately sized bunds when not in use. Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and at the site compound, and operators will be fully trained in the use of this equipment. All waste oil, empty oil containers and other hazardous wastes will be disposed of in conjunction with the requirements of the Waste Management Acts 1996, as amended. The appointed Contractor will prepare and implement a Dust Management Plan (DMP) and a Noise Management Plan as part of the CEMP. Mitigation measures which will be implemented on site are outlined in the relevant chapters in this PECR.
Construction 3.6	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, resting and important foraging sites. All lighting will be positioned away from all ecological sensitive area such as bat roosts, badger setts and the River Shannon. Lighting will be cowled and directional to reduce light splay 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
Construction 3.7	Following engagement with landowners, the siting of the proposed development and the alignment of the underground cable route were optimised to minimise habitat loss. In addition, existing agricultural access tracks will be utilised where possible. Where the clearance of vegetation cannot be avoided, vegetation removal will be kept to a minimum as far as possible. The proposed works area will be defined at the outset by the erection of temporary fencing to define the limits of site works under the supervision of a qualified

	ecologist. The demarcation of the works area will ensure no vegetation clearance will occur outside the proposed development site boundary. Planting of any type of vegetation will not occur along the permanent underground cable circuits. Disturbed areas of ground will be reinstated by planting the same types of vegetation that were lost *e.g.* removed sections of hedgerow will be replanted using the same species such as Gorse, Blackthorn, Ivy and Bracken composition as recorded in the base line survey. This will ensure that following a re-establishment period, baseline vegetation patterns are substantially restored. The same approach will be applied to land cover by replacing agricultural grassland and scrubland on a like-for-like basis. In accordance with Section 40 of the Wildlife (Amendment) Act, all vegetation clearance within the footprint of the proposed development will be undertaken outside of the birds nesting season (1st March to 31st August inclusive) to ensure there are no impacts to protected breeding birds. However, if such periods cannot be avoided, nesting bird surveys should be carried out by a suitably experienced ecologist over a sufficient duration, and in suitable weather conditions, to provide confidence in the findings. Where no nests are recorded, the area may be cleared. Where nests are recorded, these areas (plus a precautionary buffer) should be excluded from disturbance until after birds have fledged as determined by further monitoring by the ecologist.
Construction 3.9	In the event that the construction phase of the development is delayed more than 12 months after the initial surveys a post consent verification 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. 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. 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
Operational 3.1	There will be no specific mitigation required in this instance
	Marine Aspects
Construction 4.1	**Sand Waves -** At detailed design stage is recommended to carry out a survey in order to locate these sediment features and design the cable route to avoid those areas. Prior to cable installation is recommended to carry out another survey as these features are dynamic in nature. A pre-installation clearance technique, proposed as a mass flow excavation (MFE) tool, will be deployed during the construction phase along the cable in order to flatten sand waves with amplitudes of more than 0.5m. This activity will reduce the risk of sand waves re-establishing after the cable installation. In areas where it is not possible to avoid these features, it is recommended to bury the cable deeper in order to avoid the cable damage
Construction 4.2	**Seabed Slopes** - In order to reduce the vulnerability of the cable as a consequence of the installation in areas with steep slopes, it is recommended to carry out a micro routing at detailed design stage. At an early stage of this project a survey data has been done and the selected route has been designed to reduce risk. It is recommended at construction phase the use of rock filled bags in areas where the steep slope can't be avoided.
Construction 4.3	**Sediment Dispersion** - Construction activities such as trenching, and cable installation will release sediment and they will be dispersed in the area due to currents. Best practice guidelines will be adopted by the Contractor to avoid unnecessary sediment dispersion during the submarine cable installation.. Mitigation measures to control sediment dispersion for impact on ecology, are detailed in Section 7 of this report. Installation of the cable should be programmed to avoid periods of peak spring tidal currents. For example, this should be considered submarine cable installation during slack states of the tide to reduce the risk of strong tidal currents.

Construction 4.4	**Sediment Deposition -** Installation of the cable should be programmed in advance to avoid spring tides. Undertaking the cable installation during neap tides when the tidal flows are smaller is likely to result in the settling of sediment more rapidly and less dispersion of suspended sediment. Design of slopes are subject to further design work at detailed design stage. Slope stability of proposed ramp and side slopes are based on conservative slope angles for the materials observed from preliminary site surveys. Trench and excavation depths have been minimised where possible to limit excavations and the need for material disposal
Operation 4.1	**Shoreline Erosion** - As a prevention to avoid shoreline erosion a rock revetment is designed to be installed at the toe of the concrete slipway structure. This rock revetment will limit the amount of erosion and the potential of landslides at the cliff. Monitoring of the structure is recommended on a yearly basis in order to assess any early erosion signs and prevent the potential collapse of the structure.
Operation 4.2	**Sediment Mobility -** 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 operation 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, the mitigation for the proposed development includes: i. Full cable burial risk assessment to be completed at the detailed design stage; and ii. Post construction monitoring. A campaign of periodic marine survey inspections over the as built location of the cables to monitor the movement of sand waves and determine cable burial depth. Ongoing monitoring allows the cable operator with the data necessary to mitigate the long-term risk of cable burial and exposure of the cable by way of early intervention. The specification of the types of marine survey techniques and frequency of the surveys will be confirmed prior to completion of the cable installation works. This enables the construction survey data to be part of the assessment.
	Land, Sediment and Geology
Construction 5.1	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 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; 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; and 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; 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. Excavated material and top soil 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
Operation 5.1	There will be no specific mitigation required in this instance
	Water, including Flood Risk
Construction 6.1	• The appointed Contractor will be required to develop a Construction Environmental Management Plan (CEMP) which will include a comprehensive and integrated plan for erosion and sediment control measures as set out in this PECR. The CEMP will document all relevant legal obligations for construction sites in terms of water quality control in Ireland in addition to setting out recommended best practice including mitigation measures in respect of trenching and trenchless techniques. The CEMP will be reviewed regularly and modified as necessary; • 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 soil arisings 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[55]. 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 the drainage ditch crossing points and should be positioned 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
Operation 6.1	All storm water runoff will be collected on-site and discharged to ground. The storm water collection system will be fitted with a silt trap and a full retention petrol interceptor which will remove silt / grit and hydrocarbons prior to discharge to ground.
	Landscape and Visual
Construction 7.1	There are no specific landscape mitigation measures proposed during the construction phase. Details on the construction site management are set out in the CEMP (i.e. site fencing and construction access points plus good construction site management). Measures on dust management and noise mitigation are set out in the relevant sections of this table.

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

Operation 7.1	There will be no specific mitigation required in this instance
	Archaeology and Cultural Heritage
Construction 8.1	All mitigation measures will be undertaken in compliance with national policy guidelines and statutory provisions for the protection of the archaeological, architectural and cultural heritage. The principal archaeological mitigation measure identified for the proposed development is archaeological monitoring during construction, with the proviso to resolve fully any archaeological material observed at that point. Archaeological monitoring is recommended for all ground and seabed disturbances. This is to include, as / when feasible, items such as the Pre-lay Grapnel Runs (Item 2) and the use of the Mass-flow Excavation (Item 4); items which from part of the seabed clearance and preparation works. Monitoring of the Pre-lay Grapnel Runs provides the opportunity to inspect any debris recovered as part the clearance works. In addition, use of a Mass-flow Excavator may provide the opportunity to view live images of the seabed along the cable route; this equipment often having the capability to provide real-time sonar and camera imaging of the seabed during the excavation process. However, it was found during the laying of the 220 kV cables that the underwater visibility from the camera was ineffective. As noted in Table 11.8 above, archaeological test excavation at the two landfall sites in addition to the adjacent land to the existing Kilpaddoge substation is proposed. The post consent pre-construction testing will take place under licence by the National Monuments Service. Geotechnical investigations will be programmed to coincide with the above foreshore testing and will be undertaken under archaeological supervision. Further consultation will occur with the Department of Regional Development, Rural Affairs, Arts and the Gaeltacht following completion of the pre-construction phase archaeological measures. Should any archaeological findings be observed, additional pre-construction mitigation may be necessary All archaeological works will take place under licence to the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht (DCHG) and the National Museum of Ireland (NMI) in accordance to National Monuments Act 1930, as amended.
Operation 8.1	All physical archaeological, architectural and cultural heritage impact issues will be resolved at the pre-construction stage of the development and therefore no potential impacts are envisioned at the operation stage of the proposed development
	Noise and Air
Construction 9.1	A Construction Noise Management Plan will be prepared. In this document the Contractor is obliged to give due regard to BS5228:2009+A1:2014 Part 1 and Part 2, which offers details guidance on the control of noise and vibration from construction activities. The proposed development will implement best practical means (BPM) as defined in BS5228 standard to all on site activities. Noise from construction activities will be limited to the values set out in the BS5228 and adhered to during the construction phase. It is also recommended that a comprehensive noise monitoring protocol will be set out within the Noise Construction Management Plan. Construction noise and vibration levels will be monitored and assessed; • On a continuous basis throughout construction, and frequently reviewed by the Environmental Clerk of Works (EnCoW); • As and when required, during critical phases of construction; • In response to the receipt of reasonable complaints investigated by the EnCoW; • At locations representative of sensitive receptors in the vicinity of the works typically at the agreed locations closest to the works.
Construction 9.2	Dust Management Plan (DMP) will be prepared as part of the project Construction Environment Management Plan (CEMP). As part of the CEMP, the Contractor will also develop and implement a stakeholder communications plan as part of the CEMP which will facilitate community engagement prior to the commencement of construction. The CEMP will be based on the outline CEMP as provided The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the construction works. The outline dust management plan, as set out below, has been formulated by drawing on best practice guidance.

	Communication Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary Display the head or regional office contact information It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents. Site Management Record all dust and air quality complaints, identify causes and take appropriate measures to reduce emissions in a timely manner and record the measures taken Make a complaint log available to the local authority, when asked Record any exceptional incidents that cause dust and or air emissions, either on or off site, and the action taken to resolve the situation in the log book Preparing and maintaining the site Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period Avoid site runoff of water or mud Keep site fencing, barriers and scaffolding clean using wet methods Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site; if they are being reused on site cover as described below Cover seed or fence stockpiles to prevent wind whipping Operating vehicles/ machinery and sustainable travel Ensure all vehicles switch off engines when stationary – no idling vehicles Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable Impose and signpost a maximum-speed limit of 15mph on surfaced and 10mph on unpaved surface haul roads and work areas Operations Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction Ensure an adequate water supply on the site for effective dust/ particulate matter suppression/ mitigation using non-potable water where possible and appropriate Use enclosed chutes and conveyors and covered skips Minimise drop heights from conveyors loading shovels hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever available Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods Measures specific to construction Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process in which case ensure that appropriate additional controls measures are in place Measures specific to trackout Use water-assisted dust sweepers on the access and local roads, to remove as necessary any material tracked out of site Avoid dry sweeping of large areas Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable Record all inspections of haul routes Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable) Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit and layout permits
Operational 9.1	There will be no specific mitigation required in this instance

	Material Assets, including Traffic
Construction 10.1	Traffic Certain aspects of the development of the proposed development to date have already included mitigation in terms of design and route selection, for example. Prior to commencement of the development, a Construction Traffic Management Plan will be prepared in consultation with Kerry County Council and Clare County Council. The CTMP will identify the safety measures required at access and egress locations and will take into consideration the following guidelines, as appropriate;- Department of Transport "Guidance for the Control and Management of Traffic at Road Works", (2010); and Department of Transport "Chapter 8: Temporary Traffic Measures and Signs for Roadworks", (November 2010). Car parking will be provided within the temporary laydown area within the Moneypoint Generating Station Complex and Kilpaddoge GIS Substation during the construction phase. All HGV traffic will approach site access from the existing station entrances The preparation of the CTMP and general matters relating to construction will occur in the context of and having regard to the CEMP and other related matters and deliverables relating to the development within the Moneypoint Generation Station and the Kilpaddoge BESS development The CEMP will be based on the OCEMP which accompanies these applications. 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. These will be stipulated in the granted Foreshore Licence process
Construction 10.2	Utility Services All reasonable measures will be taken to avoid unplanned disruptions to any services during the proposed works. This will include thorough investigations to identify and reconfirm the location of all utility infrastructure within the works areas, and the implementation of robust procedures when undertaking works around known infrastructure services. Service disruptions impacting the surrounding residential, social and commercial properties will be kept to a minimum, only occurring where unavoidable. Prior notification of disruptions will be given to all impacted properties. This will include information on when disruptions are scheduled to occur and the duration of the disruption. Consultation with relevant neighbouring parties will be undertaken prior to any proposed disruptions
Construction 10.3	Waste Management A Construction Waste Management Plan (as part of the CEMP) will be prepared prior to commencement of development. The plan 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 need for concrete, tarmacadam, and other quarry products in the construction of the proposed development is unavoidable. The impact is lessened in that all quarries are registered and have been granted planning permission and should therefore operate to the highest environmental standards 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) and *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects*, Department of the Environment, Heritage and Local Government (DoEHLG), June 2006. 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. 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. All employees will be made aware of their obligations under the Plan.

	The Plan will be available for inspection at the site of the proposed substation at all reasonable times for examination by the Local Authorities All waste generated during the operational phase will be managed in accordance with the relevant provisions of the Waste Management Act 1996 and associated amendments and regulations, particularly with regard to the use of appropriately permitted waste contractors and destinations for waste materials
Operational 10.1	No mitigation measures are deemed necessary

A. Project Supporting Information

An Bord Pleanála Strategic Infrastructure Notification

Step 4 Report

Step 4 Public Information Brochures

B. Marine Aspects

Sediment Modelling Report

C. Biodiversity

Aquafact Benthic Survey

NPWS Licence Permit

D. Archaeological and Cultural Heritage

ADCO Archaeological Impact Assessment Report