Le réseau de transport d'électricité

EIRGRID
The current. The future.

Celtic Interconnector
Connecting the electricity grid of Ireland and France

Joint Environmental Report

May 2021

Co-financed by the European Union
Connecting Europe Facility

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List of Abbreviations

AOC	Aire d'Origine Contrôlée (Controlled Area of Origin)
AOP	Aire d'Origine Protégée (Protected Area of Origin)
BPO	Best Performing Option
CLSZ	Converter Station Location Zones
CNDP	Commission Nationale du Débat Public (National Commission for Public Debate)
CURTE	Commission des Utilisateurs du Réseau public de Transport d'Electricité (Public Electricity Transmission Network Users Commission)
DHPLG	Department of Housing, Planning and Local Government
EBPO	Emerging Best Performing Option
EC	Environmental Code
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
ENTSO-E	European Network of Transmission System Operators for Electricity
HDD	Horizontal Directional Drill
HDPE	High Density Polyethylene
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IDA	Industrial Development Authority
INNS	Invasive and Non-Native Species
JER	Joint Environmental Report
MMO	Marine Management Organisation
MPDB	Marine Planning Development Bill
NIS	Natura Impact Statement
NTM	Notification to Mariners
PCI	Project of Common Interest
PNHA	Proposed Natural Heritage Area

PPE	Plan Pluriannuel de l'Energie (Multi-year Energy Plan)
RPP	Risk Prevention Plan
RTE	Réseau de Transport d'Electricité
SIA	Strategic Infrastructure Act
SID	Strategic Infrastructure Development
TDP	Transmission Development Plan
TMP	Traffic Management Plan
TYNDP	Ten Year Network Development Plan
UK	United Kingdom

Non-Technical Summary

What is the Celtic Interconnector?

The Celtic Interconnector project involves the construction of an **electricity interconnector** enabling electricity to be exchanged between Ireland and France, and the wider European Union.

This project is being developed by RTE and EirGrid, the companies responsible for managing the electricity transmission networks in France and Ireland.

Why should the Celtic Interconnector be constructed?

There are three main socio-economic benefits of the Celtic Interconnector:

- **Facilitating an increase in the use of renewable energy**: An interconnection between Ireland and the continent will increase the integration of renewable energy at the European level and enable France and Ireland to move forward in terms of the energy transition (in line with national policies in respect of the development of renewables).
- **Security of supply**: Pooling resources enables countries to better cope with contingencies and spikes in electricity consumption. Interconnection will promote mutual assistance between the two countries and would work in both directions.
- **Improving European Solidarity on Energy**: The Celtic Interconnector project will be a benchmark project in terms of European Solidarity on Energy. It will enable Ireland to benefit directly from the European integrated electricity market. The Celtic Interconnector will be Ireland's only direct transmission link with another Member State of the European Union.

In this context, the project enjoys strong support from both the French and Irish governments, as well as from the European Commission.

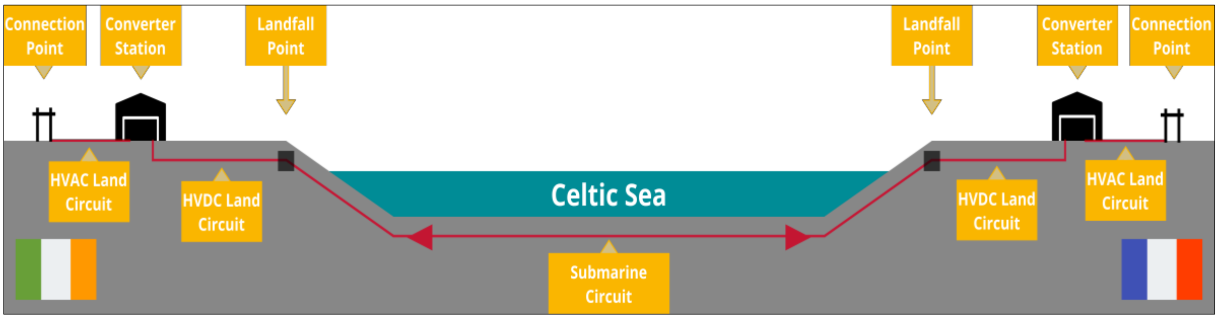
Through a decision of **14 October 2013**, the European Union recognised the "France-Ireland Interconnector" as being a **Project of Common Interest (PCI).** This label was renewed on a bi-annual basis since 2013 (in 2015, 2017 and 2019).

Non-implementation of the Celtic Interconnector (also known as the "Do nothing" alternative) would mean foregoing its benefits and slowing down the development of renewable energy required to combat climate change.

What does the Celtic Interconnector comprise?

In summary, the Celtic Interconnector will have a length of approximately 575 km, primarily comprising both onshore and subsea cables linking grid connection points (known as sub-stations) in Ireland and France.

The diagram below illustrates the various elements of the project.

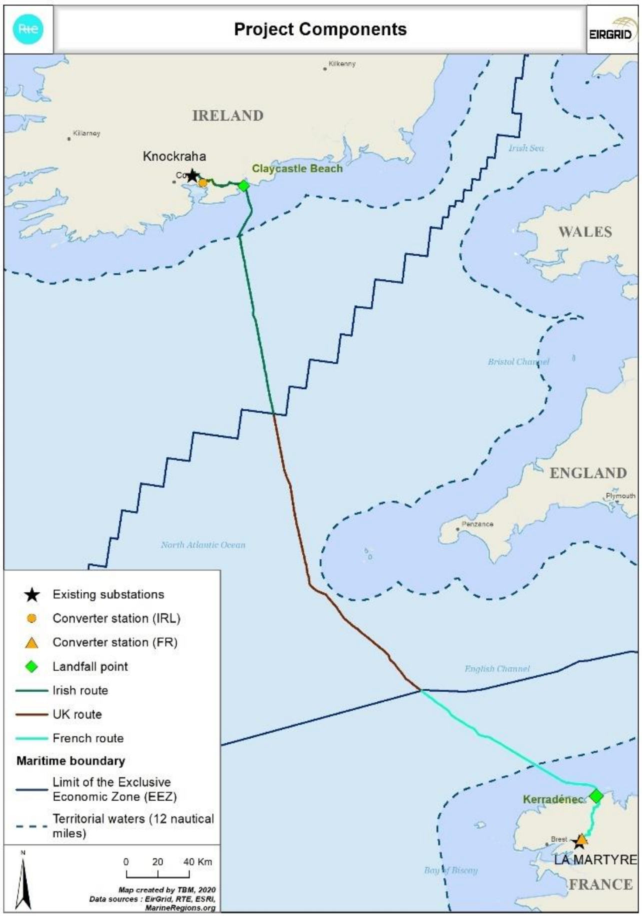


The project will connect two substations: one in Knockraha (East Cork in Ireland) and the other in La Martyre (Finistère department in France).

The interconnector will cross both terrestrial and offshore areas:

- Onshore circuit in Ireland and France;
- Offshore circuit in Irish, UK and French waters.

The offshore area covers national Territorial Waters in both Ireland and France and the Exclusive Economic Zones of Ireland, the UK and France. It is not proposed to locate any infrastructure within UK Territorial Waters.



Map 1: Map of the Project Elements

The subsea cables will carry electricity using HVDC technology. When onshore, this will be converted to HVAC technology – the type of electricity technology used on the national grids of both Ireland and France – at facilities known as a Converter Stations.

How was the Celtic Interconnector route decided?

The route was decided through a series of studies and surveys intended to define the best performing option.

This involved three main phases:

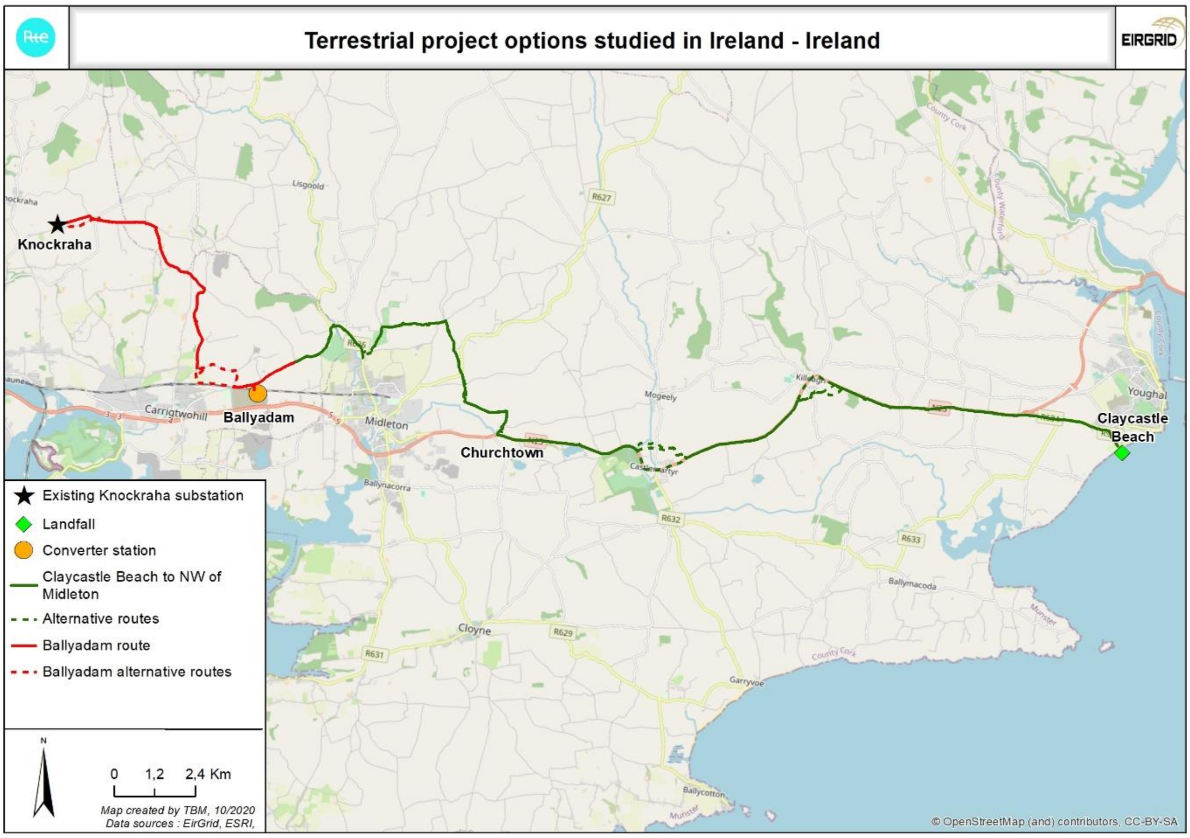
- A joint phase covering connection strategies and the best performing offshore route:
    - 6 routes were initially compared;
    - 2 of the routes were included in a comparative analysis;

- A consultation and study phase to identify the best performing locations for the elements to be located in Ireland, conducted in line with EirGrid's six step approach to grid development; and,

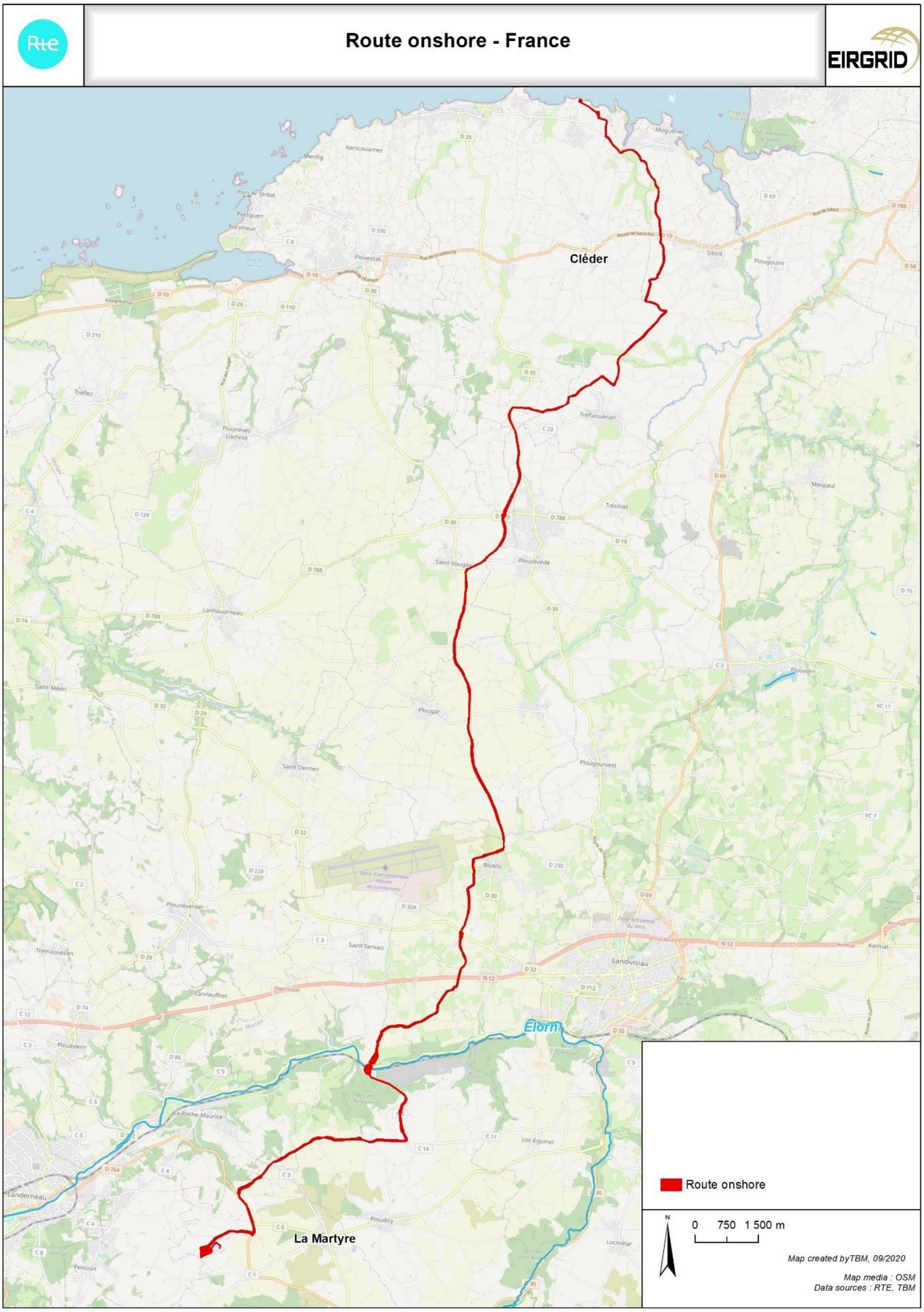
- A consultation and study phase in France to define the zones in which the elements are to be located, conducted in partnership with the general public and stakeholders within the territories. As a result of this process the study area was gradually reduced in size.

It is important to understand that, while Ireland and France have different legislative requirements, policies, and practice for grid development, RTE and EirGrid have worked closely to ensure a coordinated and consistent approach to the development of this project wherever possible or appropriate.

The following maps show the onshore options in Ireland and France, as of November 2020.



Map 2: General Location of the Onshore Cable Route in Ireland



Map 3: General location of Onshore Cable Route in France

Does the Celtic Interconnector generate likely significant effects?

The project is undergoing specific environmental surveys in each country to study and appraise the potentially significant effects it may have for the receiving environment.

These studies involve assessing the current states of the environments in each country, identifying potential effects and designing avoidance and mitigation measures.

The surveys carried out to date have raised the following points.

Onshore

Potential significant effects have been identified in both the Irish and French territories. The following common elements have emerged from the surveys:

- Effects on the landscape and receiving environment during the operational phase associated with the operation of the converter stations;
- Temporary effects during the construction phase, associated with the undertaking of a significant civil engineering construction project between the coast and the existing substations;
- Temporary effects associated with noise, as well as other disturbance and nuisance generated by construction work;
- Effects on local biodiversity, particularly during construction;
- Permanent effects on aquatic environments, drainage and groundwater caused by the siting and construction of the converter stations; and
- Temporary disruptions to the road network during the construction works.

Offshore

Potential significant effects have been identified in the marine environment. The following elements have emerged:

- Increased levels of underwater noise, and associated effects on sensitive receptors, e.g. marine mammals;
- Localised changes to:
  - marine, coastal and intertidal processes, including sediment transport regime, around areas of rock armour / mattressing; and
  - water and sediment quality, including increased levels of suspended solids, and potential for release of sediment-bound contaminants;
- Loss of marine, coastal and intertidal species:
  - Direct due to disruption of seabed / placement of cable protection;
  - Indirect due to, for example, smothering, or changes in availability of prey resources;
- Temporary disturbance / loss of intertidal habitat during cable landfall installation;
- Disturbance / disruption of fishing and shipping activities (commercial and recreational);
- Disturbance / damage to established marine, coastal and intertidal users and infrastructure (e.g. existing cable routes, coastal recreation);
- Introduction of invasive and non-native species (INNS) through use of rock armouring from potentially international quarries / locations; and
- Potential for effects on sensitive buried peats within Irish Territorial Waters.

Measures

Avoidance and mitigation measures to respond to these potential effects have been adapted to each particular situation.

The planned measures are intended to avoid all potentially significant effects of the proposed development, including for Natura 2000 sites.

When will the Celtic Interconnector be constructed?

Environmental surveys will be performed and all relevant permits / licences will be obtained in each country.

Subject to receipt of these consents and other necessary authorisations, construction work will then be able to commence.

Construction of the Celtic Interconnector is scheduled to take place between 2023 and 2026.

The Celtic Interconnector is scheduled to enter service in late 2026 or early 2027.

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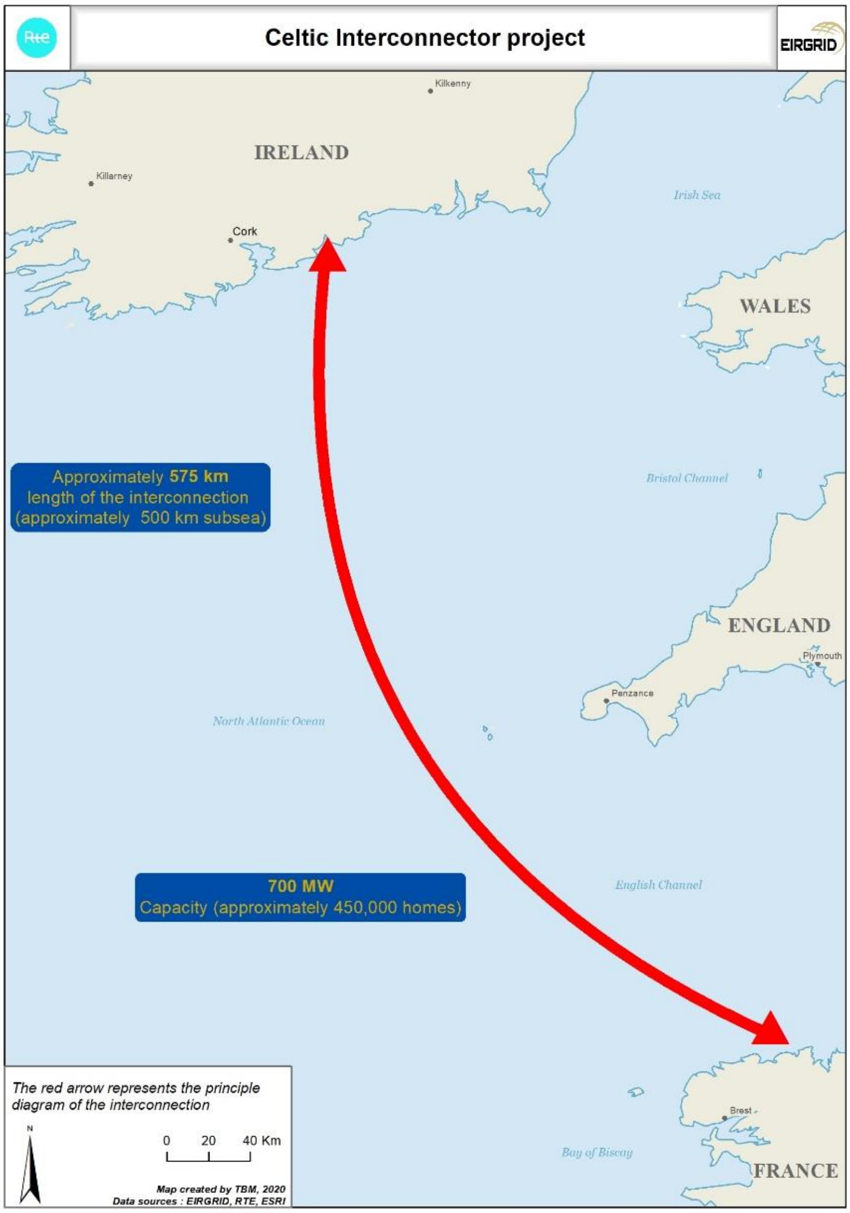
1.1 What is the Celtic Interconnector?

The Celtic Interconnector project involves the construction of an electricity interconnector enabling electricity to be exchanged directly between two countries of the European Union: France and Ireland. The Celtic Interconnector project will also allow wider exchange of electricity across the European Union.

The project, led by the two project promoters, Réseau de Transport d'Electricité (RTE) and EirGrid, is a response to European challenges such as the energy transition and the management of climate change, and will assist with the move towards a low-carbon electricity mix. It will promote the use of more sustainable electricity and put downward pressure of the cost of electricity for consumers.



Map 4: General location of Celtic Interconnector

1.2 Project promoters

Based in Dublin, EirGrid is the Irish transmission system operator responsible for the safe, secure and reliable supply of electricity throughout Ireland – both now and in the future. It develops, manages and operates the high voltage power grid in Ireland. One of EirGrid's licence obligations is to explore and develop opportunities to connect the Irish power grid to grids in other countries.

RTE is the French transmission system operator. Its fundamental mandate is to provide its customers with an economical, safe and clean supply of electricity. RTE supplies its customers through appropriate infrastructure and provides them with all systems and services they require to meet their needs in terms of economic efficiency, respect for the environment and the security of their energy supply. To this end, RTE operates, maintains and develops high and very high voltage networks. It guarantees that the electricity system operates safely and correctly. RTE is also responsible for routing electricity from other electricity suppliers (both French and European) to its consumers. 105,000 km of lines carrying between 63,000 and 400,000 volts, and 50 cross-border lines connecting the French grid to 33 other European countries, provide opportunities for electricity exchanges which are essential for economic optimisation of the electricity system.

1.3 A Project of Common Interest recognised by the European Union

At the European level, the Celtic Interconnector project has formed part of **the European Network of Transmission System Operators for Electricity (ENTSO-E) Ten Year Network Development Plan (TYNDP) since 2012**. The TYNDP is a framework enabling European Transmission System Operators (TSOs) to assess the benefits of strengthening the major European transmission network in a homogeneous and coherent manner. The framework is the subject of a broad consultation in Europe and taking place throughout the plan's development stage, from outlining different scenarios to making investment proposals, both at the pan-European level and within the Member States.

In a decision of **14 October 2013**, the European Commission designated *the "France-Ireland Interconnector"* as **Project of Common Interest (PCI)** No. 1.6 for the Northern Seas Countries Offshore Grid ('NSCOG') corridor. This label was again confirmed by subsequent lists that were published by the European Union in 2015 and 2017 and most recently in the list that was published on 31 October 2019.

The Celtic Interconnector was also labelled an **e-Highway project in November 2015**. The e-Highway2050 study revealed that Ireland has strong potential for the development of wind power by 2040 / 2050. It also demonstrated the need to increase the transmission capacity between Ireland and France well beyond that created by the Celtic Interconnector.

In France, the project has formed part of the ten-year electricity transmission network development plan since 2012. The ten-year plan, which is the subject of a consultation within the Public Electricity Transmission Network Users Commission (CURTE), was also sent out for public consultation by RTE before being forwarded to the Energy Regulation Commission (CRE).

The project is also included in EirGrid's Transmission Development Plan (TDP) which is the 10 year plan for the development of the Irish transmission network that is updated by EirGrid every year. It was most recently included in EirGrid's TDP for 2019-2028.

1.4 Joint Environmental Report (JER)

The European Commission (EC) Guidance on the Application of the Environmental Impact Assessment Procedure for Large-scale Transboundary Projects[1] states: *"For large-scale transboundary projects, the developer must comply with the requirements of the national EIA requirements of each country in which the project will be implemented. The developer should prepare individual national EIA reports and a joint environmental report that covers the whole project and assesses its overall effects, in particular cumulative and significant adverse transboundary effects."*

[1] https://ec.europa.eu/environment/eia/pdf/Transboundry%20EIA%20Guide.pdf

This JER, prepared in reference to the Guidance above, is intended to provide an assessment of the overall Celtic Interconnector project's effects.

It presents the main issues and descriptions of the significant adverse effects, including cumulative effects, of the overall Celtic Interconnector project. It provides the reader with an overview of the significant effects likely to arise from one country to the other (transboundary effects), as well as those which the project is capable of generating on a global basis.

The environmental reports and assessments carried out for each country will provide a detailed understanding of the territories crossed and the effects of the project.

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2.1 Why do we need an electricity interconnector between Ireland and France? The reasons for the project

The European power grid is in a leading position regarding the integration of renewable energy. The 2030 climate and energy framework includes the following EU-wide targets and policy objectives for the period from 2021 to 2030:

- Increasing the share of renewable energy as sources of clean energy production (27% of total energy consumption), by reducing dependence on energy from outside the European Union;

- Reducing greenhouse gas emissions (by 40% compared to 1990 levels);

- Developing a fully operational and fully interconnected internal energy market enabling production sources to be diversified and guaranteeing the security of supply.

There are three main socio-economic benefits of the Celtic Interconnector:

- **An increase in the availability of renewable energy**: Ireland's Climate Action Plan 2019 sets out how Ireland intends to develop its renewable energy generation capabilities. It states, *inter alia*, that Ireland intends to increase its onshore wind generation by 8.2GW and its offshore wind generation by 3.5GW by 2030. In France, the 2019-2028 Multiyear Energy Plan requires a 50% increase in renewable energy production capabilities compared to 2017 by 2023, and a doubling of this capacity by 2028. The creation of an interconnector between Ireland and France will enable people to benefit from the complementary wind-generation capacities of Ireland and continental Europe. Given that wind patterns are different in each region, electricity cannot usually be generated in both at the same time. France and Ireland will therefore be able to compensate for instantaneous drops in wind generation on their grids; each grid will be backed up by the other using the energy exchanged over the interconnector. In general therefore, an electricity interconnection between Ireland and the continent will increase integration of renewable energy at the European level and enable France and Ireland to move forwards in terms of the energy transition.

- **Improving the security of supply**: Increased networking and interconnection of power grids translates to greater stability and resilience. An interconnection between France and Ireland will bring many benefits in terms of security of supply; pooling of resources makes it possible to cope with unforeseen events and spikes in electricity consumption, provided that the interconnected countries do not all experience excess demand at the same time. The main hazards likely to affect the supply / demand balance between France and Ireland are weakly correlated, which actually increases the importance of the Celtic Interconnector project. The interconnector will thereby enable the two countries to provide each other with mutual assistance from a system security perspective;

  - For Ireland, the project will secure the island's grid during periods of peak consumption or low wind generation;

- For France, the project will help to secure the supply / demand structure, in particular during cold spells and periods of lower generation in France and continental Europe.

- **Improving European Solidarity on Energy**: The Celtic Interconnector project will be a benchmark project in terms of European Solidarity on Energy. It will enable Ireland to benefit directly from the European integrated electricity market. In the context of Brexit, an interconnection with France is a necessity for Ireland, since it will be its only direct power interconnection with another member state of the European Union.

In this context, the project enjoys strong support from both the French and Irish governments, as well as from the European Commission.

2.2 The location of the project

The Celtic Interconnector will have a total length of approximately 575 km and will connect two sub-stations; one in Knockraha (East Cork in Ireland) and the other in La Martyre (Finistère department in France).

The link will cross both terrestrial and offshore areas:

- Onshore circuit in Ireland and France;
- Offshore circuit in Irish, UK and French waters.

The offshore circuit will cross national Territorial Waters in the Irish and French jurisdictions and the Exclusive Economic Zones in all three jurisdictions (Ireland, UK and France).

Focus on offshore designations

The Territorial Waters of coastal states extend to a distance of 12 nautical miles (22.2 km) from the coast. The state exercises full sovereignty within these areas.

The Exclusive Economic Zone (EEZ) is the maritime area over which the coastal state exercises sovereign economic rights, i.e. exploring and exploiting, conserving and managing the natural resources of the waters (see Article 55[2] of the United Nations Convention on the Law of the Sea (UNCLOS) signed in 1982 for the specific legal regime of the EEZ and Article 56[3] of UNCLOS for the rights, jurisdiction and duties of the coastal state in the EEZ).

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[2] Article 55 of the UNCLOS states that: *"The exclusive economic zone is an area beyond and adjacent to the territorial sea, subject to the specific legal regime established in this Part, under which the rights and jurisdiction of the coastal State and the rights and freedoms of other States are governed by the relevant provisions of this Convention."*

[3] Article 56 of the UNCLOS states, *inter alia,* that: *"In the exclusive economic zone, the coastal State has sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds."*

2.3 Infrastructure components

The decision has been made to use direct current (DC) technology to carry the electricity between the two countries, as it enables large amounts of electricity to be transported over long distances underground. Converter stations will therefore need to be constructed in both Ireland and France to convert the HVDC power back to alternating current (AC) for connection into the national grids – both grid networks use AC technology. The converter stations will be connected to existing substations via High Voltage Alternating Current (HVAC) circuits.

Onshore and offshore circuits require different types of cables; these will be connected at each landfall location by way of an underground transition joint.

The new components to be developed for the Celtic Interconnector project are therefore the following:

- In Ireland:
    - An underground HVAC circuit from the connection point (being the existing Knockraha substation) to the converter station;
    - A converter station at Ballyadam, East of Carrigtwohill;
    - An underground High Voltage Direct Current (HVDC) circuit between the converter station and the landfall point;
    - A landfall point – Claycastle Beach, East Cork; and
    - A subsea HVDC circuit.
- In United Kingdom Offshore EEZ:
    - A subsea HVDC circuit.
- In France:
    - A subsea HVDC circuit;
    - A landfall point at Kerradénec in Cléder;
    - An underground HVDC circuit;
    - A converter station at La Martyre; and
    - An underground HVAC circuit.

It is also proposed to include a fibre optic link between the two converter stations. The fibre optic link associated with the HVDC circuit needs a source of electrical power in order to operate. To enable this to occur, a dedicated fibre optic power supply circuit will run from the converter stations located at each end of the HVDC circuit for the entirety of the interconnector route.

Two different power source solutions will be used for the onshore and offshore elements of the project.

- For the offshore element: Optical repeaters will be installed periodically next to the offshore HVDC power circuit (at intervals of approximately 100km). These optical repeaters need a dedicated power supply circuit. This dedicated power supply circuit will be included as part of the offshore fibre optic link and will be laid jointly with the submarine HVDC circuit.
- For the onshore element: The onshore dedicated power supply circuit will be laid in the same trench as the onshore HVDC power circuit, but it will be located in a dedicated duct.

The dedicated power supply circuit will use direct current technology; with a voltage level lower than the HVDC interconnection (i.e. it will not exceed 20,000 Volts). The transmission capabilities of the dedicated supply circuit will not exceed approximately 1 Ampere (A).

The following diagram (Figure 1) shows the various elements of the project:

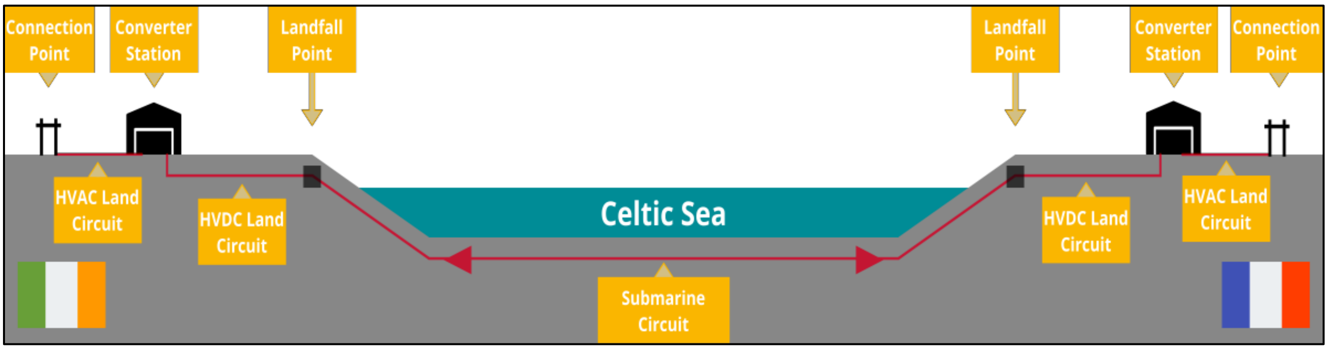
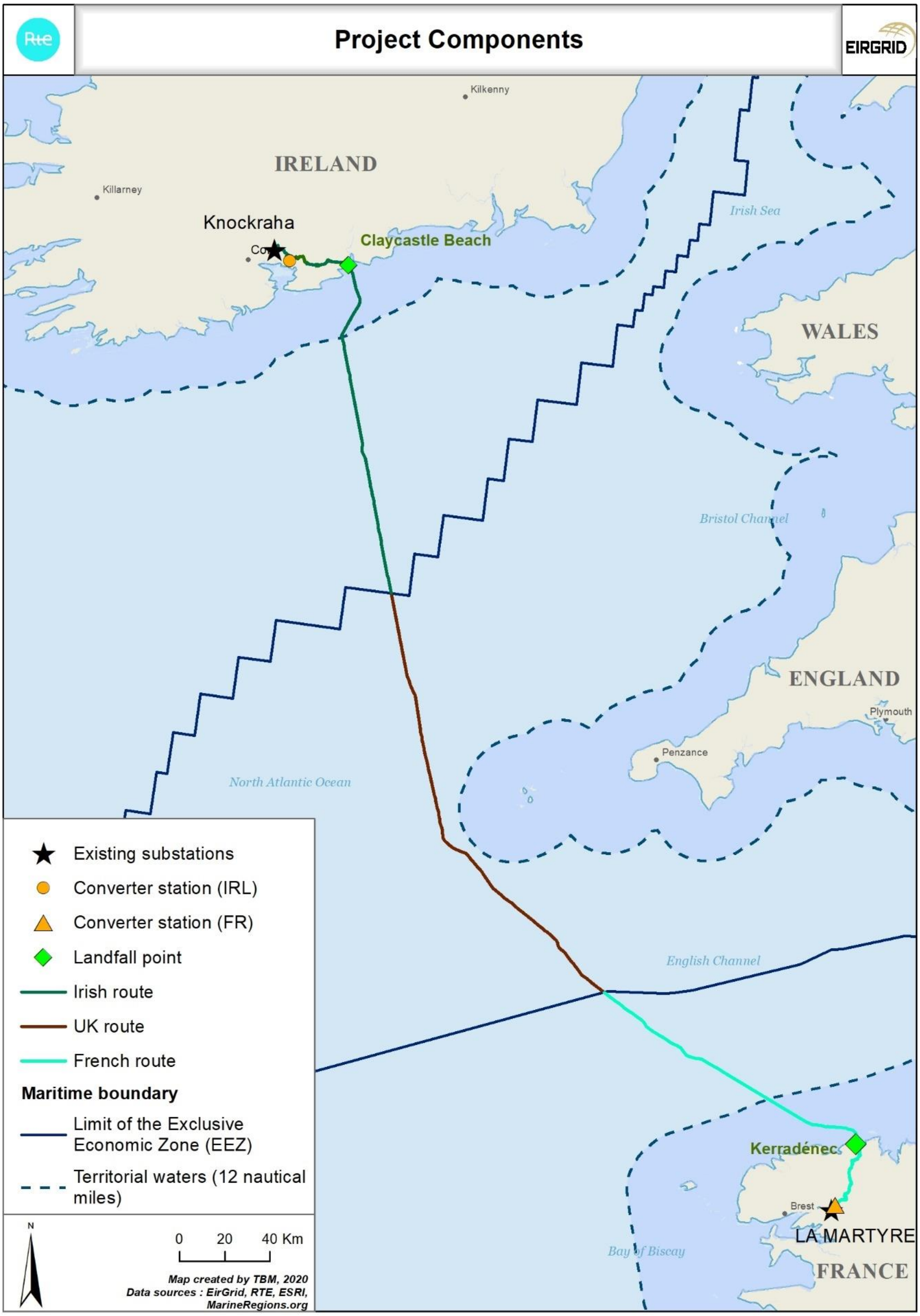


Figure 1: Diagram of various elements of the project



Map 5: Location of the project's component parts

2.4 Authorisations

2.4.1 The regulatory context in Europe

Article 7 of Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (amended by Directive 2014/52/EU), cover projects which are likely to have significant effects on the environment in another Member State.

Specifically, Article 7 of the EIA Directive states:

> *"1. Where a Member State is aware that a project is likely to have significant effects on the environment in another Member State or where a Member State likely to be significantly affected so requests, the Member State in whose territory the project is intended to be carried out shall send to the affected Member State as soon as possible and no later than when informing its own public, inter alia:*
>
> *(a) a description of the project, together with any available information on its possible transboundary impact;*
>
> *(b) information on the nature of the decision which may be taken."*

Furthermore, Article 7(4) states that the Member States concerned are required to enter into consultations regarding the potential transboundary effects of the project:

> *"4. The Member States concerned shall enter into consultations regarding, inter alia, the potential transboundary effects of the project and the measures envisaged to reduce or eliminate such effects and shall agree on a reasonable time- frame for the duration of the consultation period. Such consultations may be conducted through an appropriate joint body*."

Similarly, the 1991 Espoo Convention[4] sets out the obligations of parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impacts across boundaries.

The European Commission has published guidance document which provides guidance for applying the legal provisions related to EIA of large-scale projects[5].

This guidance was referenced in drafting this JER.

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[4] The Espoo Convention entered into force on 10 September 1997 and has been ratified by the European Union, Ireland, France and the United Kingdom. Its provisions are similar to the EIA Directive and are relevant for transboundary energy infrastructure. The Convention sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of Parties to notify and consult each other on all projects likely to have significant adverse impacts on the environment across boundaries.

[5] https://ec.europa.eu/environment/eia/pdf/Transboundry%20EIA%20Guide.pdf

2.4.2 The regulatory context in Ireland

2.4.2.1 Onshore regulatory context

- **Planning consent**

The Planning and Development Act 2000 (as amended) forms the basis for the Irish planning system for development on land.

Section 182A of the Planning and Development Act 2000 (as amended) 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 shall be made directly to An Bord Pleanála. This is part of a wider category of development known as Strategic Infrastructure Development (SID).

The Act confirms that 'transmission' in relation to electricity includes the transport of electricity by means of an interconnector.

The proposed onshore element of the development (extending to the Mean High Water Mark) therefore comprises SID, and the application for approval for the proposed development will therefore be made directly to An Bord Pleanála.

- **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 in the light of each individual case, the direct and indirect significant effects of a project are identified, described and assessed in an appropriate manner. The requirements of the EIA Directive have been implemented into Irish law pursuant to the provisions of, *inter alia*, the Planning and Development Act 2000, as amended and the Planning and Development Regulations 2001, as amended (Planning Regulations).

Schedule 5 of the Planning Regulations, identifies the requirements of EIA for different project types. Submarine electricity cables are not listed as a category of development requiring an EIA, however, EirGrid has decided that, having regard to the nature of the proposal, a whole project approach should be taken to EIA and accordingly an EIA Report (EIAR) will accompany the Irish SID application.

2.4.2.2 Territorial Waters and Exclusive Economic Zone

- **Foreshore Licence**

The Foreshore Act 1933 (as amended) makes provision for the granting of leases and licences relating to the Irish foreshore (defined as *"the land and seabed between the high water or ordinary of medium tides and the twelve nautical mile limit"*). Offshore projects consents occur by way of a Foreshore Licence under Section 3 of the Act, which is required for cable installation and protection works, including rock protection and mattressing on the land and seabed from the High Water Mark for a distance of 12 nautical miles.

An application for a Foreshore Licence will therefore be submitted by EirGrid in respect of the Celtic Interconnector project - including a supporting Environmental Impact Assessment Report (EIAR) for the reasons outlined in Section 2.4.2.1 above, an Appropriate Assessment Screening Report and if necessary a Natura Impact Statement

(NIS) will accompany the application. Consultation will be carried out prior to the application's submission.

EirGrid has engaged in pre-application consultation under the Foreshore Act 1933 (as amended) with the Department of Housing, Local Government and Heritage (DHLGH) since October 2018.

2.4.3 The regulatory context in the United Kingdom

2.4.3.1 The Marine Works (EIA) Regulation 2007 (as amended)

Council Directive 85/337/EEC on the assessment of certain public and private projects on the environment ('the EIA Directive') is transposed into UK law for projects within the marine environment by The Marine Works (EIA) Regulations 2007, as amended by the Marine Works (EIA) Regulations 2017 ('the 2017 Marine Works Regulations').

These regulations outline the type of projects that require an EIA and set out the process to be followed for a Marine Works application to assess the effects of the proposed development on the environment.

The Project was deemed by the Marine Management Organisation (MMO) as the UK competent authority to not constitute EIA development and therefore the wider context of the 2017 Marine Works Regulations are no longer relevant to the Project.

2.4.3.2 Marine and Coastal Access Act 2009

The Marine and Coastal Access Act 2009 ('the 2009 MCA Act') provides a marine planning system along with provisions for the improvement of marine conservation and management, including the creation of the Marine Management Organisation (MMO), responsible for marine licensing in the UK's marine areas. It provides that a Marine Licence is required for certain activities carried out within the UK marine area.

Approximately 211 km of the cable route for the Celtic Interconnector project will be located within the UK EEZ. The works for this part of the project comprise cable installation and protection activities, including installation of rock protection and mattresses. For cable protection activities, the project requires a Marine Licence provided under the Marine and Coastal Access Act 2009.

When deciding on a Marine Licence application, the MMO consider the Marine Policy Statement, relevant marine plans, policies and all relevant matters including the need to:

- Protect the environment;
- Protect human health; and
- Prevent interference with legitimate uses of the sea.

To enable the MMO to make their decision, the applicant must provide sufficient information regarding the proposed development, including detailed description of the works, and an assessment of any potentially significant effects which may arise as a result.

2.4.3.3 **Offshore Planning Policy**

The MMO is in charge of preparing Marine Plans for all marine and coastal areas around England. The Celtic Interconnector Project concerns the South West Marine Plan which covers an area of 68,000 km². The Marine Plan is currently in Draft form and was published for public consultation between January and April 2020. The objective of this Plan is to provide a strategic approach to decision making, to deliver the high level marine objectives of the Marine Policy Statement and to align with the National Planning Policy and other National Policy Statements, while focusing on the sustainable development of the area.

The planning policy requirements for the South West Zone that are applicable to the Celtic Interconnector Project and that will be addressed in the Marine Licence Application are as follows:

- SW-CAB-1: Preference should be given to proposals for cable installation where the method of installation is burial. Where burial is not achievable, decisions should take account of protection measures for the cable that may be proposed by the applicant. Where burial or protection measures are not appropriate, proposals should state the case for proceeding without those measures.
- SW-CAB-2: Proposals demonstrating compatibility with existing landfall sites and incorporating measures to enable development of future landfall opportunities should be supported. Where this is not possible proposals will, in order of preference: a) avoid b) minimise c) mitigate significant adverse impacts on new and existing landfall sites, d) if it is not possible to mitigate significant adverse impacts, proposals should state the case for proceeding.
- SW-CAB-3: Where seeking to locate close to existing sub-sea cables, proposals should demonstrate compatibility with ongoing function, maintenance and decommissioning activities of the cable.

2.4.3.4 **Appropriate Assessment**

In the UK, Habitats Regulations Assessment (HRA) is required to determine Likely Significant Effects (LSE), and (where appropriate), assess adverse effects on the integrity of any European site, as designated for nature conservation, where a pathway may exist between the proposed development and that designated site.

The first stage in this process is 'Screening', to identify whether a project is likely to have a significant effect on the interest feature of a site, either alone or in-combination with other plans or projects. If potential effects are identified, then an 'Appropriate Assessment' is conducted, to ascertain whether the proposed project will have an adverse effect on the site's integrity. This assessment is conducted by the Competent Authority, supported by the HRA Report, prepared and presented by the applicant.

2.4.4 **The regulatory context in France**

2.4.4.1 **Environmental Impact Assessment**

In transposing Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (amended by Directive 2014/52/EU), the law of 12 July 2010 on the national commitment for the environment implements a procedure intended to categorise projects according to their importance, either by subjecting them to an environmental assessment or to an examination procedure on a case-by-case basis.

The list of projects is provided in the appendix to Article R.122-1 of the Environment Code (EC). The Celtic Interconnector falls under the following case:

- Part 5: Energy
    - Section 33: High and very high voltage underwater power lines
        - Systematic environmental assessment.

2.4.4.2 Appropriate Assessment

This environmental assessment includes an environmental impact study pursuant to Article L.122-1 EC.

Consequently, and in compliance with clause 3 of Article R.414-19 EC, the Celtic Interconnector must also undergo a Natura 2000 Impact Assessment.

2.4.4.3 Summary of the authorisations required

The French permits and consents required for the Celtic Interconnector are summarised in the following table.

The element associated with each permit is specified. For simplification, the term *"underground link"* is to be understood as the landing point and the underground direct and HVAC circuits.

Table 1: List of French authorisations

Code	Type of permit / consent	Element in question
Environmental Code	Environmental permit	Undersea circuit in Territorial Waters Underground circuit Converter station
Town Planning Code	Compatibility with 5 town planning documents	Underground circuit Converter station
General Public Property Code	Request for a concession for use of the maritime public domain	Undersea circuit in Territorial Waters
Energy Code	Declaration of Public Interest	Underground and undersea circuit
Code on expropriation for reasons of public interest	Declaration of Public Interest[6]	Converter station

2.5 The project schedule

The overall project work schedule is as follows:

- Laying of the subsea cable: in three periods of two quarters in 2024, 2025 and 2026;
- Laying of the underground cable in France and Ireland (civil engineering works and laying of cables): 2023 to 2025;
- Construction of the converter stations in France and Ireland: 2023 to 2026.

As currently envisaged the Celtic Interconnector is scheduled to enter service in late 2026 or early 2027.

[6] The Declaration of Public Interest can potentially be substituted by a request for a Project Declaration. In the event of voluntary acquisition of the plots of land necessary for the construction of the converter station on the day of submission or during the examination of the files, RTE will submit a request for a Project Declaration under the Town Planning Code and will withdraw the request for a utility declaration under the Code on expropriation for reasons of public interest.

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3.1 Alternative study process

Article 5(1) of the EIA Directive provides that the developer shall include:

- A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment; and,
- Any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.

Annex IV of the EIA Directive further provides:

- A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

The Commission Guidance (Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report 2017) states that: *"The level of detail concerning the description of the environmental effects of the Alternatives may be less than for the chosen option. Nevertheless, the aim of the exercise is to provide a transparent and well justified comparison".*

Having regard to the above, the EIARs for each relevant jurisdiction of the Celtic Interconnector project includes a comprehensive consideration of alternatives.

The project as presented in this document is a summary of a series of analysis and studies intended to identify the best performing option from a variety of perspectives, including environmental, technical, socio-economic, deliverability, economic and social.

This involved three main and generally concurrent phases:

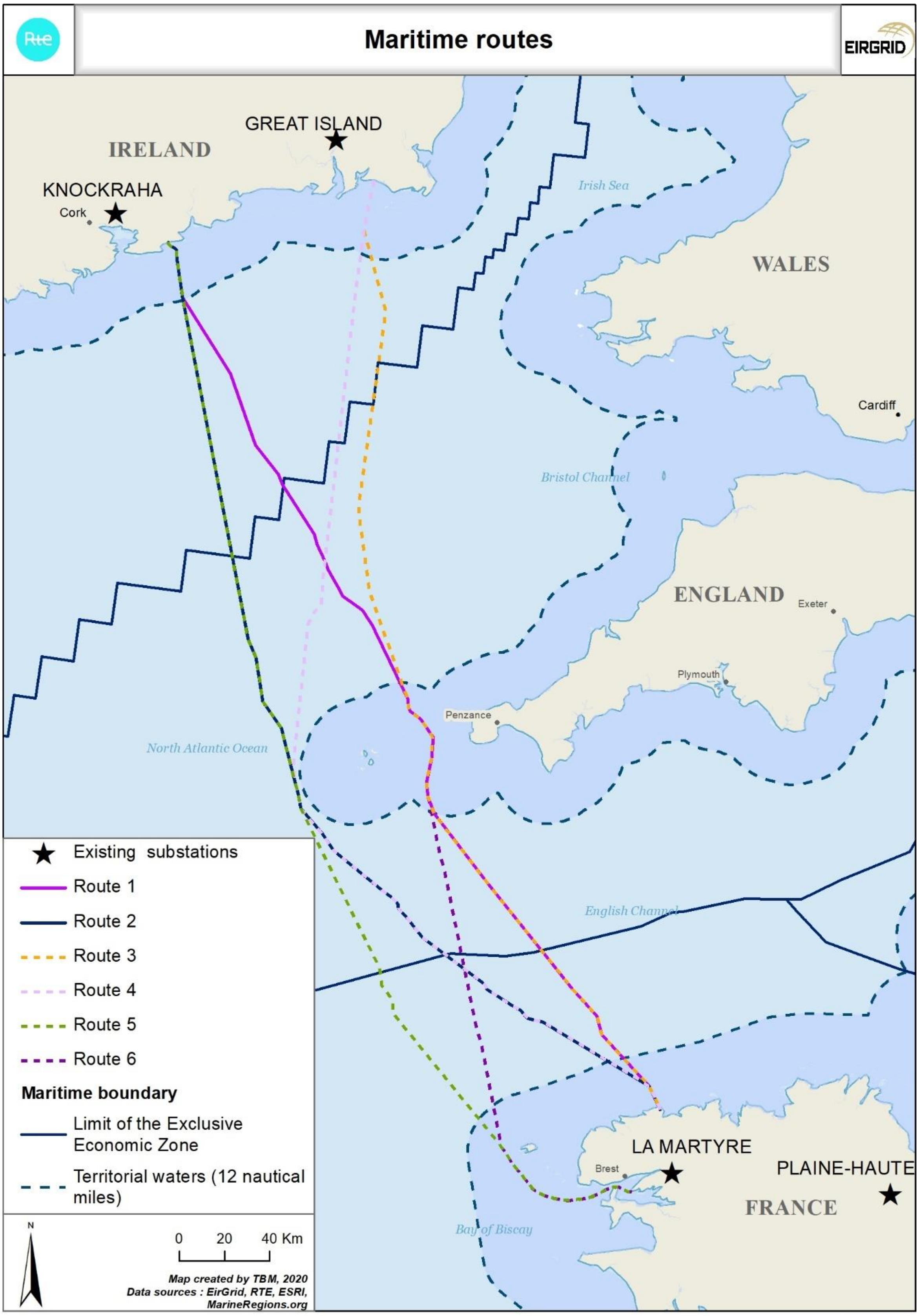
- A common phase covering connection strategies (including technologies) and the best performing offshore route from a technical, environmental, economic and other perspective;
- An Irish consultation and study process to define the regions in which the component parts are to be located; and
- A French consultation and study process to define the regions in which the components parts are to be located.

3.2 A study of offshore alternatives

3.2.1 Analysis strategy

The analysis is based on a number of key parameters, summarised as follows.

a. The shortest route connecting Ireland and France: from the south of Ireland to Brittany in France.
b. The identification of 6 offshore routes based on the main technical and environmental constraints (Map 6).
c. The identification of existing substations as potential national grid connection points for the interconnector.



Map 6: Locations of the 6 offshore routes studied and feasible connection substations

3.2.2 **Analysis undertaken**

2 existing substations in each country were assessed to determine their suitability as national grid connection points facilitating the Celtic Interconnector: Great Island (West Wexford) and Knockraha (East Cork) in Ireland, and La Martyre and Plaine-Haute in Brittany, France.

An analysis of the two substations in Ireland concluded that the Irish transmission system could accommodate the potential power flows from the Celtic Interconnector significantly better with the connection point at Knockraha rather than a connection point at Great Island. Connection at Great Island would likely require a significant level of upgrading of existing transmission system infrastructure and / or the construction of new infrastructure in comparison with the Knockraha option.

In France, the La Martyre substation was chosen as it is connected to the grid via a double circuit. The Plaine-Haute substation is connected to the French grid via a single 400 kV circuit; it was therefore rejected as being insecure (in the event of the single circuit being lost).

3.2.3 **Comparison of offshore routes**

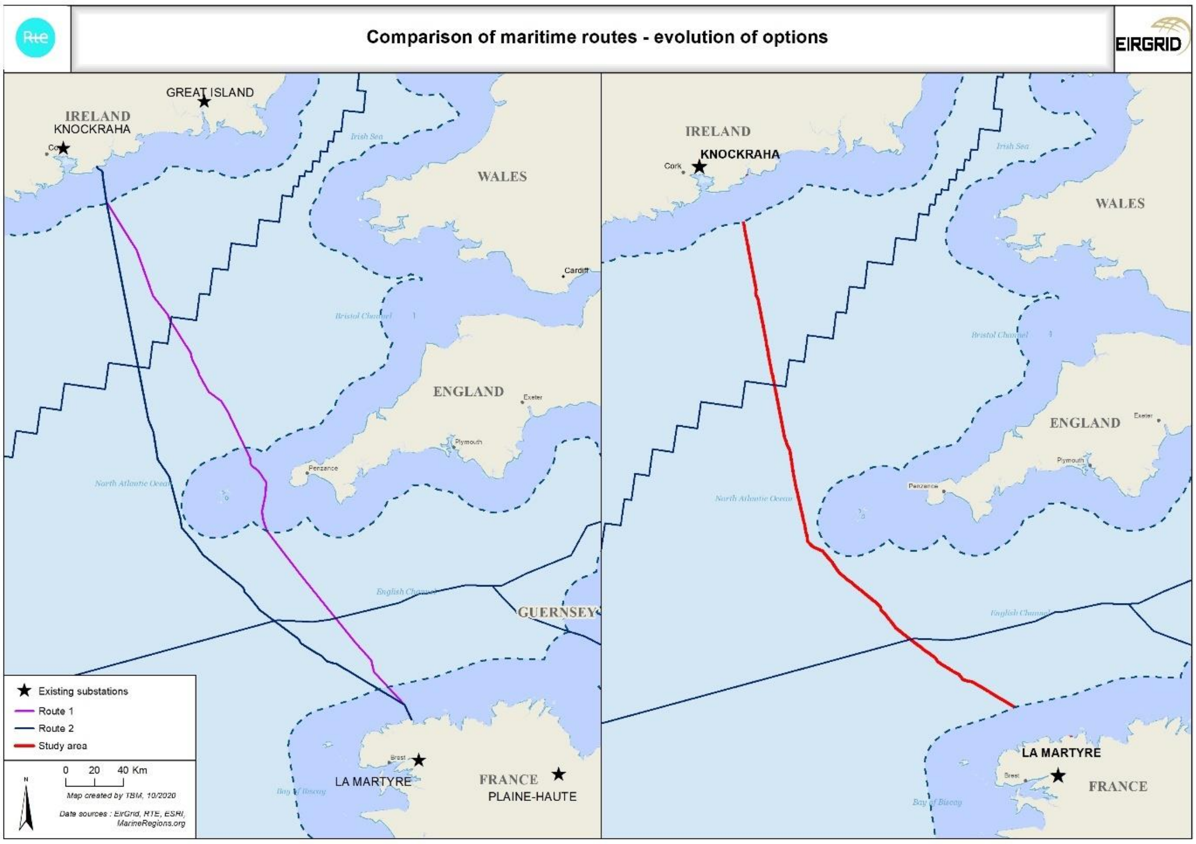
A study was conducted to identify and assess viable offshore route options between the South coast of Ireland and the North West coast of France. The study considered matters including the shortest reasonable route between the two countries and potential engineering and environmental constraints. This overall study also examined the availability and potential of cable landfall locations.

A study of the approach conducted by Brest Harbour revealed a number of technical and environmental issues: the harbour entrance (presence of ammunition dumps, characteristics of the seabed, a large number of unidentified military cables, significant constraints in terms of biodiversity) and inside the harbour (dense urban infrastructure, various types of maritime traffic). The offshore approach around the North coast of Finistère was therefore chosen.

Of the routes identified, the two preferred marine routes were from the East Cork area to North Brittany in France, laid as Route 1 and Route 2 in Map 6 above.

These are the preferred options given the levels and types of constraints present along the routes, as well as other factors such as total length. Route 1 is the shortest and has the second fewest number of constraints. Route 2 is the third shortest route and has the fewest constraints.

Overall, although slightly longer, the best performing option was identified as Route 2 (the fewest constraints regarding the following criteria: varying depths of mobile sediment, presence of cables and wrecks, fishing zones, crossing protected sites and Natura 2000 habitats, consideration of maritime traffic), it was therefore selected for marine survey in 2014 (Map 7).



Map 7: Routes to the selected offshore route

3.3 The Study of terrestrial alternatives in Ireland

3.3.1 EirGrid's six-step approach to grid development

The Irish onshore elements of the Celtic Interconnector project follow EirGrid's six-step approach to grid development as outlined in EirGrid's *Have Your Say* document, as illustrated below. This approach facilitates engagement and consultation with stakeholders and the public which helps to explore options fully and make more informed decisions.

Figure 2: The six step approach to grid development (source: EirGrid)

Step 3 confirms the study area for the project. Step 4 concludes with the identification of the Best Performing Option (BPO). The BPO is brought forward to Step 5, the planning process. During Step 5 the EIAR, NIS and other particulars that will accompany the applications for consent are prepared. The entire history of the study is available on the project's website.

3.3.2 Step 3

Step 3 confirmed and assessed the study area in East Cork (following the determination as per above that this was the strongest location for the connection point to the national grid) and detailed the onshore constraints in order to identify 5 potential landfall locations and 14 potential Converter Station Location Zones (CSLZs) that, on the face of it, could be suitable for the development of a converter station and associated infrastructure. They are presented in Figure 3 below.

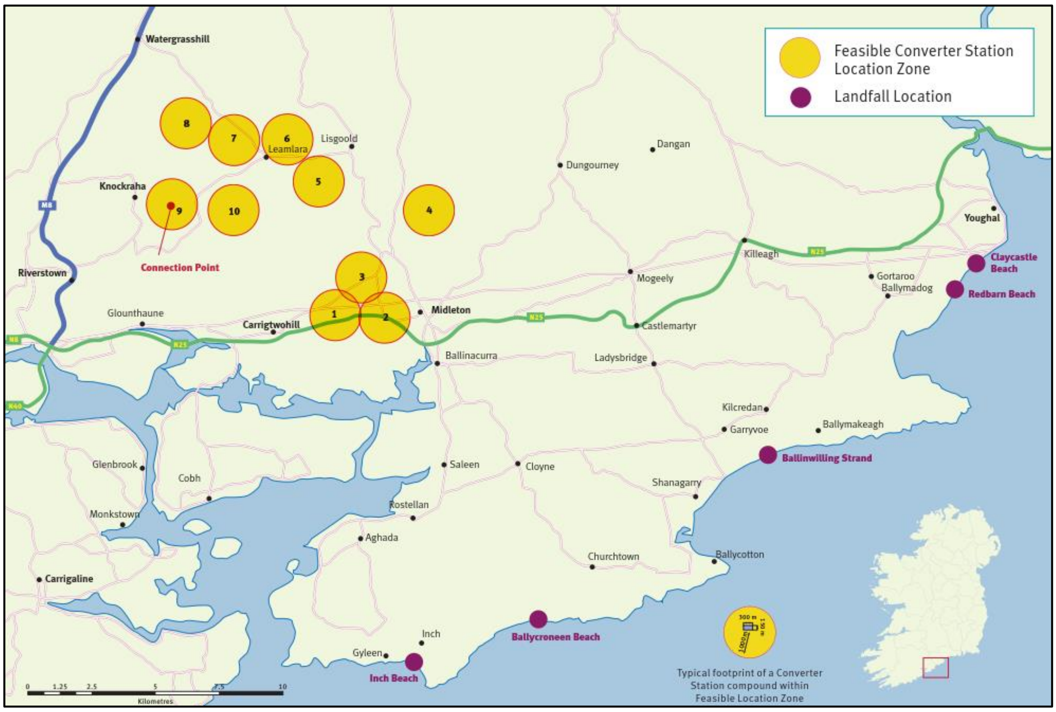


Figure 3: Step 3 Feasible Landfall Locations and CSLZ's

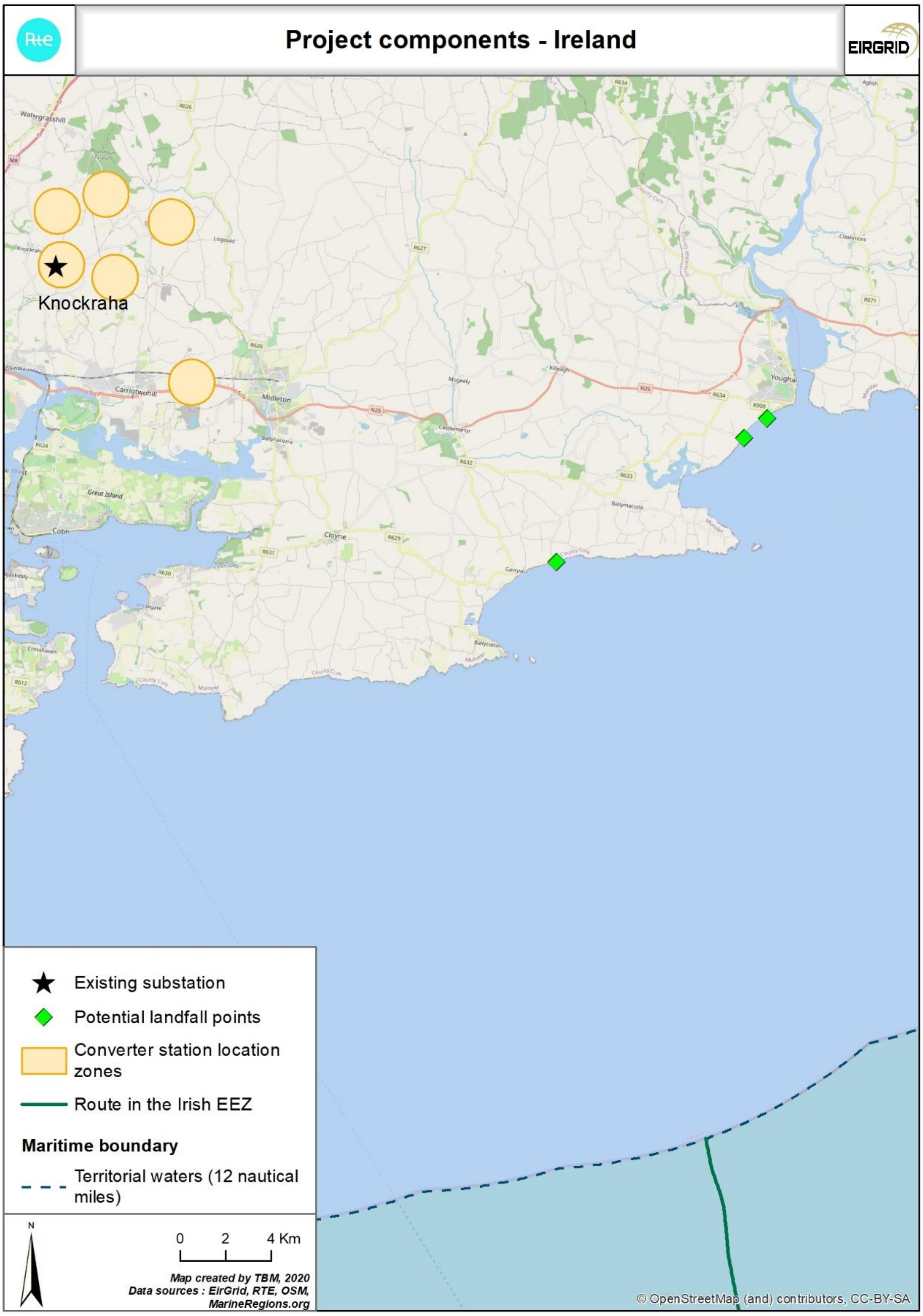
These options were evaluated, and a shortlist of options was identified and published by EirGrid. The Step 3 Shortlist is presented in Table 2 and in Map 8 below.

Consultation on the shortlist of options took place between 11th April 2019 and 10th June 2019.

Table 2: Step 3 Shortlist of Landfalls and CSLZ's in Ireland

Landfall location	CSLZ
• Ballinwilling Strand 2 (BW2) • Redbarn Beach • Claycastle Beach	• CSLZ 1 – Ballyadam • CSLZ 6 – Leamlara • CSLZ 9 – Knockraha • CSLZ 10 – Pigeon Hill • CSLZ 12 – Kilquane • CSLZ 14 – Ballyvatta

Stakeholder feedback gathered at Step 3 was analysed before confirming the shortlist of options. EirGrid also wrote to all stakeholders concerned in September 2019 to advise them of the outcome of Step 3.



Map 8: Shortlisted Landfall Locations and Converter Station Location Zones

3.3.3 Step 4

Further assessments were carried out in Step 4 in order to refine the shortlisted options. These assessments were undertaken in parallel with landowner and community engagement, and feedback received also informed the project development process.

Figure 4: Refined shortlist of project options identified during Step 4

In November 2019, EirGrid announced that it had identified an Emerging Best Performing Option (EBPO) for the location of the landfall and underground cable routes in Ireland along with three options for the converter station location as shown in Figure 4 above and in Table 3.

Table 3: Step 4 Shortlist of converter station site options in Ireland

Landfall location	Converter Station Site (CSS)
• Claycastle Beach	• CSS 1 – Ballyadam • CSS 9B – Knockraha • CSS 12 – Kilquane

3.3.4 Landfall location and HVDC route analysis

As was previously outlined, three landfall locations were shortlisted in Step 3 (Map 9):

- Claycastle Beach;
- Redbarn Beach; and
- Ballinwilling Strand.

In Step 4 Claycastle Beach emerged as the best performing landfall location for the subsea cable to arrive on the coast. One of the main reasons for this is that there is a sedimentary channel on the seabed approaching this landfall. Due to this, no rock-cutting would be required, compared to other landfall locations investigated.

The subsea HVDC cable will connect to an underground HVDC cable using a transition joint which can be installed behind the beach.

For all converter station site options, it was assumed that the HVDC underground cable from Claycastle Beach would follow the same route from the landfall to Churchtown, mainly along the N25 national road. Local options exist in the villages of Killeagh and Castlemartyr either to remain on the national road or to follow an off-road alignment. In the vicinity of the settlement of Midleton the route follows the local road network to the converter station site.

Map 9: Shortlisted landfall locations in Ireland

3.3.5 Analysis of shortlisted converter station sites

3.3.5.1 Ballyadam

The Ballyadam site is owned by the Industrial Development Authority (IDA) and is commonly referred to in the area as the former Amgen site, having regard to a previously permitted industrial development at that site (that was never completed).

As this is in an urban area zoned for industrial activity, there could be less of an impact on the human and social environment from a converter station at this location when compared with the other rural options under consideration. For example, noise would be considered in the context of existing background noise levels from the N25 National Primary Road, while visual impact must be considered in the context of this site as a planned evolving location for industrial and employment-related development.

It is noted that the wider environs of Carrigtwohill – to the West and North-West of the site – are planned for future residential and associated development; however, there is sufficient latitude in terms of siting locations within the site, and in terms of on-site design options, to ensure that no significant impact will arise to these potential future development areas from the planned converter station development.

There is potential environmental and technical complexity associated with this site, for example relating to drainage and geology. The ground in this area is dominated by karst, generally referring to soluble rock such as limestone, dolomite and gypsum. Some 30 caves are recorded within approximately 3 km of this site. This site is also the farthest from the Knockraha point of connection to the national grid. However, these issues are considered to be surmountable with an appropriate design response.

3.3.5.2 Knockraha

This site is adjacent to and East of the existing Knockraha station, the proposed connection point to the Irish national grid, with the shortest distance of HVAC cable when compared with other options under consideration. There is therefore considerable technical benefit associated with this option.

However, this site is in a rural setting and is in an elevated and exposed location. It already hosts an existing electricity substation with a significant number of existing overhead line circuits crossing the landscape, comprising alignments of both wooden pole and large tower structures. The substation itself has a number of tall and visible structures, in particular including steel gantries and lightning masts.

3.3.5.3 Kilquane (Meeleen)

This site is to the East of a commercial forest and is approximately 2 km straight line distance North of the existing Knockraha station.

The site benefits from a high degree of natural screening due to a combination of the mature forest plantation that backs it to the West and North, and the elevated terrain a short distance to the East. However, this area remains an undisturbed rural ecological habitat.

An area known as *"The Rae"* is located within the forest plantation is understood to have been used as a site and burial ground during the Irish War of Independence. In general, there is considerable existing and potential historic, archaeological and cultural heritage in this area.

Construction access to this site could either be through the forest, or via the local road network from the East, subject to potentially significant road upgrades.

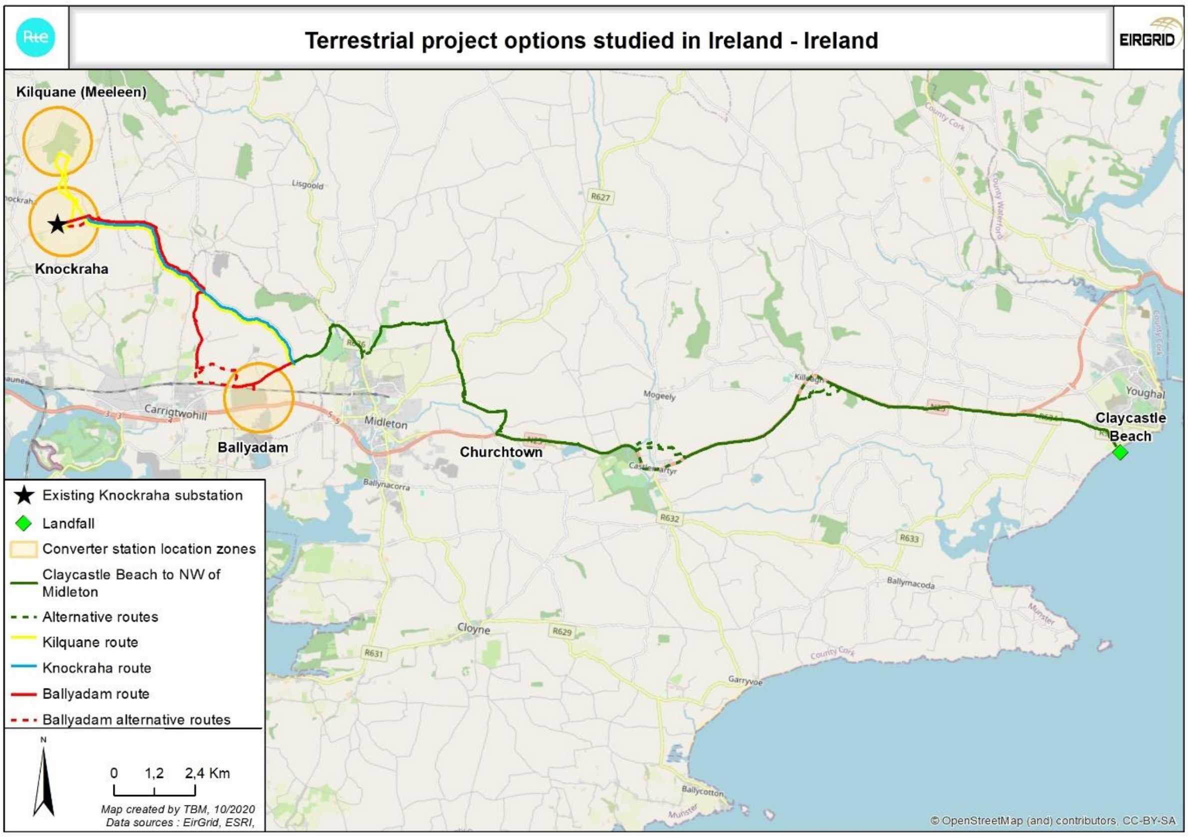
A cross-country AC connection was identified for the substation as an alternative to a road-based option which would pass through the centre of Knockraha Village.

Map 10: Converter station sites studied

3.3.6 The terrestrial solution in Ireland

Map 11 identifies the options considered for the Irish onshore elements of the Celtic Interconnector project. Focused site investigations and studies have informed the identification of the Best Performing Option for the project, which will be brought forward to the planning stage. In summary, this comprises a landfall location at Claycastle Beach, a DC route primarily along the N25 and local road network, a converter station at

Ballyadam, an AC route along the local road network to the grid connection point at Knockraha.



Map 11: Locations of onshore project options in Ireland

3.4 The study of terrestrial alternatives in France

Following the decision to route the circuit through the North of Finistère, RTE commenced the *"Fontaine"* consultation process which took place between December 2018 and July 2019 (this process occurred in reference to a Circular of 9th September 2002: "*Development of public electricity transmission and distribution networks"*) and the public consultation with the CNDP.

This consultation process included a progressive analysis of the region, delineating and justifying a study area in the first instance, and a corridor of least impact in the second.

This corridor of least impact is defined during the French consultation process.

For the French jurisdiction, the corridor of least impact had to be defined from the point at which the cable enters the French EEZ and finishes at the existing substation at La Martyre, taking into account locations for the landfall point and the converter station.

The main element taken into account for the definition of the corridor, based on different "sections" options (see Map 12), was the importance of the impact on the environment. As a result, the width of the corridor varies in order to exclude major environmental constraints, while still presenting a technically realistic solution.

After the approval of the corridor of least impact, detailed environmental and technical studies were conducted to define more precisely the location of all necessary project elements that have to be included into the corridor of least impact.

The Corridor of Least Impact is therefore equivalent to the Best Performing Option in Ireland.

3.4.1 <u>The study area</u>

The project study area in France was defined at a plenary meeting held on 20 December 2018. This study area avoids a number of potential environmental issues, while ensuring the technical ability to implement a number of alternative options.

The terrestrial study area takes a number of issues into consideration including environmental factors (such as rivers, wooded areas, ecological zoning), human factors (such as towns and settlements) and historical / cultural heritage factors (such as archaeological sites, historic monuments).

The offshore study area was defined so as to entirely avoid Natura 2000 sites: Nord Bretagne (FR2512005, FR2502022), Talus du Golfe de Gascogne-Mers Celtiques (FR5302015, FR5212016), Abers-Côtes des Légendes (FR5300017), Baie de Morlaix (FR5310073, FR5300015).

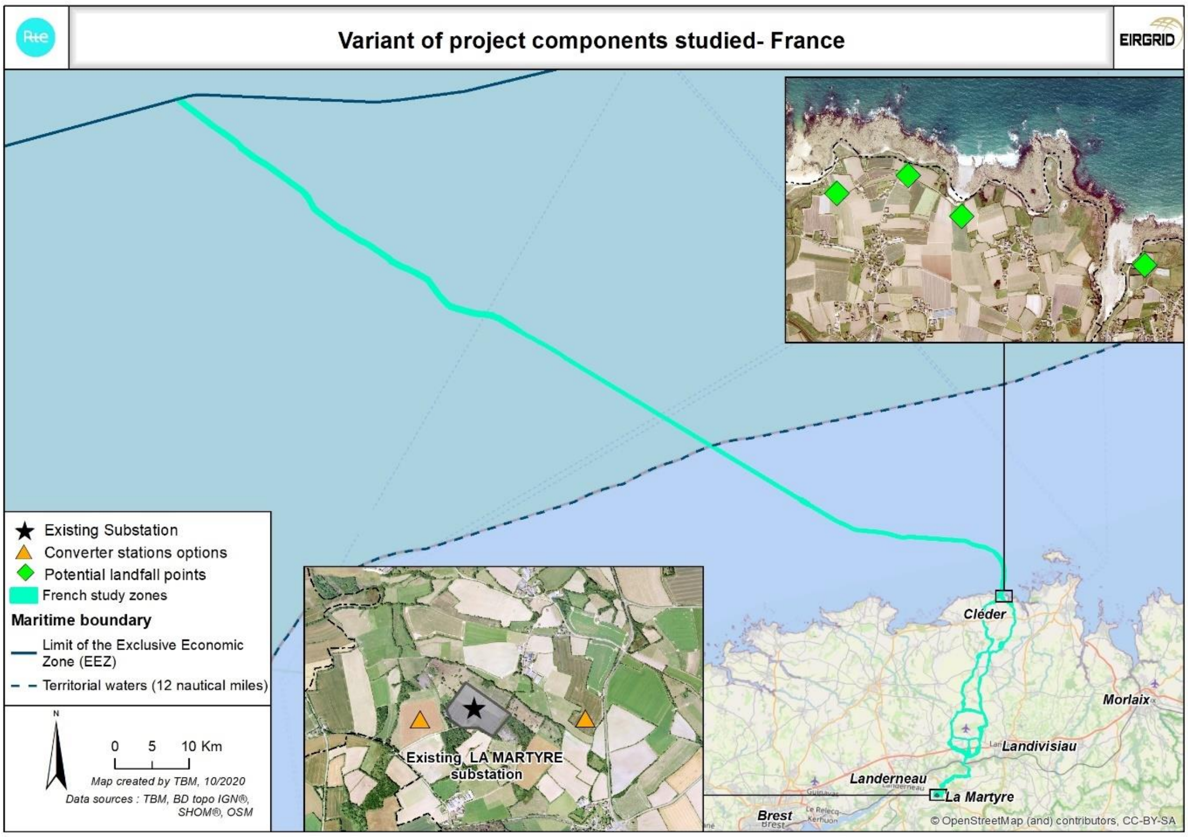
3.4.2 <u>The corridor of least impact</u>

Following a detailed analysis of the region (identification of issues, definition of sensitive areas) in which the approved study area is located, the locations and characteristics of the various component parts of the project were compared.

The corridor of least impact was defined based on the locations of the four component parts:

- The location of the converter station and its link to the existing substation (2 locations studied);
- The terrestrial zone (5 sections and 5 intermediate routes studied);

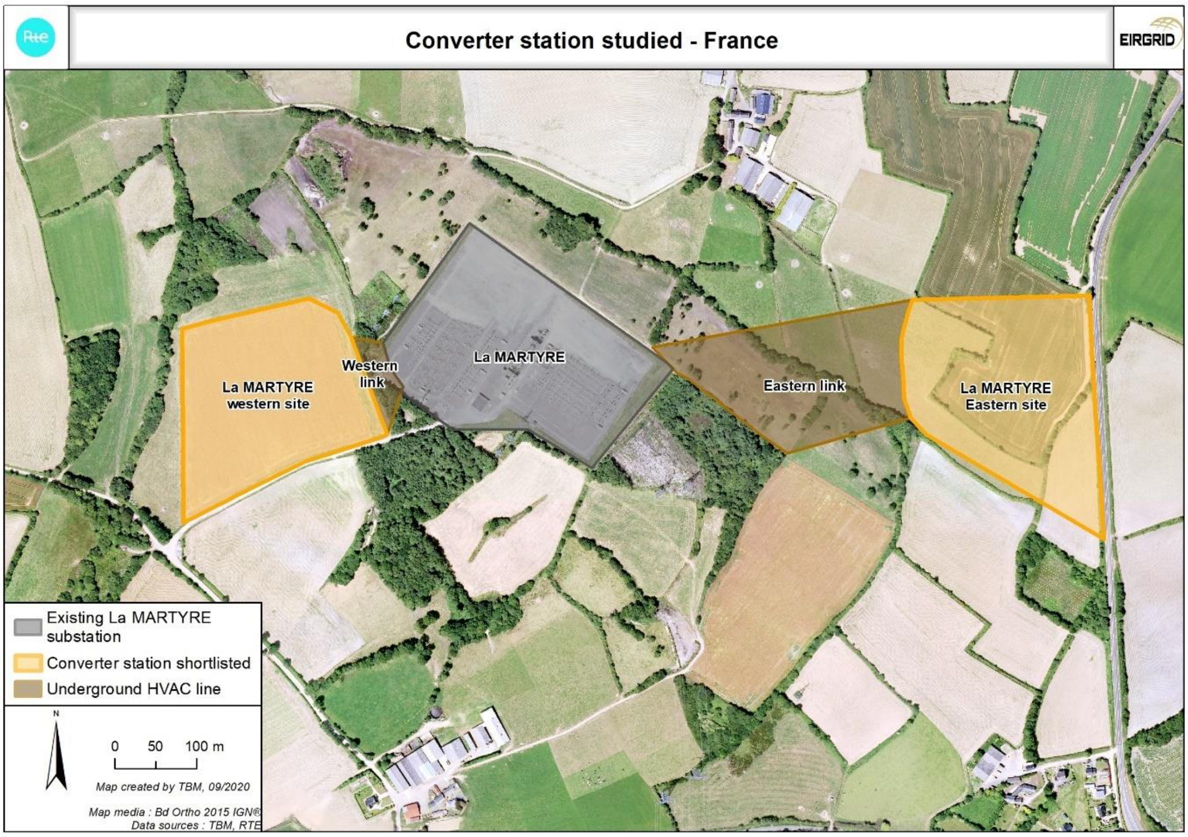
- The location of the landfall point (4 sites studied); and
- The offshore zone (1 zone proposed).



Map 12: Terrestrial variants studied in France

3.4.2.1 Study of the locations of the converter station and the HVAC circuit

Considering all sensitive factors (essentially, wetlands and human habitats) for the areas surrounding the La Martyre substation, two locations were studied: one to the West and one to the East of the existing substation.



Map 13: Converter station locations studied in France

A comparative analysis showed that the Western site performed better than the Eastern site, due to:

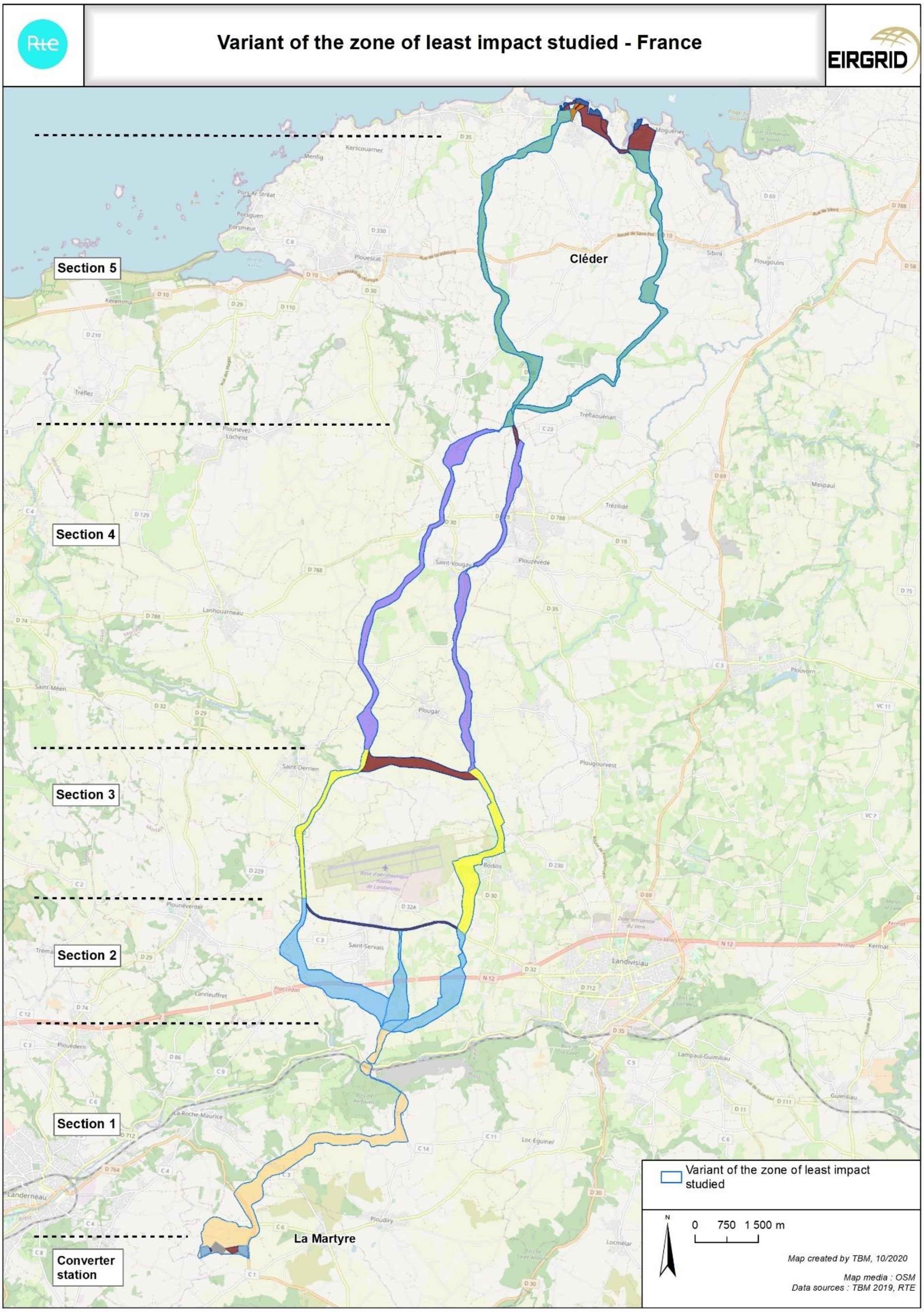
- The absence of sensitive natural areas (hedgerows, wetlands, waterways);
- Topography which is more favourable to integration within the landscape;
- Greater distance from residential areas.

3.4.2.2 Terrestrial study area

The corridor of least impact study was identified by means of evaluating the issues within the study area as being low, medium or high in terms of sensitivity.

Primarily seeking to avoid major sensitive areas, several routes from the coast to the existing substation at La Martyre were defined.

These corridors are shown on the following Map 14.



Map 14: Terrestrial zone options studied in France

A comparative analysis was undertaken for 5 sections of the corridor (represented by different colours on the Map 14 above).

The analysis enabled decisions to be reached regarding the corridors of least impact within each of those sections.

The following Table 4 summarises the major criteria used to differentiate solutions for each section.

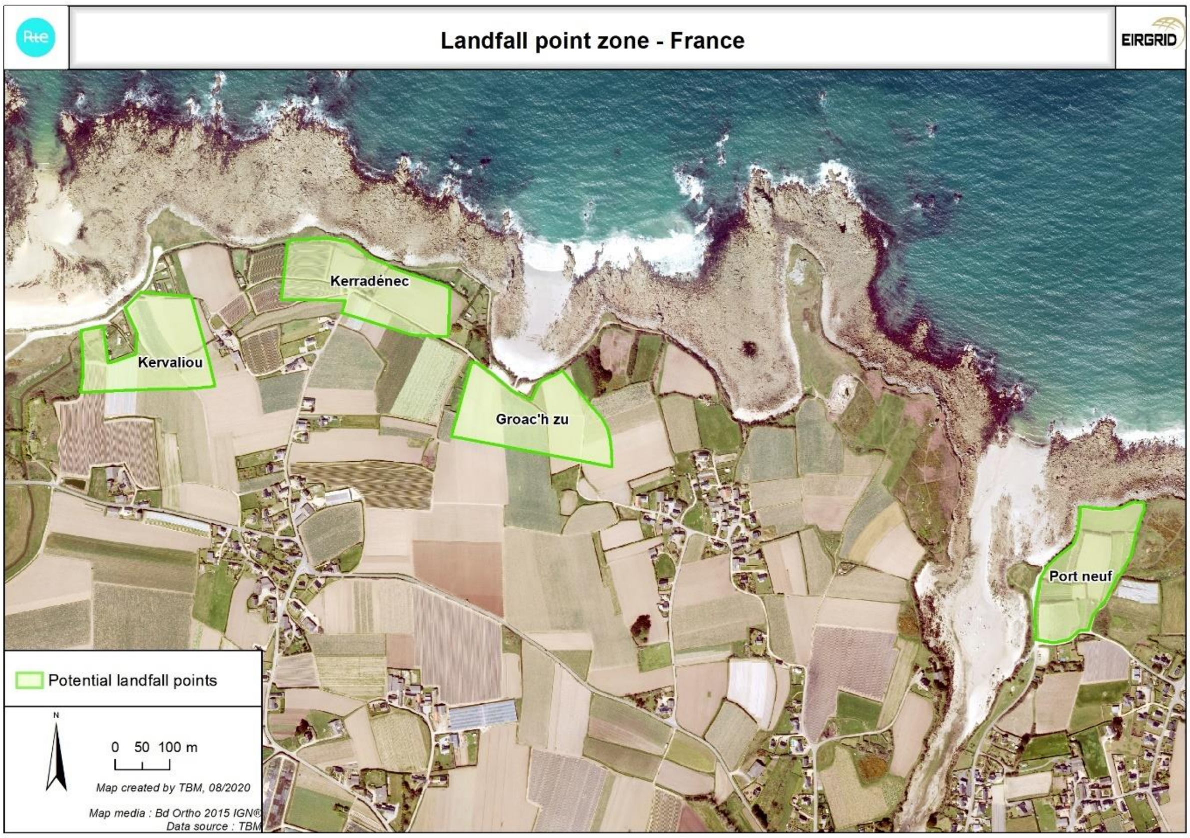
Table 4: Criteria to compare French terrestrial variant zones

Section	Primary criterion in the choice of the solution
Section 1	Only one solution proposed
Section 2	Smallest areas of archaeological sites Smallest areas of wetlands Smallest areas of woods
Section 3	Smallest areas of wetlands Shorter lengths of water courses
Section 4	Less housing No protected wooded areas
Section 5	Smallest areas of wetlands Less human presence

3.4.2.3 Landfall study

4 potential landfall points on the coast of the study area were included in a comparative analysis: Kervaliou, Kerradénec, Groach'zu and Port Neuf (Map 15).

The analysis was based on the location of each landfall point and the terrestrial approaches to these locations from Section 5 in Map 14.



Map 15: Locations of landfall points studied in France

In conclusion, the landfall point at Kerradénec was considered to have the least impact due to reduced human risks (fewer buildings, fewer recreational sites (beaches), there are no anchorages / ports or port activities and no tourist accommodation). Furthermore, this location presents fewer challenges in terms of biodiversity and aquatic environments (no watercourses, wetlands or areas included in a Tidal Flooding RPP).

3.4.2.4 <u>Offshore study</u>

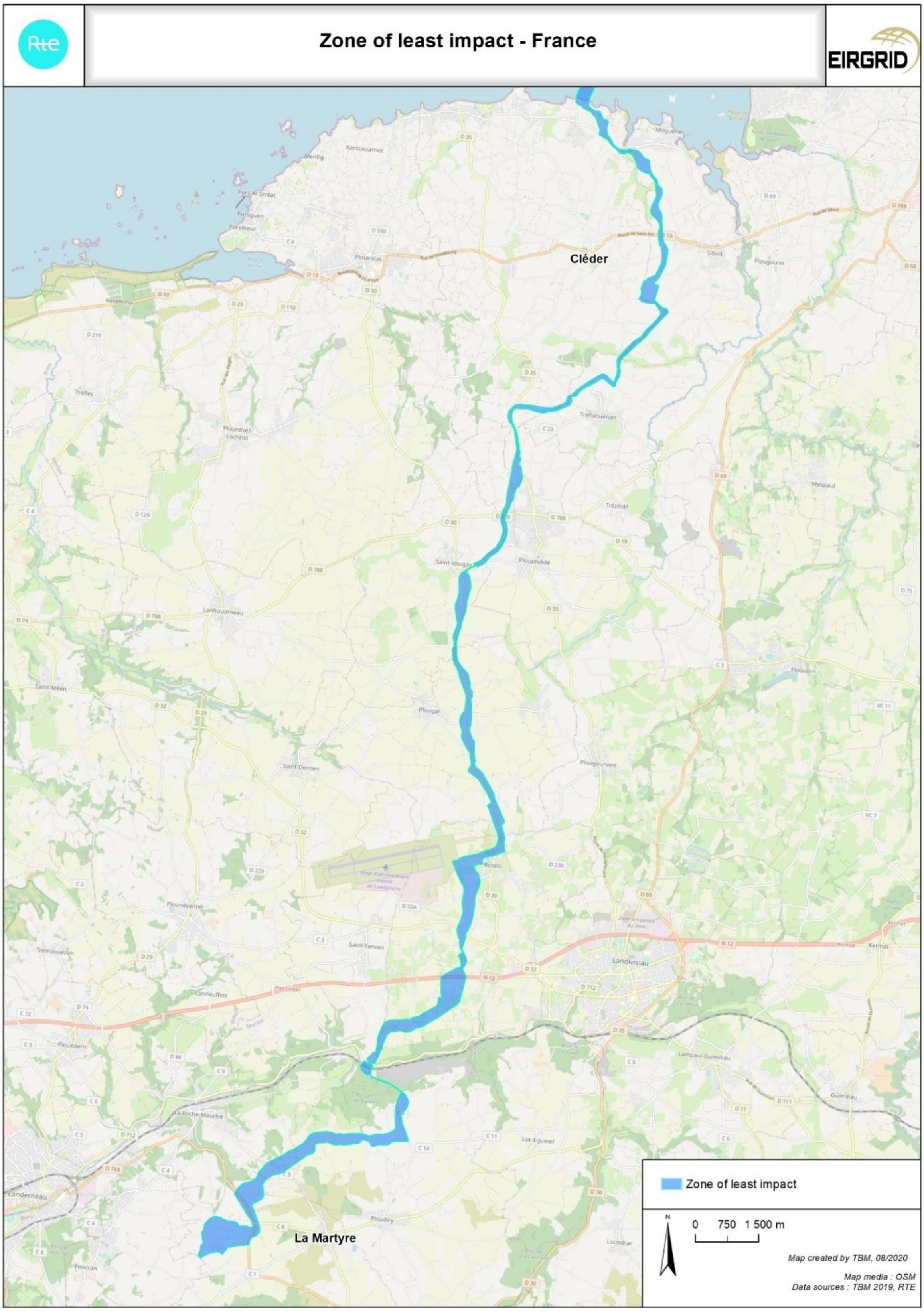
The study area already manages primarily to avoid potential technical and environmental challenges in the offshore domain.

The identified corridor of least impact has a total width of 2 km, making it possible to include all landfall points and the entire maritime route determined previously – see Section 3.2 above. The perimeters of all geotechnical, geophysical and environmental studies now fall within this zone.

3.4.2.5 <u>Conclusion</u>

Combining each of the component parts of the project that have the least technical, environmental, human and other impacts allowed for identification of an overall least impact solution for the Celtic Interconnector project in France. This is identified in Map 16 below.

The proposed corridor of least impact was approved at a plenary meeting.



Map 16: Location of the terrestrial corridor of least impact in France

3.5 The "Do nothing" alternative

3.5.1 Changes in territories in the absence of project implementation

3.5.1.1 Onshore

In France and Ireland, the land areas concerned are mostly agricultural areas / farmlands of high local economic value / interest; residential, industrial and commercial activities are also present locally. These environments are not likely to change significantly over time. To a large extent, the location of the route will be preferred along the local road network.

If the onshore project did not go ahead, the existing patterns of land use and activities would be maintained regardless of any changes associated with climate change.

Regarding environmental issues, non-implementation of the project would have no effects on the flora and fauna. Maintenance, improvement or degradation of these populations will depend on factors such as climate change and the loss of natural environments due to urbanisation and economic activity.

3.5.1.2 Offshore

Non-implementation of the project will produce no effects for maritime environments in the 3 jurisdictions in question.

The evolution of these environments will depend on current levels of exploitation (management of protected sites, other activities such as dredging and military operations) and future exploitation, whether these are:

- planned (marine renewable energy, cables);
- or subject to change: evolution of commercial fishing activities (highly dependent on resources), evolution of maritime traffic (dependent on economic port activities), evolution of maritime fleets (reduction of noise, reduction of polluting discharges).

The ways in which maritime territories evolve will generally depend on the overall effects of climate change, and therefore on the policies put in place in that area.

3.5.2 Loss of benefits if the project does not go ahead

As was illustrated in Section 2.1, the Celtic Interconnector meets a number of needs.

Ireland has an ambitious Climate Action Plan which includes significant development of renewable energy, particularly wind power, both offshore and onshore. The level of development will depend on its ability to use the energy produced in Ireland or to export it toward the European network and vice versa.

Non-implementation of the Celtic Interconnector project might lead Ireland to reduce its renewable energy capacity, because there would be no possibility to export the surplus of renewable energy produced, which would reduce its effect on the transition to a low carbon energy future.

The Celtic Interconnector will also promote energy exchange within the European Union ensuring enhanced security and reliability of electricity supply. In particular, it will enable renewable energy from producer countries to be used when and where it is needed.

Non-implementation of the Celtic Interconnector would prevent Member States benefiting from the strengths of each other's electricity systems, and also from the integration of major sources of renewable energy in Europe.

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4.1 Introduction

This section describes the current characteristics of the territory in Ireland in which the project will be constructed, the potentially significant effects associated with each of its elements, mitigation measures to avoid or minimise those potential effects and consequent likely significant effects.

A significant effect is an effect:

- that can reasonably be expected to occur;
- which, by its character, magnitude, duration or intensity will alter a sensitive aspect of the environment.

The component parts involved are the following:

- The landfall point;
- The HVDC underground circuit running from the landfall point to Churchtown, and from there to the converter station;
- The converter station and the HVAC underground cable connection to the existing substation at Knockraha.

The specific project proposal will be addressed fully in the EIAR that will be submitted for EIA by the relevant Competent Authorities.

4.2 Description of the onshore project

4.2.1 HVDC / HVAC Underground Land Circuits

The Interconnector will use both High Voltage Direct Current (HVDC) and High Voltage Alternating Current (HVAC). HVDC is used for the transmission of electrical power over long distances where HVAC is not technically or economically feasible; this in particular relates to the subsea element of the project.

The transmission grids in both Ireland and France are operated at HVAC. Connection to both systems will require a converter station at both French and Irish ends – to convert the electricity from HVDC to HVAC and vice versa.

A HVDC underground land circuit will therefore connect the landfall point and the converter station. A HVAC underground land circuit will connect the converter station and the connection point to the Irish national grid at Knockraha substation.

It is EirGrid's preference to install the HVDC / HVAC cables in the public road network; studies are ongoing to determine that this is feasible for the project. There may be certain locations along the route where the use of the public road is not feasible or preferable; in these local instances, off-road or cross-country route options will be identified and proposed.

The cables will normally be installed in ducts within a trench in the road. The duct arrangement, number of individual cables and separation between them varies between HVAC and HVDC sections.

The trench required for the HVAC cable route is somewhat wider (approximately 2 m width) than that required for the HVDC cable route (approximately 0.8 m width). This is primarily due to the required number of cables per phase – the HVAC circuit for the Celtic Interconnector requires six cables (two cables per each of the three phases are required to achieve the power transfer capacity associated with Interconnector at 220 kV); in addition, a fibre optic link is required to facilitate associated telecommunications. In contrast, the HVDC element requires two cables plus a fibre optic link.

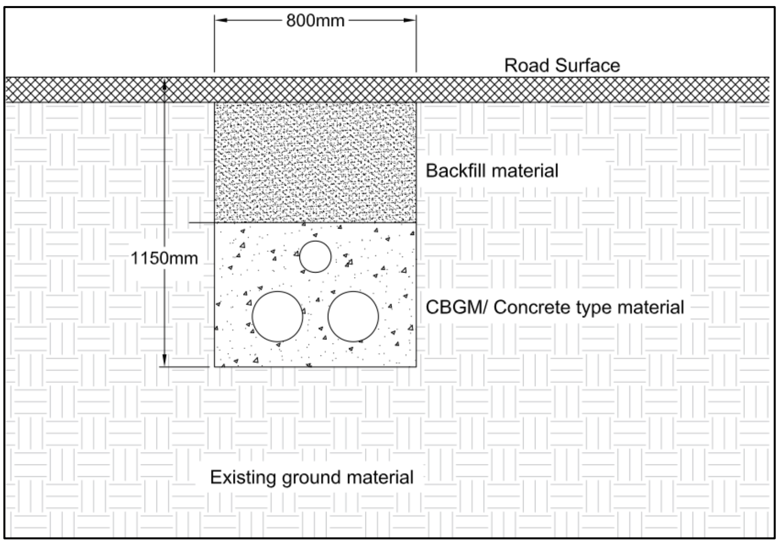
Both HVDC and HVAC cable types will need trenches to be opened within the road, the ducts installed in the correct arrangement and the trench backfilled with suitable back fill material, with marker tape and marker boards laid over for protection. In addition, joint chambers will also be constructed at regular intervals along the length of the cable route. A joint chamber is a precast concrete underground chamber approximately 6 m long and 3 m wide, where lengths of cable are jointed together. The ducts are therefore brought to each end of the chamber. The road above will be reinstated following duct installation.

The cable is manufactured and delivered to site on drums in lengths of approximately 500 m - 1,000 m. Prior to installation of the cable, the ducts are proven, cleaned and sealed from the joint chambers. Typically, the cable is pulled through the ducts and each section is jointed at the joint chamber.

High voltage cable is a highly specialised product and must be installed within specific tolerances. Maximum pulling tensions will apply to the cable and any bends in a duct section will add tension to the cable when it is pulled into the duct installation. For this reason, HV cable routes are preferred to be straight, with slow managed bends where necessary. Depending on the complexities of the route, exceptions to this can be made, provided always that pulling tensions are within the strength of the cable and will not cause any damage to the cable.

The installation conditions of the cable, including depth, affect its performance. The standard duct arrangement for the HVDC cable is below. This is the optimum and preferred arrangement providing sufficient depth for protection and cover but not such that performance is affected.

Indicative HVDC cable standard duct arrangement along the road can be seen below (Figure 5).

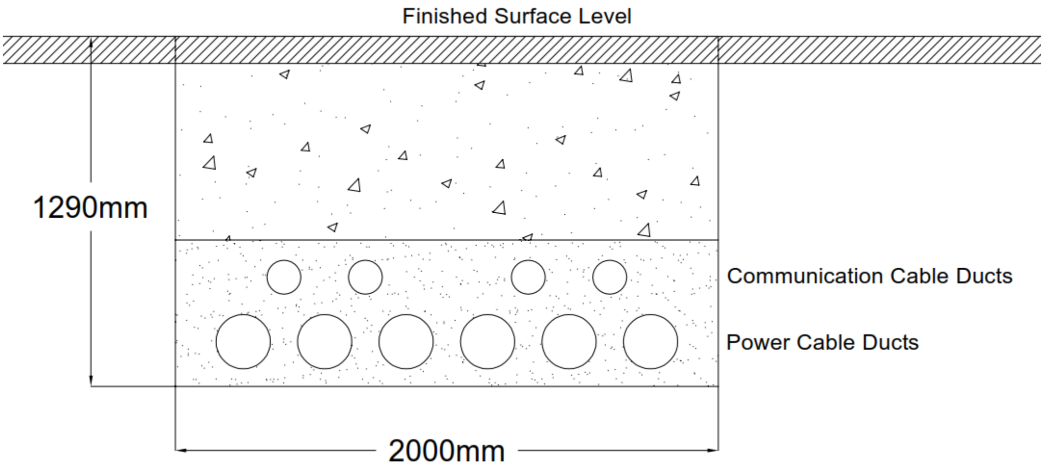


Source: Mott MacDonald

Figure 5: Indicative HVDC Cable Standard Duct Arrangement - Cross-section

The standard duct arrangement for the HVAC cable is shown in Figure 6 below. This is the optimum and preferred arrangement providing sufficient depth for protection and cover but not such that performance is affected.

At this stage, a 1,600 mm^2 cable with two cables per phase has been considered. In general, this would give a typical trench width of 2 m at an indicative depth of 1.29 m. As such, sufficient space may not be available in the existing local road network to accommodate the required width of the HVAC cable trench. The trench dimensions and the capability of the road network to accommodate the required trench width will be refined as part of the detailed design process. The road will be fully re-instated after installation of the cable.



Source: Mott MacDonald

Figure 6: Indicative HVAC Cable Standard Duct arrangement with two 1600 mm^2 cables per phase - Cross Section

4.2.1.1 <u>Horizontal directional drilling</u>

Horizontal directional drilling (HDD) is a standard cable construction methodology that is likely to be required along the HVDC / HVAC cable routes to facilitate local crossings such as watercourses.

HDD involves drilling a pilot hole from one side of the crossing to the other side while supporting the bored hole with bentonite. The drill bit is oriented by the surveyor, and the driller pushes the drill string into the ground to maintain the bore path. The drilled cuttings are flushed back by the drill fluid flowing via nozzles in the bit, up the annulus to the surface, where they are separated from the fluid fraction for disposal. A comprehensive closed-loop drilling fluid mixing and circulation system with recycling capability is utilised to minimise the volume of fluids required on site.

Ground investigation will be undertaken at potential HDD locations to confirm that HDD and other drilling methods can be used to construct the cable installation.

In-stream works will be undertaken at watercourses where HDD is not required. Appropriate protocols for engagement with Inland Fisheries Ireland will be adhered to.

4.2.2 Converter Station Compound

The converter station is the point at which power conversion from HVAC to HVDC and vice versa takes place. The HVDC circuit from the landfall terminates at the converter station and at the other side of the conversion process, the HVAC circuit connects the converter station to the transmission system.

The station will be unmanned (other than for ongoing maintenance) with control managed remotely. EirGrid operate a similar scheme, the East West Interconnector, a 500 MW link between the transmission grids of the islands of Ireland and Great Britain.

The converter station will be an industrial type building and outdoor compound with typical overall compound dimensions of 150 m x 300 m. The station will include an HVAC switchyard, transformers, house generator, cooling system, control building and converter building (typical building height of existing converter station in Ireland is approximately 25 m, however with recent advancements in HVDC technology the building height for the Celtic Interconnector converter stations is expected to be up to 20 m).

4.2.3 Connection Point

The HVAC transmission system (the "grid") provides for the bulk transfer of power from sources of power generation such as windfarms, hydroelectric and conventional power generation plants to load or demand centres such as large urban or industrial areas, or to support the local distribution network.

The HVAC system consists of many high voltage (HV) substations, connected via overhead line and underground cable circuits. These substations operate as a three-phase system at different voltage levels, 400 kV, 220 kV and 110 kV, throughout the system in Ireland. For the Irish onshore elements of this interconnector project, the connection point to the existing HVAC Transmission System will be the existing Knockraha 220 kV station in County Cork.

4.3 Description of the baseline environment and likely significant effects

4.3.1 Landfall Location: Claycastle Beach

4.3.1.1 Description of the baseline environment

As noted in Section 3 above, Claycastle Beach south of Youghal in County Cork has emerged as the Best Performing Option for locating the Irish landfall. The beach is a very popular recreational site, especially during the summer months, and is used as a local amenity resource all year round.

Claycastle Beach has a narrow strip of transitional dune that has been heavily modified in places to accommodate development such as caravan parks, carparks and boardwalks. The transitional dune merges into fixed dune before adjoining the reed swamp of Ballyvergan Marsh proposed Natural Heritage Area, pNHA, (Site Code 000078).

Ballyvergan Marsh is the largest area of coastal marsh in County Cork and it also contains one of the largest reedbeds in the country. Common Reed swamp is the predominant habitat within the marsh and this habitat supports a number of specialist bird species that are adapted to life among the reeds such as Water Rail, Sedge Warbler, Reed Warbler and Reed Bunting. Ballyvergan is of national importance for its population of the scarce but increasing Reed Warbler, its roosting hen harrier population, and its pre-migratory roost of barn swallow.

The rare flowering plant Wild Clary has been recorded on the dunes immediately to the West of Claycastle Beach. Whilst not protected, and classed as of *"Least Concern"* in the Irish Red List for Vascular Plants[7], the Red List notes Wild Clary is *"a rare species in Ireland, found in vulnerable habitats"*.

A transition joint bay is required at the landfall to connect the subsea HVDC cable to the onshore HVDC cable. As discussed in respect of general cable laying activities above, this joint bay will be fully underground and will comprise a pre-cast structure. Land above the joint bay will be reinstated following its construction. The transition joint bay will be located on lands above the beach.

The HVDC cable route from the transition joint bay at Claycastle Beach runs adjacent to Ballyvergan Marsh pNHA and through it for a short distance at the extreme Eastern edge before reaching the regional and National road network.

Joggers and walkers cause considerable disturbance to waterbirds along Claycastle Beach especially during high water as the available shoreline area can be as narrow as 3-5 m in places. The regularly occurring species such as Oystercatcher, Sanderling and the various gull species have become habituated to human-related disturbance and their natural response is to fly on to less disturbed stretches of beach.

Ballyvergan Marsh has been subjected to repeated human activities from multiple drainage attempts, land reclamation, water level control and the construction of a railway line through the site.

Winter and breeding bird surveys have been undertaken at Claycastle Beach and Ballyvergan Marsh since 2019 to inform the project.

It was noted during the surveys near Ballyvergan Marsh in June 2020 that a Greenway (a combined off-road cycle path, walking route and recreational trail) development is under construction along the now disused railway line which forms part of the proposed cable route from Claycastle Beach. The track had been entirely cleared of scrub by 23 June 2020. This development will result in a large increase of human activity along the track and close to areas used for winter roosting by Hen Harriers. The interface of this greenway development with the HVDC cable route will be very limited.

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[7] Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

4.3.1.2 Discussion of environmental effects associated with the landfall point

- **Air and Climate, including Flood Risk**

Given the nature and scale of the proposals, significant adverse impacts on air quality and on climate change through the release of greenhouse gas emissions as a result of the project are not anticipated.

Claycastle Beach, and an extensive part of the surrounding area have been identified as being within an area of Extreme Coastal Flood risk; however the installation of a subsea cable at Claycastle is not expected to have a significant adverse impact in terms of flood risk given its burial within the seabed and its narrow linear extent.

- **Land, Soils and Ground Conditions**

Works associated with the installation of the cable at Claycastle Beach may necessitate excavation of a section of the Ballyvergan Marsh pNHA. Given the scale of the excavation works necessary, relative to the size of the marsh habitat as well as a robust construction methodology for this particular area, there is limited potential for significant adverse impacts on land, soils and ground conditions at Ballyvergan March pNHA.

- **Biodiversity**

With the implementation of seasonal constraints to activities at Claycastle Beach, i.e. if excavation work takes place outside the breeding season (late March to mid-August or May to mid-August for Reed Warbler), it is anticipated that significant impacts on breeding bird populations in Ballyvergan Marsh associated with cable installation along the proposed route can be avoided. This is due to the limited extent of disturbance or damage (excavation of a relatively narrow trench to be re-filled post installation) at the extreme Eastern edge of the site. In addition, the majority of the HVDC cable in this area is along the public road; the only excavation work within the Ballyvergan Marsh will be a short crossing of the Greenway route. The Greenway is being developed for recreational activity. As such, potential damage to the reedbed habitat is likely to be limited and short-term.

There is the potential for disturbance to roosting Hen Harriers at Ballyvergan Marsh during cable installation activities if noise levels are persistently high in the late afternoon period between November and March. However, given the anticipated use of long-established methodologies that will be employed for cable laying, construction activities will be temporary and short-term at any point along the cable. If post consent verification surveys confirm roosting in proximity to the cable corridor, mitigation measures can include a restriction of high-noise level operations at a specific sensitive location in the vicinity of the sensitive area.

- **Material Assets, including Traffic, Resource Use and Waste Management**

It is anticipated that local access to Claycastle Beach, including a portion of the large car park above the beach will be restricted for a few weeks when the transition joint bay and associated ducting is being installed. Further, local access along a particular part of the beach will be restricted when the cables are being installed, although it is the case that this is a very long beach and the majority of its length will be accessible. Where possible, works will be carried out outside the summer season. A Traffic Management Plan (TMP) will also be implemented as part of the Construction Environmental Management Plan (CEMP) to ensure that significant adverse impacts, albeit temporary, are minimised.

It is not anticipated that there will be any significant adverse impacts on traffic during the operational phase.

Resource use will be minimised wherever possible and waste will be managed in accordance with the waste hierarchy and in accordance with the Waste Management Act 1996, as amended, and all associated regulations.

- **Cultural Heritage**

There is potential to encounter previously unrecorded cultural heritage sites during intrusive works. A watching brief under licence will therefore be carried out for any intrusive groundworks carried out to inform the project.

With the implementation of appropriate mitigation measures it is considered that significant adverse effects cultural heritage effects can be avoided.

- **Landscape**

It is not anticipated that there will be any significant adverse landscape effects associated with the operational phase. Landscape impacts during the construction phase will be temporary in duration, limited to a few weeks or months.

- **Major Accidents and Hazards**

No part of the project will concern a SEVESO site. With the implementation of best practice on site during construction and standard design mitigation measures significant impacts associated with major accident and hazards during either the construction or operational phases of the development are not anticipated to occur.

- **Noise and Vibration**

Given the nature of the activities significant vibration impacts during either the construction or operational phases are not anticipated.

Installation of the cable may result in temporary noise impacts, although given the linear nature of the cable, these will not occur in any one location for any significant length of time. Mitigation measures, such as timing of works and the implementation of a CEMP will ensure that construction activities, so far as is practical, do not result in significant adverse noise impacts.

Given the nature of the activities significant operational phase impacts are not likely.

- **Population and Human Health**

Installation of the cable at Claycastle Beach will result in localised disturbance and disruption with local access to a particular portion of the beach and car park restricted for a few weeks or months. Mitigation measures, such as timing of works and the implementation of a CEMP including a TMP, will ensure that construction activities, so far as is practical, do not adversely impact amenity, traffic or the environment in the surrounding area in terms of noise, access, disruption and / or nuisance.

It is not anticipated that there will be any significant adverse population or human health impacts during the operational phase.

4.3.2 Converter Station Site Location: Ballyadam

4.3.2.1 Description of the baseline environment

The Ballyadam site is located between the settlements of Carrigtwohill and Midleton. It is bounded to the South by the N25 national road and bounded to the North by the Cork to Midleton rail line. The site therefore has a generally urban context, is zoned for industrial use and is accessible to the national road network. Prior to 2006, the site was used for agriculture and was largely improved grassland. During 2006 and 2007 it is understood that the site was prepared for industrial development in accordance with planning permission granted by An Bord Pleanála (ABP - the Irish Planning Board) for a large industrial facility, and surface vegetation (excluding a wooded knoll) was cleared following substantial earthworks. Stone/gravel was imported for roads and hardstand areas. The preparatory site works were abandoned in 2007, and since then it appears that re-vegetation of site has been taking place, with grassland vegetation/habitat developing on calcareous soils in recent years.

The converter station site location comprises a mosaic of habitats closely associated with shallow, well-drained calcareous ground. The dominant habitat is dry calcareous grassland.

The site is low lying and is located within an area of known karst features. The 2007 ABP Inspector's Report for the permitted industrial development refers to a significant number of individual swallow holes across the site (the term 'swallow hole' refers to a steep-sided and enclosed depression in a limestone region). The 2012 Carrigtohill Groundwater Flood Risk Assessment[8], carried out on behalf of Cork County Council, noted that a new sink hole formation was observed on the site in 2010, highlighting relatively rapid geomorphic change on the site and the potential for ground instability.

The nearest ecologically protected areas are Great Island Channel Special Area of Conservation (SAC; 1058) and proposed Natural Heritage Area, and the Cork Harbour Special Protection Area (SPA; 4030), located approximately 2.5 km from the site. Karst landscapes offer minimum attenuation and allow the rapid movement of contaminants into groundwater. It will therefore be assumed that there is a pollution pathway between the site and the Natura 2000 sites protected within Cork Harbour.

[8] https://corkcocoplans.ie/wp-content/uploads/bsk-pdf-manager/2016/07/Annex-C-1023_CarrigtohillGroundwaterFRA_RevA-_withFig2Aand2B.pdf

The converter station location (North-East of the Ballyadam site) comprises a variety of habitats that are typically found in shallow, well-drained calcareous ground. At the site of the converter station, greater knapweed *Centaurea scabiosa* (‘near threatened’) and bee orchids *Ophrys apifera* (‘uncommon’) were found in a small area of ’semi-natural dry grasslands and scrubland on limestone’ which qualifies as a priority Annex 1 habitat (6210). A number of bee orchids were also found in the vicinity of the Ballaydam converter station.

During line-transect 2019/2020 wintering bird surveys at Ballyadam, two red-listed species were observed. Two Black-headed Gulls were seen briefly in the site on one survey and this species is unlikely to occur regularly at Ballyadam due to the lack of suitable habitat. Meadow Pipits were recorded in small numbers on all of the walk-over surveys and small numbers were also recorded in grassland areas within the site.

During 2020 breeding bird surveys:

- No Annex I species were recorded but the abandonment of the site over the past decade and extensive tree planting in the early stages of implementing the permitted industrial development have combined to produce several dynamic habitats that have been colonised by a range of bird species, many of which have become scarce or rare in the surrounding landscape.
- Based on the current Birds of Conservation Concern in Ireland listings, two red-listed species of conservation concern were recorded during the breeding season: Meadow Pipit *Anthus pratensis* and Yellowhammer *Emberiza citrinella*. Eleven amber-listed species were also recorded: Stock Dove *Columna oenas*, Skylark *Alauda arvensis*, Sand Martin *Riparia riparia*, Swallow *Hirundo rustica*, House Martin *Delichon urbica*, Robin *Erithacus rubecula*, Stonechat *Saxicola rubecula*, Goldcrest *Regulus regulus*, Starling *Sturnus vulgaris*, Linnet *Carduelis cannabina* and Greenfinch *Chloris chloris*. A total of 42 bird species was recorded breeding or foraging. This is a significant species total for an area of land that is situated in an intensively farmed landscape and a site that was formerly used for agricultural purposes.

Meadow Pipits occurred in significantly high numbers (25 breeding pairs) and the presence of this relatively large local population no doubt facilitated occupation of the site by a pair of Cuckoos (Meadow Pipits are the main host species for Cuckoo in Ireland). The Cuckoo *Cuculus canorus* is now a very rare species in East Cork and other intensively farmed parts of the county.

The site does not appear to be an important location for wetland birds in the winter due to the very limited areas of suitable habitat. Ballyadam is not likely to be of any great significance to the species of Special Conservation Interest in the Cork Harbour SPA.

The local road network along the HVAC route from Ballyadam to Knockraha is generally wide enough to accommodate two cars to pass each other; however, in some places the road is relatively narrow.

A number of finds were recorded during site archaeological monitoring carried out in 2007.

The site is low lying and is potentially overlooked by a scenic route to the West (S42: Road at Cashnagarriffe, N.W. Carrigtwohill and Westwards to Caherlag). Scenic routes also occur to the North East, to the South West and to the South to the South West and to the South but these are all low-lying which hinders long distance views.

There are two residential properties to the North of the railway line to the North of the Ballyadam site. Other dwellings occur primarily to the West of the overall site.

Background noise levels around Ballyadam are influenced by the N25 and the rail line.

4.3.2.2 Discussion of environmental effects associated with the Converter Station Options

- **Climate, including Flood Risk**

In terms of climate change adaptation, in general the main risk to the Irish Transmission System arises from risk of flooding arising from river or drainage system channel / infrastructure capacity exceedances, storm surges, sea level rise and also extreme precipitation levels. This affects all infrastructure on the grid.

In respect of Ballyadam, a flood risk assessment of Carrigtwohill, to the West of Ballyadam, demonstrated considerable uncertainty regarding the hydrology in the area. The hydrogeological assessment highlighted an area in proximity to Ballyadam as an area at risk of groundwater flooding. The report also stated that Cork County Council have confirmed ongoing flooding issues at this location.

A preliminary flood risk assessment of the site has been carried out and it has concluded that the site is not considered to be at risk of flooding from fluvial or coastal sources. The converter station site is not considered to be at risk from ground water sources, although access and egress along the access roads may be at risk. Provided that the converter station site is raised and the existing depressions are infilled, the converter station site is not considered to be at risk from pluvial sources, although access and egress along the access roads may be at risk.

Suitable mitigation measures in the form of dedicated flood water routing and compensatory storage would therefore need to be designed and constructed to ensure that there is no measurable increase in flood risk to people and property in the 'post-development' case.

- **Land, Soils and Ground Conditions**

The construction of the converter station will result in significant impacts in terms of land, soils and ground conditions.

Once constructed, with the implementation of design mitigation measures, it is not anticipated that there will be significant impacts in terms of land, soils and ground conditions.

- **Biodiversity**

The construction of the converter station could result in significant impacts on the 'near threatened' floral species *Centaurea scabiosa*, bee orchids and on a smaller area of 'semi-natural dry grasslands and scrubland on limestone' that qualifies as an Annex 1 priority habitat (6210). A strategy for the translocation of near threatened plants, bee orchids and priority Annex 1 habitat is being developed as a mitigation measure. Other than the potential impacts on the plants and habitats present in Ballyadam, no significant adverse impacts on protected sites or species are anticipated for the area where the converter station is located.

- **Material Assets, including Traffic and Resource Use and Waste Management**

The installation of the onshore HVAC/HVDC cables and the construction of the converter station compound may result in significant adverse impacts on traffic but they will be short-term in duration.

It is not anticipated that there will be any significant adverse impacts on traffic during the operational phase.

Resource use will be minimised wherever possible and waste will be managed in accordance with the waste hierarchy and in accordance with the Waste Management Act 1996, as amended, and all associated regulations. A Traffic Management Plan (TMP) will also be implemented as part of the CEMP to ensure that disruption is minimised.

- **Cultural Heritage**

There is potential to encounter previously unrecorded cultural heritage sites during intrusive works. A watching brief under licence will therefore be carried out for any intrusive groundworks carried out to inform the project.

With the implementation of appropriate mitigation measures it is considered that significant adverse effects on cultural heritage effects can be avoided.

- **Landscape**

While there is potentially relatively extensive visibility in the areas surrounding Ballyadam, much of the visibility range is expected to fall within unpopulated farmed fields. A converter station at these sites would likely be viewed in the context of existing developments and infrastructure in the surrounding areas.

- **Major Accidents and Hazards**

With the implementation of best practice on site during construction and standard design mitigation measures, significant impacts associated with major accident and hazards during either the construction or operational phases of the development are not anticipated to occur.

- **Noise and Vibration**

Given the nature of the activities, significant vibration impacts during either the construction or operational phases are not anticipated.

Installation of the HVDC and HVAC cable and construction of the converter station site compound may result in short-term noise impacts. Mitigation measures, such as timing of works and the implementation of a CEMP will ensure that construction activities, so far as is practical, do not result in significant adverse noise impacts.

Given the nature of the activities significant operational phase impacts associated with the HVAC / HVDC cable during the operational phase are not likely.

With the implementation of mitigation by design, it is not anticipated that there will be any significant adverse noise impacts during the operational phase.

- **Population and Human Health**

Installation of the HVAC / HVDC cable and the construction of the converter station compound will likely result in significant short-term adverse nuisance impacts, including noise and traffic.

Mitigation measures, such as timing of works and the implementation of a CEMP including a TMP, will ensure that construction activities, so far as is practical, do not adversely impact population and human health.

It is not anticipated that there will be any significant adverse population or human health impacts during the operational phase.

5. The terrestrial project in France

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5.1 Introduction

This Section describes the current characteristics of the territories (lands) in which the project will be constructed and the likely significant effects associated with each element located in the onshore zone in France. The project covers a linear distance of approximately 40 km from the coast in the municipality of Cléder (Finistère, Brittany) to the municipality of La Martyre.

The component parts involved are the following:

- The landfall point;
- The HVDC underground circuit;
- The converter station and the HVAC underground circuit to the pre-existing substation.

5.2 Description of the onshore project

5.2.1 The landfall point

The transition joint bay comprises an underground concrete structure, the maximum dimensions of which are 20 m in length and 6 m in width. The structure will be buried at a depth of about 2 m to maintain a minimum load height of 1 m (Figure 7).

The landfall transition joint bay will be set back from the coastline.

Figure 7: Landfall chamber under construction (RTE)

Once the underground and subsea cables have been connected, the landfall transition joint bay will be fully sealed and reinstated.

5.2.2 The HVDC underground link

The underground link comprises a pair of electricity cables and a fibre optic link. The fibre optic link handles communications between the converter stations in the two countries and are also used to monitor the line.

The general principle is to lay the cables in sheaths at the bottom of a trench. The average depth of the trench will be 1.3 m, with a width of 70 cm.

The cables will be transported on reels with average lengths between 1 and 2 km. Sealed and buried concrete joint bays are required along the length of the route, their dimensions will be roughly 12 m x 2.5 m. These will not be visible once completed.

One of the following two methods will be used for the cable ducts (Figure 8):

- Cable ducts with PVC sheaths laid in concrete;
- Cable ducts with HDPE (high-density polyethylene) sheaths laid in bare earth.

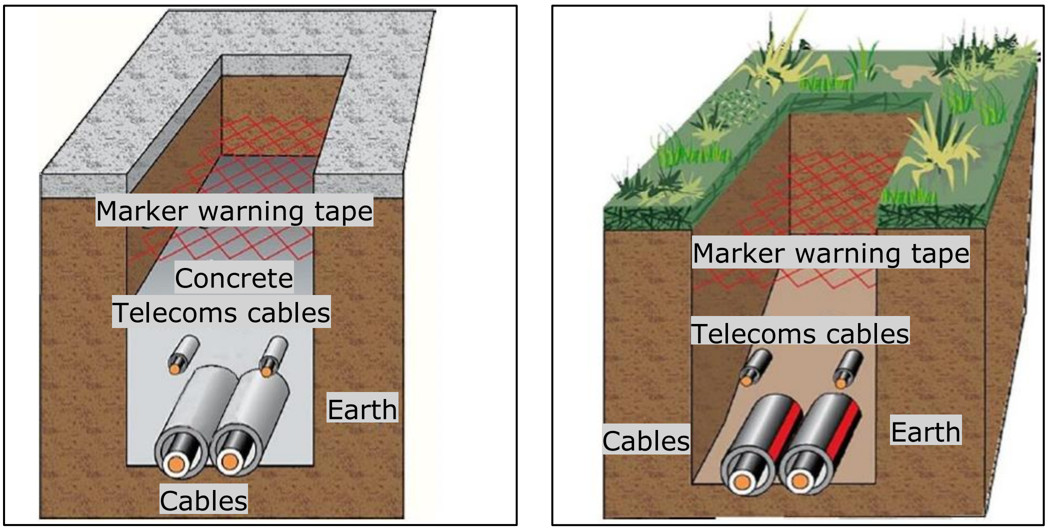


Figure 8: Schematic representation of cables laid in the trench: PVC in concrete (left) and HDPE in bare earth (right)

When conditions do not allow conventional laying in a trench, certain other special techniques may be used. The choice of technique will depend on several factors.

In the context of the Celtic Interconnector, these situations mainly arise when crossing waterways and railway tracks.

Solutions include directional drilling, corbelling, micro-tunnelling, driving/sinking, and burial in the watercourse.

5.2.3 Converter station

The entire converter station will be fenced and accessed through a single entrance gate.

The perimeter of the converter station will contain the following:

- A main building covering an area of approximately 5,000 m^2 (0.5 ha) and with a height of approximately 20 m, as well as several other auxiliary buildings, all covering an area of approximately 2,000 m^2 (0.2 ha).
  - The following systems will be installed in the converter station:
    - A power electronic based converter enabling the conversion of power from AC to DC and vice versa.
    - The main components installed in the building include power transistors (IGBTs) known as 'valves'. This will require (open air) cooling fans to be installed.

- The auxiliary buildings will be used for:
  - Offices and welfare facilities for the personnel;
  - Testing, controlling and managing the cooling system of the converter station's electrical equipment;
  - Supplying and distributing power to the converter station;
  - Housing a back-up generator unit;
  - Equipment and spares storage.
- The installation also includes external electrical equipment including 3 transformers (as well as an additional transformer, in reserve), capacitors and filters.

The final (detailed) design of the building will depend on the construction company selected. Figure 9 below illustrates one type of building, although the final architectural design may change.

Construction will involve civil engineering works. On-site construction machinery will include mechanical excavators and dump trucks for earthworks and mixer trucks for the platform, foundations, and storage areas (building and equipment).

Several special transport convoys may be required, in particular for the power transformers.

Figure 9: Example of an existing converter station

5.2.4 The HVAC underground line

The converter station will be connected to the existing substation at La Martyre by a 400,000 kV AC underground cable.

This underground cable will run over a length of a few hundred meters between the two structures.

Three electric cables, with dimensions and characteristics equivalent to those of the HVDC cable, will be laid in ducts (Figure 10).

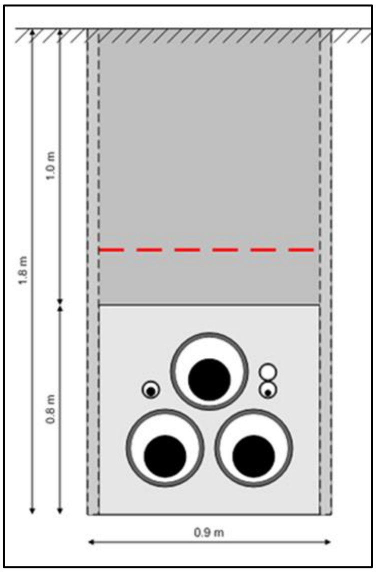


Figure 10: Indicative HVAC Cable Standard Duct arrangement

5.3 Description of baseline environment and likely significant effects

5.3.1 Land use

The following graph (Figure 11) shows the distribution of land use within the study area.

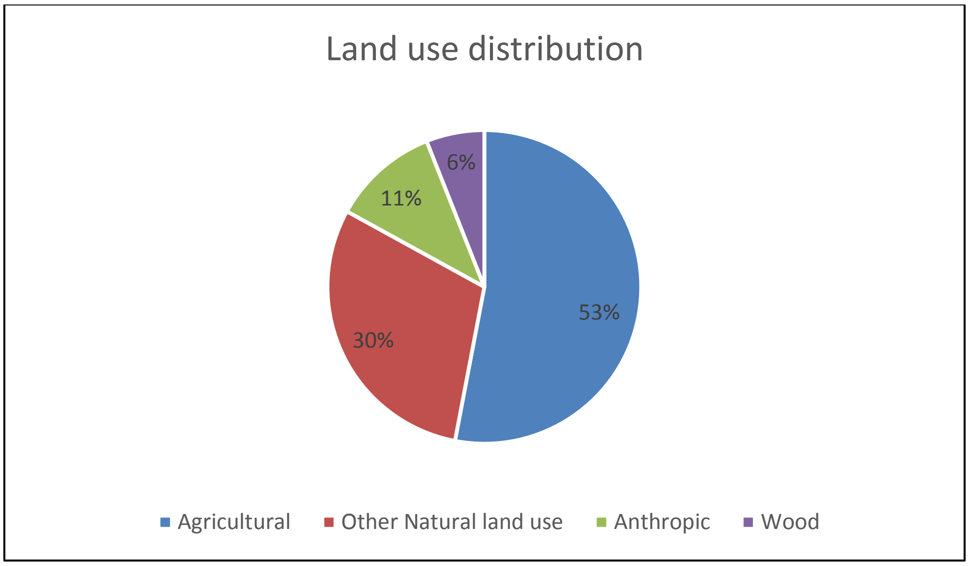


Figure 11: Land use distribution in French study area

Agricultural land is farmed extensively across the receiving environment and on a continuous basis. Within the study area, farmland has a very high value in terms of employment and the local economy. Its percentage within the area (53%) demonstrates its importance, particularly in the Northern part. The Supra-municipal Planning Document (Territorial Cohesion Programme) highlights agricultural land as being of structural importance to the economy of the region.

Natural spaces include all areas which are not used on an intensive basis. They include wooded areas (like hedge grid, etc.) and other types of habitats (scrubs, grasslands, etc.), as well as areas used by certain animal species.

These species tend to appear in larger areas of the southern part of the study area, mainly south of the Elorn River.

Aquatic environments are a ubiquitous feature within the territory. Several watercourses run through the study area, the two main ones being the Guillec and Elorn, with their respective tributaries. These watercourses and the wetlands bordering them are zoned as preservation areas in the Supra-municipal Planning Documents.

Lastly, these features all exist within a dense network of hamlets and other settlements, surrounding a number of towns. Buildings are therefore uniformly clustered and scattered over the entire study area, along with the associated road network.

Map 17: Land use distribution within French study area

5.3.2 Aquatic environments

The aquatic domain covers various types of water environments.

As mentioned above, several rivers run North-to-South through the study area.

These bodies of surface water are also circulation zones for wildlife, and the wetlands bordering the banks are highly biodiverse environments.

The Elorn River is a rich ecological zone and classified as a Natura 2000 site (Special Area of Conservation site code 5300024). It is also a local source of drinking water.

The groundwater is extracted for human consumption at two collection points in the Southern part of the study area: a surface water collection point on the Elorn, and two groundwater collection points. These drinking water catchment areas are governed by measures regulating the types of activities and works permitted there.

What are the likely significant effects for aquatic environments?

During the construction phase, alterations to the quality of aquatic environments will be the main effects in that components of the project will affect both surface water and groundwater bodies. Effects may include accidental pollution (on-site machinery, storage areas) and increased turbidity of the water (discharges of drilling sludge and other materials). Dredged crossings may also change the physical and hydraulic characteristics of waterways (impacts on riverbeds, banks, hydraulic cross-sections).

With the implementation of appropriate mitigation measures it is considered that significant adverse effects on aquatic environments can be avoided.

Therefore, there will be no likely significant effect on aquatic environments arising as a result of the project.

During the operational phase, the construction of the converter station will have the greatest impact as it will occupy approximately 4 to 5 ha of agricultural land on a permanent basis. Approximately 2 ha of this land will be concreted and therefore will increase the rate of discharge of rainwater and any pollutants generated by the converter station to the watercourses.

5.3.3 Biodiversity

Within the study area, the flora, fauna and local habitats are observed by specialists on an annual basis. Research is conducted into the following groups: birds, mammals, amphibians, reptiles, insects and flora.

Figure 12 summarises the main data.

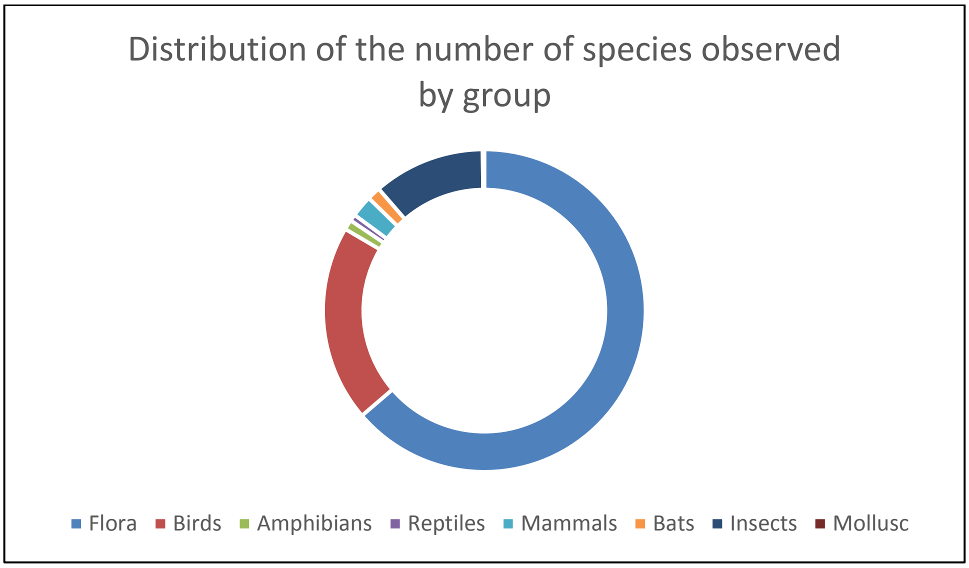


Figure 12: Distribution of the number of species observed by group

As illustrated in Figure 13, some species have been highlighted according to ecological criteria: scarcity, threat status.

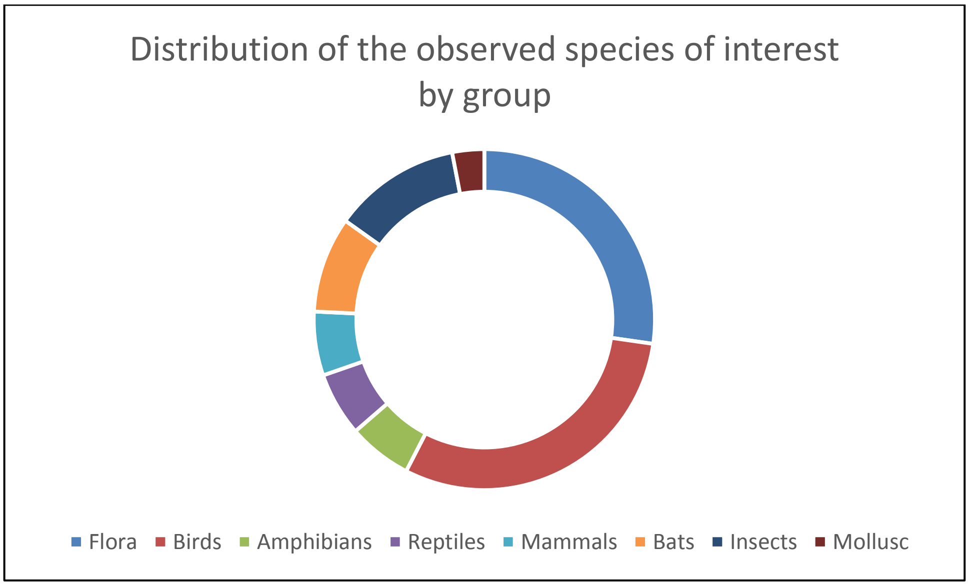


Figure 13: Distribution of the observed species of interest by group

Flowering plant species of interest are distributed along the entire route within different types of habitats: crop fields, coastal grassland, wooded embankments, and wetlands. The presence of several invasive exotic plant species should also be noted.

In the birds group, species of interest include those frequenting the study area during the nesting period: Marsh tits, Eurasian bullfinches, Turtle doves, Reed buntings, Yellowhammer, Common linnets, European honey buzzards, Western marsh harriers, Little owls, Peregrine falcons.

The habitats occupied by these species include hedgerows, wooded areas, scrub and wetlands within the territory.

Species of interest within the mammals group include semi-aquatic species (European Otter, European water vole), which occupy several watercourses and their banks, and also bats (Western barbastelle, Greater horseshoe bat, Natterer's bat). The latter can be found in wooded areas and also in buildings (e.g. on farms).

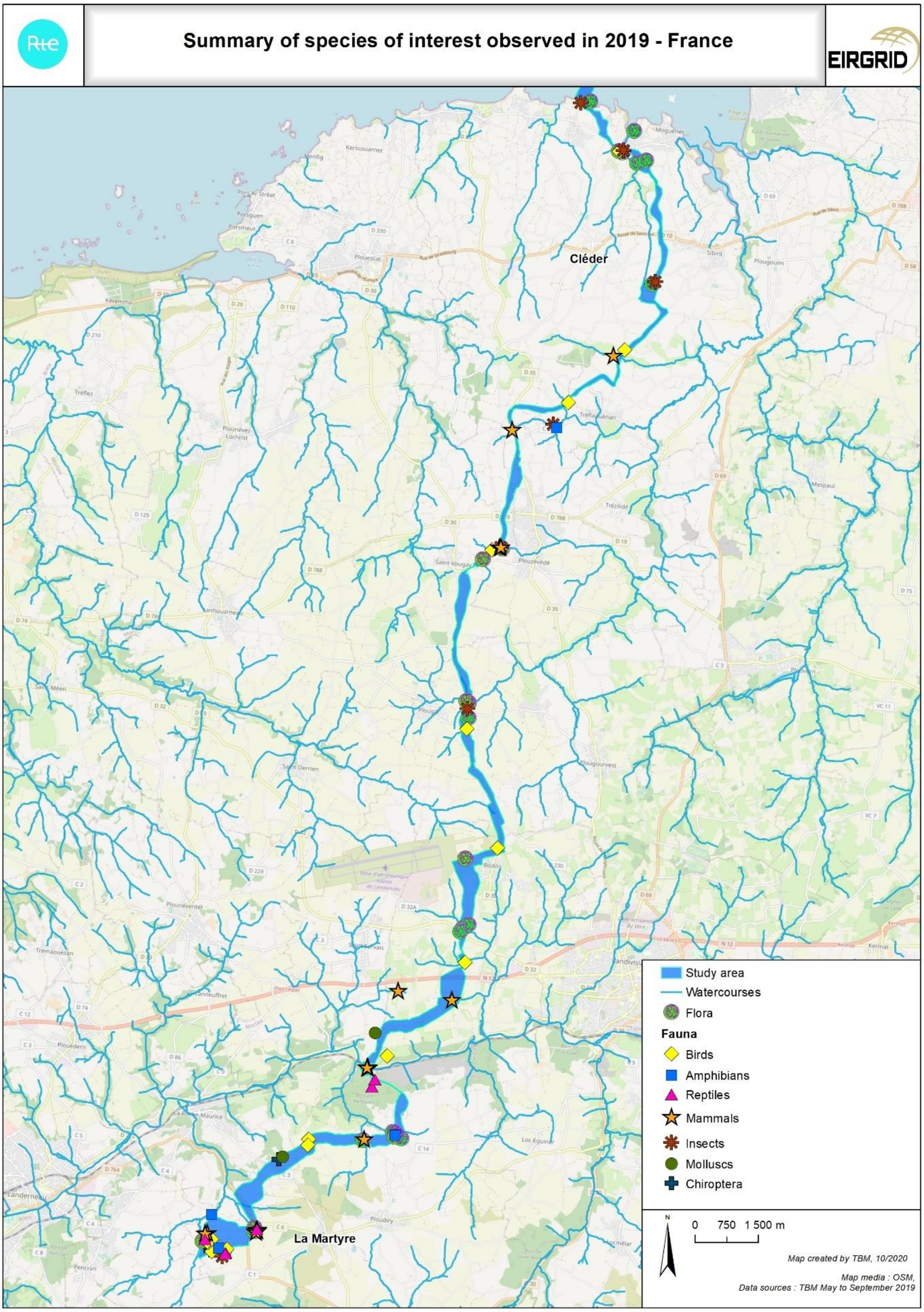
Species of interest in the amphibian group include the Common midwife toad and the Common frog. These species reproduce in wetland areas, and make use of nearby wooded areas.

Species of interest in the reptiles group include the Common European adder and the Viviparous lizard.

Insects of interest include butterflies, dragonflies and damselfies, and grasshoppers and related species. Species of note include the Lulworth skipper (which inhabits coastal grasslands), the Red-veined darter, the Short-winged Conehead and the Mudflat grasshopper.

Amongst the molluscs, a species of interest is the Quimper snail, a species associated with woodlands and embankments.

The following Map 18 shows the locations where these groups of interest have been observed.



Map 18: Main terrestrial species of interest in the French study area

The previous paragraphs illustrate the challenges, in terms of biodiversity, within the French section. However, some species are also listed in the annexes of the European Habitats and Birds Directives.

The following Table 5 lists these species.

Table 5: European directive species identified in the French study area

Group	Species (Common name)	Species (Latin name)
Birds	Annex 1 of the Birds Directive: European honey buzzard, Western marsh harrier, Peregrine falcon	*Pernis apivorus, Circus aeruginosus, Falco peregrinus*
Amphibians	Annex IV of the Habitats Directive: Common midwife toad	*Obstetrican alytes*
	Annex V of the Habitats Directive: Green frog, Red frog	*Pelophylax sp. (kl. esculentus), Rana temporaria*
Reptiles	Annex IV of the Habitats Directive: Viviparous lizard	*Zootoca vivipara*
Mammals	Annex II of the Habitats Directive: European otter, Western barbastelle, Greater horseshoe bat	*Lutra lutra, Barbastellus barbastellus, Rhinolophus ferrumequinum*
	Annex IV of the Habitats Directive: European otter, Western barbastelle, Serotine bat, Daubenton's bat, Natterer's bat, Kuhl's pipistrelle, Common pipistrelle, Grey long-eared bat, Greater horseshoe bat	*Lutra lutra, Barbastellus barbastellus, Eptesicus serotinus, Myotis daubentoni, Myotis nattereri, Pipistrellus kuhlii, Pipistrellus pipistrellus, Plecotus austriacus, Rhinolophus ferrumequinum*
Molluscs	Annexes II and IV of the Habitats Directive: Quimper snail	*Elona quimperiana*

What are the likely significant effects on biodiversity?

The construction phase will have the most significant impacts on biodiversity (the effects are considered to be negligible during the operational phase).

One of the primary effects is associated with the footprint of the construction site itself. Construction will cause effects such as loss of plants from flowering species, loss of habitats used by certain species during their biological cycle (rest, feeding, reproduction) and a loss of members of those species present in the area (especially birds, amphibians, semi-aquatic mammals, molluscs)

Two types of scenarios exist: temporary construction areas for the underground cable and the landfall point, and a permanent area for the converter station.

Other effects include those related to light and sound emissions. These are temporary effects, although they are likely to disturb some animals' biological cycles.

Lastly, risks associated with accidental pollution must be taken into account while the work is under way. There is a potential risk that the habitats of certain species could be damaged; rivers being the most sensitive environments.

With the implementation of appropriate mitigation measures it is considered that significant adverse effects on biodiversity can be avoided.

Therefore, there will be no likely significant effects on biodiversity on biodiversity arising as a result of the project.

5.3.4 Human context

Although no town and settlement centres are traversed by the cable route, the human settlement is easily identifiable within the study area, given the large network of buildings and hamlets in particular.

These include both residential and commercial buildings mainly related to agricultural activities: greenhouses, livestock buildings and farms.

Agricultural activity predominates along the coast and includes polycropping (primarily vegetable growing) and polybreeding. There are a large number of greenhouses in this sector.

It is also the geographical area of the "Roscoff onion" AOP/AOC.

Heading further South towards the Elorn, agricultural activities are more oriented towards livestock farming (pigs, mixed granivores and milk production) and polycropping.

A number of businesses and service providers are also present in the villages near the study area. Industrial and economic infrastructure is mainly located in the nearby major cities: Plouescat, Landivisiau, Landerneau and Brest. The presence of the Landivisiau naval aviation base should also be noted. The latter extends over the municipalities of Bodilis, Saint-Servais, Saint-Derrien, Plougar and Plounéventer and is an intermittent source of noise (aircraft).

There is a working quarry to the South of the Elorn.

The study area also comprises a tourist area, mainly associated with coastal activities (sports, hiking, beaches).

What are the likely significant effects for the human population?

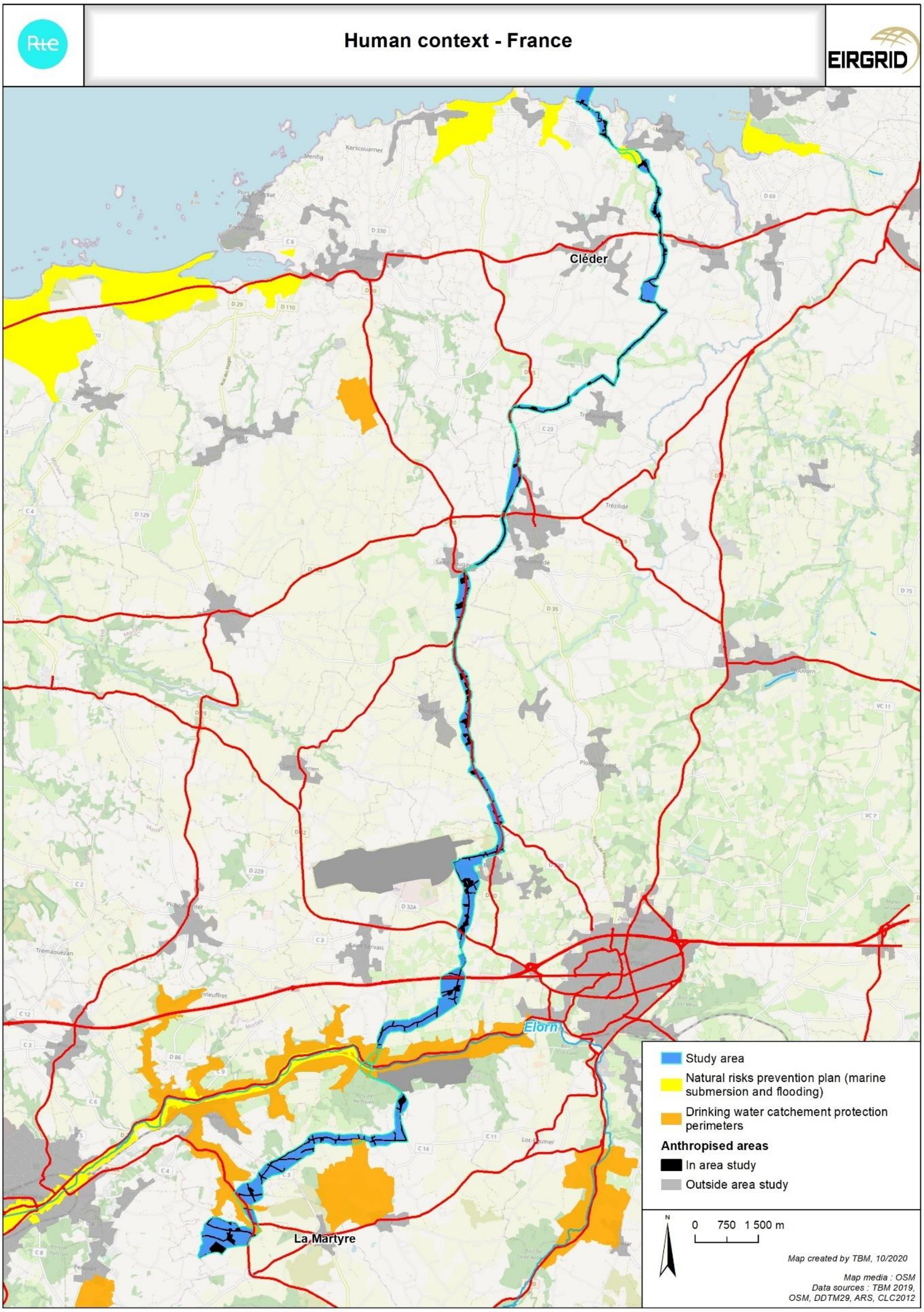
During construction of the underground cable traffic flow will be disrupted when works are taking place alongside roads (local and departmental), and near hiking routes (near the coast).

Similarly, agricultural activities will be temporarily disrupted due to site access requirements.

When in operation, the only potential disturbance related to noise generated by the installations for the population will be caused by the converter station.

With the implementation of appropriate mitigation measures it is considered that significant adverse effects on human population can be avoided.

Therefore, there will be no likely significant effects on human population arising as a result of the project.



Map 19: Summary of the human context in France

5.3.5 Natural risks

The study area is subject to flooding risks associated with two natural phenomena:

- Tidal flooding
- Watercourses bursting their banks

Both these risks are addressed by regulations covering works and construction intended to protect the public in the event of incidents.

The risk of tidal flooding only affects the coastal section (municipalities of Cléder and Sibiril) near the mouth of the Port Neuf cove.

The risk of watercourse flooding is associated with the Elorn River and, in particular, the plots within the study zone directly next to it.

> What are the likely significant natural risks?
>
> Potential effects associated with the underground cable include elevated risks of tidal flooding and inundation stipulated in the risk prevention plans. Risk prevention plans define the rules for at-risk areas and are intended to mitigate the risks for the populations present. All development projects must be compatible with these rules.

5.3.6 Landscape and heritage assets

5.3.6.1 Landscape

According to the Finistère Atlas of Landscape Issues, the zone is divided into three landscape units, from North to South:

- The Léon Légumier;
- The Plateau Léonard;
- The Marches de l'Arrée.

These three units cover the entirety of the aforementioned region.

The Léon Légumier is divided between the coastal section and the predominating vegetable fields behind it. The Plateau Léonard offers wide panoramas punctuated by vertical structures such as bell towers and water towers. There are few trees and views over huge distances are available due to the lack of elevated topography. It is an area which is intensively farmed.

The Marches de l'Arrée unit includes vegetation common to moors and wetlands. The landscapes are semi-open with more accentuated topography, including hills. The network of hedgerows is significant, although these are sometimes removed when fields are expanded.

5.3.6.2 Heritage assets

Heritage assets are mainly located outside the study zone.

There are two listed sites and a number of historical monuments with conservation perimeters close by (churches, castles and manors).

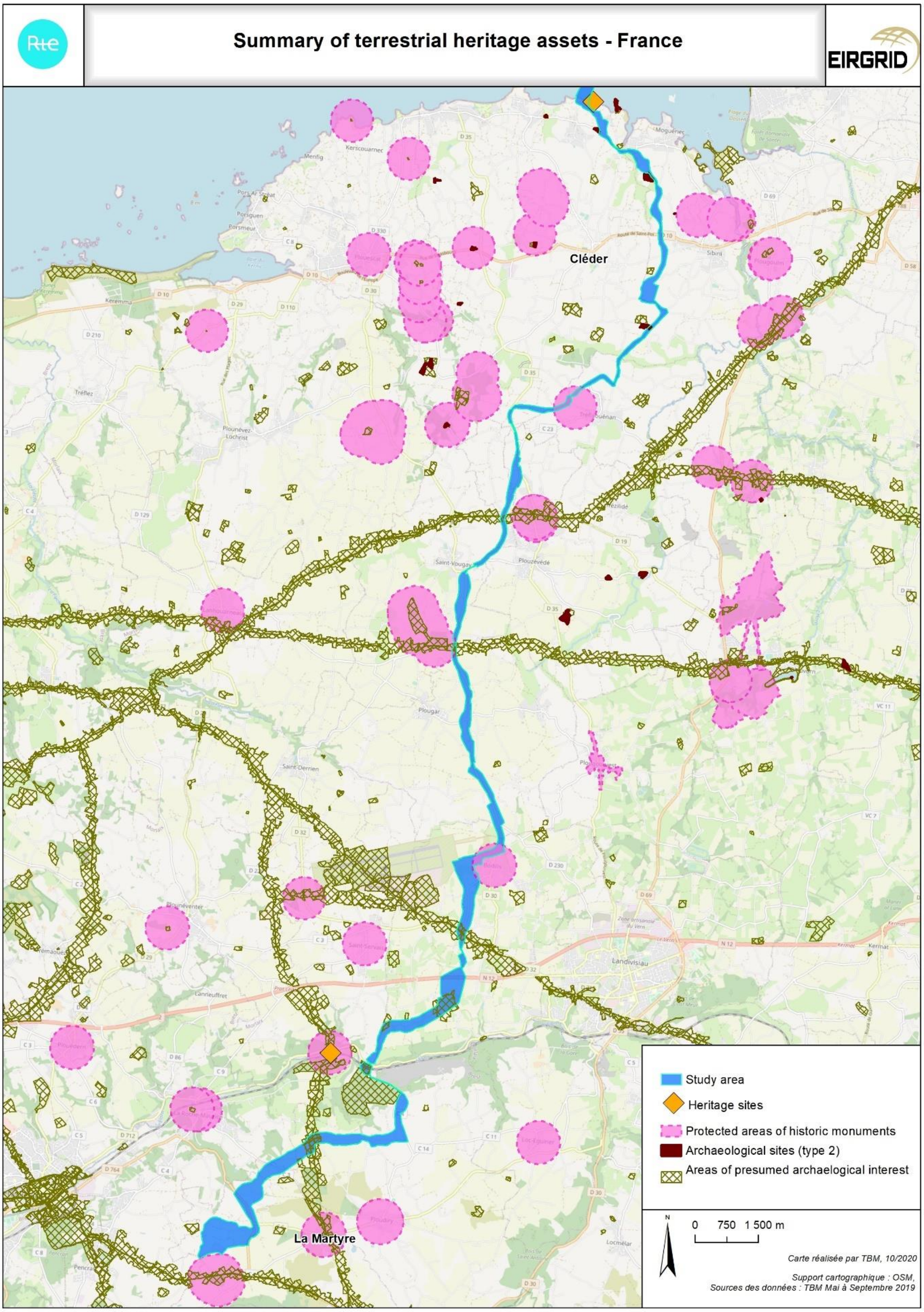
The heritage assets include a number of potential archaeological sites, as is evidenced by the number of ancient thoroughfares running through Finistère.

<u>What are the likely significant effects for the landscape and heritage assets?</u>

The landscape is likely to undergo permanent significant alteration due to the construction of the converter station, the only above-ground structure in the project. However, the building's location in a topographic low point and in direct proximity to an existing electricity substation will mitigate these effects.

Therefore, there will be no likely significant effects on landscape arising as a result of the project.

Given the siting and design (including mitigation) of both the converter station and the cable route, there are no likely significant effects for the heritage assets in the region.



Map 20: Summary of terrestrial heritage assets in France

5.4 Environmental measures

5.4.1 Mitigation: from the study area to the general outline

Following the original identification of a project study area, the baseline environmental and human components therein were analysed. This facilitated the refinement of the study area by RTE, and ultimately to the project area identified in this document.

Intended to mitigate potential negative effects on the receiving environment, the process involved ongoing assessments to reduce the size of the study area based on environmental issues and technical constraints.

The study area was eventually reduced from 720 ha to a general outline of 120 ha (Map 21).

The following graph (Figure 14) gives a comparison of the surface areas affected by certain environmental issues, showing the degree of mitigation achieved:

- Land use: cultivated areas, anthropogenic areas, woodland areas, natural areas;
- Aquatic environments: wetlands, catchment protection perimeter;
- Biodiversity: a number of plant species of interest, habitats of Natura 2000 species: Viviparous lizard, European Otter, Common midwife toad, Red frog, Green frog;
- Natural risks: risk prevention plan;
- Heritage: archaeological areas of interest.

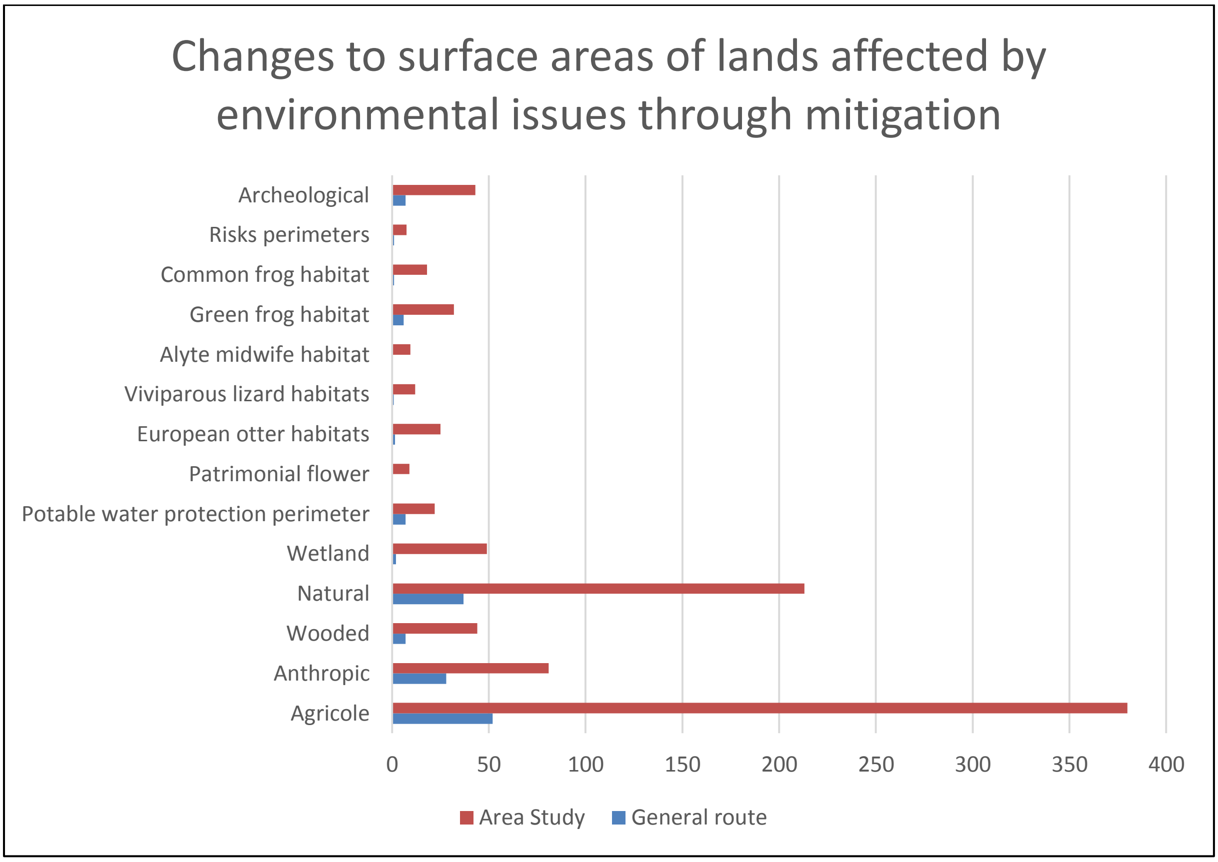
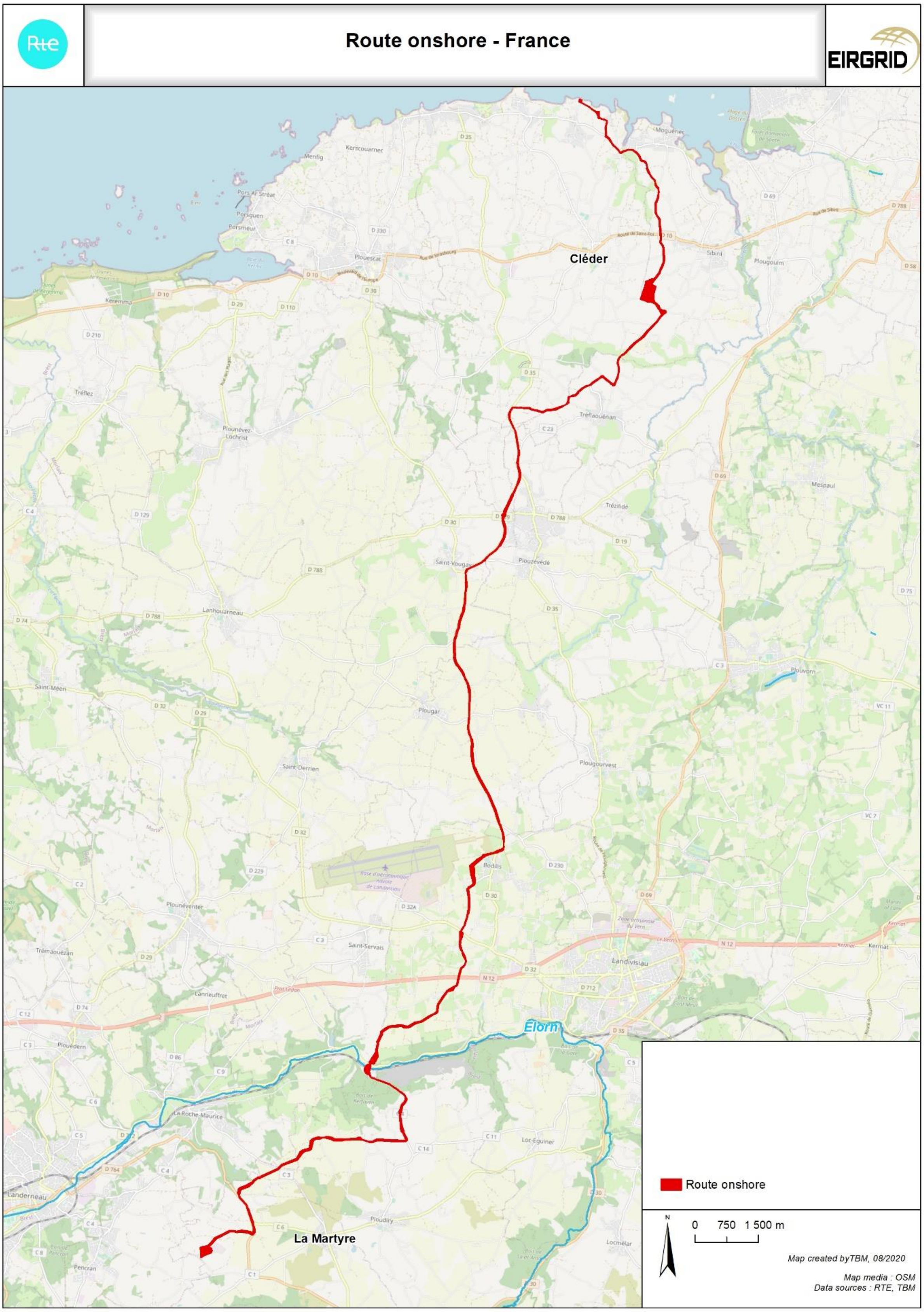


Figure 14: Evolution of surface affected by environmental issues through mitigation

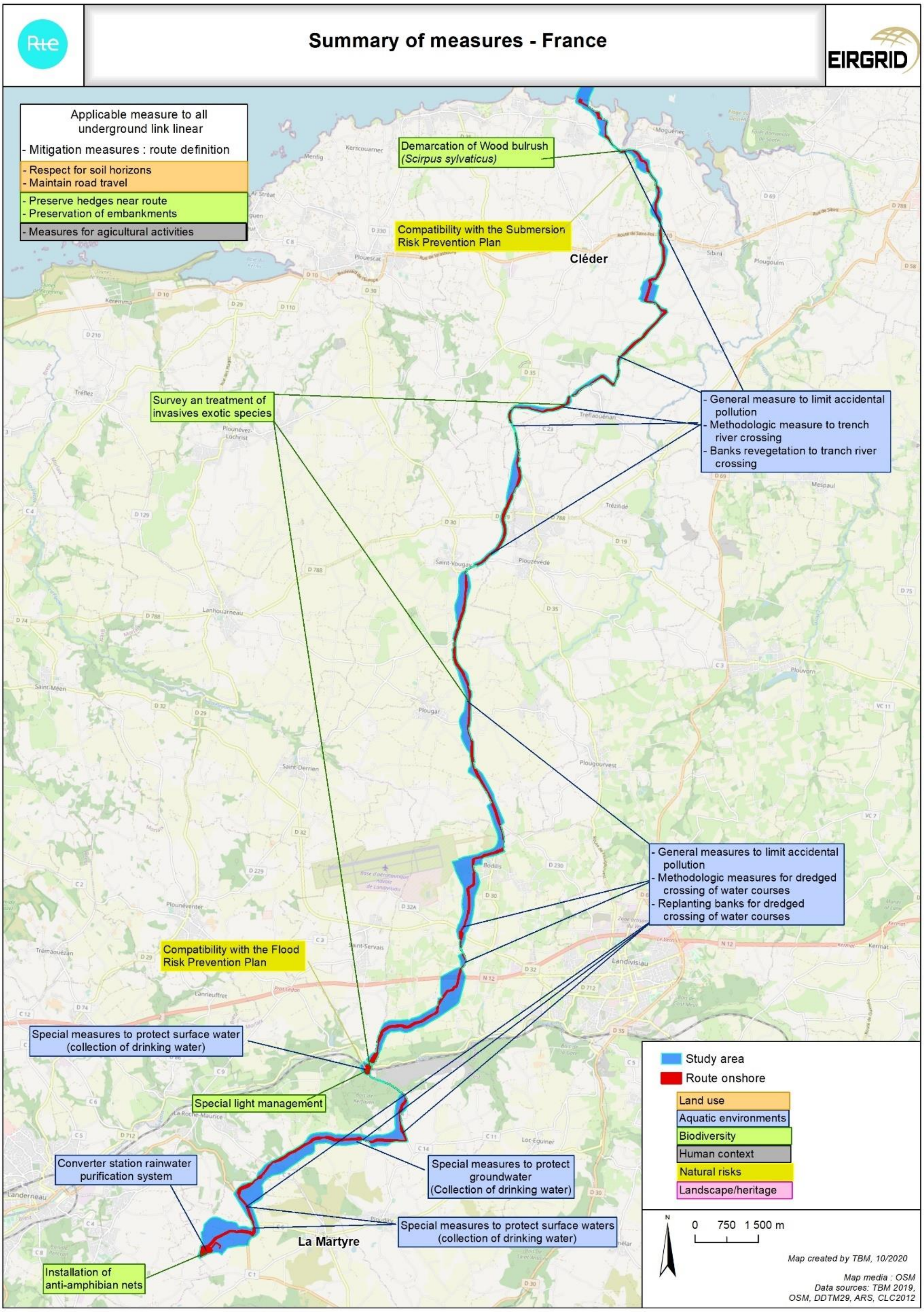


Map 21: The general terrestrial outline in France

5.4.2 Mitigation measures

Following an analysis of the project's effects, a certain number of mitigation measures were implemented over its entire length.

These measures are summarised in the following Map 22.



Map 22: Summary of terrestrial measures in France

6. Offshore project

The following legislation and guidelines have relevance to the offshore elements of the project:

- EIA Directive: Submarine interconnector cables are not specifically mentioned as being subject to an impact study in application of the EIA Directive in so far as they are not included in Annex I (project submitted for evaluation) nor Annex II (submission of certain projects for evaluation) by determination of the Member States);

- Espoo Convention of 1991: Defines the obligations of the parties to assess the environmental impact of certain activities early enough in the project's schedule;

- Recommendations of the European Commission on the application of the environmental impact assessment procedure for large-scale cross-border projects;

- Habitats Directive;

- Foreshore Act 1933 (as amended);

- Marine Works Regulation 2007;

- Marine and Coastal Access Act 2009;

- National Planning Policy Statement in the UK;

- Environmental Code;

- General Code on the Property of Public Entities (Concession for the Use of the Public Maritime Domain).

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6.1 Introduction

This Section sets out the offshore zones crossed by the project.

The approximate linear distance of the offshore portion of the Celtic Interconnection is 500 km. This is broken into approximate linear distances for each element of the offshore route as set out below:

- 34 km in Irish Territorial Waters;
- 117 km in the Irish Exclusive Economic Zone;
- 211 km in the UK Exclusive Economic Zone;
- 87 km in French Exclusive Economic Zone;
- 48 km in French Territorial Waters.

The component parts involve the following:

- The subsea approaches to the landfall points;
- The HVDC subsea circuit.

6.2 Project description

6.2.1 <u>Landfall Area in Ireland</u>

The proposed construction method selected for the identified Best Performing Irish Landfall at Claycastle Beach is by open cut (opening a trench in the seabed and placing the cable in the trench and then covering over – please see Figure 15), as the landfall and its approach is composed of sandy sediments with depths in excess of 3m.

The first phase of the construction sequence involves the installation of pre-installed conduits within a trench excavated across the beach. The trench will be excavated using standard land-based construction equipment (such as long arm excavators) with the aid of a temporary sheet piled cofferdam to ensure trench stability and an adjacent temporary causeway for site access. The trench will be backfilled, and the site reinstated to its original condition following installation of the pre-installed conduits.

The second phase of the construction sequence will coincide with the offshore cable installation works (see further below) and will involve pull-in of the offshore cables through the pre-installed conduits and into the Transition Joint Bay (TJB – refer to Section 4 of this JER) using a cable winch spread.

Figure 15: Example of an open-cut trench (source: EirGrid)

This will be an underground chamber of approximately 20 m by 6 m and will be installed underground behind the landfall area at Claycastle Beach. This chamber is likely to be a pre-cast concrete structure. Installation of the chamber is expected to take approximately 2 weeks and will be scheduled to coincide with the installation of the landside cable duct and co-ordinated with the offshore cable installation, As appropriate, having regard to any seasonal constraints that may apply.

During the temporary construction period, the landfall area (the affected portion of the beach and car park) will be required to facilitate access for equipment associated with both the construction of the joint chamber and the pulling of the cable. It will require to be fenced off for public health and safety reasons, as would be the case with any construction site.

6.2.2 Landfall Area in France

6.2.2.1 Study of the various options.

Several methods for the implementation of sub-structures are available. However, a comparison of the various trenchless techniques has resulted in horizontal directional drilling (HDD) being selected as the preferred solution. A solution using three separate drill holes (2 for each of the power cables and 1 for the fibre optic link) is preferred for this activity.

6.2.2.2 HDD at the Landfall Area

The HDD process at the landfall from the offshore side requires large-scale maritime resources. A jack-up* platform (Figure 16), a cable lay vessel (or barge for reeling out the cable) and several support boats will be required for the operation.

Figure 16: A jack-up platform

In respect of the HDD process at the landfall from the onshore side, an area of around 3,000 m^2 will be required to accommodate a drilling platform. This platform will include the drilling machinery, the pulling winch and other equipment.

The drilling platform is a temporary structure and the site will be restored to its original condition on completion.

Figure 17: Directional drilling rig in operation

6.2.2.3 Management of drilling mud and cuttings

Sub-structural techniques require the use of drilling fluids which mainly comprise water and bentonite, a type of clay which facilitates the drilling of pilot holes in rock. Additives (the usual additives for this type of work) may also be used to improve drilling performance.

A mixture of drilling fluids and cuttings are expelled from the bore hole during drilling operations.

When drilling pilot holes, the majority of the mixture is recirculated to the onshore entry point. This sludge is then recycled and reused.

During boring operations some of the drilling mud and cuttings may be re-circulated to the sea floor.

6.2.3 The subsea cable

The subsea cable is comprised of a pair of electrical cables as well as associated fibre optic link.

Each electrical cable is made up of a central section (called the "core") made from copper or aluminium wrapped in several layers of insulation and enclosed in protective metal outer layers (known as armouring). The cables have typical diameters of between 10 and 15 cm and masses of between 35 and 50 kg per metre.

6.2.3.1 Operations preceding installation of the cable

This stage prior to laying and burying the cable involves preparing and clearing the seabed to facilitate access for the trenching machine. Only certain sections of the route will require this depending on the characteristics of the seabed (obstacles, etc.).

Several types of preparation work are required:

- Survey prior to work;
- Clearance of obstacles;
- Clearance of the sea floor along the corridor;
- Levelling of sand waves.

Figure 18: Plough and grapple for clearing obstacles

6.2.3.2 Cable laying and protection

The cables are laid by a cable ship. These types of ships can currently carry sections of cable up to 100 km in length. Sections of cable can also be transported by another vessel and then loaded onto the cable ship for laying.

- **<u>Cable burial</u>**

Three techniques can be used to bury cables depending on the nature of the seabed in that particular location:

- <u>Jetting:</u> water jets are used to dig a trench or to fluidise the sediment enabling the cable to sink into the seabed under its own weight;
- <u>Ploughing:</u> this technique is suitable for coarse soils and soft rock (similar to ploughing a field);
- <u>Rock-cutting:</u> This technique is suitable for harder types of seabed (agglomerated rock or gravel). The seabed is cut using a chain saw or circular saw.

In general, a combination of several of these techniques is used to bury the cables, depending on the type of seabed encountered along the route.

The preferred approach for the project is to bury the cable. In areas where cable burial is not feasible, external cable protection techniques will be used (rock placement or mattressing – see below Figure 19).

- **<u>Cable protection</u>**

External protection is required to protect the cable in areas where trenching is not deemed feasible (i.e. due to the presence of hard rock or seabed obstacles that could not be cleared), or as a remedial secondary protection measure if the target depth of lowering (DOL) cannot be achieved.

The primary external protection approach is through rock placement.

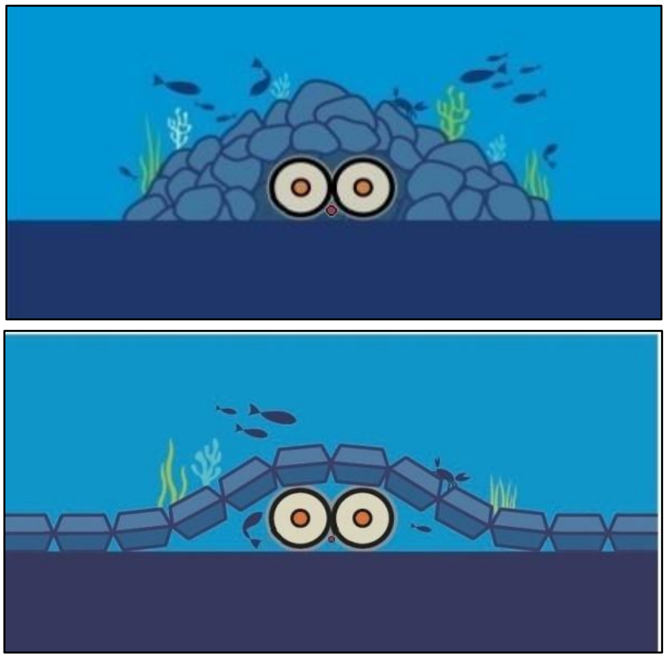
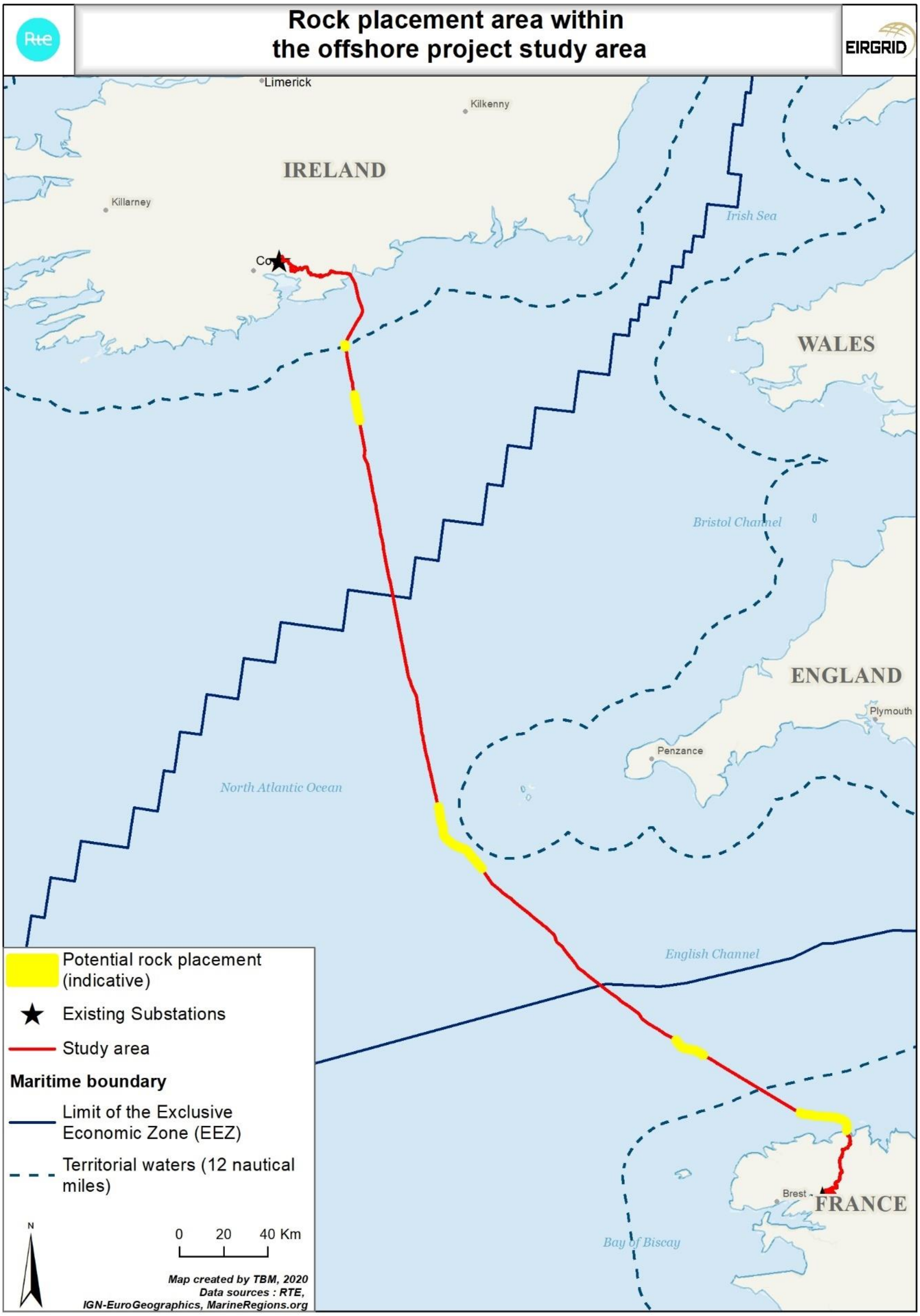


Figure 19: Conceptual illustration of rock placement (top) and a concrete mattress (bottom)

The following Map 23 shows the indicative locations of the main offshore work sites of the Celtic Interconnector project where it is currently anticipated that external protection may be required, i.e. the locations of proposed rock placement areas. This map is purely indicative and may be subject to further change. More details about the volumes of the rock placement that are required will be provided in the Environmental Report submitted as part of the Marine Licence application.



Map 23: Indicative Locations of offshore rock placement areas (Note this will only be confirmed in post-consent detailed survey and design)

6.3 Description of the baseline environment

6.3.1 Physical context

The following subsections are based on bibliographical data. These are the references that have been used:

ACRI-IN, Open Ocean (2018) – Celtic Interconnector Project - Definitive Corridor Study - Nearshore Section Metocean Study – RTE Report, 622p.

ACRI-IN, Open Ocean (2018) – Celtic Interconnector Project – Hydrosedimentary definitive study – RTE Report, 116p.

Chantraine J., Autran A., Cavelier C., *et al* (2003) – Geological map of France at 1:1,000,000.

BRGM edition, Garlan T., Marchès E. (2010) - Nature des fonds marins / SRM MC – Document SHOM, 6p

Osiris (2015) - Celtic Interconnector Marine Integrated Geophysical / Geotechnical Results Report. RTE – EirGrid. 108p. and appendixes

Pantin HM, Evans CDR. (1984) - The Quaternary history of the central and Southwestern Celtic Sea. Marine Geology 57: 259-293

Reynaud JY, Tessier B, Berné S, Chamley H, De Batist M. (1999) - Tide and wave dynamics on a sand bank from the deep shelf of the Western Channel Approaches. Marine Geology 161: 339-359.

6.3.1.1 Climatic conditions

6.3.1.1.1 Wind

Close to the Irish coast (Figure 20), the average wind speed varies between 6.5 m/s and 7 m/s. The prevailing wind direction is from the West (South-West, West, North-West).

The average wind speed exceeds 8 m/s over most of the identified cable route. A zone of strong winds is present in the Northern section of the route, between latitudes 51°N and 51.3°N, off the Irish coast. In this zone, average wind speed exceeds 8.6 m/s. Winds start to weaken around 50 to 75 km off the Irish coast.

The Isles of Scilly appear to have no effect on wind speeds. Most of the time the wind comes from the West (South-West, West, North-West). In the English Channel, although Westerly and South-Westerly winds still prevail, Northerly, North-Easterly and Easterly winds are also present, especially in anti-cyclonic weather conditions.

Winds start to weaken as they near the French coast. Along the coast of Brittany, the average wind speed is between 6 m/s and 6.5 m/s. Westerly and South-Westerly winds generally prevail. However, the distribution of headings shows that winds blowing from the Channel (North-Easterly) become dominant during April and May. South-Easterly winds, on the other hand, are very rare.

The winds are stronger in winter and weaker in summer. They are strongest between December and February and weakest between June and August. Seasonal variability is high and fairly uniform over the whole study area. Maximum winds are approximately 10 m/s stronger in winter than in summer.

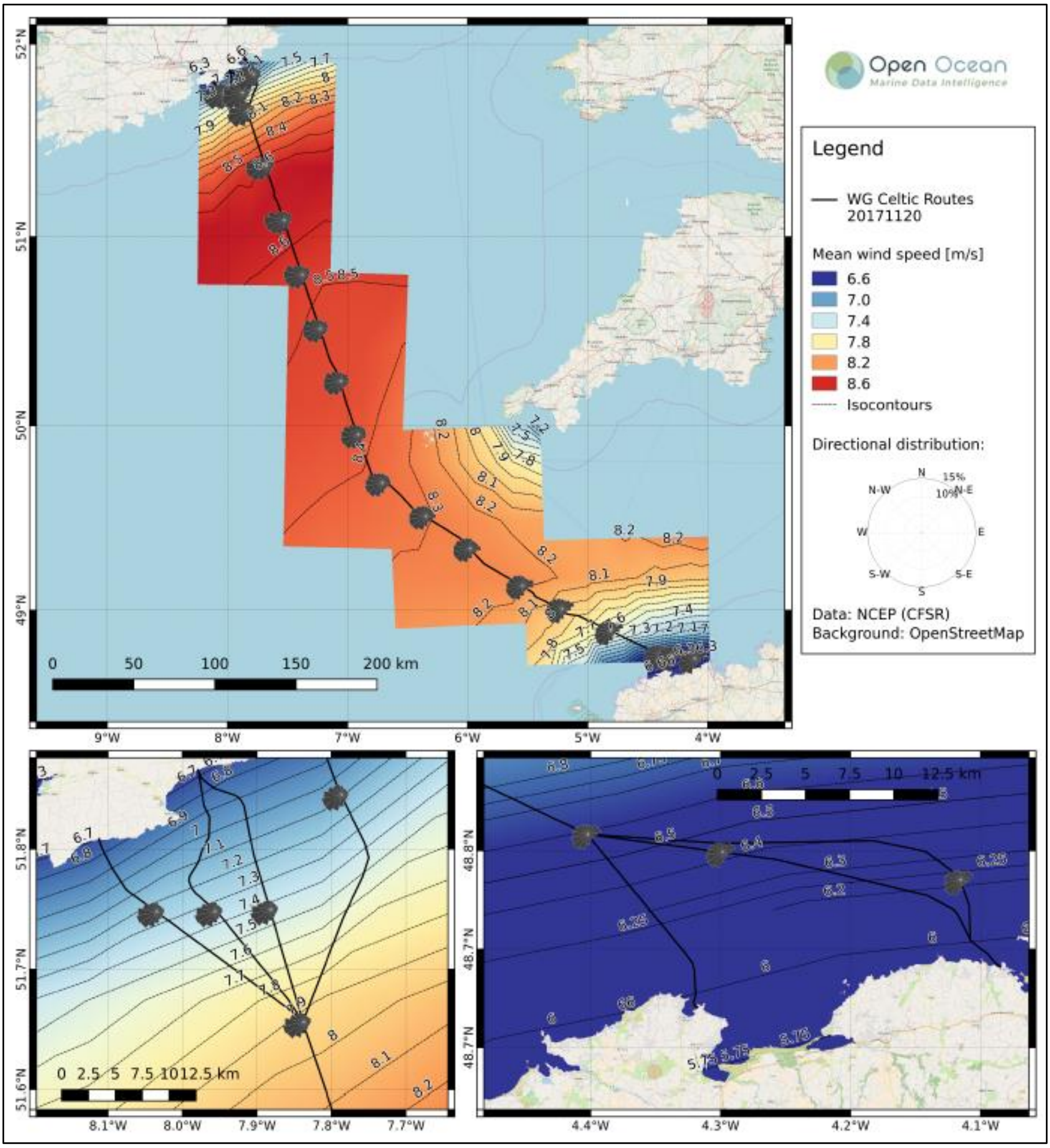


Figure 20: Annual average wind speed and distribution of average wind directions between Ireland and France. Source: Acri-IN and Open Ocean (2018)

6.3.1.2 Oceanographic conditions

6.3.1.2.1 Seawater temperature and salinity

The average annual water temperature rises north to south from below 12°C near the Irish coast to 13.5°C near the French coast. The average water temperature near the Irish coast is 13°C at the surface and 7°C at the sea floor. Offshore, the average water temperature is 11°C at the surface and 5°C near the sea floor. The average water temperature near the French coast is 11°C at the surface and 7°C at the sea floor.

Across the study area surface temperatures are at their highest in summer and lowest in winter, while sea floor temperatures are at their highest in autumn and lowest in spring.

Salinity also increases from North to South, from 34.5 mg/litre of seawater (annual average near the Irish coast) to 35.1 mg/litre of seawater (annual average near the French coast). Salinity remains very stable throughout the year in all areas. Consequently, variations in water density are mainly caused by temperature changes.

6.3.1.2.2 Ocean waves

Waves in the study area are caused by ocean swells and local winds blowing off the coast of Ireland into the English Channel.

High-energy swells from the Atlantic Ocean create harsh wave conditions across the entire offshore area. Wave heights begin to decrease at around 70 km from the coast, both on the Irish and French sides, mainly due to the dissipation by friction with the seabed (Figure 21). The highest wave heights are found to the West of the Isles of Scilly (6.3° W, 50° N). The energetic swells from the Atlantic affect most of the cable corridor with a Westerly angle of incidence. In the Irish section of the corridor, strong winds change the main direction of the swell to a WSW angle of incidence. Near the Irish shore, refraction caused by the seabed tends to align the waves along the bathymetric contours. The waves therefore come mainly from the South-West, and even from the SSW near Claycastle Beach. On the French side, waves tend to shift to the North or North-West in the coastal approaches. Swells are lower in the Irish coastal zone than in the French zone due to greater refraction.

Waves are higher and have longer periods in winter than in summer. Seasonal variability is significant beyond a distance of 2 km from the coastline, and lower near the Irish and French coasts. The directional distribution of waves remains constant throughout the year, with sea conditions being characterised by long swells and Westerly winds.

In quantitative terms, the average significant wave height generally varies between 2.5 m offshore and 1 m inshore. The maximum significant height values are above 12 m offshore, decreasing towards the coast.

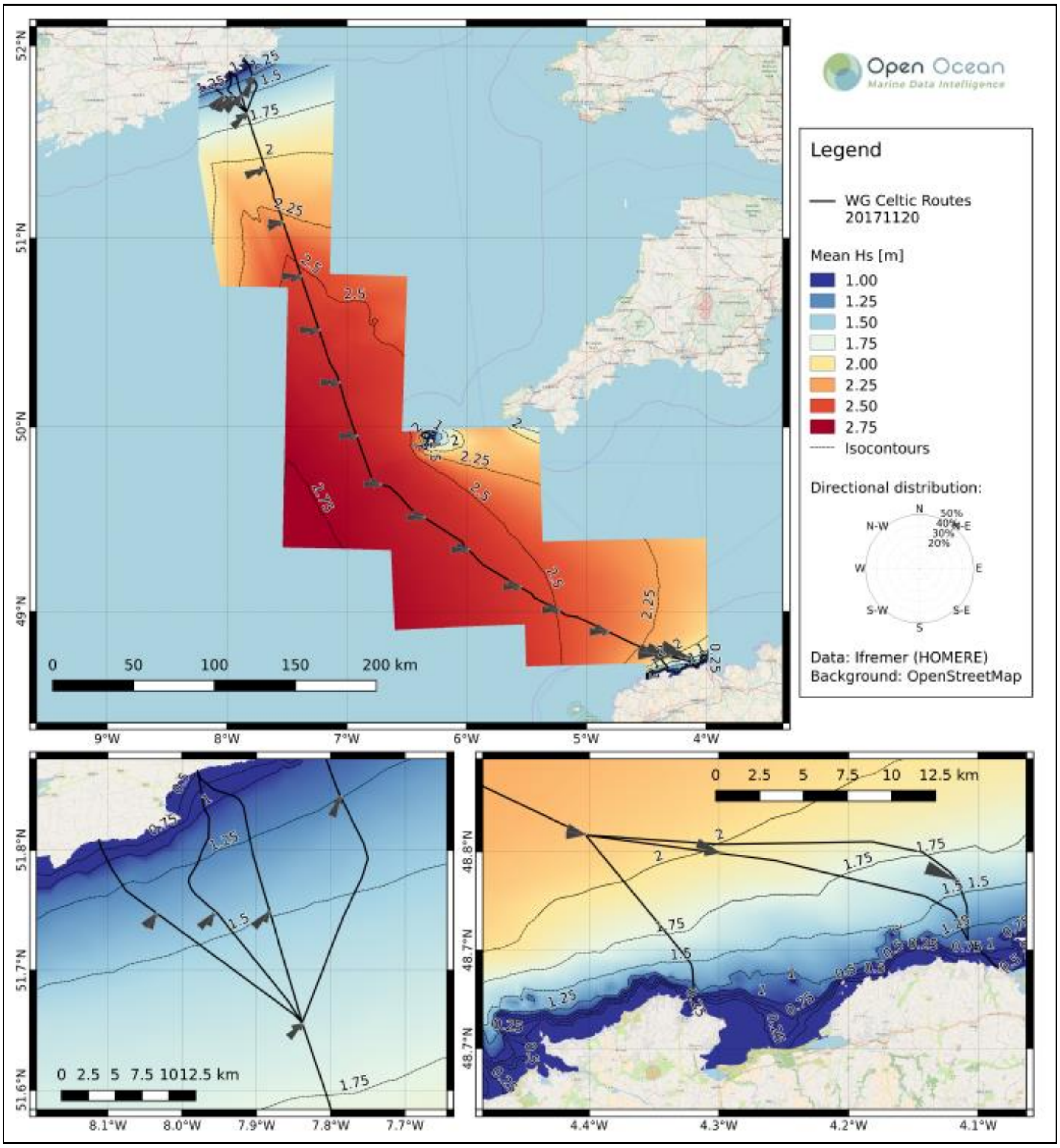


Figure 21: Annual average of significant wave heights and distribution of average wave directions between Ireland and France. Source: Acri-IN & Open Ocean (2018)

6.3.1.2.3 Ocean currents

The currents are generally tidal, becoming stronger near the French coast in the Western Channel.

In the Northern half of the cable corridor (Figure 22), current speeds are low (below 0.25 m/s on average) and decrease further nearer the Irish coast (below 0.175 m/s on average, due to tidal eddies).

Over most of the Southern section of the cable corridor tidal currents exceed an average of 0.3 m/s. Tidal currents travel along a WSW/ENE axis over the entire cable corridor, except within a radius of 100 km of the Isles of Scilly and in the deeper waters of the Western Channel where the tidal axis is oriented along the SW/NE axis.

At around 55 km from the French coast the current accelerates rapidly as the water depth decreases. The average current speed varies between 0.5 and 0.6 m/s up to a distance of around 10 km from the French coast. At the edge of the Breton coast, tidal currents decrease and vary between 0.1 m/s and 0.25 m/s, the highest values being recorded in open waters beyond 2 km from the shore. The tide therefore moves significant masses of water and generates strong ebbs and flows. Tidal currents are generally oriented along the East-West axis, but rotate in the West-South-East direction in the sectors closest to the shore. Nearer the shore, ebbs and flows are not aligned in the same direction, partly due to the presence of sheltered areas and very shallow waters.

Seasonal variations can be observed: tidal current speeds are fastest during equinoxes (spring and autumn) and during periods of strong winds in winter. Tidal currents are an essential factor in sedimentary motion within the study area, they also account for the absence of fine sediments (pelitic sediments (mud) in particular) in the Western Channel.

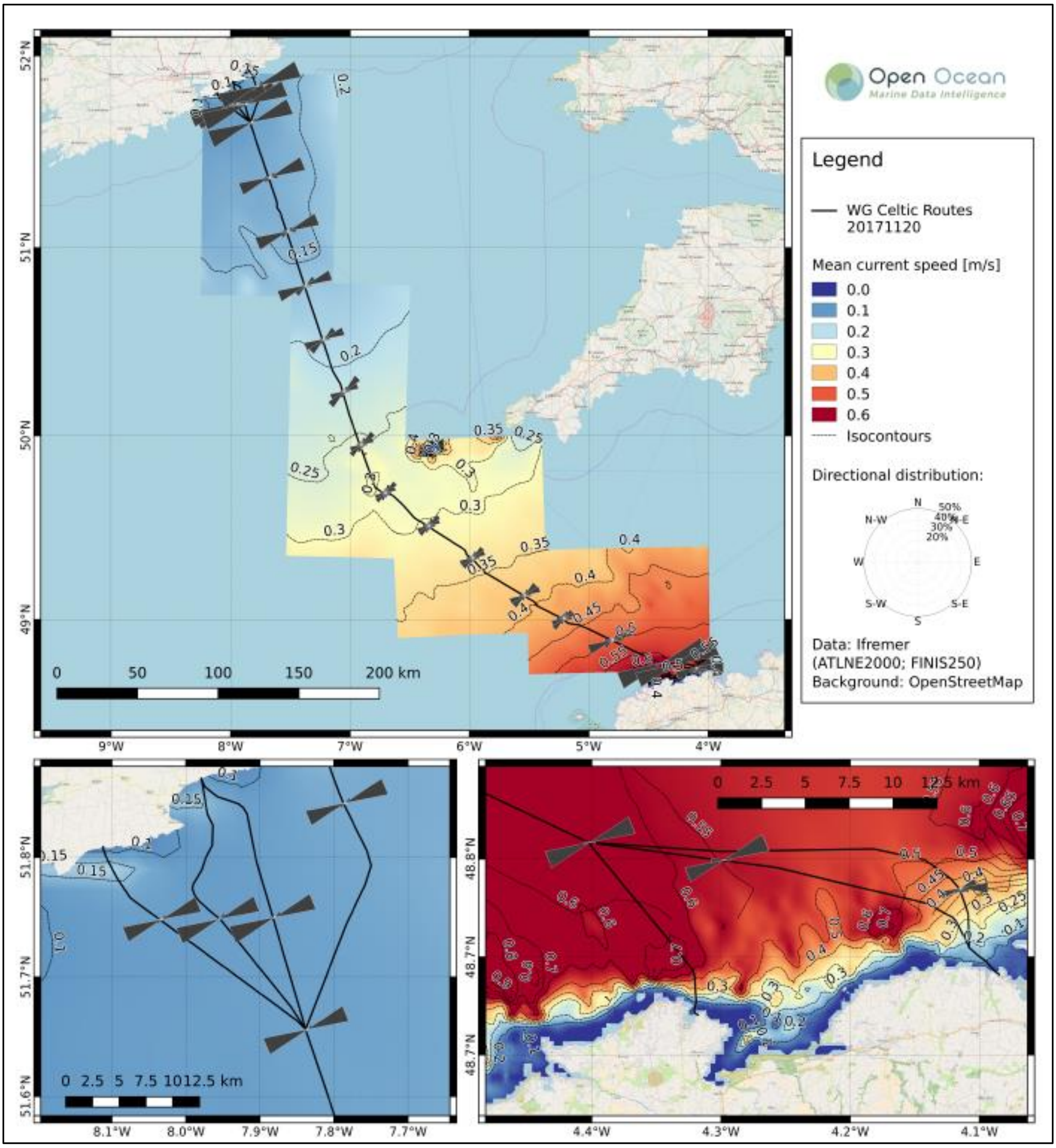


Figure 22: Annual average tidal current speeds and distribution of average tidal current directions between Ireland and France. Current headings are stated according to oceanographic conventions: direction of propagation ("going towards"). Source: Acri-IN & Open Ocean (2018).

6.3.1.3 **Geology**

The Celtic Sea is a relatively homogeneous geological region. Rocky outcrops comprising very old geological formations are mainly observed along the coasts of Brittany and Ireland. Along the Irish coastline the outcropping geological basement includes limestone and sandstone from the Carboniferous and Devonian eras (300 – 425 million years-old). In the immediate vicinity of the Isles of Scilly the substratum is granitic in nature (300 – 350 million years-old). In Brittany, the coastal fringe comprises the basement of the Hercynian orogeny of Leon. This basement consists of plutonic rocks and granitic complexes dating back 300 to 400 million years, which are outcropped to form rocky reefs and islands.

Offshore, the rocky substratum of the entire study area is covered with a layer of loose sediment that renders the morphology of the seabed flat. The geological substratum consists of successive Tertiary deposits laid down during alternating glacial and interglacial periods. The rocks that make up the Tertiary substratum are essentially sandy / clayey in nature, sometimes combined with the presence of coarser components (gravel, etc.). These Tertiary formations - Upper Paleocene and Eocene (30-65 million years-old) - lie discordantly on Cretaceous limestone and sandstone.

The surface layer of loose sediment was deposited during the last glacial period, less than a million years ago. There are two distinct units: (1) an intermediate unit consisting of gravels and pebbles (tens of cm thick) which creates a flatter morphology; and (2) an upper unit consisting of a sediment layer of variable thickness made up of sand formations (sand waves, sandy strips etc.).

The Table 6 below summarises the variations in the rocky basement encountered along the Celtic Interconnector route corridor.

Table 6: Bedrock along the Celtic Interconnector route corridor (Osiris, 2015)

Final KP (Kilometre Point)	Expected Rock Type	Eras(s)	Millions of years before present	EEZ
23	Limestone/Sandstone/Slates	Carboniferous/Devonian	304-423	Ireland
35	Chalk	Upper Cretaceous	72-113	
42.5	Lignites/Mudstones/Sandstones	Palaeogene	28-38	
93.5	Chalk	Upper Cretaceous	73-114	
185	Mudstones/Lignites/Sands	Palaeogene (Oligocene)	28-38	UK
231	Chalk	Upper Cretaceous	72-113	
235	Mudstones/siltstones	Permian/Triassic	208-303	
272	Slates/Sandstones	Permian/Triassic	208-303	
274	Sandy Clays	Lower Cretaceous	113-152	
308	Chalk	Upper Cretaceous	72-113	
310	Glauconitic Limestones	Palaeogene	28-38	
359	Clay/Sands	Eocene	38-59	
400	Silts/Mudstones/Sandstones	Neogene (Miocene)	7.25-28	France
421.5	Clays/Sandstones/Limestones	Eocene	38-59	
427	Chalk	Upper Cretaceous	72-113	
429	Mudstones/Sandstones	Lower Cretaceous	113-152	
470.5	Clays/Sandstones/Limestones	Eocene	38-59	
476	Clays/Sandstones/Chalk	Eocene/Cretaceous	38-113	
497.06	Granite/Other Igneous	Lower Palaeozoic	425-445	

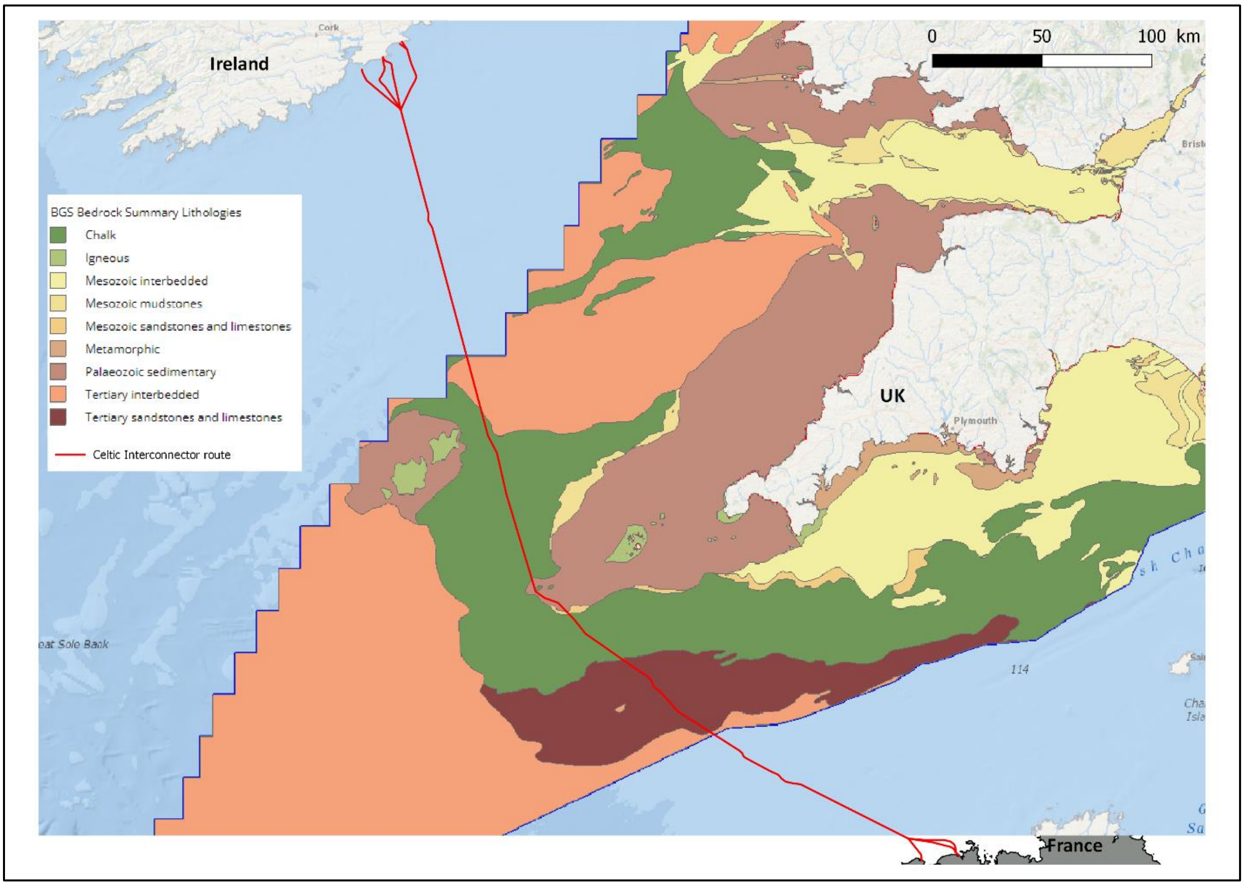


Figure 23: BGS bedrock lithologies in the UK section[9]

6.3.1.4 Morphobathymetry

The Celtic Sea can be divided into two distinct bathymetric zones:

- A broad and relatively flat interior platform extending to a depth of around 110 m;
- An exterior platform extending from approximately 110 m to the platform's edge at depths of 185 / 205 m. The exterior platform is dominated by a series of large sand banks, oriented in the NE / SW direction. Some of these sand banks are very large, such as the Kaiser Bank. They can reach lengths of several tens of km, particularly at the edge of the exterior platform.

The Celtic Interconnector corridor runs through the interior platform, where sand banks are absent.

However, the section of the corridor between the Isles of Scilly and France is characterised by the presence of large mobile sand waves. Geophysical surveys have located a large number of isolated sand waves (Barchan type) at depths of between 80 m and 110 m. Some of these sand waves approach heights of 10 m and create significant slopes. Geophysical observations have also shown that the sand waves are asymmetric. They have long flanks, with gradients generally below 5°, and shorter flanks, the gradients of which vary between 10° and 35° (Figure 8). Distances between the sand waves vary between 200 m and 1,500 m. The ridges have been observed to be between

[9] https://mapapps.bgs.ac.uk/

600 m and 1,200 m in length. These sand waves sometimes merge to form longer, curvilinear bodies. Most of the sand waves are oriented North North West (NNW) to South South East (SSE), with the steepest slopes generally facing West South West (WSW).

Based on available bathymetric data (RTE and EirGrid surveys, Shom, UKHO and GSI data), Figure 24 shows a cross-section along the route of the cable. Sediment thicknesses and the locations of sand mega ripples are also shown. The bathymetric profile highlights the presence of rocky outcrops of bedrock along the Irish and French coasts to a depth of 30 m, characterised by relatively steep gradients Rocky outcrops of bedrock extend out between 5 and 6 km from the Breton coast, and about 10 km from the Irish coast. The gradients are steep (1.2% on average, with locally higher values). There are transitional areas at both ends of the corridor between depths of 30 m and 80 m (between 15 and 25 km for the French part, 25 and 30 km for the Irish part).

The general gradients are shallower than those of the coastal fringe (0.2 to 0.4%), but the morphology of the seabed remains punctuated by the presence of rugged bedrock off the French coast. The morphology of the seabed is gentler below a depth of 80 m and does not exceed 110 m. The gradients are uniform and very shallow (less than 0.1%). At about 100 km from the Irish coast there is a well-defined sandy ridge located between depths of 90 m and 100 m. The sediment layer in this area is thicker than 2 m. Near Isles of Scilly, the morphology of the seabed is characterised by slightly raised areas.

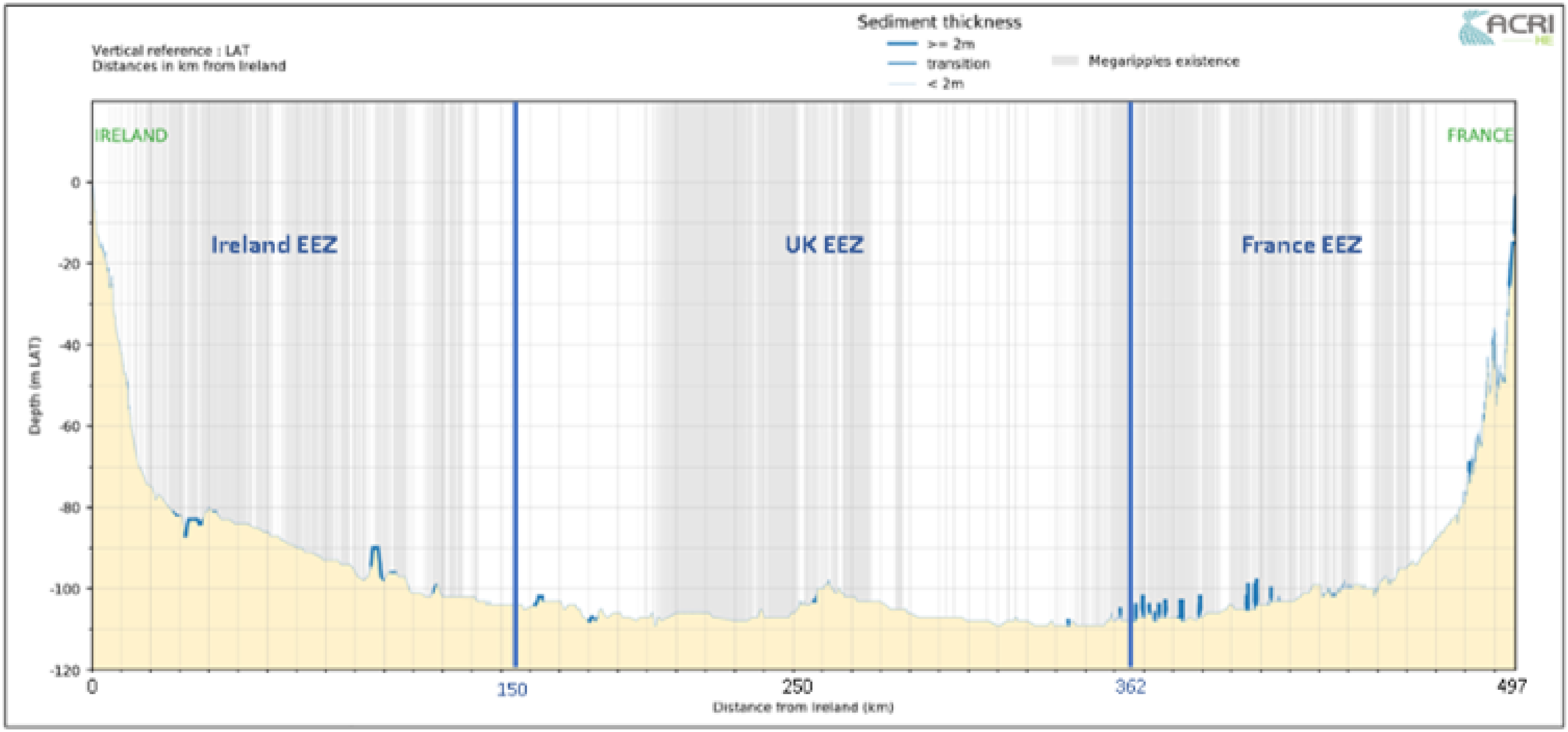


Figure 24: Bathymetric profile, sediment thickness and mega ripples along the Celtic Interconnector's main corridor (Source: RTE and EirGrid Celtic survey 2015)

6.3.1.5 Marine sedimentary environment

6.3.1.5.1 The sea floor

Rocky outcrops are common along the Irish coast (up to a distance of 15 km from the shore) and the French coast (up to 20 km from the shore), as well as near the Isles of Scilly. Sedimentary channels have been identified between the bedrock (limestone and sandstone) along the edge of the Irish coast. They are composed of gravelly sand / sandy gravel; mega ripples and blocks of glacial origin are also present. At the edge of the Brittany coast the seabed is mainly composed of exposed rocks (granites and plutonic rocks), with no visible sediment cover other than that found in small localised areas. Coarser sediments (sand, coarse sand, gravel) can also be observed as a thin surface layer resting on irregular surfaces of the bedrock. Localised depressions may be filled with sedimentary sand and coarse sand to thicknesses of 3 m. Fine sediments are almost completely absent.

Available sediment maps (EUSeaMap 2016, BRGM, BGS, Shom, Celtic Survey 2015) show that sediments on the interior platform of the Celtic Sea, above depths of 60 to 80 m, are mostly coarse to very coarse (gravelly sand / sandy gravel, gravel and small stones), with the presence of pebbles of glacial origin. Muddy sands are locally present, mainly in Irish Territorial Waters and to the North-West of the Isles of Scilly (Figure 25).

Alternating bands of sandy gravel and gravelly sand, with and without mud, can be observed along the length of the cable corridor. The coarser bed is frequently covered with sandy bodies (sand waves, strips of sand, etc.), particularly in the Southern section of the corridor between the Isles of Scilly and the French coast. Mega ripple-type sedimentary patterns are often observed within the gravelly sands. The distribution of mega ripples along the corridor is shown in Figure 24 Furthermore, a large number of blocks have been observed during geophysical surveys of the cable route corridor. These have been deposited by ice during glacial periods. The density of blocks is locally high, and they sometimes form fields on the sea bed.

Rocky outcrops are virtually non-existent in the cable corridor below a depth of 85 m, with the exception of a few occasional locations where the limestone substratum is exposed. This is particularly the case around the edges of the Channel River, which ran during periods of low sea level (over 20,000 years ago) and which is visible in the morphology of the seabed around 55 km from the French coast.

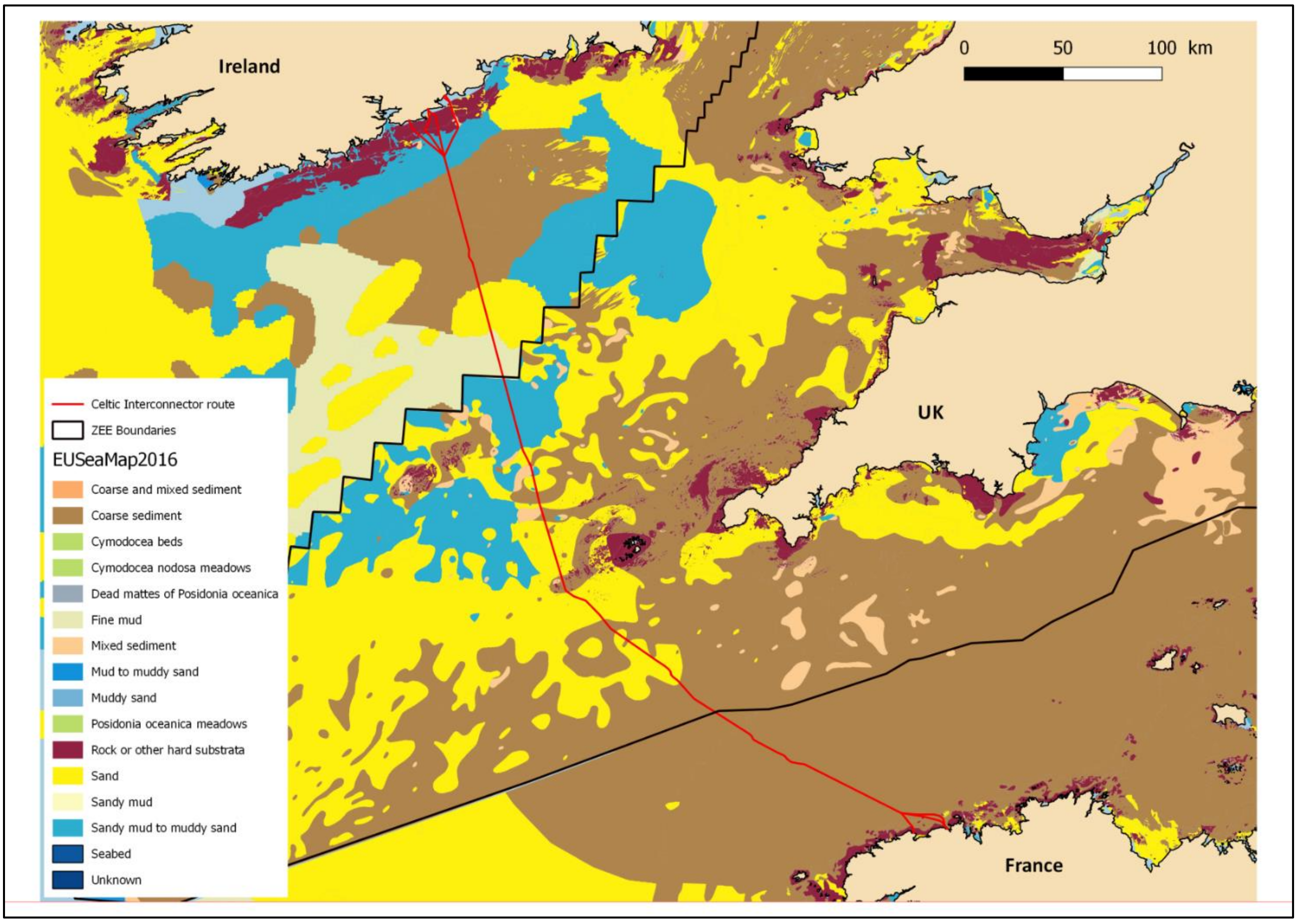


Figure 25: Emodnet Seabed Habitat dataset EUSeaMap 2016

6.3.1.5.2 Thicknesses of sediment layers

Throughout the offshore cable route, loose sediments are most often less than 2 m thick, with the exception of mobile sand dunes (the largest can be up to 8 m thick). Sediment thicknesses greater than 2 m are shown in the bathymetric profile in the Figure 24.

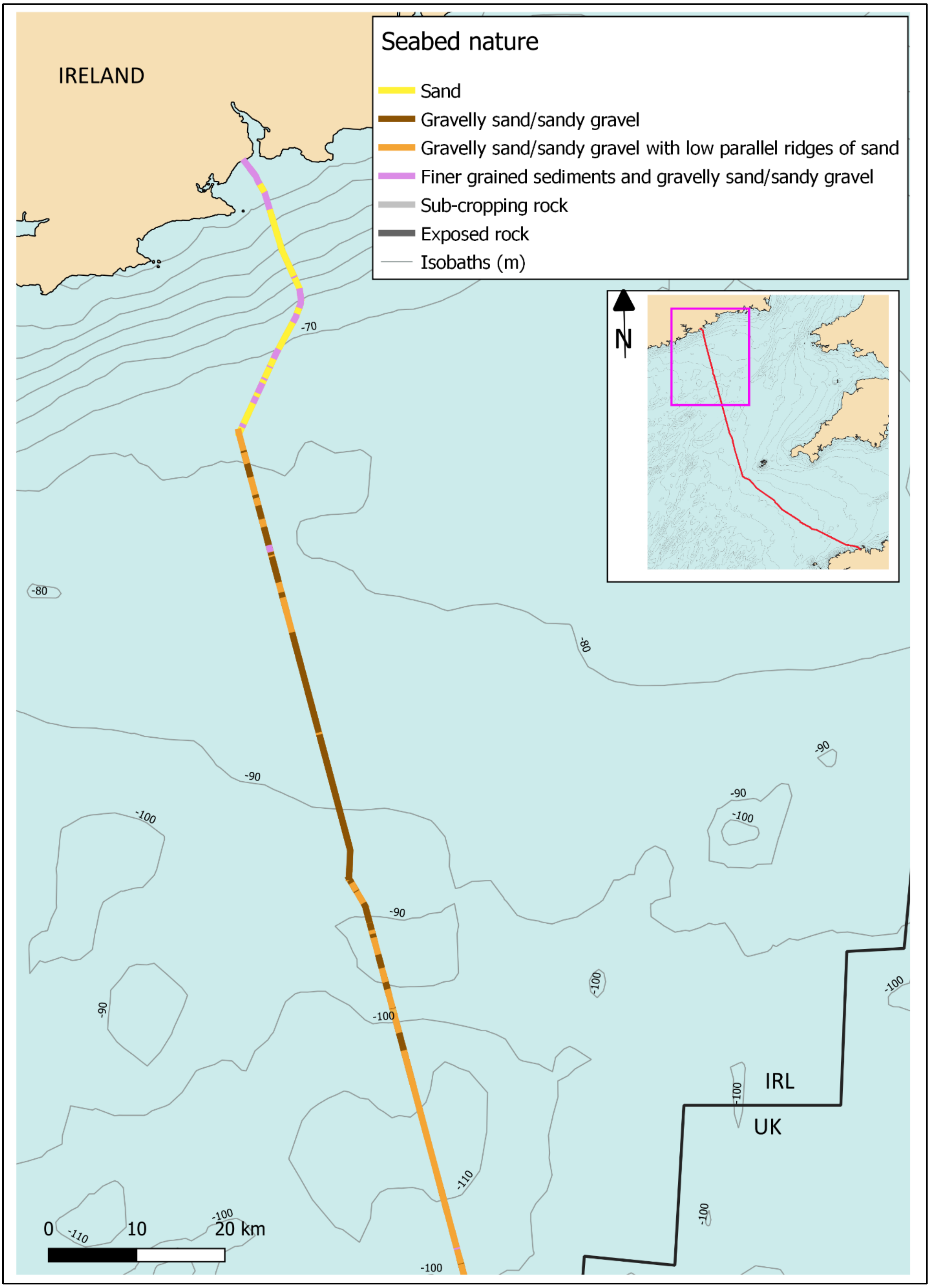


Figure 26: Seabed characteristics along the Celtic Interconnector route corridor – Ireland's EEZ

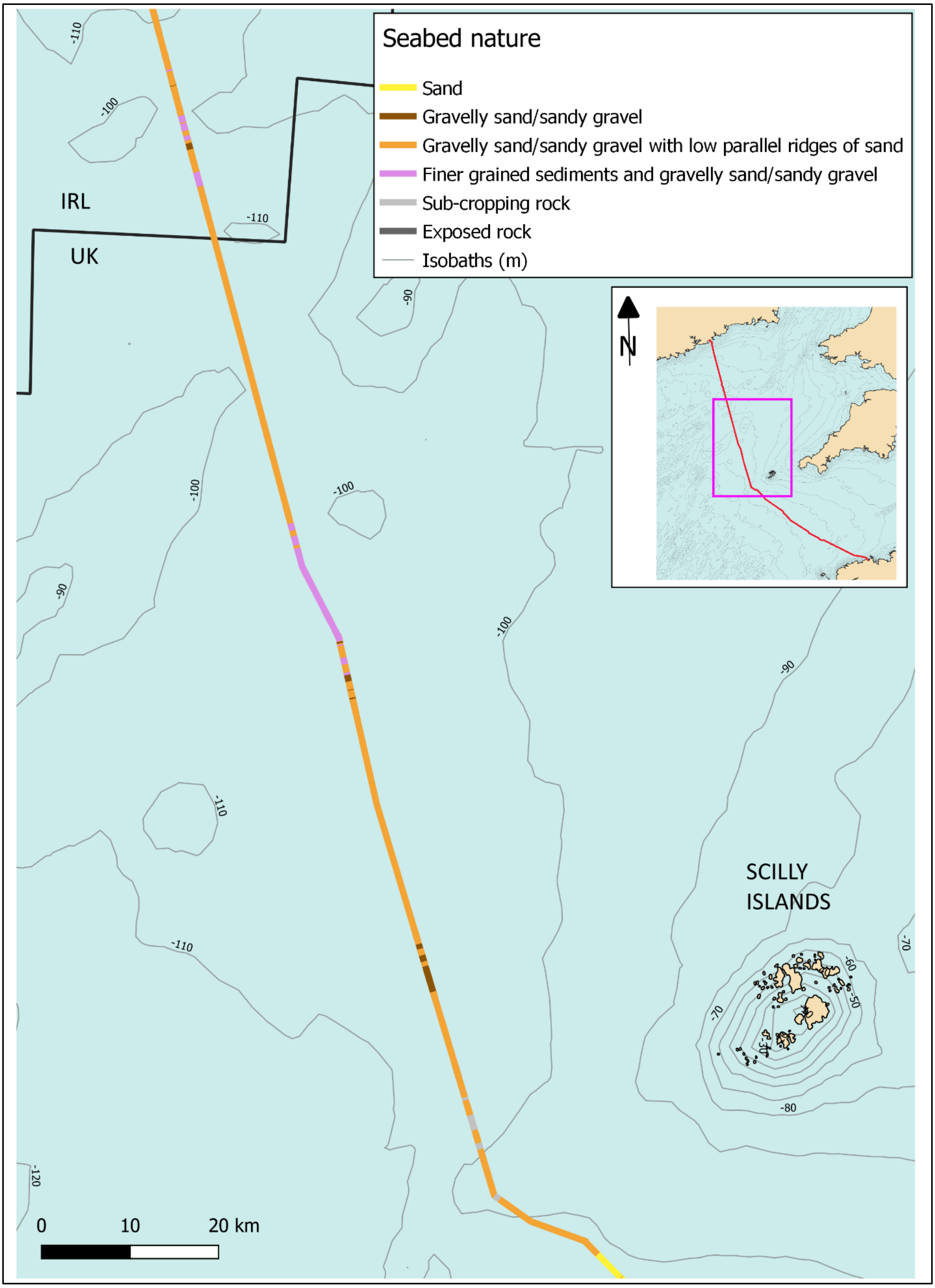


Figure 27: Seabed characteristics along the Celtic Interconnector corridor – Northern section of UK's EEZ

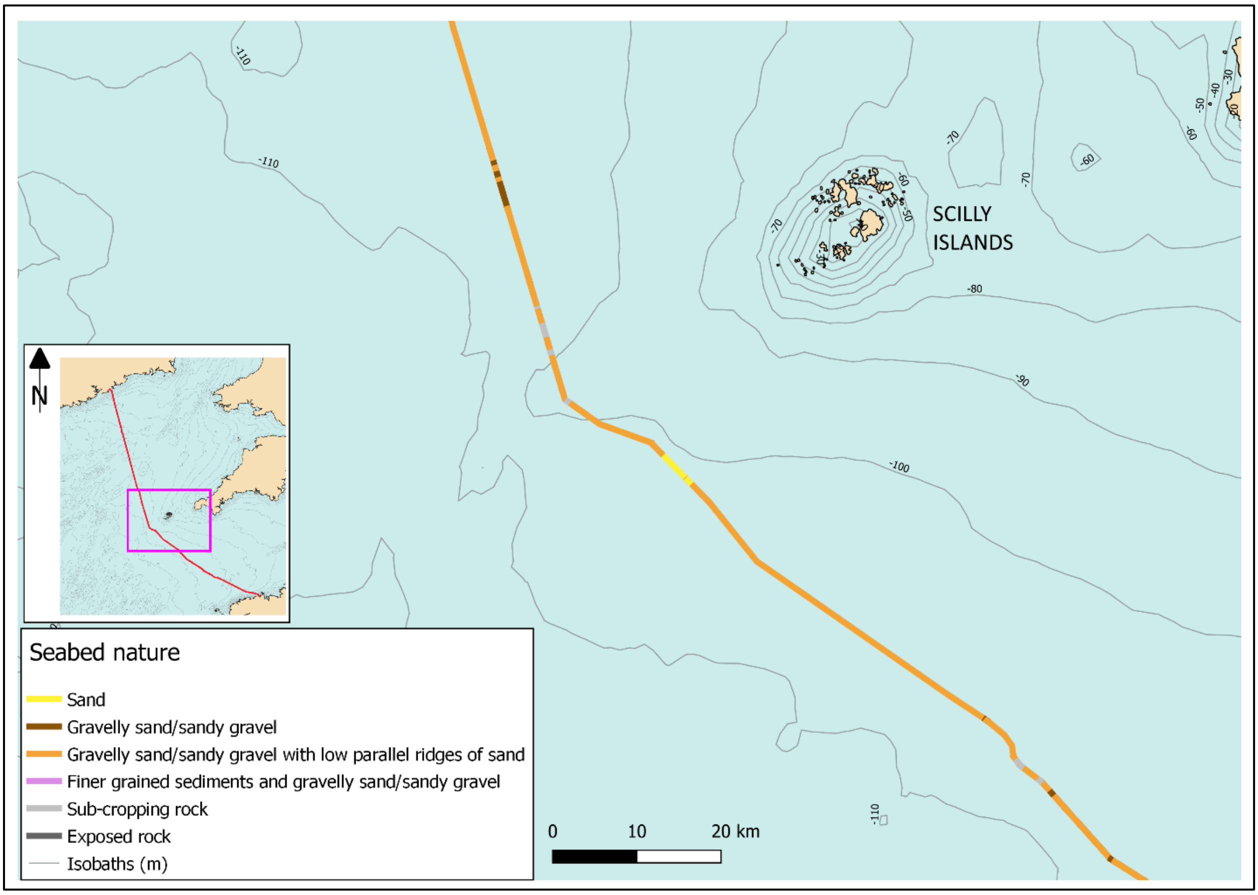


Figure 28: Seabed characteristics along the Celtic Interconnector corridor – Southern section of UK's EEZ

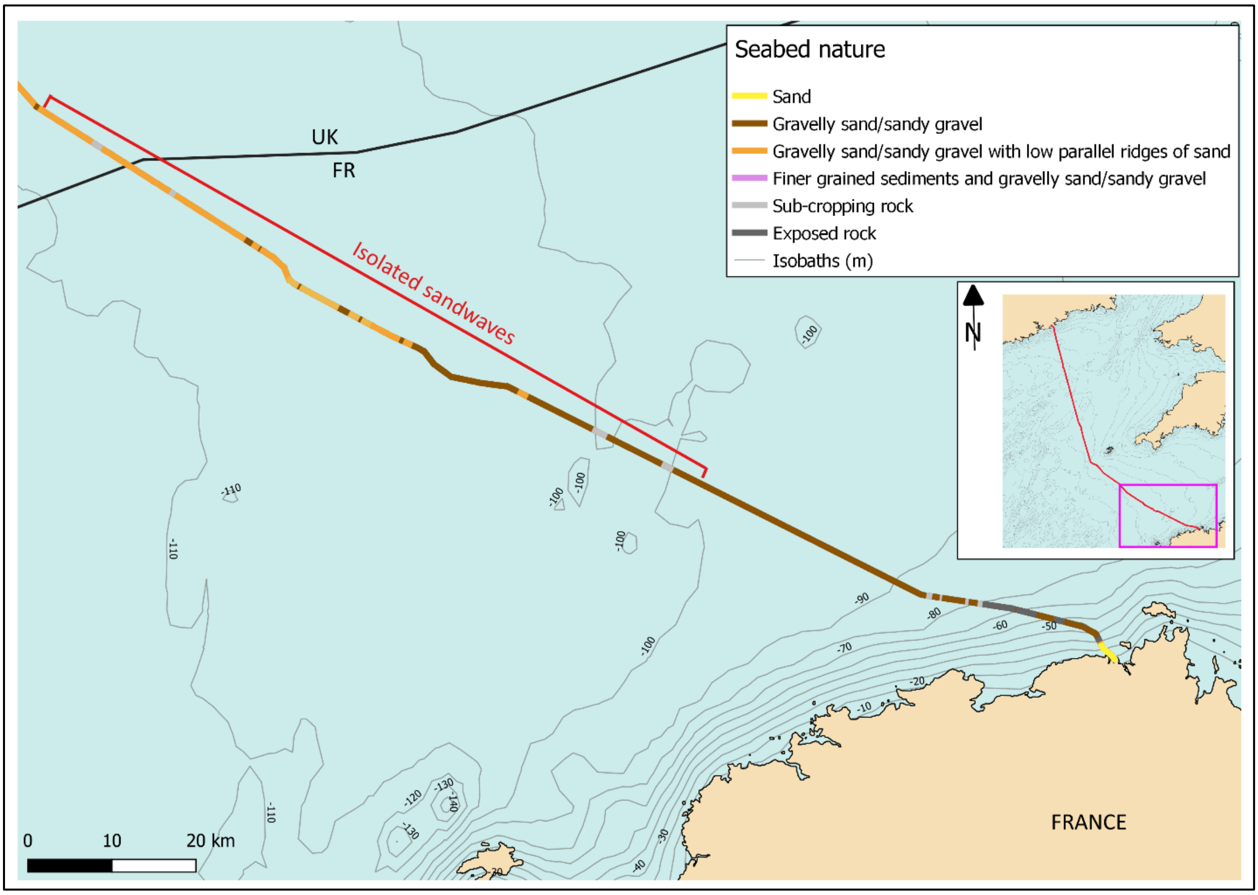


Figure 29: Seabed characteristics along the Celtic Interconnector corridor – France's EEZ

6.3.1.6 Sediment dynamics

To a depth of approximately 15 m near the Irish landfall point, the direction of sedimentary transport is generally north to south (Figure 30). Sediments are transported downwards between rocky outcrops. Between depths of 15 m and 80 m in Irish Territorial Waters, the direction of sedimentary transport is oriented in the 45° - 225° direction, usually parallel to the isobaths and generally characterised as coastal drift. Below depths of 80 m, sedimentary motion follows an ENE-WSW (67° - 247°) direction, transporting sediments along the main axis of the Celtic Sea. Figure 31 illustrates sedimentary thicknesses which may be impacted by sediment remobilisation within the cable corridor in Irish Territorial Waters. Thicknesses remains relatively low, most often below 1 m.

At the approaches to the Isles of Scilly in UK EEZ, sediments move gradually moving along an East-West axis (90° - 270°, Figure 32). Moving south from the Isles of Scilly, the direction of sedimentary transport returns to East North East (ENE)-WSW (67° - 247°), transporting sediment along the main axis of the English Channel (Figure 34). In UK EEZ, it appears that the maximum thickness of sediments which may potentially be subject to remobilisation is 1.5 m, these appear in the most southerly section (Figure 35). Off the coast of the Isles of Scilly the thickness of sediments that could be mobilised is generally less than 1 m.

At depths below 80 m in French territorial waters the direction of sedimentary transport is 67° - 247° (ENE-WSW), the currents flow along the main axis of the English Channel

(Figure 36). Furthermore, the morphology of the mobile sand dunes and the presence of polarised sedimentary structures both indicate that the direction of sedimentary transport is in the WSW direction (247°), which creates a tendency for sediments to be transported out of the English Channel. Approaching the coast at depths between 20 m and 60 m, sedimentary transport turns in the SE-NW (135° - 315°) direction. Along the French coast (0 to -20 m deep), the direction of sedimentary transport is North-South (0° - 180°). Sediments are therefore transported perpendicular to the coastline, restricted by the presence of sedimentary corridors located between rocky outcrops. The maximum thickness of sediment likely to be remobilised under the influence of oceanographic constraints in French Territorial Waters is 1.5 m (Figure 37). This maximum thickness is observed at depths around 50 m. In other areas, the thicknesses of mobile sediments are less than 1 m.

- Special case - isolated mobile sand waves

Many large isolated mobile sand waves (Barchan type) have been observed at depths below 80 m, straddling French and British Territorial Waters. According to the literature, these large isolated mobile sand waves have a tendency to migrate across the sea floor. Sea bed current calculations, based on grain size show that the deepest sand waves at 180 m are still active under the action of tidal currents. Furthermore, swells can have an impact down to depths of 140 m, and so contribute to the migration of sand waves even at depths below 70 m. However, due to the depths involved, swells probably only affect the morphology of the sea bed a few days each year during storms. According to Garlan and Marchès, the migration speeds of sand waves in the Western Channel do not exceed 10 to 20 m per year. However, the results of the hydro-sedimentary study carried out by ACRI-IN and OpenOcean for EirGrid and RTE inside the immediate study area indicate that the large isolated mobile sand waves migrate between 0 and 7 m per year.

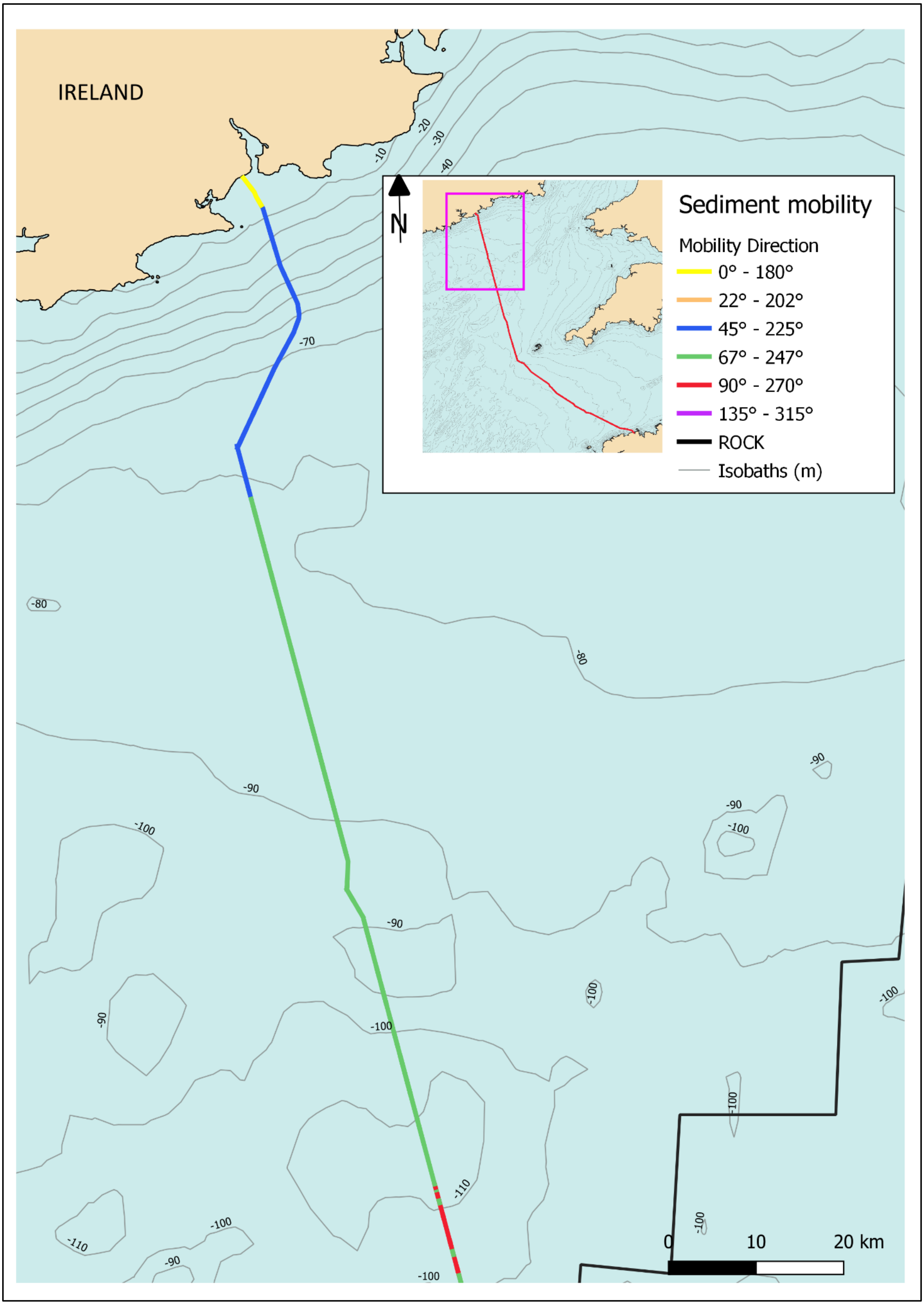


Figure 30: Sediment direction of transport (in degrees) – Ireland's EEZ

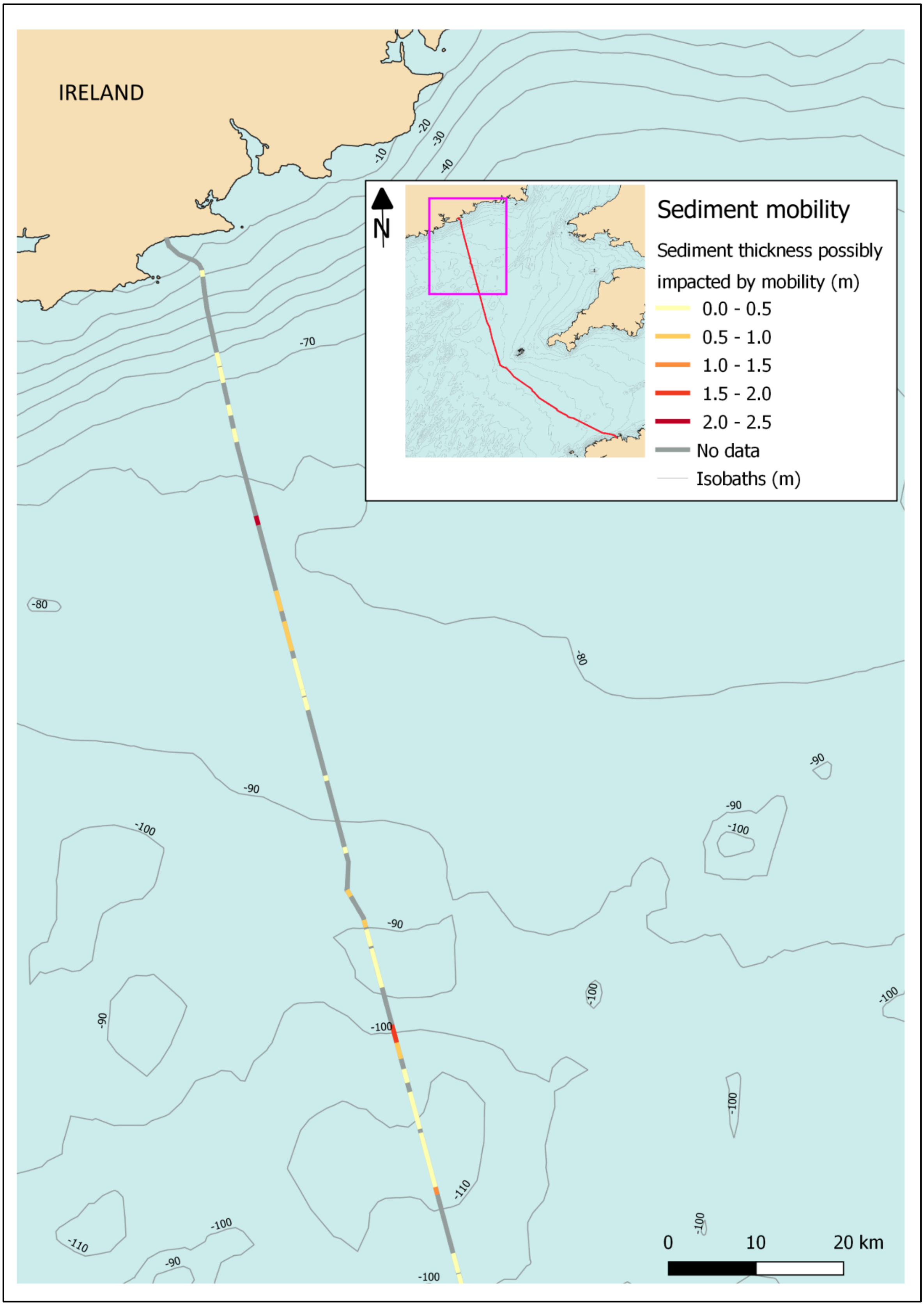


Figure 31: Sediment thickness potentially impacted by mobility – Ireland's EEZ

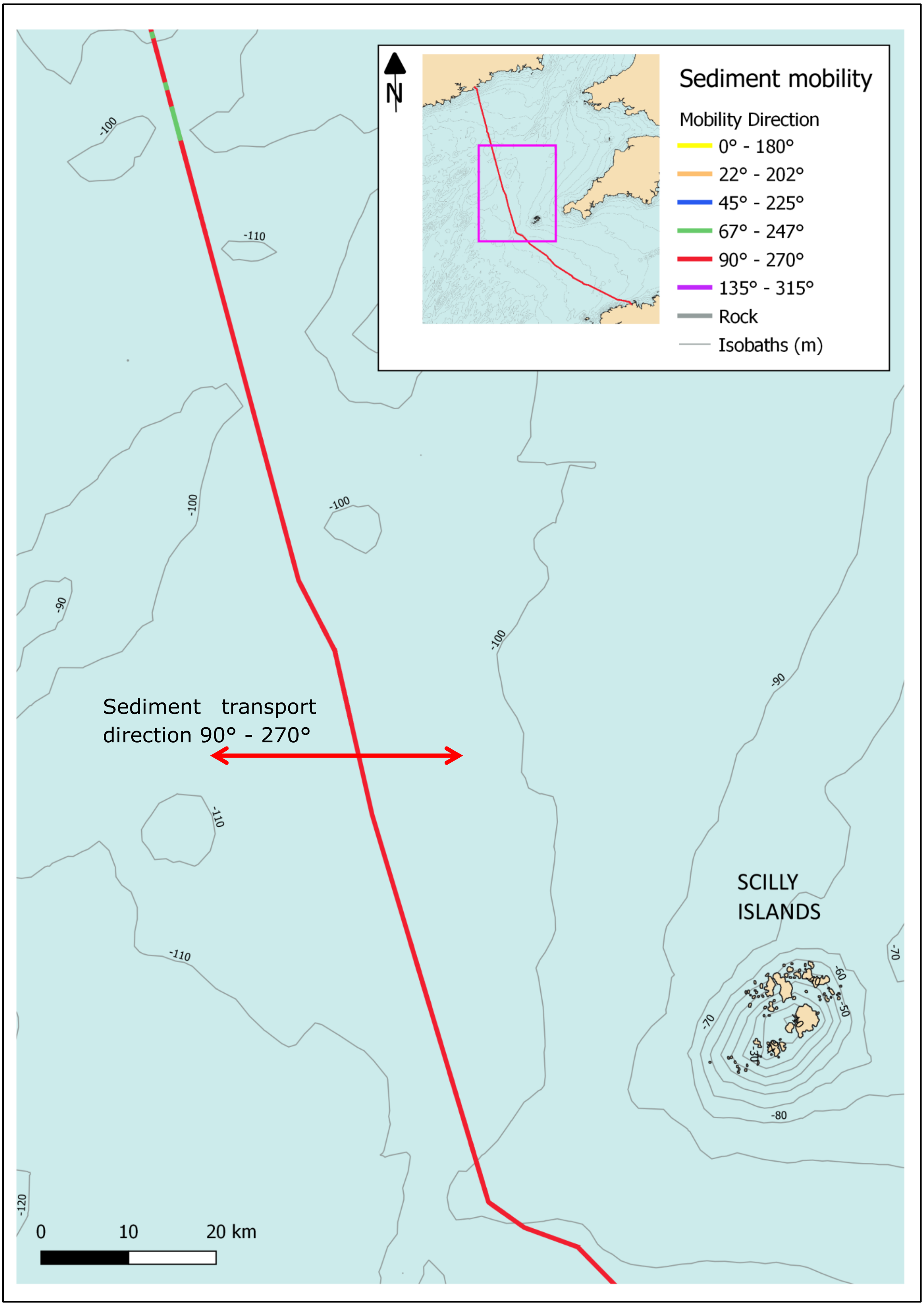


Figure 32: Sediment direction of transport (in degrees) – Northern section of UK's EEZ

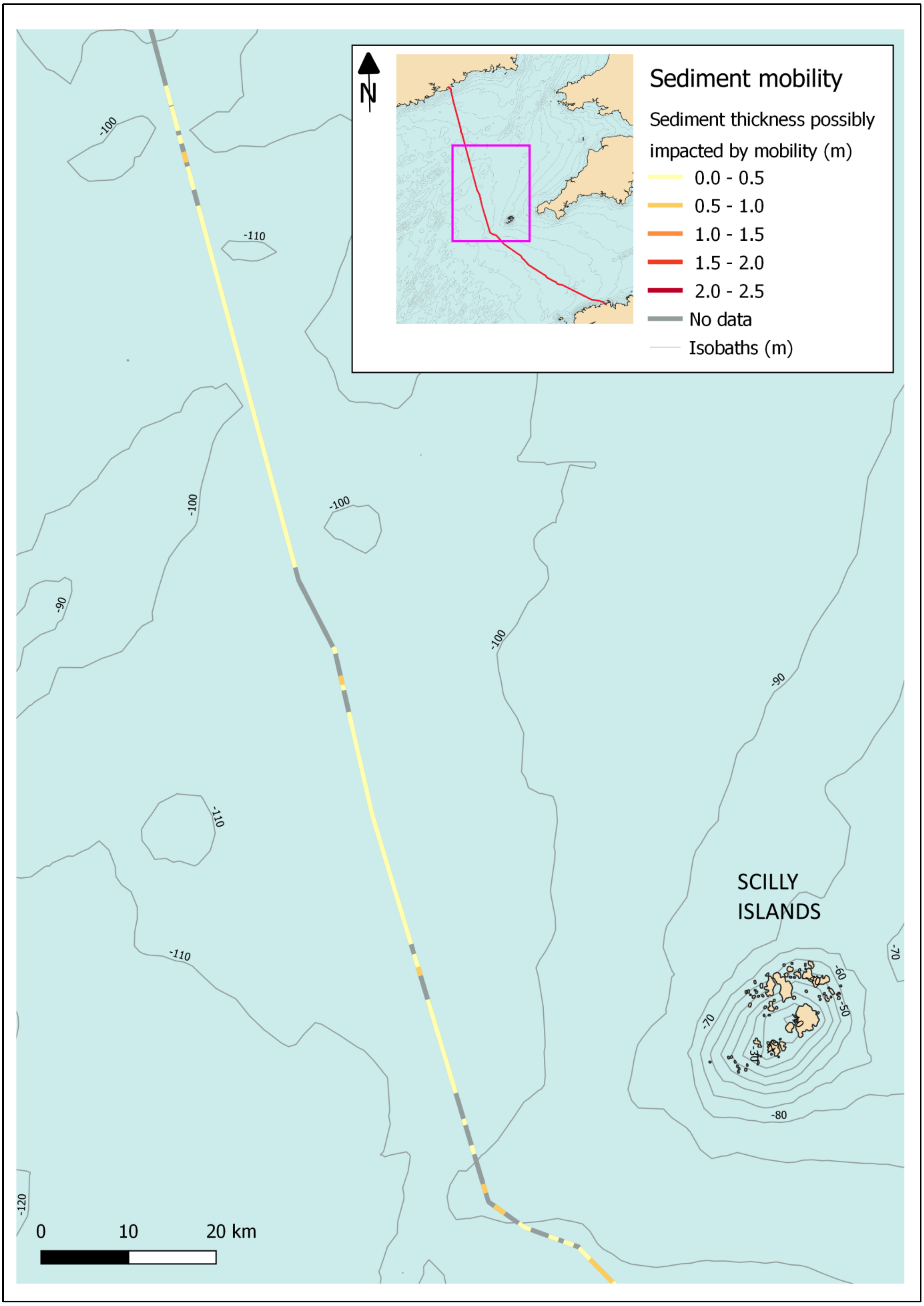


Figure 33: Sediment thickness potentially impacted by mobility – Northern section of UK's EEZ

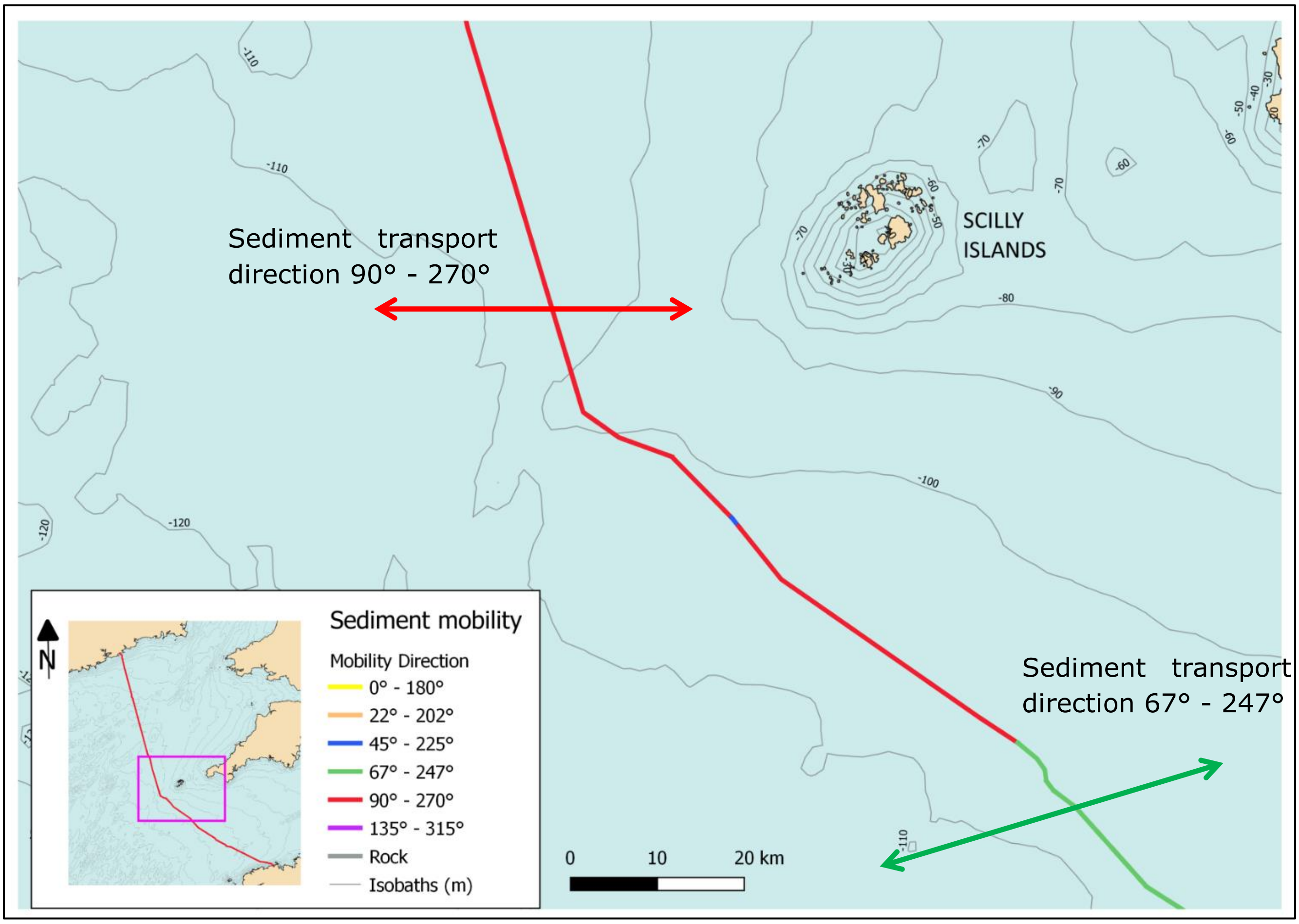


Figure 34: Sediment direction of transport (in degrees) – Southern section of UK's EEZ

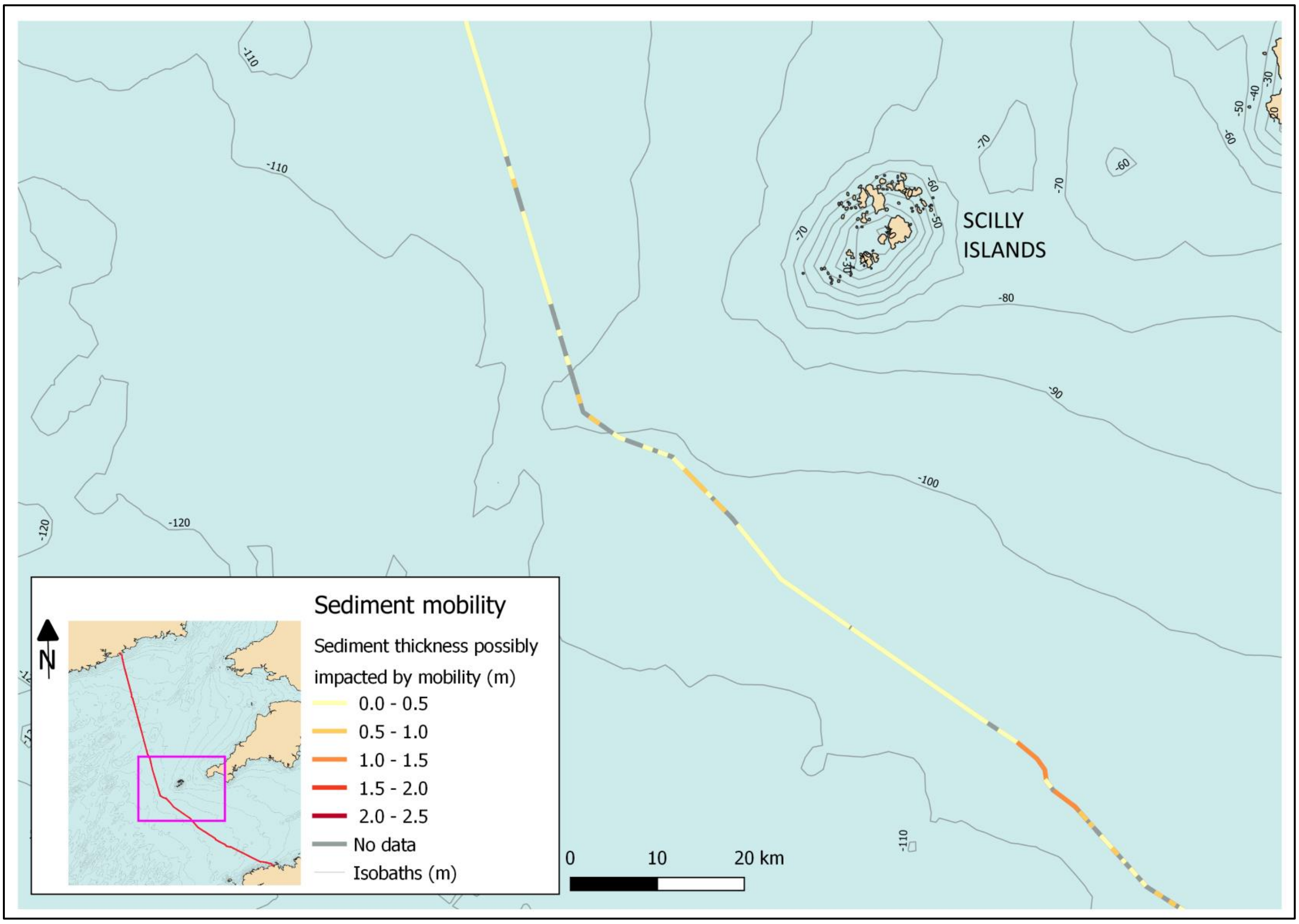


Figure 35: Sediment thickness potentially impacted by mobility – Southern section of UK's EEZ

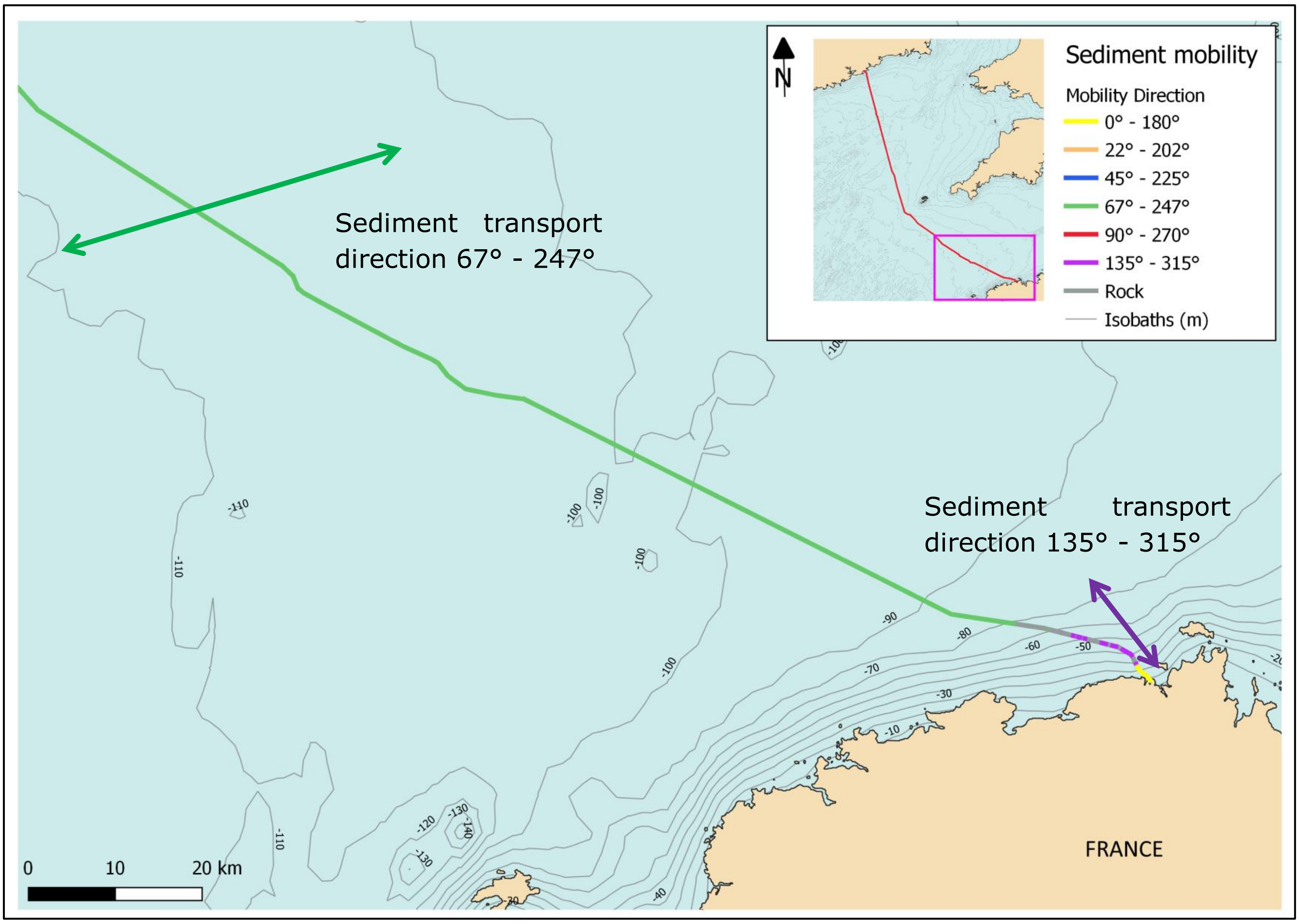


Figure 36: Sediment direction of mobility (in degrees) – France's EEZ

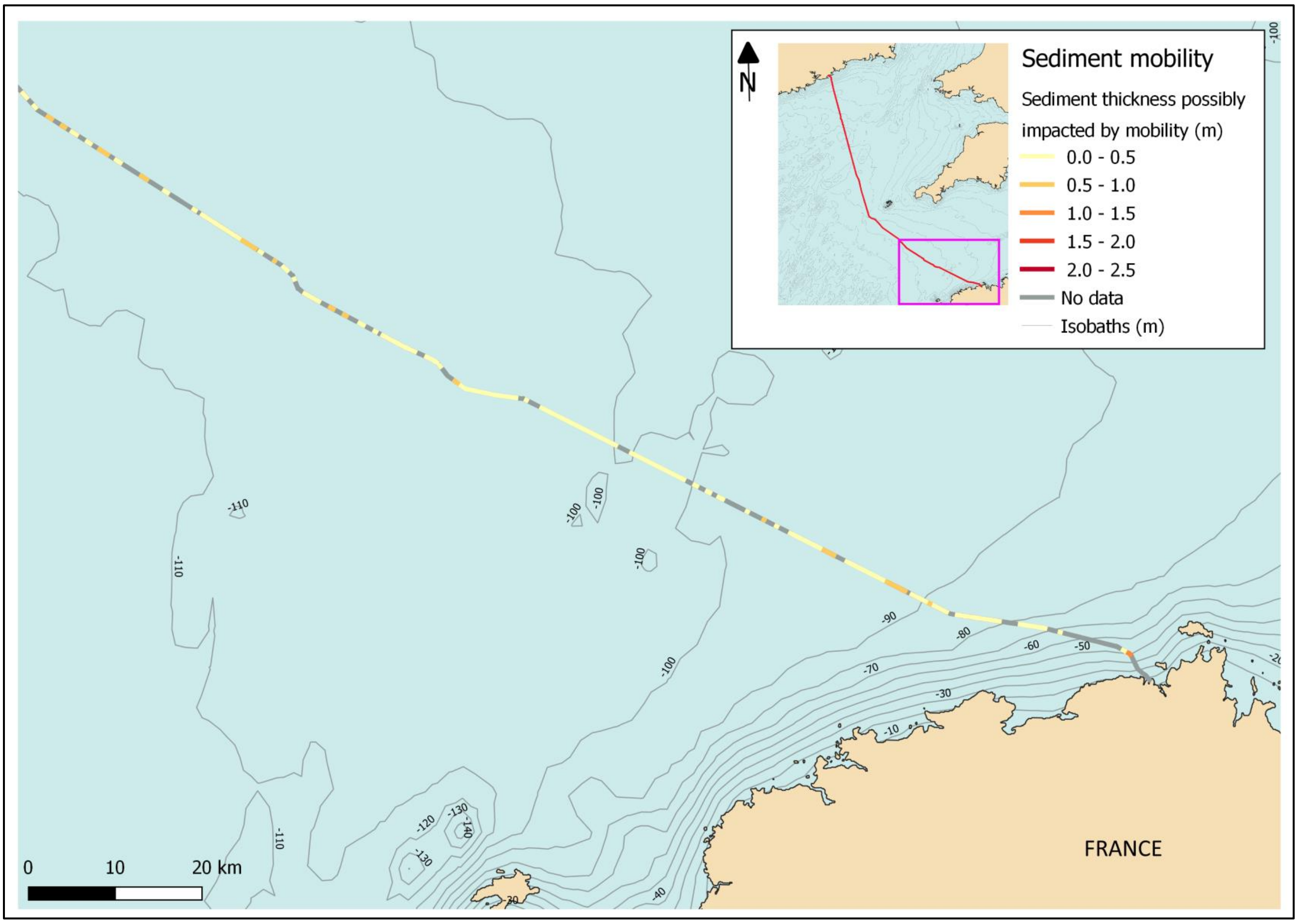
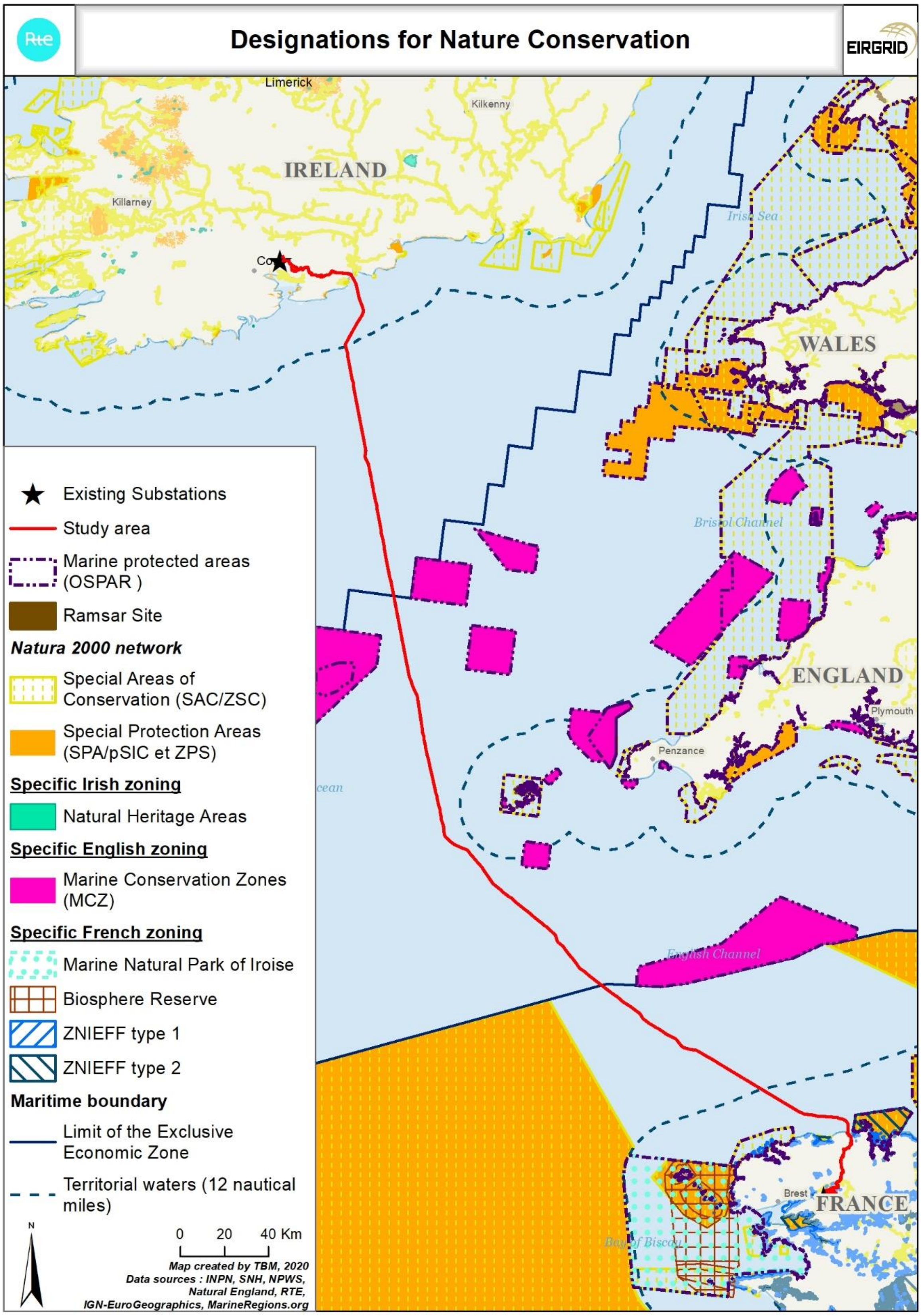


Figure 37: Sediment thickness potentially impacted by mobility – France's EEZ

6.3.2 <u>Biodiversity</u>

The following Map 24 shows all sites designated within the European Natura 2000 protected areas network as well as nationally designated nature conservation sites existing in the maritime territory.

It also shows that the maritime corridor avoids all Natura 2000 sites and other conservation and / or protection zones within the three jurisdictions (Marine Conservation Zones in England, Marine Nature Parks and Biosphere Nature Reserves in France).



Map 24: Locations of all areas designated for nature conservation

Natura 2000 sites are present along the coastlines of all 3 countries and also off the coast of France. These Natura 2000 sites include:

- Sites designated under Directive 92/43/EEC for:
    - Marine habitats as Sandbanks, Mudflats and sandflats not covered by seawater at low tide, Reefs, High energy circalittoral rock and moderate energy circalittoral rock.
    - Grey Seals;
    - Common porpoises;
    - Bottlenose dolphins;
    - *Halichoerus grypus;*
    - Fishes: *Petromyzon marinus* (Sea Lamprey), *Lampetra planeri* (Brook Lamprey), *Lampetra fluviatilis* (River Lamprey), *Alosa fallax fallax (*Twaite Shad*), Salmo salar (*Salmon*)*.
- Sites designated under Directive 2009/147/EC:
    - Sea bird habitats, some species list here: Wigeon (*Anas penelope*), Teal (*Anas crecca*), Ringed Plover (*Charadrius hiaticula*), Golden Plover (*Pluvialis apricaria*), Grey Plover (*Pluvialis squatarola)* , Lapwing (*Vanellus vanellus*) , Sanderling (*Calidris alba*) , Dunlin (*Calidris alpina*) , Black-tailed Godwit (*Limosa limosa*), Bar-tailed Godwit (*Limosa lapponica*) , Dunlin (*Calidris alpina*), Curlew (*Numenius arquata*) , Redshank (*Tringa totanus*) , Turnstone (*Arenaria interpres*); Black-headed Gull (*Chroicocephalus ridibundus*) ,Common Gull (*Larus canus*), Lesser Black-backed Gull (*Larus fuscus*), Little Grebe (*Tachybaptus ruficollis*) , Great Crested Grebe (*Podiceps cristatus*) , Cormorant (*Phalacrocorax carbo*), Grey Heron *(Ardea cinerea*), Shelduck (*Tadorna tadorna*), Pintail (*Anas acuta*) , Shoveler (*Anas clypeata*) , Red-breasted Merganser (*Mergus serrator*).

Consideration has been given to the following list of Natura 2000 sites as part of the whole project impact assessment study on Natura 2000 (the approximate distances between the Natura 2000 sites and the proposed cable route are provided in brackets).

A distinction is made between sites falling under the Habitats Directive (sites that are designated as SAC: Special Area of Conservation / ZSC: Zone Spéciale de Conservation) and sites falling under the Birds Directive (sites designated as SPA: Special Protection Areas / ZPS: Zone de Protection Spéciale).

In Ireland:

- Lower River Shannon SAC (76km)
- West Connacht Coast SAC (228km)
- Roaringwater Bay and Islands SAC (107km)
- Blasket Islands SAC (179km)
- Rockabill to Dalkey Island SAC (189km)
- Lambay Island SAC (212km)
- Slaney River Valley SAC (96km)
- Saltee Islands SAC (78 km)
- Ballycotten Bay SPA (12.5km)
- Ballymacoda Bay SPA (1.3km)
- Beara Peninsula (118km)
- Blasket Islands SPA (182km)
- Clare Island SPA (284km)
- Cliffs of Moher SPA (156km)
- Cork Harbour SPA (22km)

- Cruagh Island SPA (31km)
- Deenish Island and Scariff Island SPA (241km)
- Duvillaun Islands SPA (218km)
- Helvick Head to Ballyquin SPA (75km)
- High Island, Inishshark and Davillaun SPA (198km)
- Iveragh Peninsula SPA (266km)
- Kerry Head SPA (221km)
- Lambay Island SPA (225km)
- Magharee Islands SPA (177km)
- Mid-Waterford Coast SPA (104km)
- Puffin Island SPA (175km)
- Saltee Islands SPA (84km)
- Skelligs SPA (183km)
- Stags of Broad Haven SPA (224km)
- The Bull and The Cow Rocks SPA (101km)
- Wexford Harbour and Slobs SPA (294km)

In the UK:

- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC (283km)
- Cardigan Bay / Bae Ceredigion SAC (236km)
- Bristol Channel Approaches / Dynesfeydd Mor Hafren SAC (103km)
- North Anglesey Marine / Gogledd Mon Forol SAC (329km)
- North Channel SAC (410km)
- West Wales marine / Gorllewin Cymru Forol SAC (162km)
- Isles of Scilly Complex SAC (23km)
- Isles of Scilly SPA (27km)
- Pembrokeshore Marine / Sir Benfro Forol SAC (154km)
- Grassholm SPA (172km)
- Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA (109km)
- St Kilda SPA (793km)
- Rum SPA (696km)
- Copeland Islands SPA (461km)

In France:

- ZSC et ZPS Talus du Golfe de Gascogne – Mers Celtiques (24 km)
- ZSC et ZPS Nord Bretagne (74 km)
- ZSC et ZPS Côte de Granit rose- Sept Iles (31 km)
- ZSC et ZPS Baie de Morlaix (2 km)
- ZSC et ZPS Baie de Goulven - Dunes de Keremma (7 km)
- ZSC Guissény (19 km)
- ZSC Abers Côte des Légendes (20 km)
- ZSC Etang du Moulin Neuf (38 km)
- ZSC Rivière le Douron (30 km)
- ZSC Monts d'Arrée centre et Est (13 km)
- ZSC Rivière Elorn (0 km)
- ZSC Tourbière de Langazel (0,9 km)
- ZSC et ZPS Rade de Brest (10 km)
- ZSC Presqu'île de Crozon (26 km)
- ZSC Pointe de Corsen – Le Conquet (40 km)

- ZSC et ZPS Ouessant Molène (45 km)

The results of the SCANS-III programme (2016), the purpose of which was to estimate populations of marine mammals (cetaceans) on the continental shelf of Northern Europe, show that a number of species frequent the waters between France and Ireland. The sizes of the main populations are, in descending order: the common dolphin and the striped dolphin, the harbour porpoise, the bottlenose dolphin and the finback whale.

UK offshore waters are dotted with marine conservation areas. These sites are usually designated to protect marine habitats and their fauna (benthic populations). A large number of fish species have also been documented (including Sea bass, Anglerfish, Haddock, Red gurnard, Flounder, Megrim, as listed within MCZ designations in the vicinity) frequenting these areas. It should also be noted that some marine conservation areas include spawning and feeding grounds (sectors along the maritime border between England and Ireland).

Amphihaline fish species such as Atlantic salmon and European eel as well as marine mammals including seals, dolphins, porpoise and whale species are also present in the waters of the maritime study zone.

Map 25 shows the main types of intertidal and marine habitats present at the project level.

It highlights the three predominant types of habitats (EUNIS typology) for which the official description is indicated:

- A5.15: Circalittoral coarse sediment;

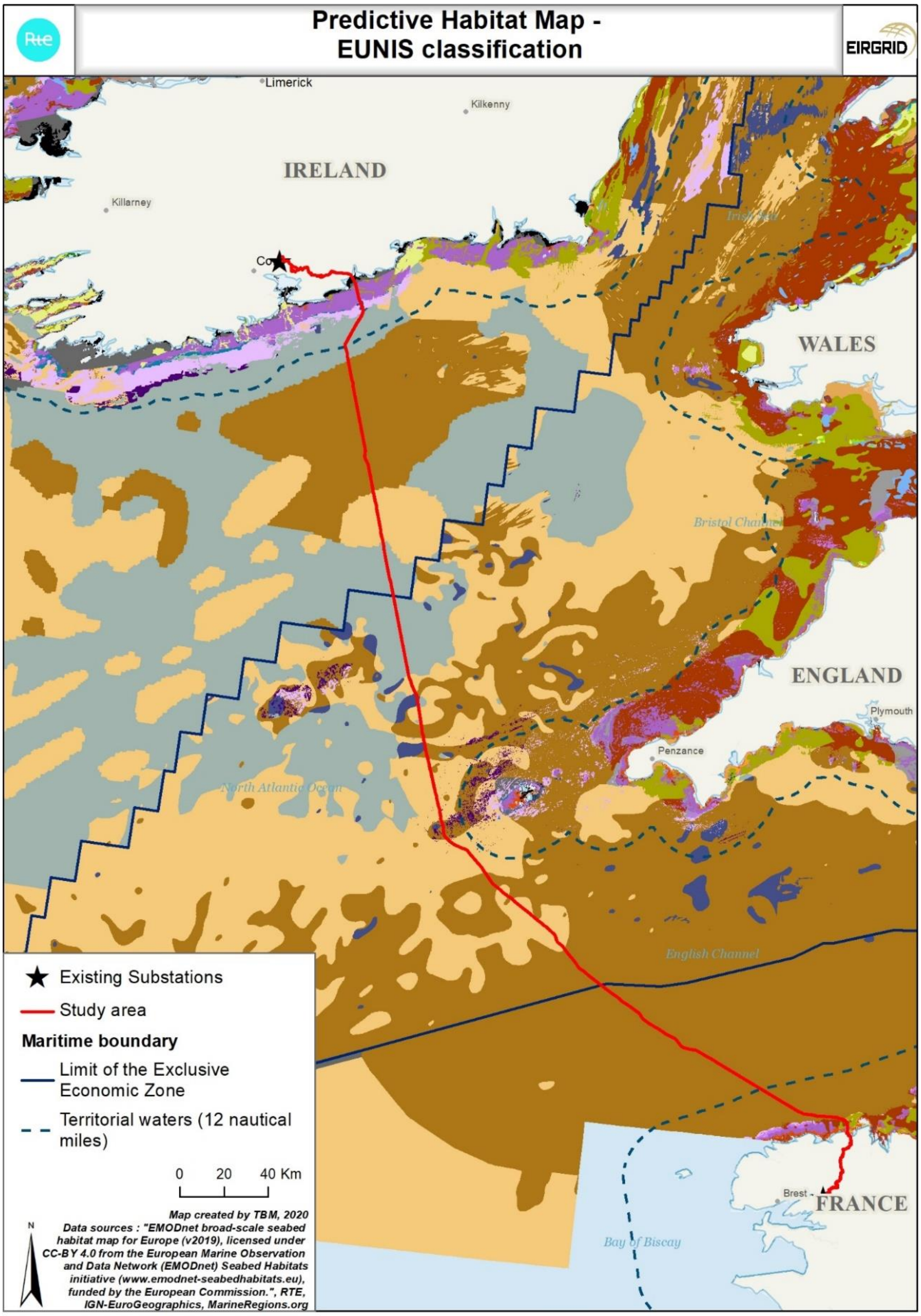
Offshore (deep) circalittoral habitats with coarse sands and gravel or shell. This habitat may cover large areas of the offshore continental shelf although there is relatively little quantitative data available. Such habitats are quite diverse compared to shallower versions of this habitat and generally characterised by robust infaunal polychaete and bivalve species. Animal communities in this habitat are closely related to offshore mixed sediments and in some areas settlement of *Modiolus modiolus* larvae may occur

- A5.27: Deep circalittoral sand;

Offshore (deep) circalittoral habitats with fine sands or non-cohesive muddy sands. Very little data is available on these habitats however they are likely to be more stable than their shallower counterparts and characterised by a diverse range of polychaetes, amphipods, bivalves and echinoderms.

- A5.37: Deep circalittoral mud.

In mud and cohesive sandy mud in the offshore circalittoral zone, typically below 50-70 m, a variety of faunal communities may develop, depending upon the level of silt/clay and organic matter in the sediment. Communities are typically dominated by polychaetes but often with high numbers of bivalves such as *Thyasira* spp., echinoderms and foraminifera.



Map 25: Marine habitats (see legend below)

Legend associated with Marine Habitats Map

- ★ Existing substations
- Study area

Maritime boundary

- Limit of the Exclusive Economic Zone
- Territorial waters (12 nautical miles)

Habitats

- A3, Infralittoral, Rock or other hard substrata
- A3.1, Infralittoral, Rock or other hard substrata
- A3.2, Infralittoral, Rock or other hard substrata
- A3.3, Infralittoral, Rock or other hard substrata
- A4, Shallow circalittoral, Rock or other hard substrata
- A4.1, Shallow circalittoral, Rock or other hard substrata
- A4.12, Deep circalittoral, Rock or other hard substrata
- A4.2, Shallow circalittoral, Rock or other hard substrata
- A4.27, Deep circalittoral, Rock or other hard substrata
- A4.3, Shallow circalittoral, Rock or other hard substrata
- A4.33, Deep circalittoral, Rock or other hard substrata
- A5, Sublittoral, Sediment
- A5.13, Infralittoral, Coarse substrate
- A5.14, Shallow circalittoral, Coarse substrate
- A5.15, Deep circalittoral, Coarse substrate
- A5.23 or A5.24, Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26, Circalittoral fine sand or cicalittoral muddy sand
- A5.27, Deep circalittoral, Sand
- A5.33, Infralittoral, Sandy mud
- A5.34, Infralittoral, Fine mud
- A5.35, Circalittoral, Sandy mud
- A5.36, Shallow circalittoral, Fine mud
- A5.37, Deep circalittoral, Mud
- A5.43, Infralittoral, Mixed sediment
- A5.44, Shallow circalittoral, Mixed sediment
- A5.45, Deep circalittoral, Mixed sediment
- A6, Deep-sea seabed
- A6.3 or A6.4, Deep-sea sand or deep-sea muddy sand
- A6.5, Deep-sea mud
- Deep circalittoral, Seabed
- Infralittoral, Seabed

N

0 50 100 Km

Maps created by TBM, 2020

Data sources : "EMODnet broad-scale seabed habitat map for Europe (v2019), licensed under CC-BY 4.0 from the European Marine Observation and Data Network (EMODnet) Seabed Habitats initiative (www.emodnet-seabedhabitats.eu), funded by the European Commission.", RTE, IGN-EuroGeographics, MarineRegions.org

6.3.3 <u>Human activities</u>

A number of human activities take place in the project's maritime zone.

The following Figure 38 (Anatec, 2016- data from April to September 2014 and May to October 2015) shows shipping densities within the corridor of the identified maritime corridor. It shows that the highest densities are in the Southern section, i.e. in UK and French waters. These high levels appear to be linked to the presence of traffic separation schemes in these sectors.

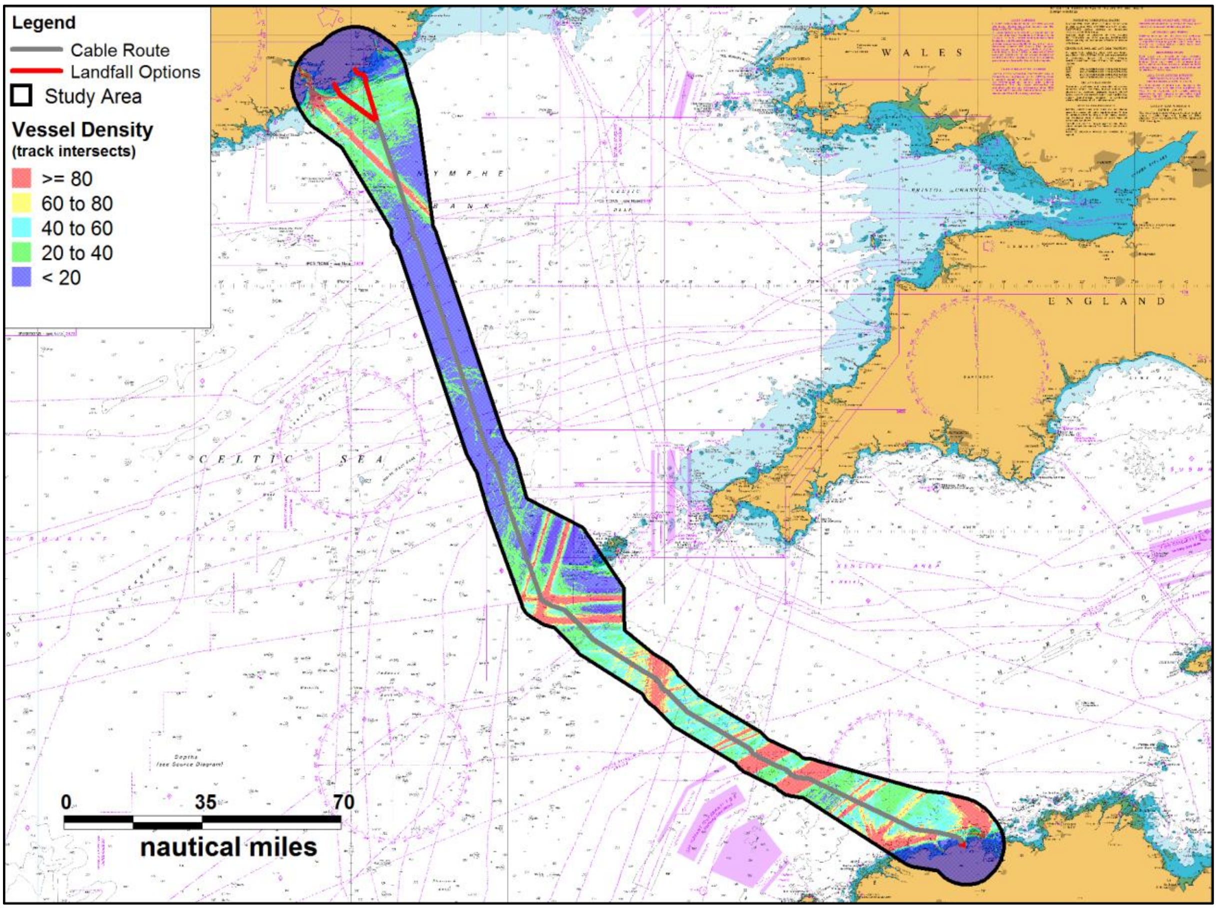


Figure 38: Shipping density (2014-2015 data)

Breaking the analysis down by type of vessel shows that the traffic around the Isles of Scilly in the direction of Cork in Ireland and the central zone of French waters, mainly includes cargo vessels and tankers. Recreational traffic is more concentrated off the coasts of the Isles of Scilly and the coastlines of Ireland and France.

Fishing vessels are present along the entire length of the corridor.

Figure 39 (Anatec, 2016) summarises the types of commercial fishing activities taking place in the corridor.

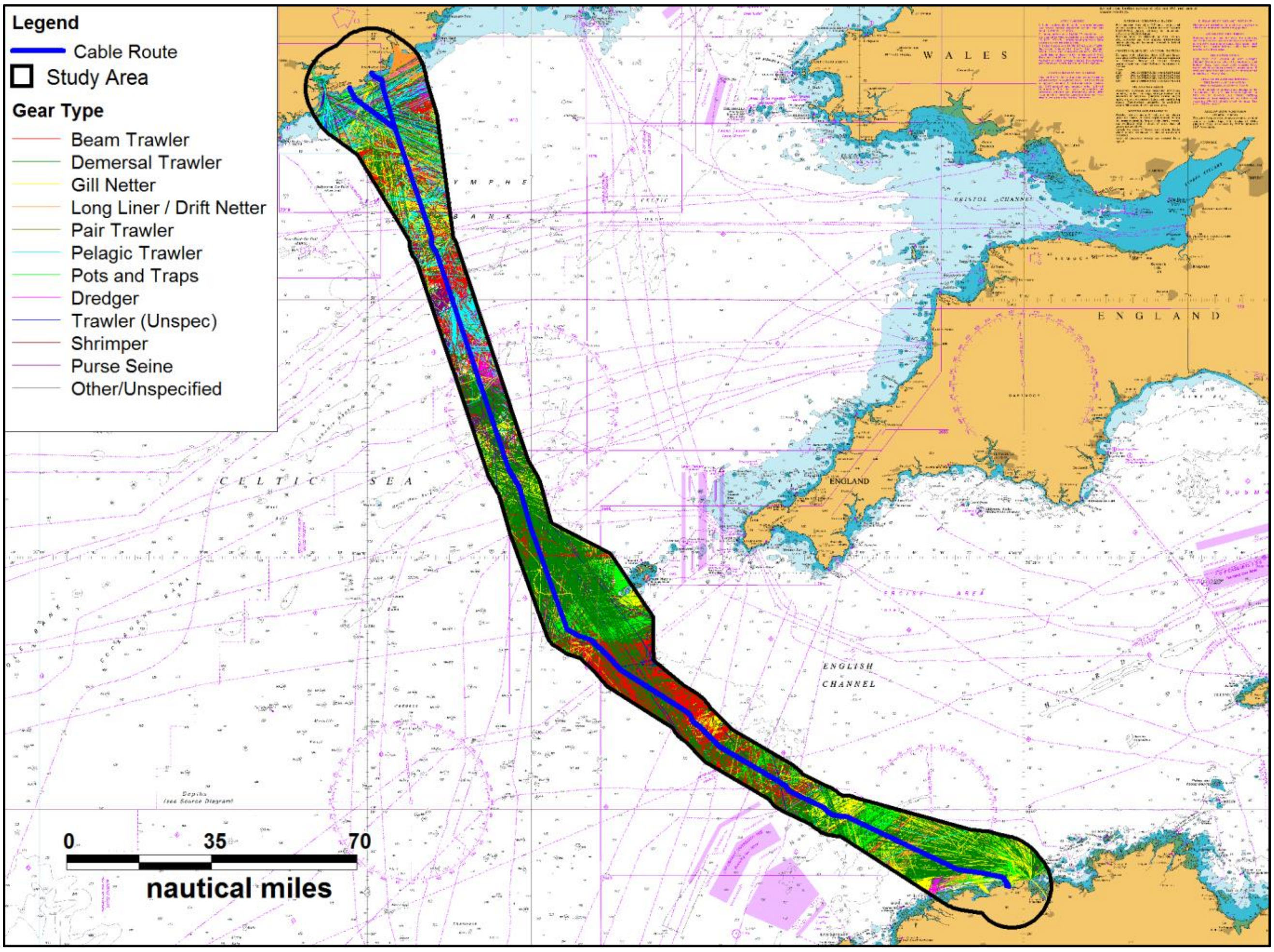


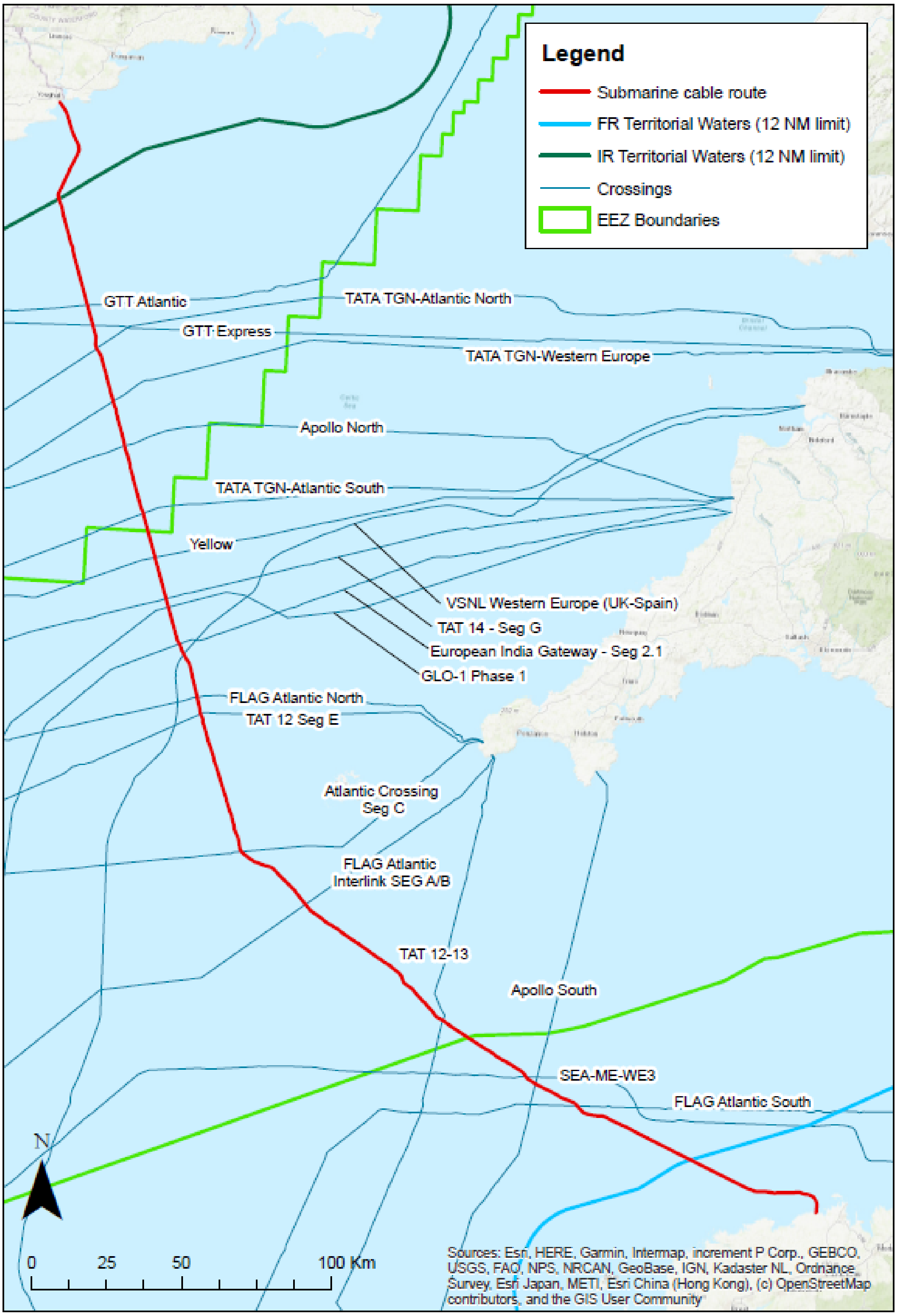
Figure 39: Types of commercial fishing activities (2014-2015 data)

Figure 39 shows that trawling (trawl nets, dredging, etc.) largely predominates over most of the corridor, while passive gear (netting) is used closer to the shore.

Lastly, pre-existing cables also represent a significant human-related factor.

Map 26 shows the cables that will need to be crossed. The majority of which were telecoms cables between the UK and other worldwide destinations.

All necessary crossings between these cables and Celtic Interconnector will be governed by agreements with each of the operators concerned.



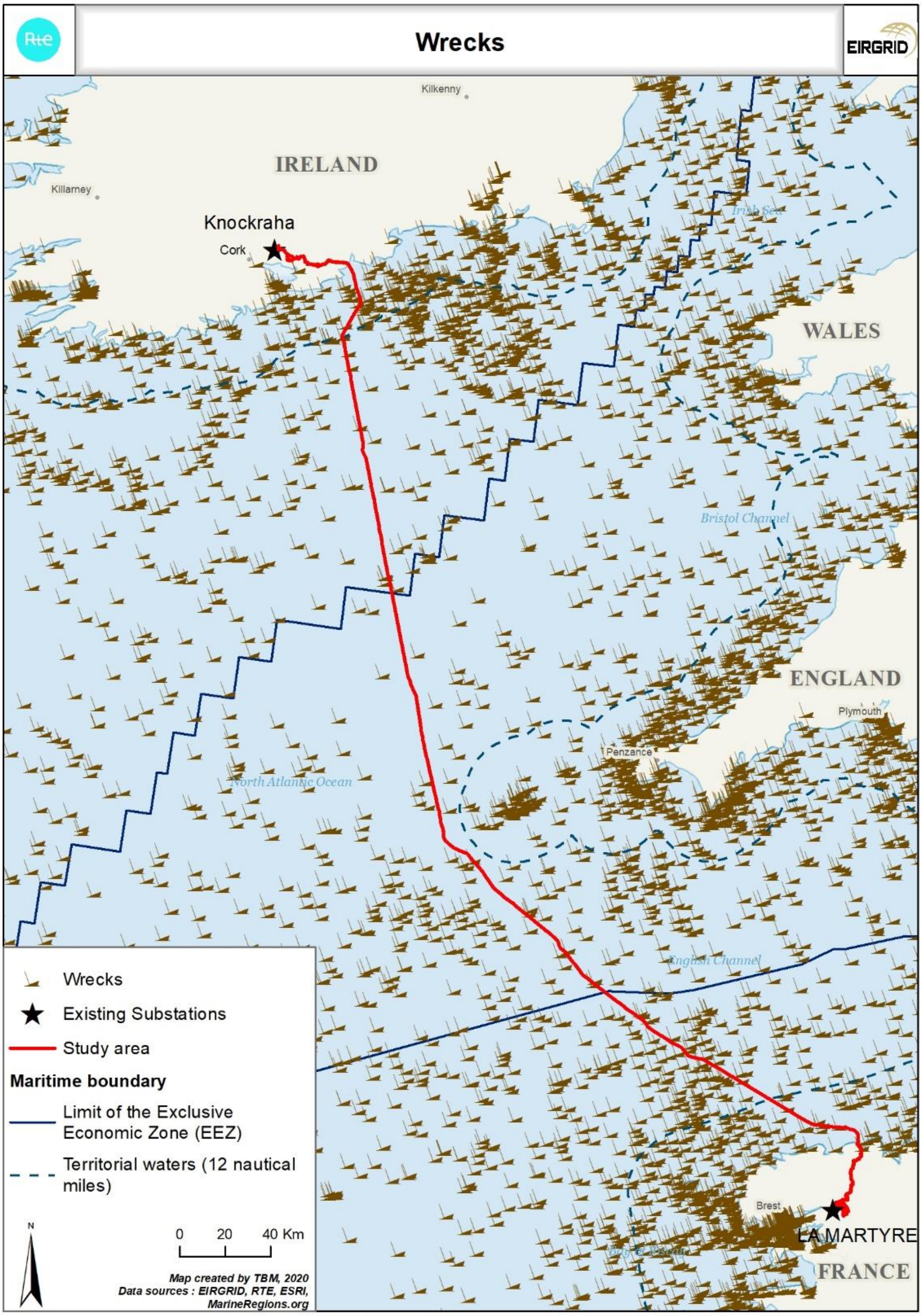
Map 26: Locations of existing cables

6.3.4 **Landscape and heritage assets**

Given the subsea nature of the project within the marine environment, there is no landscape / seascape baseline, other than the coastal seascapes, as described within Sections 4 and 5, regarding the Irish and French landfalls. Given the extent of the open marine landscape concerned, it is possible that a limited number of shipwrecks may be encountered on a localised basis during the construction phase, however, should this occur it will be managed appropriately and should not have any significant effect. Studies undertaken to date have confirmed that there is no evidence of any significant anthropogenic alteration of the seabed along the proposed cable route, save for a few existing cables crossing that exist along the proposed route.

From a marine heritage perspective, in Irish Territorial Waters, in the vicinity of the proposed landfall, exposed peat deposits of late prehistoric date survive within the intertidal zone. There is no evidence of these coastal deposits extending further offshore, but geotechnical studies have identified localised areas where layers of silts and clay interleaved with peats survive along the route corridor within the Irish EEZ and at the boundary between Irish and UK EEZ. These deposits appear to represent isolated survivals of an early prehistoric landscape that has become inundated since the end of the Mesolithic period and which has otherwise been eroded by scour and which may hold archaeological interest.

There are records of possible wrecks and geophysical anomalies which may represent elements of marine wreckage or possible unexploded ordnances (UXOs) within the cable route corridor, however, there are no identified wrecks or UXOs within the cable route corridor.



Map 27: Location of wrecks

6.4 Potential significant effects associated with the marine project and associated mitigation measures

The table below presents a summary of the potential effects arising from the project, and associated mitigation measures to avoid or minimise such potential impact.

At this stage, no specific detail can be provided regarding the extent / level to which such mitigation measures may be implemented; this will be expanded upon following completion of detailed environmental impact assessments.

These measures may be implemented based on the conclusions of analyses carried out as part of environmental surveys, and developed as part of detailed design methodologies.

Potential impact / impact source	Associated mitigation measures
Increased levels of underwater noise, and associated effects on sensitive receptors, e.g. marine mammals.	Employment of Marine Mammal Observers (MMO) during the use of noise-generating activities (for example during UXO removal, slicer use or detonation, if required). Application of slow/start method if necessary. Scheduling of construction activities to avoid of sensitive periods for key species, e.g. breeding seasons. These measures will be employed as appropriate following post-consent verification surveys.
Localised changes to marine, coastal and intertidal processes, including sediment transport regime, around areas of rock armour / mattressing.	Wherever possible, careful placement of cable protection, e.g. in a dynamic environment, avoiding placing protection perpendicular to the prevailing direction of sediment transport, thereby reducing ‘blockage’ of transport, and lowering risk of significant scour.
Localised changes to marine, coastal and intertidal water and sediment quality, including increased levels of suspended solids, and potential for release of sediment-bound contaminants.	Selection of installation / burial techniques to reduce turbidity.
Direct loss and / or indirect disturbance of marine, coastal and intertidal ecological features due to disruption of seabed / placement of cable protection.	Selection of appropriate cable protection materials, with sensitivity to the surrounding environment, e.g. use of similar rock types / dimensions as appropriate.

Potential impact / impact source	Associated mitigation measures
Direct loss and / or indirect disturbance of marine communities due to disruption coastal human recreation in coastal areas.	Where possible, construction works can seek to avoid peak recreational season.
Indirect loss of marine, coastal and intertidal communities due to, for example, smothering, or changes in availability of prey resources.	Avoidance where possible of sensitive times of year for construction activities.
Potential for effects on sensitive buried peats within Irish Territorial Waters.	Avoidance where possible, through micro-siting of route through sensitive areas. Collection of additional core samples for recording and analysis will be undertaken in specific peat locations.
Disturbance / disruption of fishing and shipping activities (commercial and recreational).	Issue of regular Notifications to Mariners (NTM) to advise other marine users of planned activities. Liaison with marine user groups, as appropriate, to communicate in relation to proposed schedule of works. Use of further NTM to advise other marine users of any changes to planned activities. Design of rock placement measures
Disturbance / damage to established marine, coastal and intertidal users and infrastructure (e.g. existing cable routes, coastal recreation).	Early engagement with owners / operators of existing cables, and design / implementation of appropriate crossing routes / methods, including installation of cable protection, and consideration of 'buffer' around existing infrastructure to minimise the risk of damage during operational / maintenance works. Liaison with marine user groups, as appropriate, to confirm proposed schedule of works. Issue of regular NTM to advise other marine users of planned activities. Consideration of scheduling construction works around key seasonal activities, where applicable / appropriate.
Introduction of invasive and non-native species (INNS) through use of rock	Adherence to best practice in identifying sources of rock.

Potential impact / impact source	**Associated mitigation measures**
armouring.	Appropriate cleaning of all cable protection materials prior to use.
Temporary disturbance / loss of intertidal habitat during cable landfall installation.	Wherever possible, avoidance of sensitive times of year for construction activities.

7. Impact assessment

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7.1 Maritime transboundary Impact assessment

7.1.1 <u>Descriptions of expected effects during the construction phase</u>

The following table 7 shows the potential transboundary effects expected at sea.

A potential effect is an effect that can reasonably be expected to occur.

Their degree of significance is subsequently specified. A significant effect is an effect which, by its character, magnitude, duration or intensity can potentially alter a sensitive aspect of the environment.

The effects are specified, followed by the subject of said effects.

The transboundary characteristics of each effect are then specified; indicating whether the effect is capable extending into neighbouring territories.

Lastly, a generic analysis of the effects for all three countries is provided. The generic analysis also assesses the effect at the transboundary scale.

The conclusions take into account the mitigation measures referred to in Section 6.4 where potential significant effects are identified.

Table 7: Potential transboundary effects expected at sea during construction phase

Effects	Receptor	Detail	Potential Transboundary effect	Generic effect of the project
Effects associated with work on the seabed	Currents Bathymetry	Temporary alteration of deep currents. Permanent morphobathymetric alteration due to work around underwater dunes.	Potentially transboundary effect during work on the subsea cable. The main potential effects are associated with the sections passing through underwater dunes in English and French waters. Underwater sand waves are located at the marine boundary between those countries.	Levelling of underwater dune ridges (pre-sweeping) would have the immediate effect of altering the morphology and reducing the heights of mobile sand waves. This would likely cause direct and very localised changes in the direction and intensity of currents. However, given the depths of the sand waves (approximately 100 m) and the moderate amount of levelling work required for the project, this should not have a significant effect on the characteristics of existing subsea currents. Pre-sweeping would likely reduce the sediment heights of the underwater sand waves to between 1 and 3 m. The variation in the height of the water column will therefore be in the order of a few percent at most. No likely significant transboundary effects.
	Sediment dynamics	Temporary changes to sediment dynamics.	Potential transboundary effect during work on the subsea cable when trenches must be created. This transboundary effect concerns all 3 jurisdictions.	Trenches will locally interfere with the sediment dynamics and gradually be filled with sediment over time. In general, the direction of transport of sediments over the entire subsea section of the cable is oriented perpendicular to the trench. This will therefore be filled by sediment lying nearby through sediment transport processes. The speed at which the trench is filled will depend on sediment mobility within the area (in the order of a few months). No likely significant transboundary effects.
	Marine habitats Seabed	Permanent loss of habitats due to rock placement or laying concrete mattressing. Permanent long-term habitat changes.	No potential significant transboundary effects Losses will be located perpendicular to the structure.	- The affected habitats are the following: - near the French coast (reduced outline) A4.1, Shallow circalittoral, Rock or other hard substrata A5.25 or A5.26, Circalittoral fine sand or cicalittoral muddy sand A5.14, Shallow circalittoral, Coarse substrate - over the entire corridor (France, Ireland, United Kingdom) - A5.15, Deep circalittoral, Coarse substrate - A5.27, Deep circalittoral, Sand - A5.37, Deep circalittoral, Mud The last three have the largest surface areas both within the project area and overall, as can be seen from the map in Section 6.2.2. In the long term, the mainly sandy environments will become rocky environments on which new species can grow, therefore potentially bringing about a positive, beneficial effect. No likely significant transboundary effect.
		Temporary alteration of marine habitats (cable burial).	Localised effect around the excavated trench. No potential transboundary effect.	Temporary alteration will be a limited as the majority of affected habitats have very large surface areas. In the end, the currents will move sediment back over the work area and local species will recolonise the area. No likely significant transboundary effect.
	Fish	Permanent loss of functional habitat (fish nurseries, spawning grounds) and	Potential transboundary effect. The functional zones occupy significant surface areas.	The marine habitats analysis is valid for the functional fishing zones at the project scale. No likely significant transboundary effect.

Effects	Receptor	Detail	Potential Transboundary effect	Generic effect of the project
		population.	This transboundary effect affects all 3 jurisdictions.	
Effects associated with noise emissions	Marine mammals	The noise generated by the work may cause temporary discomfort for animals nearby, possibly even temporary or permanent hearing loss and displacement.	Potential transboundary effect. Sound and vibration emissions may extend to areas beyond the work site. This transboundary effect affects all 3 jurisdictions.	An acoustic study carried out in France for the project provided the following results: - Audible radius: 22 km (water-jetting); - Behavioural response zone: 3.4 km (water-jetting); - temporary hearing loss zone: 1.5 km (trenching machine); - Permanent hearing loss area: 100 m (trenching machine). Due to the highly mobile nature of marine mammals, it is unlikely that species will remain in the vicinity of works for a period of time that could cause auditory damage and therefore significant effects on marine mammals are unlikely.No likely significant transboundary effect.
	Fish	The noise levels generated by the site may generate temporary discomfort for fish, or even temporary loss of hearing or death.	Potential transboundary effect. Noise emissions will propagate well beyond the area of the construction site. This transboundary effect affects all 3 jurisdictions.	An acoustic study carried out in France for the project provided the following results: - Audible radius: 24 km (water-jetting); - Temporary hearing loss: 230 m (work with support ship); Due to the highly mobile nature of fish, it is unlikely that species will remain in the vicinity of works for a period of time that could cause auditory damage and therefore significant effects on fish are unlikely.No likely significant transboundary effect.
Effects associated with sediment re-suspension	Marine habitats	Temporary damage to marine habitats due to sediment deposition.	Potential transboundary effect. The turbidity may extend to areas beyond the work site. This transboundary effect affects all 3 jurisdictions.	The habitat areas in question are very large in comparison to the project area. The existing marine conditions then appear to move the re-suspended materials to environments which are substantially equivalent in nature. This potential effect does not appear to be significant.
	Water quality / Quality of species and marine habitats / Marine species	Temporary damage to the environment through increased turbidity and the re-suspension of contaminated sediments Temporary disturbances to animals.	Potential transboundary effect. The turbidity may extend to areas beyond the work site. This transboundary effect affects all 3 jurisdictions.	Turbidity, caused by machinery moving over the seabed, the excavation of trenches and the installation of protective structures, will mainly occur when the sediment in the area is loose. The sediments encountered in the corridor do not contain fine particles. We therefore consider that re-suspension will be localised and short in duration (dispersion due to strong tidal currents). This potential effect does not appear to be significant.
Effects associated with occupancy of the water column	Fish	Temporary disruptions to amphihaline fish migration.	Potential transboundary effect. Amphihaline fish migrate from the sea to the rivers in each of the 3 jurisdictions in question	The subsea construction site will be highly localised and continuously changing. Although temporary disturbances of species are possible, the ability of fish to move enables them to avoid these areas. No likely significant transboundary effect.

Effects	Receptor	Detail	Potential Transboundary effect	Generic effect of the project
	Shipping	Temporary disruptions for commercial, private and fishing vessels.	Potential transboundary effect. This mainly affects Ireland and UK (Isles of Scilly traffic separation system).	Disruptions to shipping will be temporary and mainly due to the presence of the construction site (support ship, safety ships) in each sector. This effect will therefore change as the construction work progresses. The most sensitive sectors are those with traffic separation systems as commercial ships are least manoeuvrable here. Other types of vessels and sailing boats are easier to manoeuvre. No likely significant transboundary effect.
Effects associated with accidental pollution	Quality of marine waters	Temporary quality impacts due to accidental pollution of the water following collisions or poor handling of materials at sea (discharges of waste water, hydrocarbons, waste, etc.).	Potential transboundary effect. Accidental spillages could spread to neighbouring Territorial Waters and may affect the coastline. This transboundary effect affects all 3 jurisdictions.	This is a potential effect associated with accidents. The probability of occurrence is low. No likely significant transboundary effect.
	Marine species	Temporary alteration of habitats or even damage or disturbance to certain species.	Potentially transboundary effect. Spillages are likely to spread to neighbouring Territorial Waters and may affect the coastline. This transboundary effect affects all 3 jurisdictions.	This is a potential effect associated with accidents. The probability of occurrence is low. No likely significant transboundary effect.

7.1.2 Descriptions of expected effects during the operational phase

Table 8: Potential transboundary effects expected at sea during operational phase

Effects	Subject	Detail	Transboundary effect	Generic effect of the project
Effects associated with work on the seabed	Currents	Permanent alteration of subsea currents.	No potential transboundary effect. This effect is mainly associated with rock placement operations.	Rock placement will have the effect of permanently reducing the height of the water column by between 1 and 2 m. Given the magnitudes of the subsea currents along the offshore section of the corridor, rock placement operations in deeper areas will not have significant local effects. Minor hydrodynamic disturbances may occur in their immediate vicinity. In sectors with softer substrates, this could indirectly cause local accretion or scouring processes to occur in the vicinity of protective structures. These phenomena will, however, be largely mitigated by the coarse nature of the sediments present. No likely significant transboundary effect.
	Bathymetry	Permanent morphobathymetric alterations caused by the external rock protection.	No potential transboundary effect. Alterations will be localised around the external rock protection.	Rock placement operations will permanently alter the morphology of the sea floor (up to 2 m in height over widths of up to 10 m). In sectors with softer substrates, localised accretion and scouring phenomena induced by local hydrodynamic processes may occur around protective rock placement areas. Variations in the sea floor may induce minor erosion of soft substrates in the vicinity of the protective structures. Localised morphological alterations should not be significant as these phenomena will be largely mitigated by the coarse nature of the sediments present. Furthermore, this scenario will not

Effects	Subject	Detail	Transboundary effect	Generic effect of the project
				arise often as the cable will be buried in mobile sediments wherever possible. No likely significant transboundary effect.
		Temporary morphobathymetric alterations due to burial.	No potential transboundary effect. Localised alterations may occur around natural filling and / or secondary rock protection within the corridor.	Sedimentary coverage along the cable route is generally sufficient for burial in loose sediment. Trenches excavated in loose sediments will be filled either naturally or artificially. The strong currents present in the area will return the site to baseline levels in the short or medium term (order of a few months). No likely significant transboundary effect.
		Permanent morphobathymetric alterations due to work around underwater sand waves.	Potential transboundary effect. Sand waves are present in both English and French waters.	When it will not be possible to avoid sand waves, the initial morphology of the sand waves will be altered by flattening of the ridges. The approximate width of pre-sweeping operations will be between 7 and 8 m at most, the affected thickness will be in the order of a few metres. The trench will have a V-shaped cross-section. The affected volumes will therefore remain relatively low compared to the overall volumes of the dunes. Sediment will continue to be moved by ocean currents throughout the construction phase. Underwater sand waves that are in motion today will still be in motion after completion of the project. Hydrodynamic processes always tend to accrete materials in such a way as to create balanced sand wave morphologies. It therefore seems likely that sand wave reshaping may occur over the medium or long term, their morphological characteristics may be altered. Pre-sweeping (affecting relatively small volumes compared to the overall volume of the dune) does not appear to counter the natural tendency of ridges to regenerate due to hydro-sedimentary processes.
	Sediment dynamics	Permanent sediment transport alterations.	No potential transboundary effect. This effect is mainly associated with rock placement operations.	Rock placement and other protective structures placed on loose and hard bottoms will create obstacles for sediment transport. Local accumulations of sediment are likely to occur along the length of the subsea corridor. These will also be caused by the numerous bands of sandy sediment (assumed to be mobile) that have been observed to cover hard bottoms below depths of 80 m. This will be particularly true near the Isles of Scilly, an area in which the likelihood of surface sediment motion induced by currents is high (70 to 90%), given that the currents accelerate around the islands.
	Commercial fishing	Permanent disruptions in the availability of fishing areas.	No Potential transboundary effect. This effect is mainly associated with rock placement operations.	Fishing vessels, and trawlers in particular, are likely to change their fishing areas due to rock placement work in certain sectors. There will be a greater risk of nets getting caught in these areas. However, the external protection is designed in such a way as to allow trawl nets to pass over them. It will be up to the examining authorities to decide whether fishing can take place around the subsea construction site.
Effects associated with electromagnetic	Marine species	Continuous emission of electromagnetic fields	Potential transboundary effect. This transboundary effect affects all 3	Firstly, electrical fields are not emitted into the environment thanks to the metal armouring around the cables.

Effects	Subject	Detail	Transboundary effect	Generic effect of the project
emissions		generating disturbances for benthic species, fish and marine mammals.	jurisdictions.	Regarding the magnetic field, studies show that its strength decreases rapidly moving away from the cable. Most current studies on this subject are carried out in controlled environments and target specific species (fish, crustaceans). The results are therefore difficult to extrapolate to populations in natural environments. The conclusions only show potential effects on the development of certain species without demonstrating potentially significant effects. To date, based on available information, no likely significant effects are predicted.
Effects of heat emissions	Marine species	Continuous emission of heat into the sediment causing alterations to benthic populations.	Potential transboundary effect. This transboundary effect affects all 3 jurisdictions.	While in operation, the electric current passing through the cable raises the temperature of sediment on a localised basis, the magnitude of this will vary depending on the characteristics of the sea floor and the power running through the cable. When cables are buried, more permeable sediments (larger granule size) are more likely to propagate temperature rises above the cable. Studies to date show that the heating effect could reach a maximum of 2° C at a distance of 80 cm from the buried cable (burial depth is of the order of 1.5 m). Due to its localised nature, this effect is not considered to be significant.

7.2 Terrestrial transboundary impact assessment

Terrestrial works will take place in both Ireland and France.

There will be no transboundary effects due to the distance separating the two countries.

Similarly, terrestrial construction work in Ireland and France will have no transboundary effects in the United Kingdom.

7.3 Transboundary effects on Natura 2000 sites

This Section builds on information contained in Sections 4, 5 and 6 of this JER.

Map 28 shows all existing Natura 2000 sites along the Celtic Interconnector's corridor.

7.3.1 <u>Natura 2000 sites crossed by the project</u>

The project corridor has been defined in such a way that only one Natura 2000 site is crossed. This is the Rivière Elorn SAC (FR5300024) in France.

This site has a total area of 2,395 ha and is designated for a total of 15 species, and 20 habitats:

- Marine habitats (Rade de Brest sector);
- Continental aquatic habitats;
- A series of habitats associated with the river itself: wetland meadows, riparian forests, peat bogs;
- Amphihaline fishes (Sea Lamprey, Brook Lamprey, Hallis shad, Twaite Shad, Atlantic Salmon);
- Freshwater fish (Bullhead);
- One semi-aquatic mammal (European otter);
- One species of bat;
- Insects (Marsh Fritillary Stag Beetle);
- Molluscs (fresh water and land-based): Elona quimperiana, Freshwater pearl mussel,
- Various species of flowers (Sphagnum pylaesii, Killarney fern, Floating water-plantain).

Within the context of the project being led by RTE in France, the Elorn River could be crossed using two methods: corbelling or the use of a sub-structure.

Both methods will significantly mitigate significant effects on the conservation goals of the Natura 2000 site.

A detailed analysis carried out as part of the project's impact assessment showed that there are no expected effects in terms of loss of habitats. Effects involving temporary disturbances to species have been identified (effects related to noise, light and potential pollution), but the planned mitigation measures will prevent significant impacts and maintain the conservation goals of the Natura 2000 site. However, the determination of this matter is within the jurisdiction of the relevant competent authorities for the Habitats Directive.

7.3.2 Other Natura 2000 sites

7.3.2.1 Offshore and onshore Natura 2000 sites

Natura 2000 sites in Ireland, UK and France which are closest to the project's corridor could potentially suffer indirect effects associated with the construction process and during operation.

Indirect effects may include the resuspension of sediment, noise emissions and the risk of accidental pollution.

As was observed in Sections 7.1.2 and 7.1.3, several of these effects are likely to have transboundary consequences. However, following proposed mitigation measures it can be concluded that there will be no significant impacts and the integrity of Natura 2000 sites will not be adversely affected from the project alone. Cumulative effects are described in Section 7.4. The list of Natura 2000 sites is presented in Section 6.3.2.

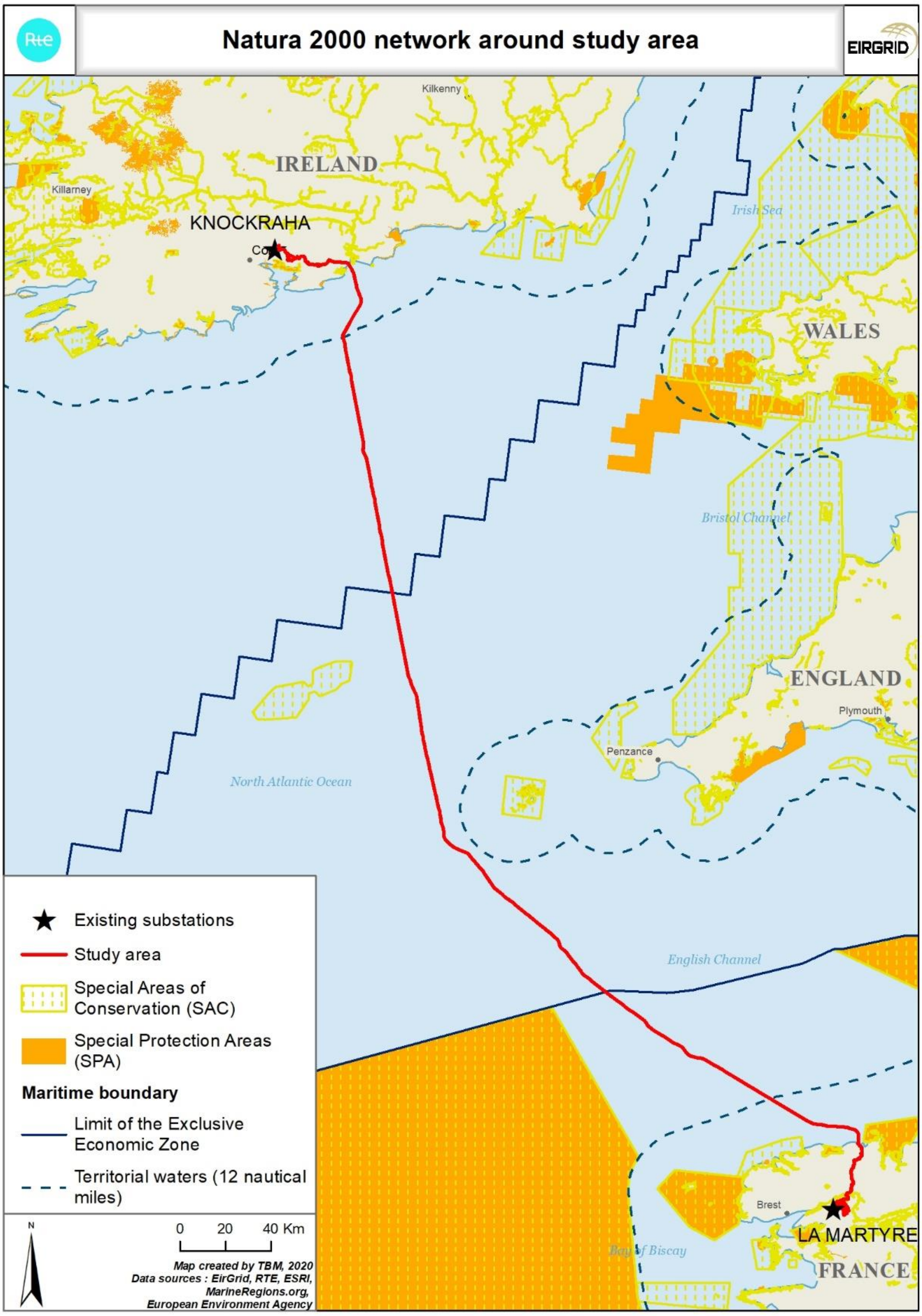
7.3.2.2 Onshore Natura 2000 sites

In Ireland, the Natura 2000 sites closest to the project are the Ballymacoda SPA (4023) located c. 1.7 km to the South-West of the proposed landfall, and the Great Island Channel SAC (1058) and Cork Harbour SPA (4030), located approximately 2.5 km from the converter station site option at Ballyadam. Karst landscapes offer minimal attenuation and allow contaminants to move through groundwater rapidly. It will therefore be assumed that a pollution pathway exists between the site and the EU-protected sites within Cork Harbour.

Following mitigation, it is considered that there is no reasonable scientific doubt as to the absence of effects on Natura 2000 sites. However, the determination of this matter is within the jurisdiction of the relevant competent authorities for the Habitats Directive.

7.3.3 Conclusions

It is considered that the Celtic Interconnector project will not have any significant transboundary effects on Natura 2000 sites. However, the determination of this matter is within the jurisdiction of the relevant competent authorities for the Habitats Directive.



Map 28: Locations of Natura 2000 sites

7.4 Assessment of cumulative effects

7.4.1 Cumulative effects at sea

The analysis referred in Section 7.1 shows that, with the implementation of appropriate mitigation measures, the potential effects of the subsea cable on the environment are not significant.

No offshore projects have been identified, the effects of which would be likely to combine with those of the Celtic Interconnector. It is therefore reasonable to conclude that the Celtic Interconnector is not likely to generate potentially significant cumulative effects in conjunction with other offshore projects.

However, this will be further addressed in detail during the environmental impact assessment process; as additional details will be provided on the projects, including their potential effects and their possible overlap with those of the Celtic Interconnector project.

7.4.2 Cumulative onshore effects

7.4.2.1 In France

In France, the overall analysis identified two projects whose effects could combine with those of the Celtic Interconnector:

- The project to continue exploitation of the Kerfaven quarry in Ploudiry and to expand it;
- The construction of a combined-cycle power plant in Landivisiau and its supply lines (gas supply and electricity transmission lines).

- **Ploudiry project**

During the construction phase, the Celtic Interconnector project will generate cumulative effects with the Kerfaven quarry extension project (the Celtic Interconnector cable route passes the entrance to the quarry) regarding the following factors:

- discharge into water courses: the project will also discharge material into the Elorn;
- noise emissions: construction work, and drilling in particular, will generate noise pollution which will accumulate with that generated by the quarry;
- construction work will lead to additional traffic on the RD 712 road, which will combine with the traffic generated by the quarry.

During the operational phase, the Celtic Interconnector project will not generate impacts which will accumulate with those of the quarry expansion project. The cumulative effects of these two projects are therefore only temporary.

- **Landivisiau project**

According to the available information, construction work for the combined-cycle power plant and its supply lines should be completed by mid-2022, so they should not coincide with work on the Celtic Interconnector project. The two projects should therefore not produce cumulative effects during the construction phase.

With regards to the operating phases of the combined-cycle power plant at Landivisiau and the converter station at La Martyre, the following cumulative effects may arise:

- Landscape impacts: The two sites are too far apart to create cumulative effects for the landscape;
- Hard standing: The two sites will cause soil sealing; runoff from the two projects will be collected and discharged into the Elorn River at a controlled rate following retention. Although there is only one discharge point, the additional flows generated by soil sealing at the two sites will not have either quantitative or qualitative impacts on the Elorn as the flow rates will be controlled and regulated. In addition to this, attenuation areas will reduce chronic pollution and trap accidental spillages;
- Natura 2000: The fact that there will be no impacts on the Elorn Natura 2000 site common to these two projects has been demonstrated in the Natura 2000 impact assessments for each project;
- Flora and Fauna: Quimper snails are present at the site of the power plant, but not that of the converter station.

- **Conclusions**

An analysis of the impacts of these two projects and the avoidance, reduction and compensation measures to be implemented, has shown that the two projects will not create cumulative effects.

7.4.2.2 In Ireland

There is potential for future projects and plans within the zone of impact of activities associated with the project to result in cumulative effects. These and other cumulative effects will be assessed, where appropriate, as part of the EIAR to be submitted with the planning consent application for the Irish onshore and offshore elements of the Celtic interconnector project.