Kildare-Meath Grid Upgrade

Planning & Environmental Considerations Report (PECR)

Volume 2: Main Text

April 2023

This document is Volume 2: Main Text of the Kildare-Meath Grid Upgrade Planning and Environmental Considerations Report (PECR).

The whole PECR consists of a number of documents and should be read together.

Kildare-Meath Grid Upgrade PECR

- Volume 1: Non Technical Summary
- **Volume 2: Main Text**
- Volume 3: Appendices
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Kildare-Meath Grid Upgrade Planning & Environmental Considerations Report (PECR)

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Contents

1. Introduction

1.1 Introduction

Jacobs has been appointed by EirGrid plc (EirGrid) to prepare this Planning and Environmental Considerations Report (PECR) to accompany an application for planning approval to An Bord Pleanála (ABP).

The project for which approval is being sought is called CP966 Kildare-Meath Grid Upgrade (hereafter referred to as the Proposed Development) and includes approximately 53 km of new 400 kV underground cable between the existing Woodland substation in the townland of Woodland, near Batterstown, County Meath and the existing Dunstown substation in the townland of Dunnstown, near Two Mile House, County Kildare, as well as upgrades to both substations.

Approximately 38 km of the proposed underground cable is located in County Kildare and approximately 15 km of the proposed underground cable is located in County Meath. Approximately 82% of the underground cable will be located within public roads and approximately 18% will be located in private lands, to avoid location-specific constraints.

This PECR provides information relating to the planning and environmental considerations associated with the Proposed Development. Further details of the Proposed Development are provided in Chapter 5 of this PECR.

1.2 Who is EirGrid?

EirGrid is the state-owned Transmission System Operator and is responsible for a safe, secure and reliable supply of electricity, now and in the future.

EirGrid develops, manages and operates Ireland's national high voltage electricity grid (also called the 'Transmission System' (the grid)). This brings power from where it is generated to where it is needed throughout Ireland. EirGrid uses the grid to supply power to industry and businesses that use large amounts of electricity. The grid also powers the distribution network owned by the Transmission System Owner, ESB. This supplies the electricity used every day in homes, businesses, schools, hospitals and farms. EirGrid develops new electricity infrastructure only when it is needed.

The European Communities (Internal Market in Electricity) Regulations 2000 (S.I. No. 445 of 2000) sets out the role and responsibilities of the Transmission System Operator; in particular, Article 8(1) (a) gives EirGrid, as Transmission System Operator, the exclusive function:

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

EirGrid is responsible for the planning and outline design of the Proposed Development and the consent application that this PECR relates to. ESB will, as the Developer, be responsible for the development and construction of the project.

1.3 What is the Kildare-Meath Grid Upgrade project?

The Proposed Development (see Plate 1.1) will assist in the transfer of primarily renewable electricity from the south and southwest region of Ireland to the east region, and its subsequent distribution within the network in Meath, Kildare and Dublin. A significant number of Ireland's electricity generators are in the south and southwest regions, where many wind farms and some modern electricity generators are located. The power that is generated in these regions needs to be transported to where it is needed – known as demand centres. The power is mainly transported cross-country on the two existing 400 kV lines from Moneypoint station in County Clare to Dunstown substation in County Kildare and Woodland substation in County Meath. The Proposed Development will connect these two nodes and this will thereby strengthen the transmission network by improving reliability and security in the east region.

The Proposed Development is essential to meet the Government of Ireland's Climate Action Plan target of up to 80% renewable energy by 2030. The Proposed Development will also help meet the growing demand for electricity in the east region.

The need for the Proposed Development is addressed further in Chapter 2 of this report. Details on the project description are contained in Chapter 5.

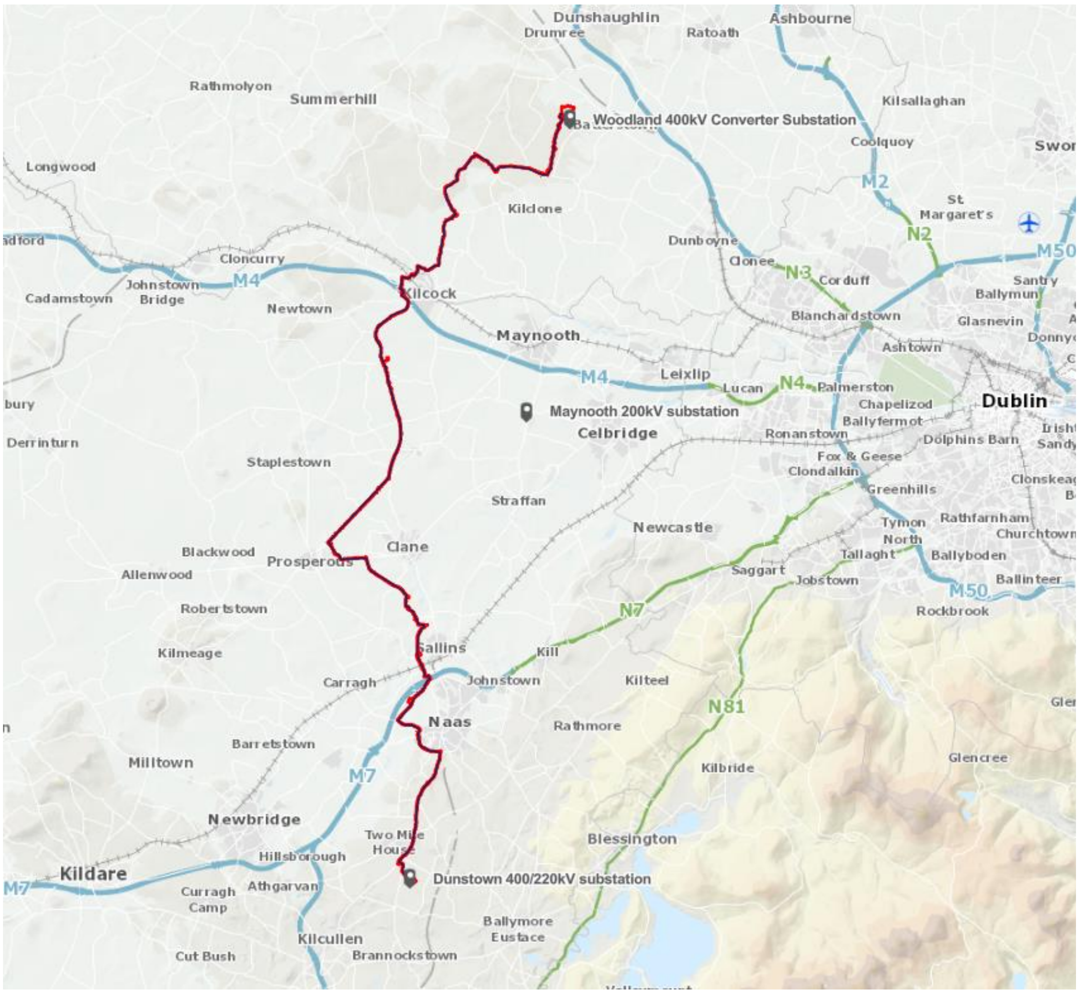
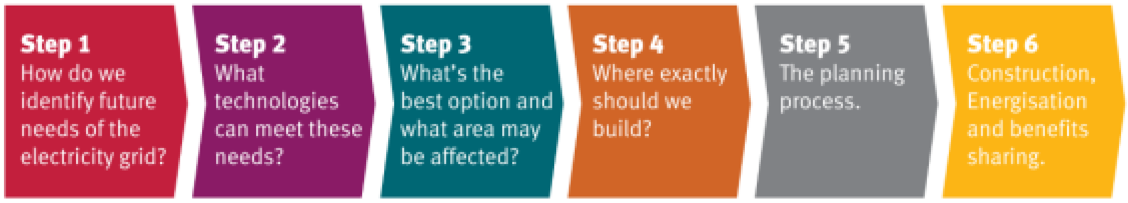


Plate 1.1 Proposed Development Location

1.4 EirGrid's Framework for Grid Development

EirGrid follows a six-step approach to identify a need to develop the transmission network and identify solutions to any identified transmission network problem. This six-step approach is described in the document 'Have Your Say' published on EirGrid's website[1]. Each step has a distinct purpose with defined deliverables and represents a lifecycle of a development from conception through to implementation and energisation.

The Kildare-Meath Grid Upgrade has developed in accordance with EirGrid's Framework for Grid Development, as illustrated in Plate 1.2.



Source: EirGrid

Plate 1.2 EirGrid's Six-Step Framework for Grid Development

The Framework ensures that project development occurs in a consistent and structured manner, with adequate and appropriate opportunities for public and stakeholder participation in project decision-making.

The consideration of alternatives for the Proposed Development must be understood as occurring in the context of, and from the early stages of, the Framework for Grid Development.

In accordance with EirGrid's Framework, a comprehensive and consistent multi-criteria analysis was applied to decision making within each of the steps of the project's development, including in considering a number of technical and routing alternatives. The multi-criteria analysis facilitated a balanced consideration of the following criteria relating to project development:

- Environmental;
- Social;
- Technical;
- Deliverability; and
- Economic.

This project has been in development since 2017 when its need was identified and confirmed.

In Step 1, EirGrid identified the need. In this case it involved a transmission network problem in the transfer of power across the existing 400 kV transmission network from west to east along with the transfer of this power within the transmission network as it reaches the east coast. The issues encountered include limitations in both current carrying capacity and voltage stability.

[1] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/

In Step 2, EirGrid compiled a shortlist of best performing technical options, which went out for public consultation between November 2018 and February 2019. This included a mix of overhead line, underground cable and upvoltage[2] technologies. Four of those options were taken forward to Step 3 in April 2019.

In Step 3, EirGrid re-confirmed the need for the project and investigated and consulted on the shortlisted technology options from September 2021 to November 2021, to strengthen the electricity network between the Woodland and Dunstown substations. In April 2021, EirGrid identified the 400 kV underground cable option as the best performing option to progress for this project.

EirGrid concluded Step 4 in June 2022 where extensive consultation with stakeholders and the community, identified exactly where the underground electricity connection will be built.

The project is now at Step 5 which includes the preparation and submission of the application for approval to An Bord Pleanála.

Details of the alternatives considered in Step 3 and Step 4 are provided in Chapter 4 Consideration of Alternatives.

Several documents about the Kildare-Meath Grid Upgrade and the project development phase are available on the project website[3] and are included in Volume 5 of this PECR:

The relevant reports and documents are organised depending on which stage (step) of the project they refer to in EirGrid's Six Step Framework for developing projects in Ireland (they are provide in Volume 5 of this PECR):

- *Step 1 – How do we identify needs of the electricity grid?*
    - *Step 1 - Needs Report (July 2017)*
- *Step 2 – What technology can meet these needs?*
    - *Step 2A - Long List Options Report (December 2017)*
    - *Step 2B - Short List Options Report (March 2019)*
- *Step 3 – What's the best option and what area may be affected?*
    - *Step 3A - Emerging Best Performing Technology Options Report (October 2020)*
    - *Step 3B - Best Performing Technology Option Report (March 2021)*
- *Step 4 – Where exactly should we build?*
    - *Step 4A – Emerging Best Performing Route Option Report (March 2022)*
    - *Step 4B – Best Performing Route Option Report (June 2022)*
- *Stakeholder Engagement:*
    - *Summary of engagement with the public and stakeholders in Steps 1-5*

[2] This is improving existing towers and overhead lines so that they can carry high voltages.
[3] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/

1.5 Environmental Impact Assessment (EIA) Screening

An Environmental Impact Assessment (EIA) Screening Report has been prepared and a report of its findings accompanies this PECR (see Appendix 1.2). The screening exercise concluded that the Proposed Development does not require EIA.

Screening is the term used to describe the process for determining whether a proposed development requires an EIA by reference to mandatory classes of development and legislative threshold requirements or by reference to the type and scale of a proposed development and the significance or the environmental sensitivity of the receiving baseline environment.

Annex I to Directive 2011/92/EU as amended by Directive 2014/52/EU requires as mandatory the preparation of an EIA for all projects listed therein. Projects listed in Annex II to the Directive are not automatically subjected to EIA. Member States can decide to subject them to an assessment on a case-by-case basis or according to thresholds and/or criteria (for example size), location (sensitive ecological areas), and potential impact (surface affected, duration).

The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296/2018) amended the Planning and Development Act 2000 and the Planning and Development Regulations 2001 in order to transpose into Irish Law the provisions of Directive 2014/52/EU.

In Ireland, Schedule 5 (Part 1 and Part 2) of the Planning and Development Regulations 2001, as amended, transposes Annex I and Annex II to the amended EIA Directive. The Proposed Development is not of a type described by the relevant classes detailed in either Part 1 or Part 2 of Schedule 5 of the Planning and Development Regulations 2001, as amended. As such, there is no requirement for the Proposed Development to be subject to EIA.

Given that it is not a type of development listed in Schedule 5, the Proposed Development is therefore not considered to be a 'sub-threshold development', that is a development of a type set out in Part 2 of Schedule 5 which does not equal or exceed, as the case may be, a quantity, area or other limit specified in that Schedule in respect of the relevant class of development.

It is therefore considered that the Proposed Development does not require EIA to be carried out. However, it is acknowledged that formal Screening for EIA is a matter for An Bord Pleanála as the Competent Authority for EIA in respect of this application for consent.

Notwithstanding this, the Proposed Development has been considered from an environmental perspective. This PECR includes a summary of baseline data for a range of environmental topics that are relevant to the study area and the nature of the Proposed Development. These topics have been selected as they are the most likely to represent the key constraints, risks and opportunities for the Proposed Development. It should also be noted that there are interrelationships between environmental topics, for example noise, air quality, traffic and visual impacts are often interrelated.

These are addressed in the following chapters:

- Chapter 7: Population and Human Health;
- Chapter 8: Air Quality and Climate;
- Chapter 9: Noise and Vibration;
- Chapter 10: Biodiversity;
- Chapter 11: Soils, Geology and Hydrogeology;

- Chapter 12: Hydrology;
- Chapter 13: Cultural Heritage;
- Chapter 14: Traffic and Transport;
- Chapter 15: Material Assets – Agriculture and Equine;
- Chapter 16: Material Assets – Non-Agriculture;
- Chapter 17: Landscape; and
- Chapter 18: Cumulative Assessment.

It should be noted that these EIA screening considerations for this PECR and application under Section 182A of the Planning and Development Act 2000 as amended, relate to EIA under the Planning and Development Act 2000 (as amended) only. A separate process is being undertaken under the European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011 for works related to landholdings and hedgerows. That process is distinct to the Strategic Infrastructure Development' process and EirGrid will engage with the Minister for Agriculture, Food and the Marine on the requirements related to that process.

1.6 Appropriate Assessment (AA) Screening

An Appropriate Assessment (AA) Screening Report was prepared and a report of its findings accompanies this PECR (Appendix 1.3).

The conclusion of the Screening for Appropriate Assessment is that, on the basis of objective evidence, likely significant effects on the conservation objectives of any European site from the Proposed Development, individually or in combination with other plans or projects, could not be excluded and therefore it is respectfully submitted that an Appropriate Assessment of the Proposed Development is required. The Natura Impact Statement (NIS) was prepared and examined whether, in view of best scientific knowledge and applying the precautionary principle, the Proposed Development either individually, or in combination with other plans or projects, may have an adverse effect on the integrity of any Natura 2000 Site (also known as European Sites).

On review of best scientific knowledge, applying the precautionary principle, and considering the conservation objectives of the relevant Natura 2000 sites, it is considered that the Proposed Development, on its own or in combination with other plans or projects, will not have an adverse effect on the integrity of any Natura 2000 Site. Again, a formal conclusion in the matter is the responsibility of An Bord Pleanála as Competent Authority for Appropriate Assessment of this application for Statutory consent.

1.7 Construction and Environmental Management Plan (CEMP)

A Construction and Environmental Management Plan (CEMP) is provided in Appendix 5.4 of this PECR. This represents the first iteration of the CEMP, based on the general arrangement and methodologies contained in this application submission and will be implemented as a minimum. The Contractor may update the measures in the CEMP during the detailed design phase, to the extent required to comply with any planning conditions in the planning permission (if granted) for the Proposed Development and as otherwise required by the relevant Planning Authorities. The CEMP will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect the environment, are implemented.

1.8 Sustainability

The approach to sustainability is an overarching issue and it cannot be addressed within one assessment criterion (e.g. environment) and must be considered within all assessment criteria. Sustainability is at the core of the project and this section will outline how sustainability and its context with international and national sustainability measures are addressed.

It is recognised at National and Regional level that International, European, and national climate change commitments mean that power generation, transport and heat, increasingly have to be produced from sustainably produced electricity. Therefore, national and regional policy have a strong emphasis on the need for new energy systems and transmission grids.

EirGrid has identified that the project will help facilitate Ireland’s transition to a low carbon energy future.

Sustainability has been at the heart of the project where the routing principles establish how the proposed route options considered social, economic and environmental issues. Assessment of EirGrid’s five assessment criteria is the key to the consideration of sustainability on the Proposed Development.

Sustainability has been at the core of the design process for the Proposed Development. Sustainability has been central to the development of the Proposed Development, and which regulations, plans, policies and programmes have influenced the development.

The Proposed Development will consider the following topics in line with the key state of the environment messages above:

- Population and Human Health;
- Air Quality and Climate;
- Noise and Vibration;
- Biodiversity; and
- Soils.

1.9 Structure of this Report

This PECR provides a description of the Proposed Development and includes an analysis of the project’s compliance with national, regional and local energy and planning policies and an assessment of its potential environmental impacts and mitigation measures that are required to avoid any significant adverse effects as a result of the construction and operation of the Proposed Development.

This PECR report forms part of a planning application pack that has been prepared in support of the application for submission to An Bord Pleanála. The planning application pack also contains the following reports, documents and figures:

- Planning Application Form and associated Notices and Drawings;
- Planning Report;
- PECR (including figures and appendices); and
- AA Screening Report and NIS.

In order to assist with the reading and understanding of this PECR, the report has been structured into five volumes:

- Volume 1: Non-Technical Summary;
- Volume 2: Main Text;
- Volume 3: Appendices;
- Volume 4: Figures; and
- Volume 5: Supporting Documents.

The structure of this volume of the PECR report (Main Text) is set out in Table 1.1.

Table 1.1 PECR Chapter Structure

Chapter Number	Chapter Title
1	Introduction
2	Need for the Proposed Development
3	Stakeholder Engagement
4	Consideration of Alternatives
5	Project Description
6	Planning and Land Use Context
7	Population and Human Health
8	Air Quality and Climate
9	Noise and Vibration
10	Biodiversity
11	Soils, Geology and Hydrogeology
12	Hydrology
13	Archaeology, Architectural Heritage, and Cultural Heritage
14	Traffic and Transport
15	Material Assets – Agriculture and Equine
16	Material Assets – Non-Agriculture
17	Landscape
18	Cumulative Assessment and Interactions
19	Summary of Mitigation and Monitoring Measures
20	Conclusions

There were no limitations encountered, such as technical deficiencies or lack of knowledge, in compiling the information required to carry out the assessments detailed in this PECR. Any other limitations are highlighted in the relevant chapters of this PECR.

Details of the contributors that informed this PECR are provided in Appendix 1.1.

2. Need for the Proposed Development

2.1 Project Need

There are two drivers that underpin the need for this proposed transmission infrastructure development, namely:

1. Increased demand on East coast – An increase in electricity demand as part of natural growth is expected. In addition, there is a demand increase in the order of 1200 MW due to the planned connection of high energy users. This is based on executed and offered connection agreements mostly in the counties Kildare, Meath and Dublin. Part of this demand is expected to start to connect to the system in 2017 and is ramping up to the total demand figure in 2030. The interest is high and it is expected that this trend will continue with further requests for connection.

2. Integration of generation from the South and South West regions – Significant levels of new renewable generation have connected or are in the process of connecting to the transmission and distribution system in the south and southwest of Ireland. This is also where the newer and more cost effective existing conventional generation units are located. This results in a scenario whereby a significant portion of the generation sources are located in the south and southwest of Ireland away from the main demand centres within the Dublin and Greater Dublin Area, and East region in general. The power produced will hence have to be transported to get to where it is needed (known as demand centres).

These two drivers introduce cross country power flows on the existing transmission system from the West to the East coast. The Proposed Development is needed to ensure compliance with EirGrid's Transmission System Security Planning Standards (TSSPS). To ensure transmission system reliability and security, the performance of the network is compared with the requirements of the Transmission System Security and Planning Standards which are available at www.eirgridgroup.com.

The violations occur for the unplanned loss of any of the existing 400 kV circuits between Moneypoint 400 kV station in the West and Dunstown 400 kV in County Kildare and Woodland 400 kV station in County Meath in the East. The violations relate to two aspects:

- Bringing required power to the East coast; and
- Transferring this power within Counties Dublin, Kildare and Meath once the power reaches the East coast.

The power is currently transported cross-country on the two existing 400 kV lines from the Moneypoint station in County Clare to the Dunstown substation in County Kildare and Woodland substation in County Meath (shown in Plate 2.1). Transporting large amounts of electricity on these 400 kV lines could cause problems that would affect the security of electricity supply throughout Ireland, particularly if one of the lines is lost unexpectedly. To solve this emerging issue, EirGrid needs to strengthen the electricity network between Dunstown and Woodland to avoid capacity and voltage problems. The Proposed Development will help transfer electricity to the east of the country and distribute it within the network in Meath, Kildare and Dublin, helping to ensure compliance and resolve the emerging issues identified above.

Plate 2.1 Cross-country 400 kV lines

The Proposed Development will help to meet the Government of Ireland's Climate Action Plan target of up to 80% renewable energy generation by 2030. This includes the transmission of electricity from offshore renewable sources. Significant levels of new renewable generation have connected or are in the process of connecting to the transmission and distribution system in the south and southwest of Ireland. This is also where the newer and more cost effective existing conventional generation units are located. This results in a significant proportion of the generation sources being located in the south and southwest of Ireland away from the main demand centres. The power produced will hence have to be transported to where it is needed. This Proposed Development will allow more renewable generation to be connected to the electrical grid and to supply this energy to where demand is largest.

EirGrid has identified that the Proposed Development will have the following benefits:

- Community - Deliver community benefit in the areas that facilitate the project infrastructure;
- Competition - Apply downward pressure on the cost of electricity;
- Sustainability - Help facilitate Ireland's transition to a low carbon energy future;
- Security of supply - Improve electricity supply for Ireland's electricity consumers; and
- Economic - Contribute to the regional economy and support foreign direct investment.

The Proposed Development will create a new circuit in the electricity transmission network and will enhance the network in the area and provide capacity to connect new demand for electricity to support economic growth in the area and to connect new renewable generation to help with meeting national Climate Action Plan targets.

The need for the Proposed Development has been established through a series of reports completed at Steps 1 to 4. The Step 1 - Needs Report (July 2017) and other reports are available on the project website[4] (also, see Volume 5 of this PECR). This series of reports identified the need for a new connection between Woodland and Dunstown substations and that an underground cable would be the best technology solution for this need. The Proposed Development is a high voltage (400 kV) underground cable between Woodland and Dunstown substations and the need for the Proposed Development remains robust.

2.2 Do-Nothing Scenario (Technical)

The 'Do-Nothing' alternative would mean the Proposed Development will not be constructed and the existing network will be maintained in line with normal practice. From an environmental effects perspective, this means no significant change to the existing environment; and existing land management practices in the area will continue and any planning development will occur regardless of the Proposed Development.

In 2019 the Irish Government published its first Climate Action Plan setting out the Irish State's climate objectives including to achieve at least 70% of electricity from renewables by 2030. This figure has since increased with the government now expecting up to 80% of electricity to come from renewables by 2030. The enactment of the Climate Action and Low Carbon Development (Amendment) Act 2021, has now put Ireland on a legally binding path to net zero emissions no later than 2050. Should the proposed development not proceed then it will result in an impact to the achievement of climate action targets through the lack of continued integration of renewable generation into the grid. Technically, the 'Do-Nothing' scenario would result in EirGrid failing to adhere to their legal obligation under the European Communities (Internal Market in Electricity) Regulations 2000 (S.I. No. 445 of 2000) and compliance with the TSSPS. To ensure transmission system reliability and security, the performance of the network is compared with the requirements of the Transmission System Security and Planning Standards which are available at www.eirgridgroup.com.

The system analysis indicates that the network is experiencing significant violations of the compliance with the TSSPS. The violations occur for the unplanned loss of any of the existing 400 kV circuits between Moneypoint 400 kV station in the West and Dunstown 400 kV in County Kildare and Woodland 400 kV station in County Meath in the East.

The violations observed can be further divided into three technical issues:

- Thermal overloads for unplanned losses of any of the 400 kV circuits between the west coast and the east coast. The following circuits are overloaded: Maynooth – Woodland 220 kV, Dunstown – Maynooth 220 kV, Maynooth – Ryebrook 110 kV, Killonan – Shannonbridge 220 kV, Maynooth – Shannonbridge 220 kV, Cashla – Prospect 220 kV and Bracklone – Portlaoise 110 kV. These circuits are also overloaded for maintenance trip combinations despite remedial action using generation dispatch of 400 MW;

- Voltage collapse: voltage collapse means that the voltage cannot be maintained in the transmission system. The voltage in the transmission system is supported by reactive power. During certain operating conditions, a lack of sufficient reactive power in Counties Dublin, Kildare and Meath have been identified; and

- Large phase angles: large phase angles are observed due to high power transfers on existing lines and the low connectivity between transmission stations during certain operating conditions.

Consequently, EirGrid must develop the grid in response to Increased demand on East coast and Integration of generation in South and South West.

[4] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/

3. Stakeholder Engagement

3.1 Introduction

Public and Stakeholder engagement is a key tenet in EirGrid's Framework for Grid Development. EirGrid's Framework, which is outlined in EirGrid's publication 'Have your Say' is provided for the local community, landowners, elected representatives, media, and prescribed bodies and other stakeholders to be made aware of a project and most importantly provides opportunities to provide feedback as the project develops.

Throughout the development of the project, the design of the Proposed Development has been revised and refined to take account of the findings of studies and surveys and from public consultation and stakeholder feedback. This has also included ongoing consultation and engagement with the planning authorities and other prescribed bodies.

Stakeholder Engagement Reports were prepared at key steps in the project, and they are available on the project website[5]. A summary Stakeholder Engagement Report has been provided to give an overview all of the consultation from Steps 1-5 in one report. It is available on the project website and is provided in Volume 5.

The following sections of this chapter do not repeat the contents of those reports but summarise the engagement carried out with statutory bodies.

3.2 An Bord Pleanála

The Strategic Infrastructure Development pre-application process with An Bord Pleanála (Reference ABP-314112-22) was commenced by letter from EirGrid to An Bord Pleanála under Section 182E of the Planning and Development Act 2000, as amended. Pre-application meetings were held with ABP on the following dates:

- 15th September 2022;
- 15th December 2022; and
- 16th February 2023.

Appendix 3.1 includes a letter from An Bord Pleanála confirming that the Proposed Development is Strategic Infrastructure Development, requiring a planning application to An Bord Pleanála rather than the local planning authorities.

3.3 Prescribed Bodies and Agencies

Table 3.1 outlines some of the consultation that has taken place between EirGrid's project team and Prescribed Bodies and Agencies.

[5] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/

Table 3.1 Prescribed Bodies and Agencies Engagement

Stakeholder	Form of Engagement	Key Comments Raised	Responses as Addressed in this Report
Meath County Council	Virtual Meetings: • 16/09/2021; • 30/09/2021; • 31/03/2022; • 16/08/2022; • 28/09/2022; • 02/12/2022 (in-person meeting); and • 16/01/2023.	EirGrid and Meath County Council held a series of meetings to discuss the ground investigations for the Proposed Development. Other meetings were held to discuss the proposed route, the impact to roads, road closures, impacts from joint bays, and the impacts to future developments.	Chapter 11 Soils, Geology and Hydrogeology Chapter 5 Project Description
Kildare County Council	Virtual Meetings: • 14/04/2022; • 01/06/2022; • 23/06/2022; • 16/09/2022; • 05/10/2022 (in-person meeting); • 25/10/2022 (in-person meeting); and • 11/01/2023 (in-person meeting).	EirGrid and Meath County Council held a series of meetings to discuss the ground investigations for the Proposed Development. Other meetings were held to discuss the proposed route, the impact to roads, road closures, impacts from joint bays, the impacts to future developments, and the use of Sallins Bypass Bridges.	Chapter 11 Soils, Geology and Hydrogeology Chapter 5 Project Description
Transport Infrastructure Ireland	Virtual Meetings: • 20/08/2021; and • 16/09/2022.	Crossing of the M4 and M7	Chapter 5 Project Description
Irish Rail	Virtual Meetings: • 05/11/2021; • 02/12/2021 (site visit); • 01/06/2022; • 14/09/2022; • 17/11/2022; and • 28/11/2022.	Crossing of the Dublin-Sligo and Dublin-Cork/Limerick railway lines.	Chapter 5 Project Description
Waterways Ireland	Virtual Meetings: • 15/03/2022; and • 01/06/2022	Crossing of the Royal Canal and the Grand Canal.	Chapter 5 Project Description
Irish Water	Virtual Meeting: • 17/01/2023.	Discussion of the crossing of Irish Water assets.	Chapter 5 Project Description

Stakeholder	Form of Engagement	Key Comments Raised	Responses as Addressed in this Report
Gas Networks Ireland	Emails: • 12/08/2022; and • 22/08/22.	Discussion of the crossing of Gas Networks assets.	Chapter 5 Project Description
National Monuments Service	Virtual Meeting: • 19/12/2022.	Discussion on the potential effects of the Proposed Development.	Chapter 13 Archaeology, Architectural and Cultural Heritage
Inland Fisheries Ireland	Emails and telephone calls: • 02/12/2022; and • 17/01/2023.	Discussion on the potential effects of the Proposed Development	Chapter 10 Biodiversity and Chapter 12 Hydrology
National Parks and Wildlife Service	Virtual meeting: • 07/02/2023	Discussion on the potential effects of the Proposed Development	Chapter 10 Biodiversity and Chapter 12 Hydrology

4. Consideration of Alternatives

4.1 Introduction

The Proposed Development has been developed in accordance with EirGrid's Framework for Grid Development. As part of the previous steps of this Framework, a series of studies by or on behalf of EirGrid were conducted which assessed a range of reasonable and relevant options for the development. The following sections provide a summary of the alternatives considered. Further detail is provided in the Steps 1-4 reports, which are available on project website. The Step 3 and 4 reports are included in Volume 5 of this PECR (Supporting Documents).[6].

EirGrid's approach to the development of projects is set out in Chapter 1 of this PECR. EirGrid follows a six-step approach to develop the transmission network and identify solutions to any identified transmission network problem. This six-step approach is described in the document 'Have Your Say' published on EirGrid's website[7]. The six steps are shown in Chapter 1 of this PECR. Each step has a distinct purpose with defined deliverables and together they represent a lifecycle of a development from conception through to implementation and energisation. The Proposed Development is currently in Step 5 'Applying for Planning Permission'.

4.2 Steps 1-3 (Identifying the Project Need, Technology Type, and What Area is Affected)

In Step 1, EirGrid identified the need for the Proposed Development in July 2017[8]. The Step 1 report is included in Volume 5 of this PECR (Supporting Documents). The Need for the Proposed Development is outlined in Chapter 2 of this PECR. However, the Step 1 report concluded the grid in this area required further development because of two drivers: increased demand in the East Coast; and Integration of generation in South and South West. The Step 1 Report also identified the issues if the grid was not developed. This is addressed in Chapter 2 of this PECR.

In Step 2 (December 2017[9]), EirGrid compiled a shortlist of best-performing technical options (see Volume 5 of this PECR), which went out for public consultation between November 2018 and February 2019. This included a mix of overhead line, underground cable, and upvoltage technologies. Four of those options were taken forward to Step 3 in April 2019.

In Step 3 (October 2020), EirGrid re-confirmed the need for the Proposed Development and investigated and consulted on the shortlisted technology options to strengthen the electricity network between the Woodland and Dunstown substations.

To arrive at the Best Performing Option (BPO) for the Kildare – Meath Grid Upgrade and to conclude the Step 3 process, a Multi-Criteria Analysis was developed[10], and subsequently updated to incorporate consultation feedback and any new information received since October 2020.

The updated Multi-Criteria Analysis resulted in two options, Option 1 and Option 3B, having an equal overall combined performance across the criteria considered in the Multi-Criteria Analysis. The technical risk and deliverability challenges were used to help distinguish between the two options.

Option 1 (Upvoltaging – see Plate 4.1) was technically more straightforward but it is more difficult to deliver. This option would have required replacing or modifying part of the Gorman – Maynooth 220 kV overhead line and all of

[6] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/
[7] http://www.eirgridgroup.com/the-grid/have-your-say/
[8] https://www.eirgridgroup.com/site-files/library/EirGrid/Step-1-Needs-Report-Capital-Project-966.pdf
[9] https://www.eirgridgroup.com/site-files/library/EirGrid/Step-2-Part-A-Options-Report-Capital-Project-966.pdf and https://www.eirgridgroup.com/site-files/library/EirGrid/Step-2-Part-B-Options-Report-Capital-project-966.pdf
[10] https://www.eirgridgroup.com/site-files/library/EirGrid/Step-3-Emerging-Best-Performing-Options-Report-Kildare-Meath-Grid-Upgrade.pdf

the Dunstown – Maynooth 2 220 kV overhead line. A section of overhead line would have been constructed to connect the existing overhead line into Woodland substation.

The assessment of Option 1 in the October 2021 report (see Plate 4.2) found that the option performed well under the technical and economic criteria. As the option sought to maximise existing infrastructure with minimum new build, the impact on the environmental and socio-economic aspects were less compared with the other options which use new infrastructure. The Deliverability of the option was considered to be challenging because of risks and unknown technical issues that would have to be solved during the subsequent stages of project development.

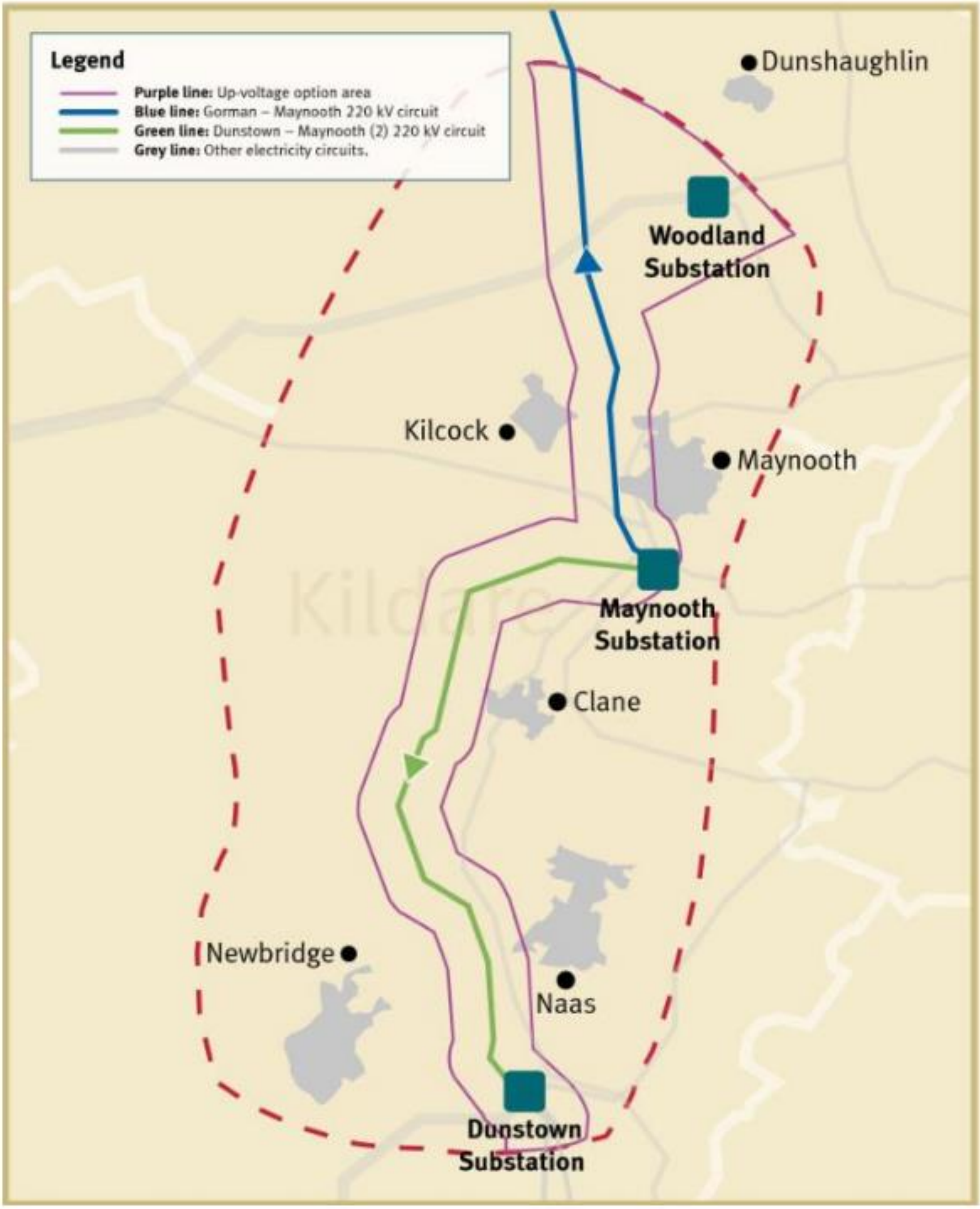


Plate 4.1 Step 3 Option 1 (Upvoltage Option) (Extracted from the October 2020 report)

	Option 1 Up-voltage 220 kV to 400 kV
Technical Performance	
Economic Performance	
Deliverability	
Environmental	
Socio-economic	
Combined Performance	

Plate 4.2 Step 3 Option 1 (Upvoltage Option) Assessment (Extracted from the October 2020 report)

Note:

The Multi-Criteria Analysis (MCA) approach facilitates a balanced consideration of the technical, economic, environmental, socio-economic and deliverability aspects of a development project. The overall evaluation in MCA is based on expert judgement; this is informed by various tools such as publicly available datasets and established guidelines or other documents, as well as feedback received from public and stakeholder engagement. In this instance, the MCA also has had regard to assessment and analysis undertaken to date in respect of the Kildare-Meath Grid Upgrade project, as captured in the various reports available on the project website at www.eirgridgroup.com

More significant/difficult/risk Less Significant/difficult/risk

This risk scale is clarified by text, as follows:

- High: Dark Blue;
- Moderate-High: Blue;
- Moderate: Dark Green;
- Low-Moderate: Light Green; and
- Low: Cream.

The key decision-making tool in the MCA approach is the performance matrix. This is a qualitative tool which uses the standard set of criteria to assess all options by means of colour coding from less constrained (yellow) to more constrained (blue). Evidence substantiating the colour coded matrix is also documented in this report. This ensures visibility and transparency in the evaluation process.

Option 3B (400 kV underground cable – this option would be later renamed Option 4) was considered to be more straightforward to deliver but was considered more technically challenging to integrate onto the system. The October 2020 report did not show the location of the underground cable options as they were subject to further consideration (see **Plate 4.3**). However, two feasible route options for an underground cable were published as part of the assessment of the technology options for the project. These options, shown in **Plate 4.4** below, were subject to a high-level assessment, and it was intended that these two route options would be subject to change as the project evolved. The routes shown were indicative and identified as part of a feasibility exercise only using the existing road network to facilitate discussion on underground cable route feasibility.

The assessment of Option 3B in the October 2020 report (see Plate 4.5) performed equally or better in all of the criteria compared with the other underground options. In terms of Deliverability and Socio-economics, challenges and risks during the construction phase were identified.

Plate 4.3 Step 3 Study Area for Underground Options (Extracted from the October 2020 report)

Plate 4.4 Step 3 Feasible Cable Options (extracted from the Step 3 Cable Feasibility Report for the Proposed Development)

	Option 3B 400 kV UGC)
Technical Performance	
Economic Performance	
Deliverability	
Environmental	
Socio-economic	
Combined Performance	

Plate 4.5 Step 3 Option 3B (Underground Cable) Assessment (Extracted from the October 2020 report)

The October 2020 report was published, and public participation and stakeholder engagement was undertaken for 10 weeks, lasting between October and December 2020. The feedback was fully considered in the decision-making process to select the BPO.

Ultimately, the decision between Option 1 and Option 3B came down to a fine balance. Option 1 was considered to be technically more straightforward but more difficult to deliver. Option 3B (renamed Option 4) was considered more straightforward to deliver but is more technically challenging to integrate on to the system.

In April 2021[11], EirGrid identified the 400 kV underground cable Option 3B as the BPO to progress for this Proposed Development. The project then moved to 'Step 4 – Where Exactly Should We Build?'. It was concluded that Option 3B had a lower risk in terms of the delivery timeline when compared to the Option 1 and had lower impact on the existing transmission system in terms of outages and other maintenance and capital works that are routinely required on the system. Option 3B would introduce a new transmission pathway between Dunstown and Woodland stations while keeping the existing 220 kV overhead line intact. This meant that the existing 220 kV circuits between Dunstown and Woodland stations, which is essential for supplying the greater Dublin network, can remain in service during the implementation of the project. This would provide flexibility to the system operator to accommodate other outages (generation and transmission) whilst also minimising the risk to security of supply. The additional transmission pathway creates greater capacity on the network to accommodate growth.

Therefore, the Proposed Development was selected to be a 400 kV underground cable and was taken forward to Step 4.

[11] https://www.eirgridgroup.com/site-files/library/EirGrid/Kildare-Meath-Grid-Upgrade-Step-3-Best-Performing-Option-Report.pdf

4.3 Step 4 – Where Exactly Should We Build?

Step 4 was divided into two sub-steps:

- Step 4A Analysis of the Route Options and
- Step 4B Best Performing Option

The sections below provide an overview of the process undertaken at Step 4A and 4B.

4.3.1 Overview of Step 4A

The Step 4A Report was published in March 2022[12] (see Volume 5 of this PECR) and presented an analysis of the four new proposed route options. It described the process followed to identify the four proposed route options and presented a comparative evaluation of those against a set of criteria. The Step 4A report identified what EirGrid, on the basis of information currently gathered, considered to be the Emerging Best Performing Option for the route of the underground cable. The Step 4A report was published and EirGrid considered all feedback arising from the report and further survey and analysis was undertaken, to confirm the BPO at Step 4B.

At the start of Step 4A, the project team re-examined the Study Area to identify improved route options from the two feasible route options established during Step 3. The design of the proposed route options at Step 4A were based on the following routing principles:

- Avoid motorways;
- Maximise the use of national, regional and local roads;
- Avoid town centres and industrial estates;
- Avoid going off-road, through private land and through agricultural land where possible;
- Avoid sensitive natural and built heritage locations;
- Minimise impact on communities where possible; and
- Minimise the overall length of the route.

Since the completion of the Step 4A process, the Government's Climate Action Plan 2023 has been published. As outlined in Chapter 2 of this PECR, the Government has confirmed the use of the public road network for grid projects, like this one, as a measure to deliver the emissions ceilings. This helps to confirm that the routing principles for the project were a sound approach.

The routing principles align with EirGrid's five key assessment criteria - Environmental; Socio-economic; Technical; Economic; and Deliverability. By following the routing principles, improved route options were designed. The routing process was refined through a Route Section Assessment and an End-to-End Assessment. This process is summarised in Plate 4.6 and presented in detail in the Step 4A and 4B reports for the project.

[12] https://www.eirgridgroup.com/site-files/library/EirGrid/KMGU-JAC-TN-0017-Step-4A-Report-08-03-2022-Compressed.pdf

Study Area

- The Study Area from Step 3 was used to identify and map constraints that should be avoided. This was an area of approximately 760km^2.

Constraints Identification

- A large list of environmental and social constraints/receptors were identified and mapped. These were highlighted as areas to be avoided. It included (amongst other things): houses, towns and villages, equine and agricultural land, motorways, designated sites, archaeological features, areas of peat, woodland, rivers, businesses, and more.

Possible route options

- Workshops were held with specialists in the project team to examine all reasonable options between Woodland and Dunstown substations, taking into account the mapped constraints, the routing principles, and the five assessment criteria.

Route Section Assessment

- A long list of route sections was identified and assessed. There were 36 individual route sections that could be combined to create over 50 different end-to-end cable route options. The individual sections were assessed against the five assessment criteria and comparatively rated.
- The individual sections which scored poorly or did not connect well with other lengths were not progressed.

End-to-End Assessment

- The shortlisted individual sections were combined to create four end-to-end options.
- These four end-to-end options were presented to the public at the August to November 2021 consultation.
- The options were assessed against the five assessment criteria and comparatively rated.

Selection of Option A (Red)

- Option A (Red) was selected as the Emerging Best Performing Option in the Step 4A Report.
- It was selected as it scored more favourably in terms of Deliverability and Socio-economics.
- From the public consultation, many respondents expressed their support for this option, stating that in general terms Option A (Red) was the 'best option' or a 'reasonable' option.

Refinement of Option A (Red) route

- At Step 4B, consultations with the councils and landowners, as well as further design, surveys, and assessments were undertaken.
- This allowed the route to be narrowed down to the Best Performing Option.
- One corridor remains because of ground conditions and this will be resolved at Step 5.
- The Project Study Area was further refined to match the area of the Best Performing Option.

Plate 4.6 The Route Design Process for Step 4A and Step 4B

The Step 4A process culminated in four route options – as shown in **Plate 4.7**.

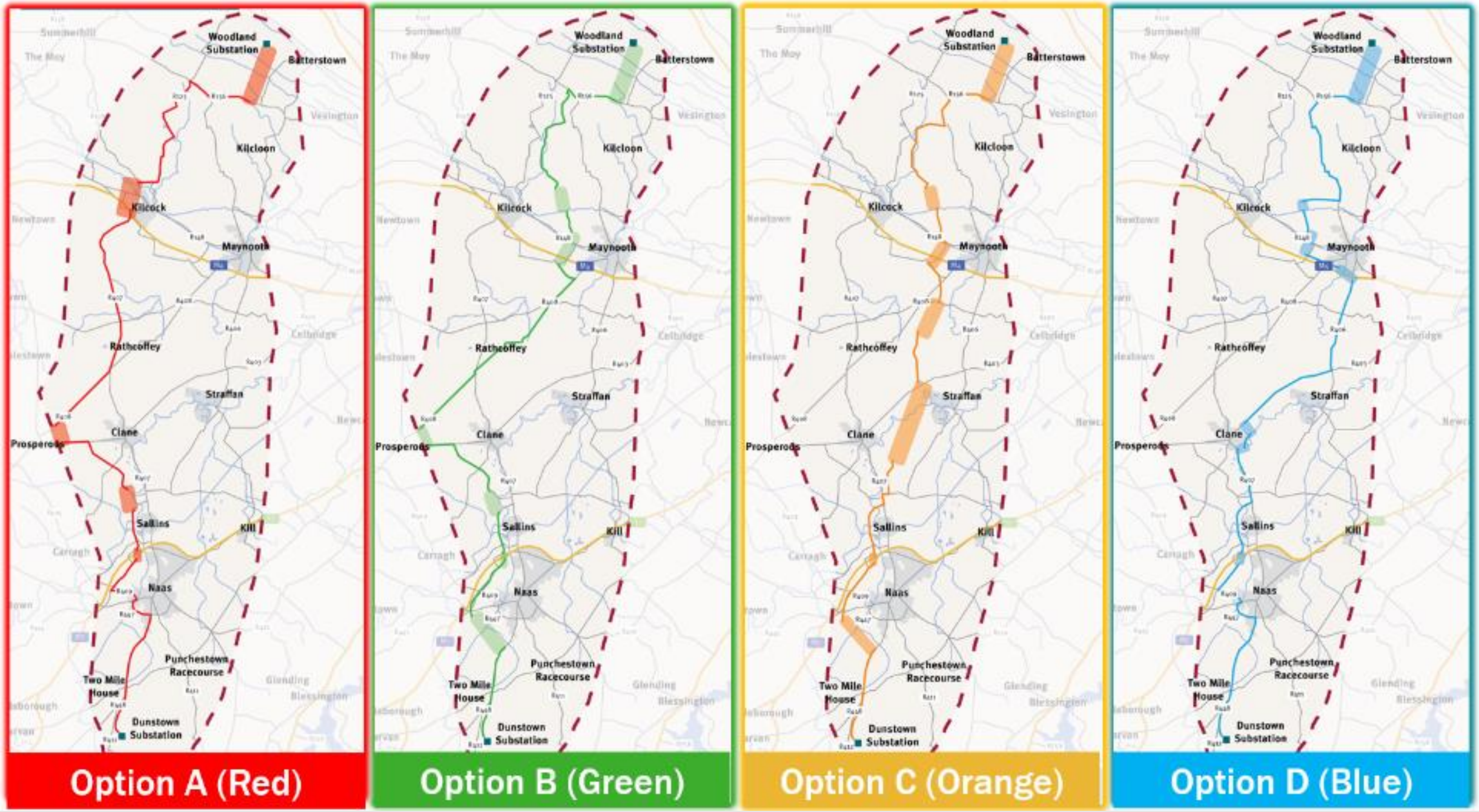


Plate 4.7 Shortlisted Options - shown in Step 4A Public Consultation (2021)

The four route options were presented for public consultation between August and November 2021.

An Engagement Summary Report, Step 4 has been prepared which outlines the consultation responses since the publication of the Step 4A report and the Emerging Best Performing Option. This report is available on the project website[13]. Table 4.1 below provides a summary of key issues raised and how the project team has considered the comments.

Table 4.1. Post Step 4A Engagement Summary (2022)

Comment	Project Team Response
Potential disruption arising from the construction of the Proposed Development, including lengthy roadworks and increased levels of traffic. The R125 should be closed because it is too narrow. The road between Mullagh and Kilcock should be closed and reinstated in better condition, meaning that the final route would have to be adjusted.	Response made in 2022: The Step 4A Report contained a multi-criteria assessment of the potential impacts at the construction phase, including traffic disruption. The construction phase impacts have been key considerations in the project to date and will be fully addressed in the Step 5 planning and environmental reports. Mitigation measures and traffic management are included in those reports, following further consultation with key stakeholders like Meath and Kildare County Councils. Update from Step 5: The Traffic Management Plan and Traffic and Transport Chapter of the PECR have fully considered the impacts to roads and to traffic. Reinstatement measures are outlined in Chapter 5 of the PECR and will be completed to the required standards.
Land use - that the cable route would go through private land, could damage crops, and that land used may not be returned to its original condition.	The routing principles have sought to avoid agricultural land as far as possible – roughly 15% of the total cable length is off-road (agricultural land). Agricultural liaison officers have met with the affected landowners and discussed potential impacts from the project, and they will continue to discuss the project going forward. Reinstatement will be provided to pre-construction conditions and will be agreed with the landowner during the construction phase. Update from Step 5: Reinstatement measures are outlined in Chapter 5 of the PECR and in Chapter 16 Agriculture. The off-road section is approximately 18% of the total length of the cable.
Potential sterilisation arising from easement.	The easement will be discussed with the affected landowners to minimise impacts as far as possible. Update from Step 5: Extensive discussions have been held between the Agricultural Liaison Officers and the affected landowners and their feedback has been incorporated in the design.
Overhanging trees on the 'Red Road'; and that realigning the road could have potential adverse impacts on the Rath (in the area of the Red Road). The Red Road should be reinstated following completion of the project.	The Red Road will be avoided following routing at Step 4B.

[13] https://www.eirgridgroup.com/the-grid/projects/capital-project-966/related-documents/

Comment	Project Team Response
Details requested with EirGrid's ecologist on planting.	Contacts are available and EirGrid is happy for any such discussions.
Potential impact to the 'North-South' Interconnector.	The Kildare Meath project does not cross the proposed North-South Interconnector and so there will be no impacts. Both are important projects for Ireland's electrical grid.
Cycling routes are considered during construction.	Provision will be allowed for cyclists in the construction traffic management. Mitigation measures and traffic management will be included in the Step 5 reports, following further consultation with key stakeholders like Meath and Kildare County Councils. Update from Step 5: The Traffic Management Plan, Traffic and Transport Chapter, and Material Assets Chapters of the PECR have fully considered the impacts to cyclists.
Compensation is supplied for sterilisation from easement, per linear metre across farmland, and for crop loss and damages. That there should be arrangements to facilitate dairy farming, including milk and silage production.	Agricultural liaison officers have met with the affected landowners and discussed potential impacts from the project, and they will continue to discuss the project going forward.
More detailed maps should be provided so that residents can identify the proximity of the route in relation to their properties.	More detailed maps have been provided on the project website and in the Step 4B Report.
If the road is to be dug up, other utilities such as cables should also be placed underground.	EirGrid is consulting with key stakeholders like Meath and Kildare County Councils and utilities providers.
The route may run through their land and farms or be in close proximity to their residence.	Agricultural liaison officers have met with the affected landowners and discussed potential impacts from the project, and they will continue to discuss the project going forward. The cable route has tried to maximise the distance from all residential properties in line with the routing principles.

Option A (Red) was selected as the Emerging Best Performing Option as it scored more favourably in terms of Deliverability compared to the other options. Option A (Red) generally scored more favourably in four of the Deliverability topics compared to the other options – Design Complexity; Dependence on Other Projects; Permits and Wayleaves; and Implementation Timelines. Option A (Red) did score more highly than Options B and D and was equal to Option C for Traffic Disturbance because it has the most in-road sections and potentially impacts more regional roads than the other options, which will increase traffic disturbance. While the potential traffic impacts will be temporary and restricted to the construction phase, in order to minimise the disturbance, traffic surveys will be undertaken to confirm this assumption. Other survey and design work will be completed to confirm the assumptions made on the required working area. In addition, localised route changes could be designed and assessed to minimise potential impacts further. Consultation will be undertaken with Meath and Kildare County Councils and other key stakeholders (such as Transport Infrastructure Ireland) to agree the approach to traffic management and avoid or reduce the potential impacts.

Option A (Red) also had less Socio-economic (community) impacts compared to other options. This is reinforced by the feedback received from respondents during the consultation period. Option A (Red) impacted the least amount of agricultural land and avoided concerns that the other options would have resulted in, such as potential impacts to the settlement of Rathcoffey, and Ovidstown along the R403 and R406; and greater potential impacts to areas of amenity, such as Alexandra Bridge, near to Clane.

4.4 Overview of Step 4B

The Step 4B report was published in June 2022[14]. At Step 4B, the BPO (Option A (Red)) was re-examined to refine the route as far as possible to remove any wider areas (corridors) and to provide more certainty on the specific location. There were five wider areas shown because these were off-road sections and further discussions were required with the affected landowners. For example, the section of the cable route between Woodland substation and the R156 (chainage 0 – 3250) was modified from in-road along the Red Road to off-road along agricultural land. Consultations with affected landowners on both sections (along with technical considerations) determined that the cable route would be improved by being off-road in this section. Another example was in the Kilcock area (chainage 15000 – 15350), feedback from the landowner resulted in the cable route following the hedgerow along the R158. This was requested to minimise impact to the agricultural field and because the land is zoned for future development.

In addition, further surveys and design were needed to determine the best location for the cable route within these wider areas.

Option A (Red) from Step 4A provided a framework for the routing process at Step 4B. While it was explained in the Step 4A Report that route changes were a possibility because of further surveys and assessment, the project team sought to avoid significant changes. However, the Step 4B process identified several areas where changes would result in an improved route.

In Step 4B, Option A (Red) was re-examined to refine the route as far as possible to remove any wider areas (corridors) and to provide more certainty on the specific location. The five wider areas shown at Step 4A were shown in this way as these were off-road sections and further discussions were required with the affected landowners. Further surveys and design were needed to determine the best location for the cable route within these wider areas.

These changes are presented in Table 4.2 and Table 4.3 below. The changes were made for a number of reasons, such as reducing potential environmental impacts, reducing road closures, or avoiding private lands. As a result, approximately 3% of the route (1.5 km out of 51.4 km[15]) was moved from the route shown at Step 4A. The maximum movement of the cable route was 240 m – this occurred on the approach to Dunstown substation where the route moved 240 m west from the location shown in Step 4A.

The Step 4B process involved close cooperation between all members of the project team – agricultural liaison officers, and specialists in the fields of Deliverability, Technical, Economic, Environmental and Socio-economic factors. This multi-disciplinary team, along with input from the stakeholders, landowners and the community ensured that the BPO would be selected through a consideration of all relevant issues.

Consultations were held with potentially affected landowners. This allowed landowner input into the potential routing and provided more information on ground conditions, environmental constraints, and farming practices that were considered in the routing process. Further surveys and assessment were undertaken to determine how the route could be refined in order to avoid or reduce the potential environmental and social impacts, and to take account of technical issues. Issues such as the cable rating and the need to maintain the structural integrity of the cable (i.e. the cable must

[14] http://www.eirgridgroup.com/site-files/library/EirGrid/KMGU-JAC-TN-0048-STEP-4B-Final.pdf
[15] At Step 4A, the cable route length was 51.4 km.

bend and not make 90° turns) have been factored into the routing. This process also included the technical assessment of the roads affected by the cable, for example, stone arch bridges in the existing roads may not be suitable for the digging of a cable trench. This is because the depths of the bridges below the roads are generally quite shallow. In these cases, off-road crossings adjacent to the bridges were assessed to be the best solution, subject to the crossing methods including site-specific environmental mitigation.

Environmental and social considerations were addressed through aerial mapping, consultation with statutory bodies, field surveys, along with input from the landowners and the community, and discussions as a project team.

This process allowed for the consideration of all factors and for the project team to discuss potential routing options for the cable route.

The Project Study Area at Step 4A was roughly 340 km^2 – a reduction of approximately 55% from the Step 3 Project Study Area, covering all four of the proposed route options. After the selection of Option A (Red) as the Emerging Best Performing Option, the Project Study Area was further refined to cover this area. The Step 4B Project Study Area is shown in **Plate 4.8**. It covered an area of 137 km^2 – a reduction from the Step 4A area of approximately 60%. These refinements have allowed community engagement to be focused to the relevant area of the route. This Study Area as shown in **Plate 4.8** has been used for Step 5.

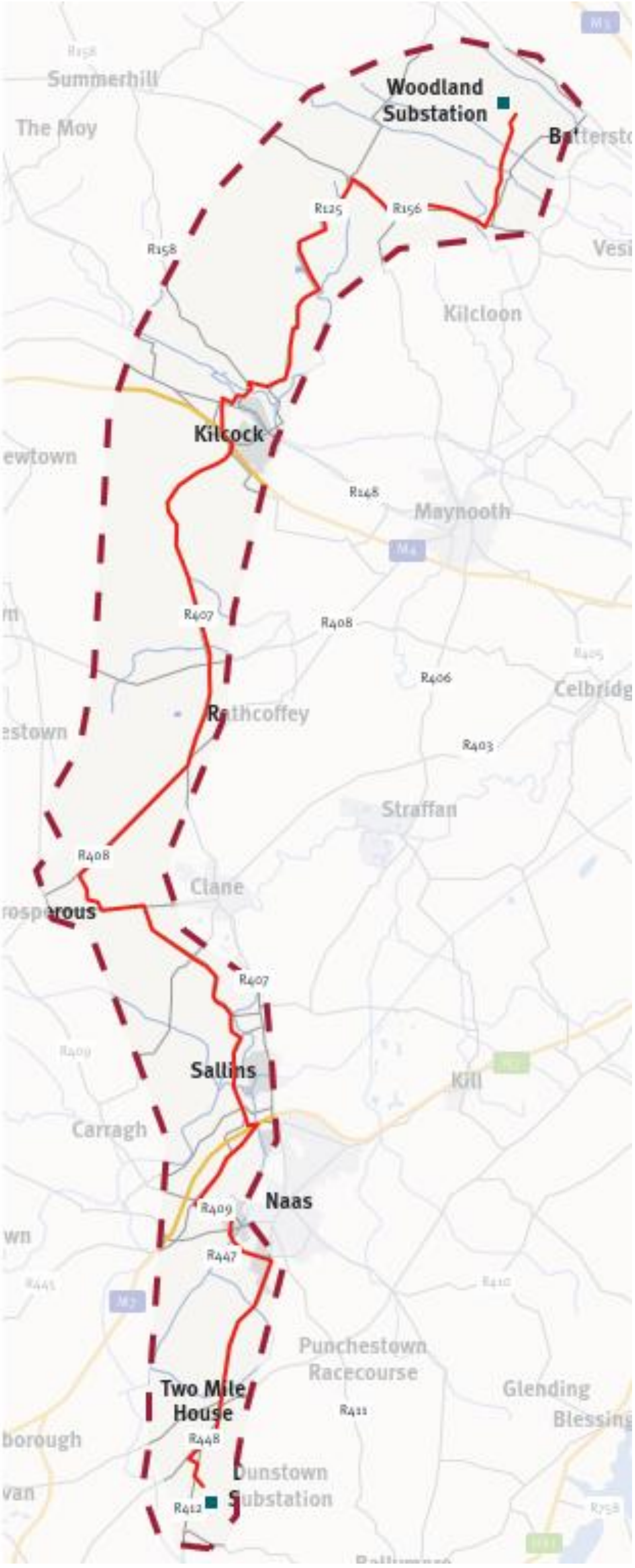
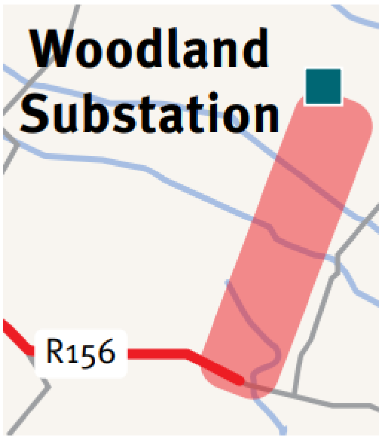


Plate 4.8 Step 4B Project Study Area

The work that was undertaken by the project team at Step 4B allowed the refinement of the Emerging Best Performing Option that was presented at Step 4A. Option A (Red), as shown as Step 4A, had five wider areas and these are shown in **Plate 4.7**. It was necessary to show these wider areas as further design, assessment and consultation were required. In Step 4B, only one wider area remained – the crossing point of the Grand Canal in Naas. Consultations with local stakeholders revealed that the area to the south of the canal is soft ground and was described as challenging in terms of ground conditions. Geological data from Geological Survey Ireland[16] have been reviewed and no recorded significant constraints to construction in this area were identified. However, it was determined by the project team that it would be prudent to undertake further surveys at this location before identifying the crossing type. Ground investigations have since been completed in this area and have not identified any challenges to the construction of the cable route in this area. A summary of the key changes at Step 4B are presented in Table 4.2 and Table 4.3.

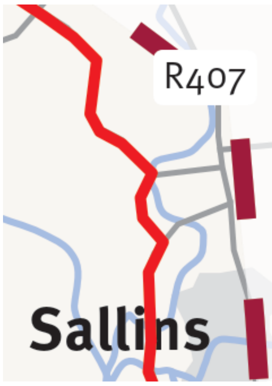
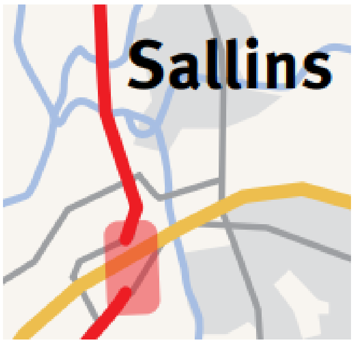
Table 4.2. Changes to Step 4A Wider areas

Step 4A Wider Areas	Step 4B Route	Reason for the Change at Step 4B (Best Performing Option)
 **Woodland Substation to R156**		This is an off-road section approximately 3 km in length through agricultural land. The use of the local roads in this area were ruled out because of two stone arch road bridges on the Red Road. These bridges are too shallow for a trench to be dug into them.
 **West of Kilcock**		The route in this area is a mixture of an in-road along the R158 and R148, an off-road crossing under the Rye Water, and crossing under the canal, railway, and the M4. From Commons South, the route travels to the south on the R407.

[16] https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx

<table>
<tr><th>Step 4A Wider Areas</th><th>Step 4B Route</th><th>Reason for the Change at Step 4B
(Best Performing Option)</th></tr>
<tr><td>

East of Prosperous</td><td>
</td><td>This is an off-road section approximately 1.1 km in length through agricultural land. The section passes slightly to the west of the Study Area previously shown by approximately 220 m. This decision was made in order to shorten the length of the cable route and to minimise potential impacts to landowners, hedgerows (through fewer hedge breaks), and agricultural land.</td></tr>
<tr><td>

North of Sallins</td><td>
</td><td>This section is a mixture of in-road sections and off-road crossing through agricultural land. It will also pass close to the River Liffey, and the design will help avoid impacts to the landscape and ecology.</td></tr>
<tr><td>

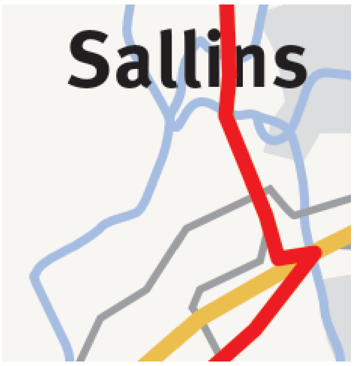
Crossing of the M7</td><td>
</td><td>This section is a mixture of in-road and off-road sections. The route comes off the Sallins Bypass and crosses over agricultural land. The route crosses under the M7 in the existing underpass (Osberstown Road). The route then connects to the R407 (Millennium Parkway).</td></tr>
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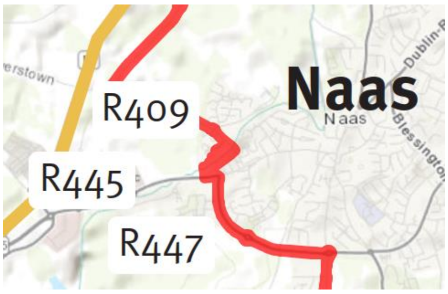
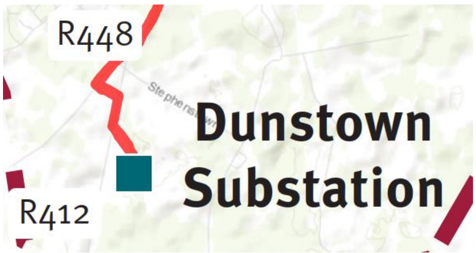
Table 4.3. Route Changes from Step 4A

Additional Areas of Changes	Reason for the Change at Step 4B
 **Grand Canal Crossing in Naas**	This was a new wider area at Step 4B. A wider area was included in this section because further surveys on ground conditions are needed before the route can be finalised. The Naas Sports Centre and adjacent residential properties will be avoided. The canal could be crossed along the R409 (New Caragh Road) or with a crossing under the canal.
 **Approach to Dunstown Substation**	This was a change from the route shown at Step 4A. The route was changed in this section to avoid a road bridge which is too shallow for the cable trench. The cable will now travel southwest along the R448 for a greater length, before turning east to connect with the R412. This change reduces potential environmental and social impacts.

These changes increased the length of the cable route from 51.4 km to 52.6 km – an increase of 1.2 km. Within this 52.6 km, there was also an increase of off-road length, from 6 km to 7.9 km.

This increase in off-road length was largely due to the changes at the Woodland substation, where the cable route is now off-road. This was because local roads in the area were considered unsuitable due to two road bridges, which do not have sufficient depth for the cable trench. The increase in the overall length will increase the cost of the project. However, it was concluded that these route refinements were minor and did not change the assessment of Option A (Red) as presented in the Step 4A Report.

It was concluded by the project team that Option A (Red) remained the Emerging Best Performing Option and that the route shown in the Step 4B Report was the BPO.

4.5 Amendments to the Best Performing Option at Step 5

In the Step 4B report, it was identified that further design, survey, assessment, and consultation would be undertaken at Step 5 and refinements to the BPO would be possible; and these refinements have been completed for the Proposed Development. This process is normal practice for infrastructure projects and allowed for further engagement with landowners to be taken into consideration and for the results of additional surveys and design work to be incorporated into the Proposed Development.

The changes between Step 4B and Step 5 are identified below.

4.5.1 Mullagh Crossroads

In the townland of Mullagh, north of Kilcock, approximately 7.5 km along the cable route from Woodland substation, the R156 road curves around in a horseshoe bend to connect with the Mullagh Crossroads. In line with the Step 4A routing principles, the use of the road for the cable route was preferred to the use of agricultural land. The cable route at Step 4A and 4B followed the road around the horseshoe bend. At Step 5, ecology surveys identified mature trees at the roadside with bat roosts at the northern end of the bend. This and a more detailed consideration of the construction of the cable around this bend led to a change in the cable route. It was determined that the cable route should be amended to cut out the bend in the road and to move across agricultural land. This change is shown in **Plate 4.9** below. The change reduced the length of the cable route by approximately 307 m but increased the amount of agricultural land affected. It is considered that this change improved the BPO by avoiding proximity to bat roosts; reducing the length of the cable; and improving the construction challenges of laying the cable around a bend in the road.

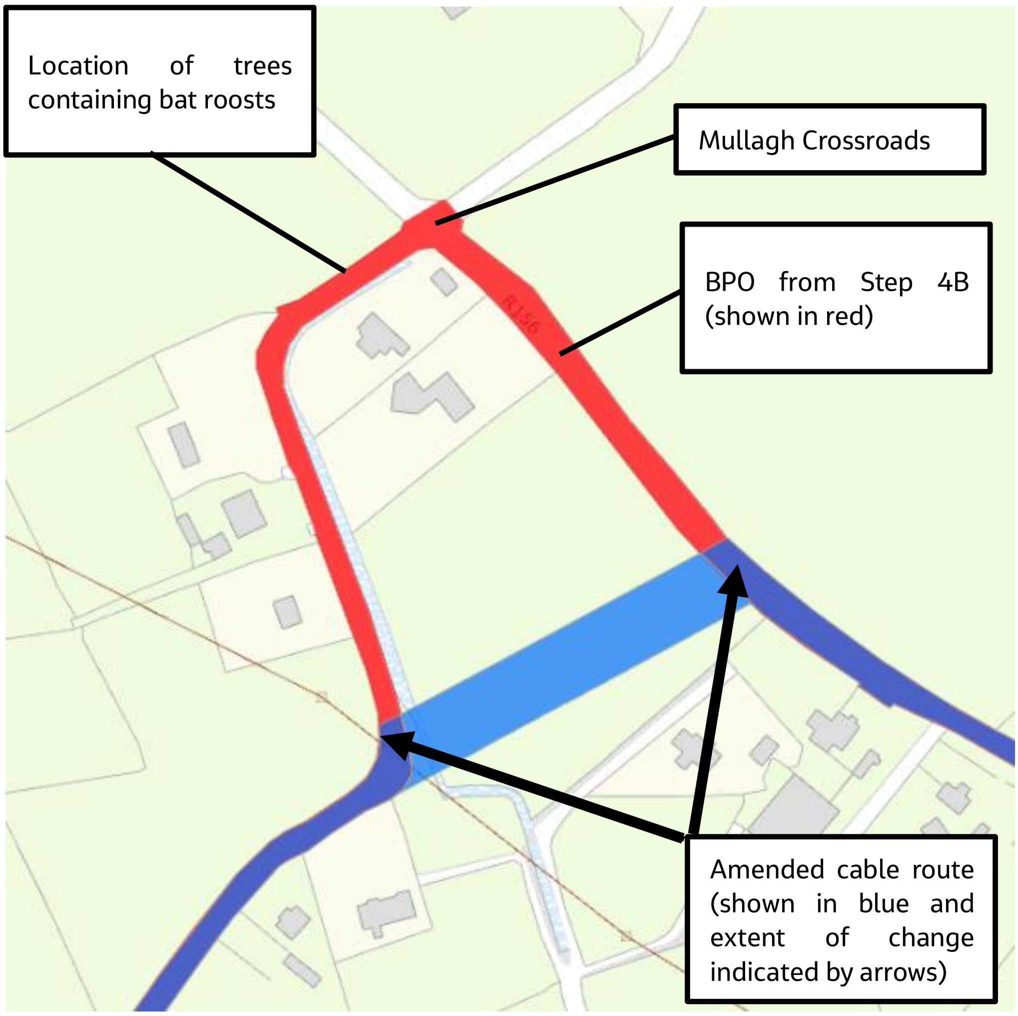


Plate 4.9 Step 5 Mullagh Crossroads Amendment

4.5.2 Baltracey

In the townland of Baltracey, south of Kilcock, approximately 22 km along the cable route from Woodland substation, the R407 crosses over a small watercourse with a stone bridge. The watercourse has been labelled as Lyreen tributary of the River Liffey_010 by the Environmental Protection Agency (EPA). It has been given the label WB20 in the Biodiversity chapter of this PECR. At Step 5, it was determined that the existing bridge was unsuitable for an in-road crossing. This was because of the shallow depth of the road over the bridge. Other crossing types were considered for this location. These included:

- an in-road Horizontal Directional Drilling (HDD) crossing – this was ruled out because of the construction area that would have been required on the R407, resulting in significant impacts to the users of the road;
- a diversion off-road adjacent to the bridge – this was ruled out because of the residential properties adjacent to the bridge. A longer off-road diversion around the properties was also ruled out because of the additional length of cable that would have been required to avoid properties either side of the R407;
- an off-road HDD crossing – this was chosen as the preferred crossing type as it allowed the properties to be avoided and the disruption to the R407 at this location to be avoided. It was determined that a diagonal HDD under the bridge would be the optimal crossing type. This is shown in **Plate 4.10** below.

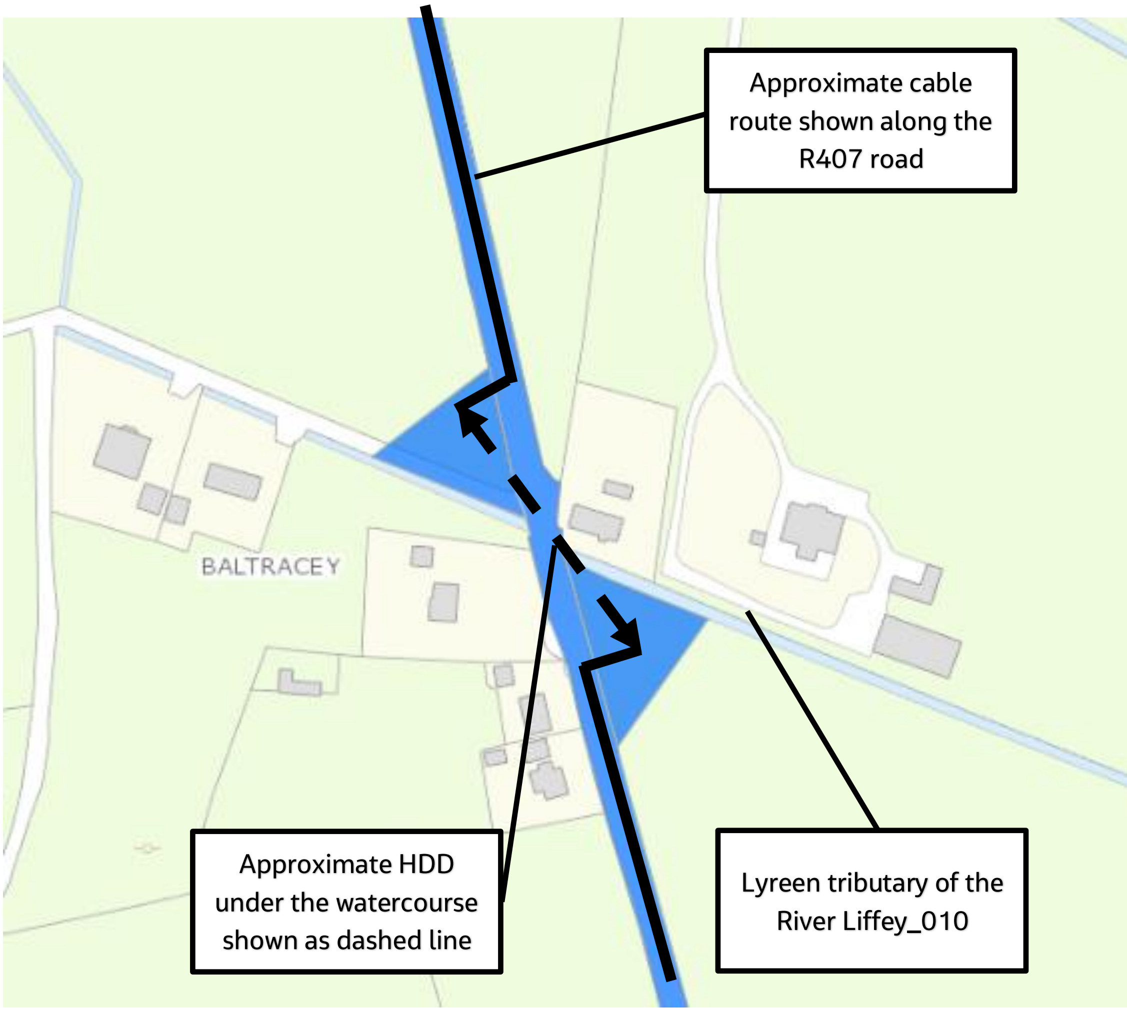


Plate 4.10 Step 5 Baltracey Amendment

4.5.3 Millicent Area

In the Millicent area, northwest of Sallins, approximately 37 km along the cable route from Woodland substation, the BPO at Step 4B was proposed to travel along the western bank of the River Liffey. At Step 5, this was reassessed following discussion with landowners. Concerns were raised about the cable route passing through the gardens of two residential properties. In addition, ecology surveys completed in Step 5 identified the presence of a number of protected species along the western bank of the River Liffey. Alternatives to the BPOs were considered and are shown in **Plate 4.11** below.

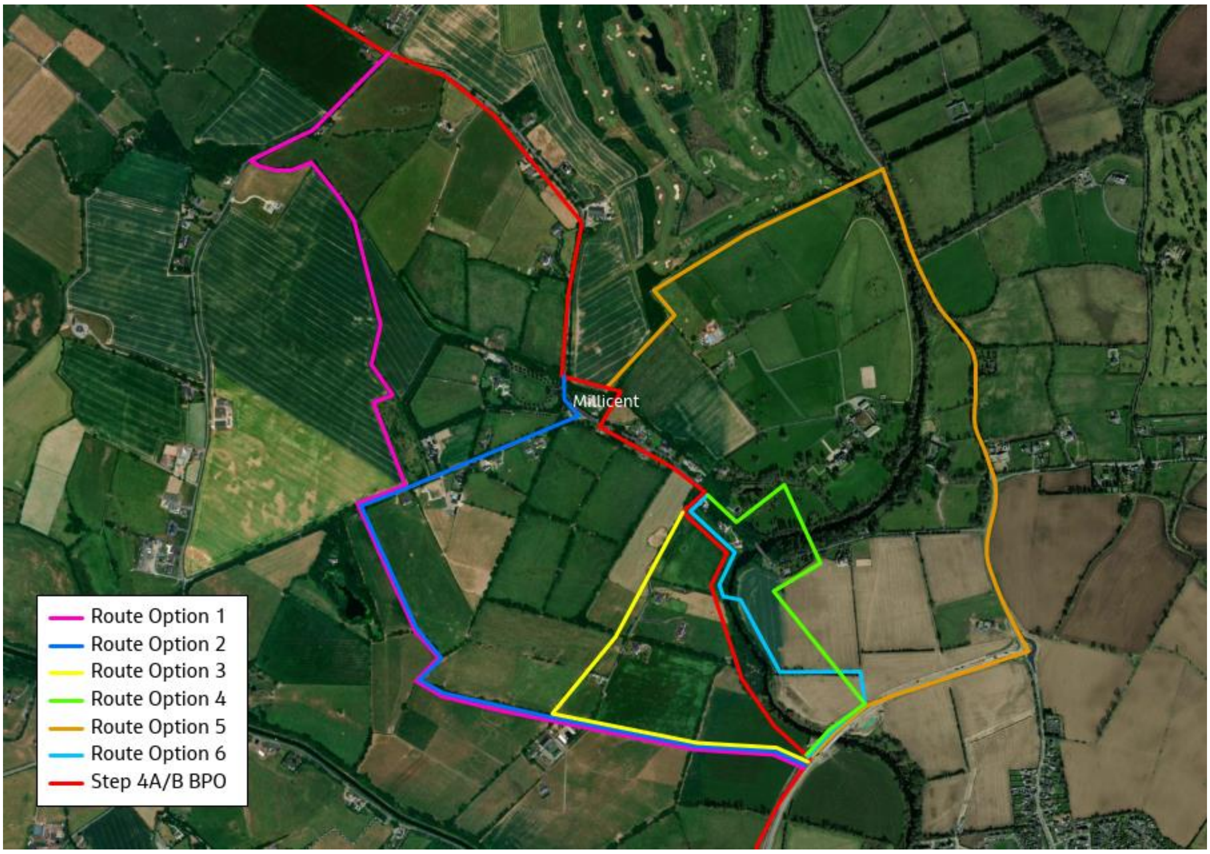


Plate 4.11: Millicent Amendments Considered at Step 5

It should be noted that other Route Options have been previously considered in this area through Step 4. Route Options to the west and east of the Route Options identified above were assessed and ruled out. Route Options to the west of Millicent were ruled out because of the length of the route, the number of landowners affected, lack of suitable roads, and the number of hedgerows and treelines affected (please see the Step 4A Report[17] for the Proposed Development – Chapter 3). Route Options to the east included Route Options C and D in the Step 4A Report (please see Chapters 6 and 7), which were ruled out.

The area around Millicent generally consists of narrow roads lined with mature trees, making both routing of the cable and siting of joint bays challenging. There are a number of residential properties in the area which could be impacted during construction. Along Millicent Road there is an old stone bridge over the River Liffey, which has a very shallow bridge deck and would not be able to accommodate a cable. It would also be difficult to cross adjacent to the bridge

[17] https://www.eirgridgroup.com/site-files/library/EirGrid/KMGU-JAC-TN-0017-Step-4A-Report-08-03-2022-Compressed.pdf

as there are residential properties on both sides of the river to the west of the bridge, and there is woodland to the east of the bridge which would need to be cut to facilitate the works. From a biodiversity and habitats point of view, this would have increased potential impacts when other Route Options exist.

To the northeast of the bridge, Millicent House is located, with its landscaped gardens. Millicent Demesne was described in the Step 4A Report as:

> *'The Garden and Designed Landscape to Millicent House. The extensive riverside demesne lands surrounding the principal house (RPS B14-26) include extant estate features such as lodges (including AH_15), a walled garden, drives, and areas of woodland and parkland depicted on historic mapping (Ordnance Survey 6", 1837 – 1842; Ordnance Survey 25", 1888 - 1913). Sections of rubble stone wall delimit the demesne and line the road from the entrance to Millicent Bridge.'*

In addition, directly north of Millicent there is a private airfield, and to the northeast of Millicent there is a golf course. These constraints, and those previously mentioned, are shown in **Plate 4.12**.

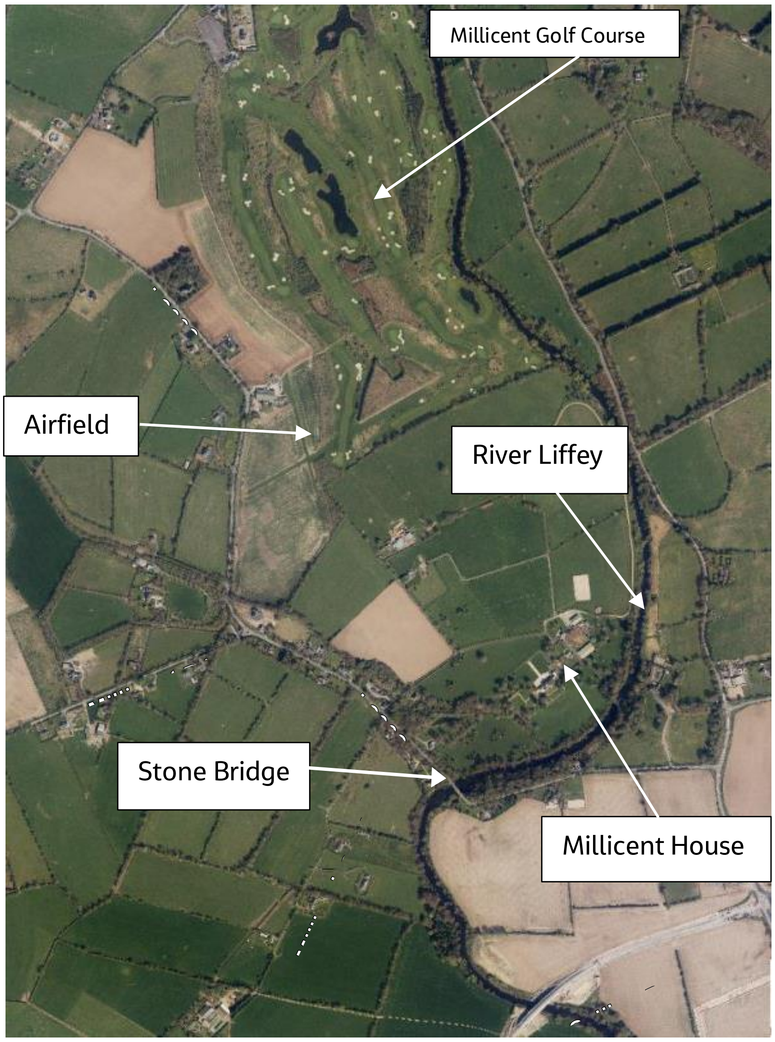


Plate 4.12 Key Constraints in the Millicent Area

Table 4.4 outlines the key measurements of each of the Route Options considered.

Table 4.4: Approximate Route Option Lengths

Route Option	Length	Length in Public Roads	Length in Fields	Net Change from Best Performing Option
1	3,650 m	650 m	3,000 m	+810 m
2	2,520 m	820 m	1,700 m	+920 m
3	1,450 m	200 m	1,250 m	+560 m
4	1,330 m	330 m	1,000 m	+380 m
5	3,300 m	2,200 m	1,100 m	+1,860 m
6	1,240 m	230 m	1,010 m	+290 m

Please note that the net change is comparing the departure points of the Route Options from the BPO as shown in **Plate 4.11**.

Each of the proposed Route Options shown in Plate 4.11 will have effects in terms of each of EirGrid assessment criteria: Economy, Technical, Environment, Socio-economics (including landowners), and Deliverability. These issues have been considered and the preferred route option identified. Having regard to the preceding text, a performance matrix illustrating the evaluation set out above is provided in Table 4.5.

Table 4.5: Evaluation Performance Matrix

Route Option	1	2	3	4	5	6
Economic						
Technical						
Environmental						
Socio-economic						
Deliverability						

Route Option 6 is the shortest of the six assessed route options, which results in the option performing better in terms of the Economy, Technical, and Deliverability criteria. The shorter length also generally decreases the potential Environment and Socio-economics effects.

As the shortest of the assessed route options, it is the most similar to the BPO – it has the smallest net change in route length. In addition, it is in a similar location to the BPO on the opposite bank of the River Liffey. Comparatively, Route Options 1, 2, and 5 are located much further away from the BPO. This larger divergence and increased length results in Route Options 1, 2, and 5 not performing as well as Route Option 6 in terms of Economy, Technical, and Deliverability criteria.

Route Option 6 avoids potential direct impacts to Millicent Demesne as compared to Route Option 4, which would have trenched through the designed gardens and may have had an increased impact on mature trees in the demesne.

Route Option 6 is also preferred to Route Option 3 because of its shorter length and decreased net change.

Overall, it is considered that Route Option 6 is preferred to the BPO and the assessed Route Options as shown in **Plate 4.11**.

In order to enter the Sallins Bypass, Route Option 6 moves to the east away from the River Liffey. The amendment to the cable route increased the length by approximately 200 m. This is a large increase, but it was required to allow the cable route to enter the R407 Sallins Bypass road at a suitable location. A location closer to the River Liffey is not possible as the road is elevated to cross the river. A location further to the east where the road is closer to the adjacent ground levels is more suitable for construction purposes.

It is considered that this change improved the BPO by avoiding impact to residential properties and their gardens and to protected species.

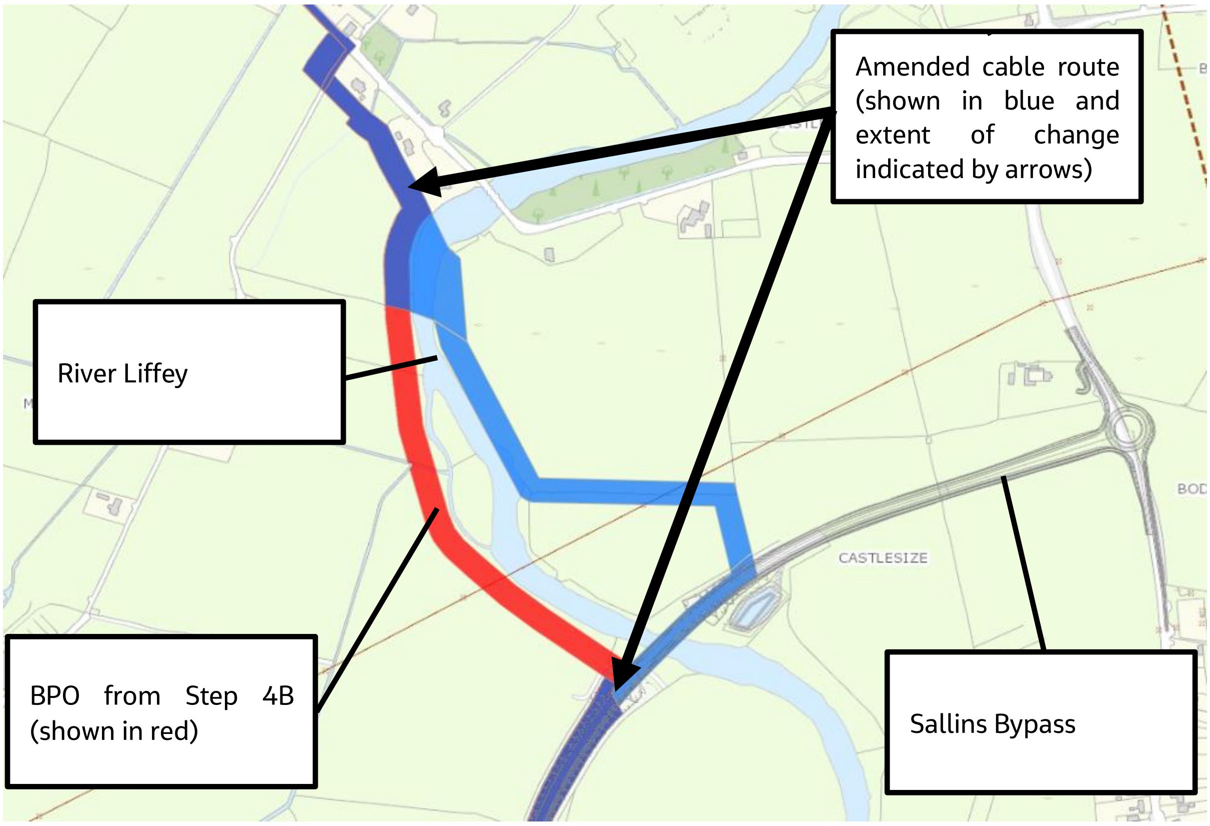


Plate 4.13 Selected Step 5 Millicent Amendment

4.6 Summary

In line with EirGrid's six-step Framework for Grid Development, Environmental, Social, Technical, Deliverability and Economic considerations have informed the determination of the Proposed Development being brought forward for approval.

Having regard to each criterion, the BPO was selected to meet the specific circumstances of this Proposed Development, allowing it to meet its intended need as a strategic infrastructure development of National importance, while avoiding or minimising environmental impact on the receiving environment.

The Proposed Development has been refined through the different steps following surveys, design, assessment, and consultation with key stakeholders including Planning Authorities and prescribed bodies, the general public and landowners and communities. These changes have been presented in published reports such as the Step 4A and 4B reports – which are also appended to this PECR (see Volume 5).

At Step 5, further amendments have been made to the cable route and these have been incorporated into the design and assessed in this PECR.

This iterative process of consideration of alternatives has sought to avoid or reduce potential environmental effects through options appraisal and evaluation while having regard to feedback from consultation and engagement with a range of bodies, agencies, landowners, and the public.

The Proposed Development description is set out in Chapter 5 of this PECR. Further information on the alternatives considered, is available in the reports contained in Volume 5.

5. Project Description

5.1 Introduction

The Proposed Development primarily comprises approximately 53 km of new underground cable, with associated equipment, apparatus and structures, and site development works, between the existing Woodland substation located near Batterstown in County Meath, and the existing Dunstown substation located near Two Mile House, in County Kildare.

Approximately 38 km of the proposed underground cable is located in County Kildare and approximately 15 km of the proposed underground cable is located in County Meath. Approximately 82% of the underground cable will be located within roads, while approximately 18% will be located off-road, to avoid location-specific constraints.

There will also be works in the two substations to facilitate the connection of the underground cable into the electrical grid.

5.2 Proposed Development Description

The Proposed Development consists of the following principal elements:

A. Installation of an underground cable (UGC), approximately 53 km in length, connecting Woodland 400 kV Substation in the townland of Woodland in County Meath and Dunstown 400 kV Substation in the townland of Dunnstown in County Kildare. The development of the UGC will incorporate the following:

- Construction of a trench of approximately 1.5 m in width and approximately 1.3 m in depth in the public road (approximately 43.5 km) and approximately 1.7 m in depth in private lands (approximately 9.5 km) in which the UGC is laid;
- Construction of joint bays, each approximately 10 m in length and 2.5 m in width – with adjacent communication chambers and link boxes along the alignment of the UGC (on average every 750 m). Where the joint bays are located off-road, permanent hardstanding areas will be created approximately 3 m around the joint bays;
- The laying of communication links and fibre optic cables between both substations, running in the same trench as the UGC;
- The laying of twelve no. permanent access tracks (approximately 4 m in width, approximately 4.5 km in length) over private lands to access the off-road joint bays (and adjacent communication chambers and link boxes);
- The provision of six no. temporary construction compounds (approximately 5.7 ha total) and two no. construction laydown areas along the alignment of the cable route;
- The provision of temporary construction passing bays at 33 joint bay locations, each approximately 100m in length and 5.5 m in width;
- The laying of 11 no. temporary construction tracks (approximately 9.5 km in total length);
- All associated water, rail, road and utility crossings using either trenchless drilling or open cut techniques; and
- All associated and ancillary above and below ground site development works, including works comprising or relating to permanent and temporary construction, roadworks, utility diversions and site and vegetation clearance.

B. Installation of additional electrical equipment and apparatus at the Woodland Substation in the townland of Woodland in County Meath. which is similar to the existing infrastructure and will be installed in a substation compound extension (Meath County Council Reference: 22/1550). This will include:

- Installation of a 400 kV feeder bay and associated electrical shunt reactor (approximately 8 m in height);

- Insulators, instrument transformers, overhead conductors, disconnectors, circuit breakers, surge arrestors (approximately 12.6 m in height) in order to connect the bay to the busbar;
- All ancillary site development works including site preparation works, temporary compound, underground cabling, and earthgrid, as required to facilitate the development.

C. Installation of additional electrical equipment and apparatus at the Dunstown Substation in the townland of Dunnstown in County Kildare which are similar to the existing infrastructure and does not require the extension of the substation compound. This will include:

- Installation of a 400 kV feeder bay and associated electrical shunt reactor (approximately 9 m in height);
- an extension to the 400 kV busbar in order to connect the 400 kV cable feeder bay to the existing 400 kV busbar
- Ten no. lightning masts (approximately 41 m high);
- Insulators, instrument transformers, current transformers, overhead conductors, disconnectors, circuit breakers, surge arrestors (approximately 12.7 m in height) in order to connect the bay to the busbar; and
- An ancillary site development works including site preparation works, temporary compound, underground cabling and earthgrid, surface water drainage, and lighting poles as required to facilitate the development.

It is anticipated that the construction phase for the proposed development will last up to approximately 42 months. The construction activities will be phased. The basic elements of the construction phase are:

- **Enabling works:** These are works to allow the construction phase to progress, including site investigations and other survey activities, vegetation[18] clearance, construction of access tracks and the temporary construction areas (e.g. compound areas and haul roads on off-road sections);

- **Phase 1: Installation of passing bays and joint bay structures:** The construction of passing bays (where required) at joint bay locations. On completion of the passing bays, it is proposed that the joint bays be installed at the same time (see Section 5.5.1 below for further details);

- **Phase 2: Excavation and installation of ducts:** A trench will be dug along the cable route, ducts installed, and the road surfacing or agricultural land will be restored. This will also include physical crossings such as motorways, rivers and railways (see Sections 5.5.2 and 5.5.2.2 for further details);

- **Phase 3: Installation of cables:** The cables will be installed at joint bay locations within the ducts. The cables will then be jointed (connected) at each joint bay location to allow the installation of a continuous circuit. The circuits will then be tested to ensure they are ready to be commissioned for use (see Sections 5.5.3 and 5.5.3.2 below for further details);

- **Substation works**: Construction works are required in the existing Woodland and Dunstown substations to connect the underground cable to the existing electrical grid (see Section 5.4 below for further details); and

- **Decommissioning**: At this stage, the project will decommission the temporary construction compounds and passing bays and complete any agreed landscaping works (see Section 5.8 below for further details).

The proposed underground cable and substation equipment is highly specialised and is generally custom-manufactured for such projects. The design of the Proposed Development is based on the current understanding of

[18] Enabling works could be required to start outside of the nesting season. This would increase the construction period to 45 months if it is required. See Section 5.5.11 of this chapter for further details.

such equipment and also proposed construction techniques, statutory requirements, consultations with affected landowners, ground conditions, and environmental constraints.

In line with all large infrastructure projects, there will be a period of detailed design after planning consent and when the contractor is appointed. The contractor will confirm the detailed design of the development following on-site detailed surveys, albeit within the scope, nature and location of the approved development (should this proposed development be approved by the consenting authority). Further details of the Proposed Development and proposed construction activities are provided below.

5.3 Underground Cable

5.3.1 Overview

There are three key elements of the underground cable:

- **Cable trench –** an approximately 1.5 m wide, 1.3 or 1.7 m deep trench that will contain the underground cables (shown in Plate 5.1 – The cable will be delivered in lengths and will need to be connected (jointed) together to create a continuous circuit. This happens at the underground joint bays; and
- **Passing bay –** a temporary traffic lane to allow traffic to flow around joint bays while construction works are ongoing.

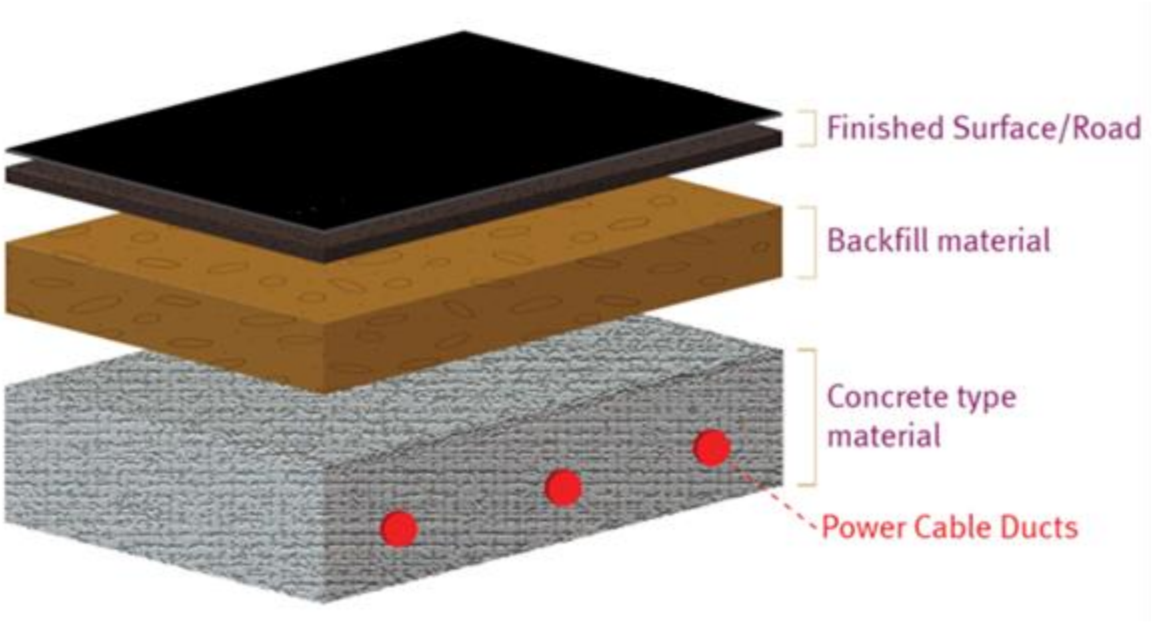


Plate 5.1 Proposed Cable Trench

The width and depth of the cable trench can vary for crossing of watercourses or utilities and for other technical reasons.

The cable will be delivered to site in individual lengths on cable drums. These lengths will be installed along the route by using 'joint bays'. A joint bay is an underground chamber located at various points on the route. These are used as locations to pull the cables into the pre-installed ducts and to connect ('Joint') together the individual cables and create a single, overall circuit.

Smaller buried chambers ('manholes') will be installed alongside various joint bay locations. There are two types:

- C2 chamber – used to join the fibre optic communication cables pulled into the pre-installed communications ducts; and

- Link box chamber – used to accommodate the link box, a device which earths the outer sheaths of the power cables.

As with any telecommunications facilities, the above two chambers are provided with removable lids to facilitate access for ongoing maintenance and commissioning works. While the joint bays have no ongoing maintenance, access from the surface is still required in the unlikely event of a cable failure needing replacement.

A typical joint bay under construction is shown in Plate 5.2. An image of a reinstated road after joint bay construction is shown in Plate 5.3. Passing bays to facilitate road traffic management around the joint bay construction locations will be required in some locations. Typically, these are where the joint bays are in the road carriageways. A typical passing bay is shown in Plate 5.4. Further detail on the construction of passing bays and joint bays is provided below.

EirGrid has carefully considered the previous investments made by Meath and Kildare County Councils in maintaining and upgrading their road surfaces. EirGrid intends to establish key principles and agree appropriate methodologies with the County Councils for road reinstatement where cable and associated infrastructure has been constructed. This could include reinstatement of road surfacing wider than the underground cable trench and joint bays. This will be in accordance with the accepted standard for underground cable development, the 'Purple Book – Guidelines for Managing Openings in Public Roads'[19]. This can also be assured by way of an appropriate Condition of Planning Approval.

As identified in Section 5.2 above, the specific location and design of joint bays and passing bays are subject to refinement at the detailed design stage.

[19] https://www.gov.ie/en/publication/eda1ae-guidelines-for-managing-openings-in-public-roads-2017/

Plate 5.2 Typical Joint Bay During Construction

Source: EirGrid[20]

Plate 5.3 Reinstated road over joint bay (darker tarmac) with C2 communications chamber (steel chamber cover)

Source: EirGrid

[20] The photographs provided in this chapter are intended to help explain the Proposed Development. They have been taken from previous projects and may not be exactly like the Proposed Development. They are intended to be illustrative of the proposed works only.

Plate 5.4 Typical passing bay – ensuring road traffic continues around a working area and joint bay

Source: EirGrid

5.3.2 Underground Cable Route Description

The majority (82%) of the proposed underground cable between the existing Woodland substation and the existing Dunstown substation will be installed within the existing public road network. Off-road routes are proposed at particular locations to avoid specific constraints. Table 5.1 below provides an overview of the underground cable route.

Laydown areas where construction materials can be temporarily stored, and construction compounds with vehicle parking and welfare facilities, will also be provided along the route. These are temporary and will be removed on project completion, and the land reinstated to its original condition. These areas are all within the planning application boundary for the Proposed Development and are described in more detail in Section 5.5 of this chapter.

Table 5.1 Route Section of the Proposed Underground Cable

Section Number	Section Name	Length (m)	Start Chainage	End Chainage	Type*	HDD	HDD Locations	Roads
1	Woodland	3,375	0	3375	Off-road			
2	R156	3,740	3375	7235	In-road			R156
		120			Off-road watercourse crossing			
3	Mullagh	160	7235	7395	Off-road			
4	R125 North	3,385	7395	10900	In-road			R125
		120			Off-road watercourse crossing			
5	R125 South	3,610	10900	14750	In-road			R125
		240			Off-road watercourse crossing			
6	R158	235	14750	14985	In-road			R158
7	Balfeaghan	615	14985	15600	Off-road	2	Rye Water; Royal Canal and Railway	
8	R148	545	15600	16145	In-road			R148
9	M4	665	16145	16810	Off-road	1	M4	M4
10	R407 North	460	16810	17270	In-road			
11	R407	9,070	17270	26640	In-road	1	Tributary of Liffey_010	R407
		300			Off-road watercourse crossing			
12	R408	3,965	26640	30785	In-road			R408
		180			Off-road watercourse crossing			
13	Curryhills	1,045	30785	31830	Off-road			
14	R403	1,170	31830	33000	In-road			R403

Section Number	Section Name	Length (m)	Start Chainage	End Chainage	Type*	HDD	HDD Locations	Roads
15	L2002 North	3,190	33000	36190	In-road			L2002
16	Millicent Demesne	275	36190	36465	Off-road			
17	L2002 South	335	36465	36800	In-road			L2002
18	Castlesize	1,005	36800	37805	Off-road	1	River Liffey	
19	Sallins Bypass	2,480	37805	40285	In-road			Sallins Bypass
20	Mills	320	40285	40605	Off-road			
21	Osberstown Road	60	40605	40665	In-road			Osberstown Road
22	M7	155	40665	40820	Off-road			
23	Millennium Parkway	2,330	40820	43150	In-road			
24	R409	1,215	43150	44365	In-road			
25	Grand Canal	385	44365	44750	Off-road	1	Grand Canal	
26	R447	1,440	44750	46190	In-road			R447
27	R448	5,200	46190	51450	In-road			R448
		60			Off-road watercourse crossing			
28	R448 South	440	51450	51890	In-road			R448
29	Stephenstown	250	51890	52140	Off-road			
30	R412	310	52140	52450	In-road			R412
31	Dunstown	450	52450	52900	In-road			Access Road

* Off-road watercourse crossing: The cable route travels over existing bridges along the in-road sections. Where existing bridges or culverts may not have sufficient cover for the cable trench, the route diverts off-road to cross under watercourses adjacent to the road. During detailed design, further assessment of the structures will determine if there is sufficient cover and if so, the cable route will be moved in-road.

Total length of the underground cable route is 52.9 km, of which in-road is: 43.6 km; and off-road is: 9.3 km

** Includes the off-road watercourse crossing.

There are a range of trenchless crossing types available. HDDs are one example and the assumed technique for the construction. Other methods could be used and would have similar environmental impacts as assessed in this PECR. The term ‘HDD’ is used throughout this PECR but the actual construction type could include other trenchless crossing types.

5.4 Substations

The existing Woodland and Dunstown substations require upgrading and extensions for additional electrical equipment and apparatus. These works are required in order to connect the 400 kV underground cable between Woodland and Dunstown and will be similar to the existing equipment within the substations.

5.4.1 Woodland Substation

The existing substation has a total size of approximately 10 ha located within ESB's overall landholding of approximately 19 ha. The Proposed Development will take place within[21] and immediately adjacent to the existing substation. The feeder bay is approximately 0.5 ha in size. They will include:

- Installation of a 400 kV feeder bay and associated electrical shunt reactor (approximately 8 m in height);
- Insulators, instrument transformers, overhead conductors, disconnectors, circuit breakers, surge arrestors (approximately 12.6 m in height) in order to connect the bay to the busbar; and
- All ancillary site development works including site preparation works.

These proposed works are in shown in Planning Drawing Number 321084AH-JAC-ZZ-XX-DR-D-1410.

The proposed electrical equipment at Woodland substation will be free-standing and has a minimal surface area. It will not require dedicated storm water drainage infrastructure as run-off can drain directly to ground via the permeable stone surfacing within the compound.

The Proposed Development will not result in any additional staff/operatives over and above that of the existing substation. Therefore, an increase in loading on the foul drainage system is not anticipated nor will any of the proposed works impact on existing foul drainage infrastructure, which will continue to undergo regular maintenance and servicing during the operational phase.

5.4.2 Dunstown Substation

The proposed works at Dunstown substation requires the extension of the existing 400 kV busbars to accommodate a new 400 kV bay to connect the new underground cable.

The proposed works will take place within the existing substation and will include:

- Installation of a 400 kV feeder bay and associated electrical shunt reactor (approximately 9 m in height);
- An extension to the 400 kV busbar in order to connect the 400 kV cable feeder bay to the existing 400 kV busbar
- Ten lightning masts (approximately 41 m high);
- Insulators, instrument transformers, current transformers, overhead conductors, disconnectors, circuit breakers, surge arrestors (approximately 12.7 m in height) in order to connect the bay to the busbar; and
- An ancillary site development works including site preparation works, laydown area; underground cabling and earthgrid, surface water drainage; and lighting poles as required to facilitate the development.

[21] An extension to the Woodland Station has been applied for to Meath County Council - Reference: 22/1550

During the construction phase, temporary facilities will be provided within the ESB ownership boundary as illustrated in Planning Drawing Number 321084AH-JAC-ZZ-XX-DR-D-1315. Any discharges from the temporary welfare facilities will be connected to a sealed holding tank to be emptied and disposed of off-site by an appropriately licensed waste contractor.

5.5 Cable Construction Phase Activities

The following sections describe the proposed construction phase activities associated with the installation of the new underground cable.

The laying of underground cables is a standard construction technique undertaken by a range of utility and other services providers. Cables will be installed in a flat formation in phases as follows:

A. Phase 1 - Installation of joint bays and passing bay structures;

B. Phase 2 - Excavation and installation of ducts; and

C. Phase 3 - Installation and jointing of cables.

Duct and joint bay installation are the most construction-intensive and invasive elements of cable route installation because digging of a trench is required. For in-road cable laying, this phase will have the largest potential impact on traffic, including the potential need for rolling road closures (to through traffic) and diversions.

While the specifics of any cable-laying schedule are dependent upon the contractor and nature and location of the project, it is generally the case that cable ducts can be laid in a road at a rate of approximately 40 m-50 m per day although a rate of 20 m-50 m per day is anticipated in built up areas where utilities are more common.

Joint bays are generally located at average intervals of 745 m along the cable route of the Proposed Development. Shorter intervals may occur where the route alignment is more complex. Joint bays are typically installed in three days. The road is reinstated after cable installation. Road reinstatement along the route of the cable trench follows the completion of the trenching and ducting as it moves in sequence along the route.

Cable pulling and jointing, which commence when the trenching and ducting is well advanced along the route, is executed from the joint bay locations. Where this activity would likely require a road closure to be undertaken, the provision of a passing bay at the location of the joint bay will facilitate through movement of traffic along the road by means of a single traffic-signalled lane at the joint bay.

Plate 5.5 shows a typical cable trench in a public road after installation of ducts and prior to back fill. Marker boards can be seen within the trench prior to final reinstatement. Plate 5.6 presents a reinstated road following laying of underground cable.

Plate 5.5 Proposed Cable Trench In-Road

Source: EirGrid

Plate 5.6 Reinstated Road Following Laying of Underground Cable

Source: EirGrid

5.5.1 Phase 1 - Installation of Joint Bays and Passing Bay Structures

5.5.1.1 Joint Bays

Joint bays generally consist of precast concrete walls and bases located below ground. The joint bays are 10 m long x 2.5 m wide x 2.6 m overall depth. Sand or lean mix concrete will be used as a foundation layer to the underside of the chamber. The ducts will be installed to each end of the chamber, then checked, cleaned and sealed.

The open concrete chamber will temporarily support the retained ground on the outside of the chamber during the ducting activities. Once these activities are completed, the open chamber will be temporarily backfilled with appropriate material and the road temporarily reinstated until cable installation.

During cable installation, the joint bay will be reopened and material within the chamber removed, and replaced following completion of the cable installation.

The joint bay locations are provided in Table 5.2.

Table 5.2 Proposed Joint Bay and Passing Bay Locations

Joint Bay	Approximate Chainage	Approximate Distance from previous Joint Bay	Location	Passing Bay required?	Side of road Passing Bay is located	Hard Standing Area
JB 01	706	N/A	Off-road	N/A	N/A	Yes
JB 02	1494	788	Off-road	N/A	N/A	Yes
JB 03	2241	747	Off-road	N/A	N/A	Yes
JB 04	2978	737	Off-road	N/A	N/A	Yes
JB 05	3750	772	In-road	Y	North	No
JB 06	4521	771	In-road	Y	South	No
JB 07	5190	669	In-road	Y	North	No
JB 08	5919	729	Off-road	N/A	N/A	Yes
JB 09	6629	710	In-road	Y	South	No
JB 10	7283	654	Off-road	N/A	N/A	Yes
JB 11	8028	745	In-road	Y	North	No
JB 12	8585	557	Off-road	N/A	N/A	Yes
JB 13	9144	559	In-road	Y	South	No
JB 14	9914	770	In-road	Y	East	No
JB 15	10730	816	Off-road	N/A	N/A	Yes
JB 16	11457	727	In-road	Y	East	No
JB 17	12294	837	In-road	Y	East	No
JB 18	13036	742	In-road	Y	East	No
JB 19	13893	857	Off-road	N/A	N/A	Yes
JB 20	14758	865	Off-road	N/A	N/A	Yes
JB 21	15390	632	Off-road	N/A	N/A	Yes
JB 22	16144	754	Off-road	N/A	N/A	Yes
JB 23	16885	741	Off-road	N/A	N/A	Yes
JB 24	17546	661	Off-road	N/A	N/A	Yes

Joint Bay	Approximate Chainage	Approximate Distance from previous Joint Bay	Location	Passing Bay required?	Side of road Passing Bay is located	Hard Standing Area
JB 25	18296	750	In-road	Y	South	No
JB 26	19172	876	In-road	Y	East	No
JB 27	20010	838	In-road	Y	East	No
JB 28	20759	749	In-road	Y	East	No
JB 29	21507	748	In-road	Y	East	No
JB 30	22288	781	Off-road	N/A	N/A	Yes
JB 31	23010	722	Off-road	N/A	N/A	Yes
JB 32	23770	760	In-road	Y	West	No
JB 33	24439	669	In-road	Y	East	No
JB 34	25269	830	Off-road	N/A	N/A	Yes
JB 35	25950	681	In-road	Y	East	No
JB 36	26640	690	Off-road	N/A	N/A	Yes
JB 37	27380	740	In-road	Y	North	No
JB 38	28196	816	In-road	Y	North	No
JB 39	29029	833	In-road	Y	North	No
JB 40	29824	795	In-road	Y	South	No
JB 41	30656	832	In-road	Y	South	No
JB 42	31365	709	Off-road	N/A	N/A	Yes
JB 43	32062	697	In-road	Y	South	No
JB 44	32943	881	Off-road	N/A	N/A	Yes
JB 45	33656	713	In-road	Y	West	No
JB 46	34466	810	In-road	Y	North and South*	No
JB 47	35221	755	In-road	Y	North	No
JB 48	35998	777	In-road	Y	East	No
JB 49	36814	816	Off-road	N/A	N/A	Yes
JB 50	37431	617	Off-road	N/A	N/A	Yes
JB 51	38250	819	Off-road	N/A	N/A	No
JB 52	38920	670	Off-road	N/A	N/A	No
JB 53	39675	755	Off-road	N/A	N/A	No
JB 54	40378	703	Off-road	N/A	N/A	Yes
JB 55	41165	787	In-road	N	Not required due to road width	No
JB 56	41800	635	In-road	N	Not required due to road width	No
JB 57	42744	944	In-road	N	Not required due to road width	No
JB 58	43433	689	Off-road	N/A	N/A	No
JB 59	44073	640	Off-road	N/A	N/A	No
JB 60	44884	811	Off-road	N/A	N/A	Yes

Joint Bay	Approximate Chainage	Approximate Distance from previous Joint Bay	Location	Passing Bay required?	Side of road Passing Bay is located	Hard Standing Area
JB 61	45373	489	In-road	N	Not required due to road width	No
JB 62	46109	736	In-road	N	Not required due to road width	No
JB 63	46876	767	In-road	Y	East	No
JB 64	47635	759	In-road	Y	West	No
JB 65	48392	757	In-road	Y	East	No
JB 66	49148	756	In-road	Y	West	No
JB 67	49915	767	In-road	Y	West	No
JB 68	50689	774	In-road	Y	East	No
JB 69	51366	677	Off-road	N/A	N/A	Yes
JB 70	52116	750	Off-road	N/A	N/A	Yes

*A passing bay is currently on both sides of the road at Joint Bay 46. At detailed design stage, one location will be selected, and the other passing bay location will not be utilised.

5.5.1.2 Passing Bays

Passing bays are short sections of temporary roads around joint bays where space restrictions would otherwise have potentially closed the highway to traffic. The passing bays will include temporary traffic management arrangements as agreed with Local Authorities.

The installation of the passing bay requires removing and temporarily storing the ground top layers off-road, to the side of the carriageway. This material will be used to allow reinstatement later. The passing bays will then be constructed to a standard agreeable to Meath County Council and Kildare County Council. The passing bay will be constructed to be at the level of the existing road surface. This may require the importation of fill material in certain locations. Roadside drains will be maintained and where it is required; culverts and piping will be used to maintain the waterflow under the passing bay. Temporary drainage will be provided to ensure appropriate run-off from the new road surface. Plate 5.7 and Plate 5.8 show passing bays that have been developed for other cable projects. Drawing Number 321084AH-JAC-ZZ-XX-DR-K-2202 provides a typical plan of a passing bay and the location and dimensions of each passing bay are shown in Drawing Numbers 321084AH-JAC-ZZ-XX-DR-Z-2101 to 2174.

Where the road is still not wide enough for a passing bay or where it is not suitable for a passing bay, a road closure may be required to undertake the work. Further detail on proposed road closures and diversions is provided in the construction phase Traffic Management Plan provided in Appendix 5.1 of the PECR.

The passing bays will not be in use for the full duration of the construction period. The bays will be used during the joint bay construction and the cable pulling and jointing process. When the bays are not in use, measures will be put in place to ensure no illegal parking.

The reinstatement of the passing bays will occur on the completion of Phase 3 of the construction period. The materials used to construct the bays will be removed from site and taken to a suitably licensed facility. The area will be reinstated and relandscaped to reflect the previous landform at each location. In line with best practice, no ash trees will be planted, only native species will be used, and where affected, species-rich hedgerows will be planted. The adjacent road surface, painted lines, and other requirements will be restored in line with the Purple Book.

Plate 5.7 Passing Bay in Construction

Source: EirGrid (on the Kilpaddoge- Knockanure 220 kV underground cable Project, Co. Kerry)

Plate 5.8 Operational Joint Bay with Passing Bay

Source: EirGrid (on the Kilpaddoge- Knockanure 220 kV underground cable Project, Co. Kerry)

5.5.2 Phase 2 - Excavation and Installation of Ducts

5.5.2.1 Duct Installation

The cables will be pulled into ducts pre-installed into the cable trench.

When a length of trench has been excavated, the ducts are laid on bedding material of cement bound granular mixture. Once laid, the ducts are backfilled with a thermally suitable material and warning marker boards are laid above them. The fibre optic ducts will be laid and backfilled before the trench is reinstated. These fibre optic ducts are for the operational use of ESB and are not associated with internet provision. The trench reinstatement will match the local environment. In the case of roads, this will be to the surfacing standard agreed with Meath County Council or Kildare County Council.

The duct installation will progress sequentially, starting at one joint bay and moving towards the next along the route. The construction area moves along in tandem with the progress of the duct installation, with only the minimal necessary area cordoned off. It is anticipated that multiple crews will work along the 53 km route simultaneously.

5.5.2.2 Duct Installation in Roads

The primary difference between construction in off-road areas and in-road areas is that there is generally little space within road areas for local storage of construction materials such as excavated material and new fill material. This means that designated laydown areas may be required along the road to support construction activities.

For trench excavation works in roads where there is good amount of space, vacuum excavation or mechanical excavators are typically used. The excavated material will be loaded into lorries for removal off site at a suitably licensed facility.

An average rate of construction for the cable route is assumed to be approximately 40 m-50 m per day.

Excavation for the underground cable areas of road with heavy utility congestion can become slower due to the challenges of working around high numbers of existing utilities. Generally, the intent will be to retain the existing services in place by working around them. The utilities may either be parallel to the Proposed Development (i.e. alongside the duct run) or may be crossing the duct run.

The project team for the Proposed Development will engage with the utility owners prior to construction. Significant consultation has already taken place with utility providers and construction principles have been established, subject to further detail at the detailed design stage. Arrangements will be in place to ensure that utilities are crossed by the underground cable safely and with appropriate methodologies to support and protect existing assets. In some instances, where there is an interface with a particularly sensitive utility, works may need prior agreement and/or supervision by the utility.

Hand digging methods and smaller excavators will be used if required. To protect the working area, temporary traffic management may be required to divert traffic.

For roads with heavy congestion of existing utilities, a progress rate for site preparation, excavation, cable duct installation and reinstatement are estimated at approximately 20 m-50 m per day.

5.5.2.3 Underground Cable Laying in Agricultural Lands

For agricultural lands such as grassland and tillage, the underground cable design is essentially similar to what is installed in the roads with the exception of restoration of sub and topsoil instead of road construction material. The methodology for duct construction is similar with construction of joint bays, ducting, and cable installation and jointing being essentially the same.

As these construction works are located off-road in agricultural lands, a temporary working strip of 30 m wide is proposed – as shown on Drawing Numbers 321084AH-JAC-ZZ-XX-DR-Z-2101 to 2174. While the cable trench is only approximately 1.5 m wide, the 30 m working strip is needed to:

- Facilitate temporary storage of subsoil and topsoil which must be removed from:
    - The footprint of the temporary construction access track (typically up to 4 m wide);
    - The footprint of the cable trench;
    - A safety buffer strip between temporary access track and the trench;
- Allow construction of a temporary construction access track alongside the cable trench to allow for the movement of construction equipment and materials along the section of the route on the agricultural land;
- Ensure sufficient working space for the excavation of the cable trench and the installation of the cable ducting; and
- Allow segregated storage of the various types of topsoil and subsoils from the cable trench for later re-use.

Plate 5.9 shows a typical temporary working strip on agricultural land for an electricity cable project. Stripped topsoil can be seen stored to the left of the strip with a temporary construction access road in the centre right. Subsoil is also temporarily stripped from areas either side to create space for trench installation, materials storage and subsoil storage.

For in-road sections, once the duct and joint bays are constructed, the road can be reopened. The cable installation and jointing can be a separate later exercise as access is via the public road network. On agricultural land, the temporary access tracks need to remain in place until after the completion of the cable pulling and jointing works. This is because there is no other way to provide access to these off-road locations. For this reason, it is anticipated that for the Proposed Development any off-road working strip will be unavailable to an affected landowner for the duration of the construction period. This will include from initial fencing-off to removal of the fence following reinstatement of land along the working strip.

After construction, the temporary access tracks will be removed. However, the Proposed Development will require 12 permanent access tracks, which will be stoned, 4 m wide and maintained by ESB. These are to allow access to off-road joint bays from either existing access tracks or entrances. These tracks will be used infrequently for operational maintenance by ESB. Where an access track crosses an existing field boundary, a gate will be provided to maintain the boundary. Where an access track crosses from one landowner to another, access will be for ESB only and measures will be put into place to ensure livestock do not escape during ESB access (e.g. double gates). The permanent access tracks are provided to the following joint bays: JB1-4 (one access track for all four joint bays); JB8; JB10; JB15, JB21, JB31, JB42, JB49, JB50, JB54, JB60, and JB70.

The access track to Joint Bay 15 will cross a watercourse called Jenkinstown stream_010 (labelled as WB07). This watercourse also will be crossed by the cable as an open-cut trench. A culvert will be used to cross the watercourse unless an alternative arrangement can be agreed with the landowner. The culvert will be designed to prevent any changes in flooding and in line with the Inland Fisheries Ireland (IFI) guidance so that there is no significant ecological impact.

Where possible, an off-road cable alignment seeks to follow field boundaries so as to minimise potential impact on farm operations. However, there will be a requirement to cross a number of fields, ditches, hedgerows, or other features as necessary.

Construction of HDDs below existing infrastructure e.g. water bodies will need temporary construction compounds. These areas are to create launch and reception pits for the HDD boring equipment and facilitate logistics and storage works. For watercourses where HDD is not used, these crossings may employ an open trench method. Where necessary, field boundaries may be removed and ditches culverted to ensure continuity of drainage. Each work area is demarcated securely with fencing, and this will prevent works outside of the agreed areas.

Further details of HDD and open cut crossings are provided below.

Plate 5.9 Typical Underground Cable Construction in Agricultural Lands

Source: EirGrid

5.5.2.4 Cable Crossings (water, utility, bridges, etc.)

The cable route will cross existing structures, utilities and watercourses at various locations. These crossings will be facilitated by either open cut trenching or HDD as appropriate. Location-specific detail is provided in Appendix 5.2. A description of open cut trenching and HDD methods is given below. The underground cable will be a minimum of 300 mm from existing services as per EirGrid's Functional Specifications[22]. This distance will increase depending on the utility type. Future utilities in the vicinity of the underground cable will need to consult with ESB and maintain the minimum distances.

Prior to the cable crossing works, there will be detailed utility and services surveys.

The identification of crossings along the proposed cable routes has been based on consultations with utility providers, site walkovers, field studies, and reviews of publicly available information such as Environmental Protection Agency (EPA) datasets and mapping. All crossings will be confirmed at the detailed design stage and the mitigation detailed and proposed as part of this PECR will be implemented when dealing with any such features.

5.5.2.5 Watercourse Crossings

Details of the proposed watercourse crossings are provided in Appendix 5.3. In summary:

[22] https://www.eirgridgroup.com/site-files/library/EirGrid/110kV-Underground-Cable-Functional-Specification-General-Requirements.pdf

- Five watercourses will have an HDD crossing;
- 25 watercourses will have a trench crossing;
- Ten watercourses will be crossed in-road with no direct effects on the watercourse; and
- One watercourse will be affected by a passing bay.

The Proposed Development will cross the following significant watercourses:

- Rye Water (WB13[23]) – HDD crossing;
- Royal Canal (WB14) – HDD crossing;
- River Liffey (three crossings: WB35 – HDD; WB36 – crossed in-road; WB37 – crossed in-road);
- Grand Canal (two crossings: WB38 - crossed in-road; WB42 – HDD).

Trench crossing through watercourses could stir up sediment in the waterbody and have negative impacts. To reduce this risk of discharging sediment, it is proposed to carry out all of these works in a dry works area.

The dry works area will be isolated by installing an impermeable barrier between the watercourse and the works area. The impermeable barrier will be tailored to the watercourse in question. Techniques include the use of inflatable dams, frame dams, or in smaller watercourses, sandbags.

Water pumped from the dry works area will be treated using settlement tanks to remove sediment prior to discharge back to the watercourse. Discharge water will be to a standard agreed with IFI. As a potential habitat enhancement measure, silt dewatering bags may be used. These trap silt and only allow clean water through. They can be left to biodegrade, enhancing the local habitat.

Water will be carried over or around the isolated dry works area. This may be either by pumping or temporary diversion. Where possible, provided there is no risk of excessive scour, the diversion will be within the footprint of the existing channel. Due to the use of a temporary impermeable barrier, the channel may have localised changes in water depth, velocities and sediment erosion and deposition.

The existence of a temporary impermeable barrier within the channel, will have a direct impact on the cross section of the channel and is expected to give rise to localised changes in water depth, velocities and sediment erosion / deposition. Once the underground cable crossing is completed, the landscape will be restored in accordance with agreed requirements. These works may include riverbank stabilisation, gravel replacements etc. In all cases, the site will be restored post-installation.

Open-cut trenching works will not be carried out during extreme rainfall or high flow events. Met Éireann provides a five-day weather forecast via its website (www.met.ie). Generally, works will not take place during certain categories (e.g. red weather warnings). Depending on the specific circumstances, works may also not take place during yellow and orange warnings based on the site-specific conditions and based on an assessment by the contractor. The Contractor's Environmental Clerk of Works (EnCoW) will monitor watercourse crossings and ensure appropriate records are maintained for audit.

Unless otherwise agreed with IFI, in-stream works will be restricted to the fisheries open season (i.e. restricted to July to September).

[23] As labelled within the Biodiversity chapter of this PECR.

5.5.2.6 Open-Cut Trenches at Utility Crossings

Numerous existing utility services cross the proposed cable route as described in Appendix 5.2. Where these occur, the proposed crossing options include the following:

- **Locate below the existing service:** The underground cable would be positioned locally below the existing service. This will be to the minimum allowed spacing, as per utility owner requirements;

- **Locate above the existing service:** The depth to the top of the underground cable ducts could be reduced to a minimum of 450 mm below surface level as per the Health and Safety Authority's paper entitled, 'Code of Practice for Avoiding Danger from Underground Services'. This depth would accommodate the required separation from the service being crossed and would provide protection to the underground cable system. Steel plates and steel mesh would be installed above concrete-encased ducts; and

- **Realignment of existing utility**: The works required to do so will be coordinated with the service / utility provider and a complete coordinated methodology would be mutually agreed between all parties prior to commencement of any work.

All proposed work methodologies would aim to prevent any outages or loss of service. If the risk cannot be avoided, prearranged agreements on outages would be set in place prior to works' commencement.

5.5.2.7 Horizontal Directional Drilling (HDD)

There are six HDD crossings proposed along the cable route:

- HDD1 – ch. 15+000 – crossing of the Rye Water (WB13), to the west of the R158. The HDD length is approximately 50 m;

- HDD2 – ch. 15+380 – crossing of the Grand Canal (WB14) and Dublin-Sligo railway line, to the west of Kilcock. The HDD length is approximately 220 m;

- HDD3 – ch. 16+640 – crossing of the M4 Motorway, to the south of Kilcock. The HDD length is approximately 120 m;

- HDD4 – ch. 22+000 – crossing of the Lyreen tributary of the River Liffey_010 (WB20), along the R407. The HDD length is approximately 100 m;

- HDD5 – ch. 37+100 – crossing of the River Liffey (WB35), north of Sallins. The HDD length is approximately 120 m; and

- HDD6 – ch. 44+600 – crossing of the Grand Canal (WB42), in Naas. The HDD length is approximately 150 m.

HDD technology has been widely used on infrastructure projects for several decades. Competent specialist contractors will be appointed to undertake the work.

The HDD Contractor will conduct the drilling works in a safe and controlled manner with appropriate planning for site and environmental constraints. The HDD design and the Contractor's methodologies will ensure that the proposed works do not adversely affect existing utilities, third-party infrastructure, and groundwater.

Temporary HDD compounds have been included within the planning application boundary for the Proposed Development. The sites will be temporarily covered with a gravel hardstanding to allow construction plant to operate safely. Launch and reception pits of approximately 3 m x 5 m will be constructed for the HDD holes.

The drill rig will bore a pilot hole between one side of the crossing to the other. The HDD technique uses a drilling fluid called bentonite to support the borehole during construction. The bentonite fluid also carries away flushings – the unwanted material removed by the drill bit. The drill bit is kept on its planned alignment using surveyors and sensors which are constantly monitored by the drill rig operator.

The drilled arisings are flushed to the surface where they will be separated from the fluid fraction for disposal. The drilling fluid is maintained in a closed loop, meaning the bentonite is pumped, captured, cleaned and circulated again. A typical HDD drilling rig is shown in Plate 5.10.

Plate 5.10 Typical HDD Drilling Rig

Source: EirGrid

Constant monitoring by the specialist drilling team of fluid volume pressure, pH, weight and viscosity will be carried out. The volume of cuttings produced will also be monitored to ensure that no over-cutting takes place and that hole cleaning is maintained. The nature of the cuttings will also be monitored to understand the ground conditions as the drilling progresses.

After the initial pilot hole is completed, it will be reamed in a number of passes. This will enlarge the hole to the required bore size to enable the cable ducts to be pulled through. The specialist drilling team constantly monitors the operation. This includes:

- Checking that actual load stress matches designed load stress, to ensure hoop stress and buckling stress is not exceeded; and

- Drilling progress monitoring to identify voids or changes in geological conditions

When the HDD works are completed, the working platform will be removed, and the site reinstated to original condition.

The Contractor will monitor river/stream flows upstream and downstream of any directional drilling of watercourse crossings. The flow monitoring will be undertaken on a daily basis for five working days prior to the directional drilling, during the directional drilling and for five working days following completion of the directional drilling. The Contractor will record the results of such monitoring, and will provide these to ESB, EirGrid, the Local Authorities, and other bodies as required by any conditions. If a measurable increase in losses from the watercourse to ground is observed in the reach where the directional drilling took place, bed lining will be undertaken if required by IFI.

5.5.2.8 Sallins Bypass Bridges

The Proposed Development seeks to minimise the impacts of off-road crossings by routing the underground cable along the existing public road network, so far as is reasonably practicable. See Chapters 2 and 4 of this PECR for further details. This helps to avoid environmental and socio-economic impacts from crossing off-road sections (e.g. agricultural land).

Following consultation with Kildare County Council, it has been agreed, subject to detailed design, that the Sallins Bypass will be utilised for the cable route. The cable route will generally follow the footpath along the eastern boundary of the road. There will also be five crossings of bridges on the Sallins Bypass. These are:

- Structure Number 6 (River Liffey Underbridge Number 2) – a clear-span crossing of the River Liffey, approximately 200 m in length;

- Structure Number 5 (River Liffey Underbridge Number 1) – a clear-span crossing of the River Liffey, approximately 100 m in length;

- Structure Number 4 (Grand Canal Underbridge) – a clear-span crossing of the Grand Canal, approximately 60 m in length;

- Structure Number 3 (Irish Rail Overbridge) – the Dublin-Cork/Limerick crossing over the Sallins Bypass, approximately 40 m in length; and

- Structure Number 2 (Osberstown Road Overbridge) – the L2002 Osberstown Road crossing over the Sallins Bypass, approximately 15 m in length.

Structures 4, 5, and 6 (crossing of the River Liffey and the Grand Canal) will be crossed by placing the cable ducts within the footpath. Works will involve removing the existing surfacing, placing the cable ducts and resurfacing the footpath and the carriageway. This will follow the layout and appearance of the bridges as they are currently designed, with a slight increase in footpath and carriageway height to accommodate the cable route.

Subject to detailed design, the footpath level will increase by approximately 125 – 150 mm (12.5 – 15 cm). The carriageway increase will vary from bridge to bridge but will be in the range of approximately 100 mm – 145 mm. Post-construction there will be no impact to the use of the shared cycleway/footpath on the bridge and the current width will be unaffected.

The Proposed Development will ensure the waterproofing and expansion joints on the bridges are maintained and an increase in height will be longitudinally graded out to ensure safety standards are met.

Structure Number 3 (Irish Rail Overbridge) will be crossed by reusing an existing spare duct in the bridge structure. During the construction of the bridge, a 900 mm wide duct was built across the width of the bridge. Consultations with Irish Rail and Kildare County Council have confirmed that there is no current use for the duct. The design will use the existing duct for the proposed cable route. A small retaining wall will be constructed on the north and south side of the bridge to facilitate the cable ducts to enter and exit from the duct. This retaining wall will support earth that will be used to cover the cables of the Proposed Development. The cable will continue either side of the bridge in the footpath of the Sallins Bypass.

Structure Number 2 (Osberstown Road Overbridge) will be crossed in the carriageway of Sallins Bypass. There are no spare ducts or sufficient space in the footpath at this bridge to facilitate a crossing, however, there is sufficient depth in the carriageway to accommodate the cable trench. At this point the Sallins Bypass is a dual carriageway and these construction works will require temporary traffic measures, as a lane of the Sallins Bypass southbound (towards Naas) will be required to be closed.

The details of the Bridges will be developed further at the detailed design stage, to the agreement of Kildare County Council. Agreement has been given by Kildare County Council for the use of these structures which will reduce environmental and socio-economic effects, decrease the construction costs and improve the technical and deliverability considerations of the Proposed Development, compared to an off-road route (see Chapter 4 of this PECR for further details).

Impacts to pedestrian, cyclists, and other users of the footpath and cycleway, and road users on the Sallins Bypass are addressed in Chapters 14 (Traffic) and 16 (Material Assets).

5.5.3 Phase 3 - Installation and Jointing of Cables

5.5.3.1 Cable Installation

The cables will be brought to site on cable drums. The cable drums will be moved into position using specialist trailers. For in-road sections, these trailers will be lorry type, while for off-road sections, the trailers may be tractor type. The drums will be brought to the joint bay location for cable installation by 'pulling' the cable into the pre-installed duct.

Once the drum is set up, a winch system at the next joint bay including pulling cable will be attached to the nose of the cable and rollers will be used to guide the cable end towards the duct. The cables will then be pulled into the duct with lubrication being applied to the cable and duct throughout the process to control pulling tensions.

5.5.3.2 Cable Jointing

The individual lengths of cable need to be joined or 'jointed' together to create a single circuit. This is done at the joint bays along the cable route.

The cable jointing process is highly skilled, labour intensive, technically demanding and essential to the effective operation of the cables. For worker safety and comfort, a temporary waterproof shelter system with the same visual appearance as a shipping container is either placed or constructed around the joint chamber. This provides a clean environment for the jointing process to be undertaken in. In some areas, the width of the joint bay and shelter will mean temporary traffic management, including use of passing bays, may be required.

The width of the joint bays and the nature of the road network in the area means that road closures and diversions will be required in some areas along the route during construction and operation.

The cables will be pulled into each end of the chamber and the cable ends jointed together within the chamber. Jointing is expected to take approximately one to two weeks per joint bay.

Following jointing, the joint bay will be backfilled, and the road surface permanently reinstated. An example of cable pulling is shown in Plate 5.11. An example of a sheltered joint bay used during jointing is provided in Plate 5.12.

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Plate 5.11 Typical Cable Pulling at a Joint Bay

Source: EirGrid

Plate 5.12 Typical Cable Jointing Bay Shelter

Source: EirGrid

5.5.4 Construction Traffic

A Traffic Management Plan has been prepared for the Proposed Development and is contained as Appendix 5.1 of this PECR.

The proposed construction sequence to support the Temporary Traffic Measures for the in-road sections of the cable route is as follows:

- Phase 1 – Installation of passing bay and joint bay structures: The construction of the passing bays (where required) at the joint bay locations. On completion of the passing bays, it would be proposed that the joint bays are installed at the same time;
- Phase 2 – Excavation and installation of ducts: A trench will be dug along the cable route, ducts installed, and the trench backfilled, and the ground reinstated to match existing;
- Phase 3 – Installation of cables: The cables will be installed at joint bay locations within the ducts. The cables will then be jointed (connected) at each joint bay location to allow the installation of a continuous circuit.

The scale and nature of the Temporary Traffic Management will vary from phase to phase because of the different effects. Works during Phases 1 and 3 are discrete locations along the cable route, whereas Phase Two will be a rolling working area as the trench will run the entire length of the Proposed Development.

In Phases 1 and 3, the following measures will be applied:

- Single lane closure: Where the road width at the location of the joint bay is greater than 10.5 m, a passing bay would not be required and only a single lane closure required;
- Passing bay with single lane closure: Where the road width is less than 10.5 m and where there is suitable space, a passing bay with single lane closure will be constructed; and
- Full road closure (with local access arrangements): Where the road width is less than 10.5 m and where there is insufficient space to construct a passing bay, a road closure with local access arrangements will be provided for the affected area with signposted diversions.

In Phase 2, the following measures will be applied:

- Full road closure (with local access arrangements): Where the residual open carriageway is less than 2.5 m the road will be required to be closed, with local access arrangements where necessary. Allowing vehicles to pass on a carriageway less than this width would pose significant risk to road users and the delivery teams. Please note that the length of road that will be closed will be minimised and made appropriate to the area of the works. The closed section will be based on the nearest diversion point and the works required in that area;
- Lane Closure with Heavy Goods Vehicles (HGV) Diversion: Where the residual open carriageway is between 2.5 m and 3 m the road will be required to be closed to HGVs but open to Light Goods Vehicles (LGVs e.g. Ford Transit vans) and cars. All HGVs would be required to use the diversion route, requiring signage to mitigate the risk of HGVs passing the works sites; and
- Lane Closure: Where the residual open carriageway is greater than 3 m, it is proposed to keep the road open to all road users, using automated stop / go traffic signals. Automated signalling to account for the traffic

flow and demand will reduce waiting times. The lane closures would remain during the entirety of the section of works (i.e. out of hours included) to ensure safety to all road users and delivery teams.

Table 5.3 below summarises the proposed indicative Temporary Traffic Measures that will be applied for the Proposed Development. The cable route has been divided into a number of sections because of the different sections being in-road or off-road, the nature of the proposed works in that area, difference in road widths, and other factors. Table 5.3 contains only those sections where Temporary Traffic Measures are required. The table also identifies the maximum diversion length where they are required in certain sections. The diversions have been calculated on a like-for-like basis – where a regional road is affected by the Proposed Development, the proposed diversion only uses regional roads and does not include local roads in the area. In some areas, this approach significantly increases the length of the diversion.

Table 5.3 Summary of Proposed Temporary Traffic Measures

TTM Sections	Name of Section	Length of Section (km)	Average Road Width (m)	Phase 1 and 3 TTM	Phase 2 TTM	Diversion Length (km)
1.02	R156	3.9	7	Passing bay – single lane closure	Lane closure with HGV diversion	27.4
1.04	R125 North	3.5	5.7	Two measures will be used in this section (depending on the location): - Passing bay – single lane closure; and - Temporary construction platform – single lane closure.	Full road closure (with local access arrangements) *	21.5
1.05	R125 South	3.9	5.9	Two measures will be used in this section (depending on the location): - Passing bay – single lane closure; and - Temporary construction platform – single lane closure.	Full road closure (with local access arrangements) *	18.7
1.06	R158	0.2	7.7	No works required in Phases 1 and 3.	Lane closure	3.6
1.08	R148	0.5	7.8	Temporary construction platform	Lane closure	5

TTM Sections	Name of Section	Length of Section (km)	Average Road Width (m)	Phase 1 and 3 TTM	Phase 2 TTM	Diversion Length (km)
1.10	R407 North	0.5	8.2	Passing bay – single lane closure	Lane closure	3.9
1.11	R407	9.4	7.6	Three measures will be used in this section (depending on the location): - Passing bay – single lane closure; and - Temporary construction platform; - Temporary construction platform – single lane closure.	Lane closure	17.1
1.12	R408	4.1	6.1	Passing bay – single lane closure	Full road closure (with local access arrangements) *	9.6
1.14	R403	1.2	6.9	Passing bay – single lane closure	Full road closure (with local access arrangements) *	12.5
1.15	L2002 North	3.2	5.4	Passing bay – single lane closure	Full road closure (with local access arrangements) *	6.7
1.17	L2002 South	0.3	5.6	No works required in Phases 1 and 3.	Full road closure (with local access arrangements) *	9.5

TTM Sections	Name of Section	Length of Section (km)	Average Road Width (m)	Phase 1 and 3 TTM	Phase 2 TTM	Diversion Length (km)
1.19	Sallins Bypass	2.5	15	Two measures will be used in this section (depending on the location): - Single lane closure; and - Single carriageway closure – lane crossover.	Lane closure	5.6
1.21	Osberstown Road	0.1	5.2	No works required in Phases 1 and 3.	Full road closure (with local access arrangements) *	4.8
1.23	Millennium Parkway	2.3	9	Local road widening – single lane open	Lane closure	5.7
1.24	R409	1.2	11.6	Temporary construction platform	Lane closure	2.8
1.26	R447	1.4	11.2	Three measures will be used in this section (depending on the location): - Temporary construction platform; - Local road widening – single lane closure, and - Lane closure.	Lane closure	2
1.27	R448	5.3	6.7	Three measures will be used in this section (depending on the location): - Temporary construction platform; - Local road widening – single lane closure, and - Lane closure.	Full road closure (with local access arrangements) *	21.2

TTM Sections	Name of Section	Length of Section (km)	Average Road Width (m)	Phase 1 and 3 TTM	Phase 2 TTM	Diversion Length (km)
1.28	R448 South	0.4	6.9	No works required in Phases 1 and 3.	Full road closure (with local access arrangements) *	14.1
1.30	R412	0.3	5.3	No works required in Phases 1 and 3.	Full road closure (with local access arrangements) *	14.2

*Please note that the length of road that will be closed will be minimised and made appropriate to the area of the works. The closed section will be based on the nearest diversion point and the works required in that area.

The number of construction workers required during the construction phase at the substations is expected to peak at approximately 20 persons for each of the two substation sites.

Crew sizes for the construction of the cable trench, ducts, and the installation of the underground cable is estimated at approximately 10 persons per crew with three crews (teams) working simultaneously. Additionally, it is estimated that there will be approximately up to five traffic management operatives with each crew. The project offices located at the temporary construction compounds will have a maximum of 10 staff (engineers, project managers etc.) at three locations

The estimated traffic movements associated with installation of the underground cable are presented in Table 5.4. It should be noted though that the ultimate approach will be determined by the appointed Contractor, within the parameters assessed in this PECR.

Table 5.4 Approximate Estimates of Construction Vehicle movements

	2025			2026				2027				2028		
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Estimated vehicle movements for Construction Phase	5,624	4,684	9,662	2,148	926	320	10	234	780	0	0	0	2,418	0

5.5.4.1 Cable Drum Delivery

The cable will be delivered to site on cable drums with on average 750 m length of cable per drum – the exact lengths will be sized to suit the distance between each joint bay. Each cable drum will be approximately 4.3 m in diameter, and 4 m wide. This will require a large trailer to allow for transport and will be classed as an abnormal load.

There are no high-voltage cable manufacturers in Ireland. Therefore, it is assumed that the cable drums will be delivered by ship from an overseas manufacturer. An assessment has been made of Dublin Port and Belview Port in Waterford for the arrival of these drums. Both ports are well suited for the delivery and transportation from the port to the construction area. However, due to the size of the cable drums these will be an abnormal load. An assessment has been undertaken as part of the Traffic Management Plan for the Proposed Development but further assessment and consultation will be required at the detailed design stage (e.g. the exact timing of the deliveries, from which port, etc).

It is estimated that there will be 187 abnormal load deliveries. Depending on manufacturing details, these could be completed directly from the port to the construction area, or from the port to a construction compound and onwards to the construction area.

Following consultation with an abnormal load specialist (see Appendix 5.1), at this stage it is not foreseen that specific road closures will be required to transport the drums provided they are accompanied by escort vehicles. The escort vehicles are there to ensure the safety of all road users but also to support the oversized load vehicle with overcoming particular obstructions. The requirement and number of escort vehicles and Garda support is at the discretion of the Permits Officer for each council or consenting authority along the route. On agreement of the final number and design of cable drum, agreement of the delivery port, and specific abnormal load vehicle, the consenting authorities can be engaged and the exact requirements for permits can be jointly agreed.

It is likely that an element of enabling works may be required. This is expected to be vegetation trimming (within the permissible environmental timeframes), the temporary movement of some street furniture, and raising any low overhead lines.

The Traffic Management Plan (Appendix 5.1 of this PECR) provides a minimum level of requirements for the Contractor. The plan will be further developed during detailed design based on specific design proposals. A Temporary Traffic Management Designer will be appointed and will prepare Detailed Temporary Traffic Management Designs for all locations where works are planned on, or impact on, any public road. Prior to commencing the works, the plan must be developed into an Operational Traffic Management Plan by the Project Supervisor Construction Stage (PSCS). The appointed PSCS/Contractor of the Proposed Development is required to carry out the Safety Audit on Operational Traffic Management Plans prior to commencing the works. The PSCS shall coordinate the implementation of the developed Traffic Management Plan during construction of the works. The Traffic Management Plan requirements will include the provision of facilities for the safe passage of pedestrian and vehicular traffic and measures to keep the impact of the works on the roads, and local communities and road users, to a minimum. All traffic management controls proposed by the Contractor must be in accordance with standards and guidance documents referenced in the Traffic Management Plan.

5.5.5 Outline Construction Schedule and Timing of Works

Subject to the grant of statutory approvals, it is anticipated that the construction phase will commence in Quarter 2, 2025 with the underground cable element of the Proposed Development becoming fully operational after construction and testing in Quarter 3, 2028.

The works at the Woodland substation are expected to last approximately 24 months while the works at Dunstown substation are expected to last approximately 12 months and will run concurrently with the cabling works.

Construction activities will gradually phase out from pre-construction to predominantly civil activities followed by commissioning and testing.

In general, it is anticipated that construction will occur during normal working hours i.e. Monday to Friday 7 am to 7 pm and Saturday from 7 am to 2 pm. There may be localised instances where night-time working is required to facilitate traffic management, however, work outside these hours and days will only be undertaken with prior agreement with Meath and Kildare County Councils.

Clearance of hedgerow, treeline or scrub vegetation, where required, will take place after 31 August and before 1 March in order to protect breeding birds (i.e. outside of the bird breeding season). Clearance may take place during the restricted period, if a suitably qualified ecologist has determined that nesting birds and other protected species are absent. Enabling works have been provisionally programmed for Q1 2025. This allows sufficient time for habitat clearance outside of the breeding season. This would increase the construction period to 45 months if it is required.

Any element of the Proposed Development requiring in-stream works in watercourses with fisheries value will be restricted to the fisheries open season (i.e. will only take place during the period July to September), unless with the agreement of IFI.

Indicative durations for the proposed works are detailed in Table 5.5. Subject to the grant of consents, it is anticipated that installation of the underground cable will take approximately 42 months in total. However, safety requirements for the installation operations / procedures, detailed design considerations and weather conditions will ultimately dictate the final programme.

The majority of the construction activities are not dependent on outages on the existing transmission system, however, specific activities associated with the connection at the existing Woodland and Dunstown substations on to the existing transmission infrastructure will be planned and programmed into EirGrid's multi-year outage programme. This is because the existing live infrastructure needs to be switched off during such connection activities. EirGrid, as Transmission System Operator, develops a detailed plan for such outages each year to ensure the safe and efficient undertaking of construction and maintenance activities involving or in proximity to existing infrastructure.

Table 5.5 Indicative Preliminary Construction Programme

Description	Estimated Construction Programme (Months)	2025				2026				2027				2028			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Proposed Development - Construction Duration																	
Overall Construction Duration	42																
Enabling Works	1 or 2 months*																
Phase 1: Installation of joint bay and passing bay structures	36																
Phase 2: Excavation and installation of cable ducts	24																
Phase 3: Installation and jointing of cables	21																
Substation works	24																
Testing and commissioning	9																
Energisation and permanent works construction complete	3																

*Enabling works have been provisionally indicated in Q1 2025 if required to allow for habitat clearance outside of the nesting season.

5.5.6 Temporary Construction Compounds

All temporary construction compounds will be secured with hoarding / fencing around their perimeter as appropriate. Temporary construction compounds will include facilities such as construction phase car parking, welfare facilities, and temporary material storage areas as necessary. Any sewage discharges from temporary welfare facilities will be connected to a sealed holding tank to be emptied and disposed of off-site by a licensed contractor to an approved licensed facility.

Where an access road is required, engineering stone fill will be laid and compacted and maintained as required for the duration of the works. Once the works are completed, the engineered stone fill will be removed, and the land will be reinstated to its original condition.

All construction workers will be required to use the designated access / egress routes only. Storage of fuel and refuelling will be undertaken within bunded areas. Water will be brought to site via tankers as required.

Security lighting will be directional and cowled. The Contractor will regularly review security lighting in this regard, to inform adaptive management if necessary and report the monitoring findings regularly to ESB, EirGrid and the local authority.

The temporary construction compounds are all located with the planning application boundary and are as follows:

- Compound No. 1: Chainage 3250, off the R156 – approximately 0.8 ha;
- Compound No. 2: Chainage 11000, off the R156 – approximately 0.7 ha;
- Compound No. 3: Chainage 21000, off the R407 – approximately 0.9 ha;
- Compound No. 4: Chainage 31000, off the R408 – approximately 1.5 ha;
- Compound No. 5: Chainage 35750, off the L2002 – approximately 1.1 ha; and
- Compound No. 6: Chainage 52000, off the R448 – approximately 0.7 ha.

Construction Laydown Areas Nos. 1 and 2 (Chainage 39750, off the Osberstown Road) are two compounds located either side of the railway line. These compounds will not be used for the storage of materials or for site offices but will be used to facilitate the works required adjacent to and under the railway bridge on the Sallins Bypass – the northern compound is approximately 0.2 ha in size and the southern compound is approximately 0.3 ha in size. There will also be a laydown area within the Dunstown substation as shown in the planning drawings, but as that area is within the existing substation site, it is not included in this list.

5.5.7 Construction and Environmental Management Plan

A Construction and Environmental Management Plan (CEMP) is included as Appendix 5.4 to this PECR and will be implemented during the construction phase in consultation with Meath County Council and Kildare County Council. This CEMP will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect the environment, are implemented.

The CEMP will remain a 'live' document which will be reviewed regularly and revised as necessary in consultation and agreement with the two Local Authorities to ensure that the measures implemented are effective as part of an ongoing review throughout the construction phase of the Proposed Development. This will confirm the efficacy and implementation of all relevant mitigation measures and commitments identified in the application documentation.

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

ESB will monitor the Contractor's performance on a regular basis and will undertake various compliance checks throughout the duration of the construction period, including the following:

- Review Contractor documents against the requirements of the CEMP;
- Undertake regular audits;
- Ensure site records are checked regularly;
- Set up a Contractor reporting structure; and
- Conduct regular meetings (at least fortnightly) where Environmental Health and Safety is an agenda item.

5.5.7.1 Traffic Management Plan

The appointed Contractor will implement the construction Traffic Management Plan (TMP) included in Appendix 5.1 of this PECR, in ongoing consultation with Meath County Council and Kildare County Council. The TMP may be subject to iterative updates in consultation and agreement with the two Local Authorities, as part of ongoing review and design development throughout the design and construction phases of the Proposed Development. The implementation of the TMP will mitigate potential construction traffic impacts on the public road network. All construction activities, including construction traffic, will be managed through the TMP.

5.5.7.2 Construction Resource Waste Management Plan

Prior to commencement of the Proposed Development, the appointed Contractor will implement the Construction Resource Waste Management Plan (see Appendix 5.5 of this PECR) which will ensure that optimum levels of waste prevention, reduction, re-use, recycling, and recovery are achieved. As with the CEMP and TMP, the Construction Resource Waste Management Plan may be subject to iterative updates in consultation and agreement with the two Local Authorities.

The Construction Resource Waste Management Plan has been prepared in accordance with waste management guidance and principles as outlined in the EPA's '*Best Practice Guidelines For The Preparation of Resource and Waste Management Plans For Construction and Demolition Projects*'[24].

All operations during the construction phase will be managed and programmed in such a manner as to prevent / minimise waste production and maximise upper-tier waste management (i.e. re-use, recycling and recovery) in line with the Waste Hierarchy, where technically and economically feasible.

The requirement to develop, maintain and operate the Construction Resource Waste Management Plan will form part of the contract documents for the Proposed Development and will be updated by the Contractor (as set out above) in advance of the commencement of construction activities on site. Waste sent off site for recovery or disposal will only be conveyed by an authorised waste contractor and transported from the Proposed Development site to an authorised site of recovery/disposal in a manner which will not adversely affect the environment. All construction employees will be required to comply with the obligations under the Construction Resource Waste Management Plan.

[24] https://www.epa.ie/publications/circular-economy/resources/best-practice-guidelines-for-the-preparation-of-resource--waste-management-plans-for-construction--demolition-projects.php

5.5.8 Environmental Clerk of Works

The Contractor will appoint an Environmental Clerk of Works (EnCoW), who will have suitable environmental qualifications. The EnCoW will have the necessary experience and knowledge appropriate to the role (including experience of linear infrastructure projects and HDD) and will be a member of a relevant professional body, such as the Institute of Environmental Management and Assessment (IEMA)). The suitability of qualifications/ experience of proposed EnCoW will be confirmed by a senior/ principal environmentalist / ecologist from ESB. The EnCoW will be delegated sufficient powers under the construction contract so that they will be able to instruct the Contractor to stop works and to direct the carrying out of emergency mitigation / clean-up operations. The EnCoW will also manage consultation with environmental bodies including the National Parks and Wildlife Service (NPWS) and IFI. The EnCoW will be responsible for carrying out regular monitoring of the CEMP and will report monitoring findings in writing to ESB on a regular basis (at least weekly, but immediately in the case of incidents or accidents).

5.5.9 Habitat Restoration Works

The following enhancement measures will be incorporated into the Proposed Development:

- Unless otherwise agreed with ESB and the local authority, the Contractor will reinstate hedgerows and treelines to a species-rich condition (i.e. five woody species per 30 m), comprising only native species; and

- All other sites will be returned as close as possible to their pre-existing condition, using the same woody species removed, or similar verge seed mixes, under the supervision and direction of the Contractor's EnCoW.

5.6 Operation and Maintenance

5.6.1 Underground Cable

A permanent easement of 5 m will generally be required above the area of the cable trench. This will be increased on certain land holdings for permanent access tracks, joint bays, HDD locations, and the section of cable between Woodland substation and the R156 or other features. This will be discussed and agreed with the affected landowners and are all within the planning application boundary shown for the Planning Application Boundary.

Routine maintenance will be required along the cable route. Access to link boxes and communications chambers will be required on an annual basis for inspection and for any necessary maintenance. ESB will undertake maintenance of the Proposed Development as electricity Transmission System Owner, through its business unit ESB Networks. A crew size of three persons is expected for inspection of the joint bays and associated communications chamber and link box. Traffic management may be required by those joint bay locations positioned in-road or on verges. Access to off-road joint bays will be provided via the permanent access tracks as described in Section 5.5.2.3). Access to these locations will be coordinated with the landowners to minimise disruption. Consultation will be undertaken with the Local Authorities prior to the works commencing. The traffic management will likely be stop-go systems in line with the measures outlined in the Traffic Management Plan.

5.6.2 Substations

Following the construction phase, operation and maintenance of the Woodland and Dunstown substations will be managed by ESB. The substations do not require any personnel for operation. Scheduled maintenance of the substations will continue to occur approximately once a year, in line with the current maintenance schedule. It is expected that approximately five persons would attend each of the substation sites.

5.7 Health and Safety Considerations

5.7.1 Project Supervisor for the Construction Stage

A Project Supervisor for the Construction Stage (PSCS) will be appointed for the Proposed Development when contractors are appointed to carry out the works. The PSCS will be responsible for developing the construction stage Health and Safety Plan, coordinating the works of Contractors and providing the Project Supervisor Design Process (PSDP) with information required in the Safety File.

5.7.2 Project Supervisor Design Process

The PSDP ensures coordination of the work of designers throughout the Proposed Development. This is to ensure they are addressing and coordinating safety and health matters from the very early stages of the Proposed Development.

5.8 Reinstatement and Decommissioning

All temporary works such as passing bays, HDD and construction compounds, and working areas within the planning application boundary will be restored to their current land use. The materials such as temporary culverts of roadside drains or stoning will be removed in the reverse of the process described above. Planting will be provided where existing vegetation has been removed. Species-rich hedgerows will be provided where existing hedgerows are affected to seek to improve on existing biodiversity levels. Trees will also be provided where it is appropriate ensuring sufficient set-back from the cable route.

Permanent works will include the joint bays and 12 permanent access tracks, and a 3 m hard standing area around the off-road joint bays. These areas will be maintained by ESB as necessary.

All affected landowners will be provided with detailed mapping which provides the location of permanent works on their land. The location of the cable route and associated permanent works will be provided to all statutory undertakers, Meath and Kildare County Councils, and will be included on ESB's register for its 'Dial Before You Dig' programme[25].

The works within the substations will also be permanent features.

Affected roads will be resurfaced in agreement with Meath and Kildare County Councils in line with the principles of the Purple Book.

The minimum design life of the permanent equipment and apparatus is expected to be 40 years. Thereafter, it is assumed that the equipment will be decommissioned and replaced with new equipment. Subject to condition assessment, parts of the permanent equipment may be reused or may have a longer service life. For example, the joint bays and cable ducts may have a service life much longer than 40 years. The cables will either be left in place or will be removed for recycling in accordance with the relevant waste management regulations in place when decommissioning takes place. The activities associated with the decommissioning phase will be similar to those associated with the construction phase discussed in this PECR, and this should be considered to apply to each subject matter appraised in this PECR.

[25] https://www.esbnetworks.ie/staying-safe/contractor-safety-/digging-and-excavation-work

6. Planning

This chapter presents a summary of the separate Planning Report that has been prepared for the Proposed Development.

6.1 National Plans and Policies

It is recognised at international and European level, that climate change commitments mean that power generation, transport and heat have increasingly had to derive power from sustainably produced electricity. Therefore, national and regional policy place a strong emphasis on the need for new energy systems and transmission grids. This section outlines how the Proposed Development accords with national, regional and local planning policy. A full policy appraisal can be found in the accompanying Planning Report.

The following are those national-level plans, policies and strategies relevant to the Proposed Development:

- **Project Ireland 2040 – National Planning Framework (NPF) –** Sets out key policy principles via National Strategic Outcomes, which include supporting and strengthening the economy and a transition to a low carbon, climate resilient society, providing access to quality services, and achieving sustainable growth and better environmental resource management. It states that Ireland's National Energy Policy is focused on three pillars: sustainability, security of supply, and competitiveness.

- **National Development Plan (NDP) 2021-2030 –** represents the national capital investment strategy plan for delivering the NSOs of the NPF, achieved via Strategic Investment Priorities to the year 2030. A core strategic investment priority is a focus on decarbonising energy, in order to 'create greater links between different energy carriers (such as electricity and hydrogen); infrastructures; and consumption sectors (such as transport and heating).' Doing so requires a coordinated programme of investment in, among other things, 'an expanded and strengthened electricity transmission and distribution network', to support an increase in both renewable and conventional electricity generation.

- **National Energy and Climate Plan (NECP) 2021-2030 –** a ten-year plan mandated by the EU to each of its Member States, in order for the EU to meet its overall greenhouse gas emissions targets. The plan establishes key measures to address the five dimensions of the EU Energy Union: decarbonisation, energy efficiency, energy security, internal energy markets and research, innovation and competitiveness. The Proposed Development is compliant with the NECP.

- **Government White Paper –** Ireland's Transition to a Low Carbon Energy Future 2015-2030 **–** sets out a framework to guide Ireland's energy policy development. The Proposed Development is considered to be an 'enhanced and extended energy infrastructure' development, which will be critical for economic development, regional development and the secure provision of energy and other services for the Irish society and economy.

- **Climate Action and Low Carbon Development (Amendment) Act 2021 and Climate Action Plan (CAP) 2021 & 2023 –** Commits to achieving 51% reduction in overall greenhouse gas emissions by 2030 and setting Ireland on a path to reach net-zero by no later than 2050. States that in order to do so there is a need for transformational policies, measures and actions, including strengthening the grid.

The Proposed Development facilitates the delivery of all three pillars of national energy policy outlined in the NPF: sustainability, security of supply, and competitiveness, and aids in moving Ireland towards a low carbon, climate-resilient society as outlined in the National Strategic Outcomes.

It also delivers on the NDP Strategic Development Priorities through the delivery of an expanded and strengthened electricity transmission and distribution network. It is compliant with the NECP and is considered to be an 'enhanced and extended energy infrastructure' development in terms of the Government White Paper.

Finally, in terms of the Climate Action and Low Carbon Development (Amendment) Act 2021 and Climate Action Plan (CAP) 2021 & 2023, the Proposed Development and EirGrid's wider programme of work, outlined in the roadmap 'Shaping Our Electricity Future', facilitates climate action via strengthening of the electricity grid.

6.2 Regional Plans and Policies

In terms of the regional context, the Proposed Development is located in the Eastern and Midlands Region of Ireland and, therefore, the relevant regional policy is the Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Regional Assembly (EMRA) 2019-2031 (Hereafter referred to as the RSES). The RSES locates the majority of the project, excluding a small portion in the north, within the Dublin Metropolitan Area. Key points from the RSES are as follows:

- Climate action is one of three key principles underpinning the RSES vision to create a sustainable and competitive region, to be achieved by securing the transition to a low carbon economy. The RSES expresses support for of the NPF, seeking 'Alignment of growth with enabling infrastructure' to ensure quality infrastructure provision and capacity improvement is provided in tandem with new development.

- The RSES states, in relation to the Dublin Metropolitan Area, that the 'Development of the energy distribution and transmission network in the region will enable distribution of more renewable sources of energy to facilitate future energy demand in strategic development areas'. The RSES specifically identifies the need for the 'expansion and upgrading of the grid with the aim of increasing the share of variable renewable electricity that the all-island system can accommodate'.

- The EMRA RSES expresses support for EirGrid's Implementation Plan 2017 – 2022 and Transmission Development Plan (TDP) 2016 and any subsequent plans prepared during the lifetime of the RSES, while it specifically references the Proposed Development, stating 'Support reinforcement of the Greater Dublin Area between Dunstown and Woodland substations to increase the capacity of the often congested and highly loaded Dublin transmission network to enable the transmission system to safely accommodate more diverse power flows and also facilitate future load growth in the area'.

The Proposed Development delivers on core objectives of the RSES to facilitate the transmission of renewable energy across Ireland and delivers grid improvements that will both align with and facilitate the economic and population growth envisaged within the EMRA RSES. The fact that the Proposed Development is specifically referenced within the EMRA RSES also serves to demonstrate the importance of delivering this specific grid infrastructure improvement to the wider region.

6.3 Local Plans and Policies

This section outlines planning policy documents and key policy drivers against which the application for approval will be assessed. Key plans are as follows:

- Kildare County Development Plan (KCDP) 2023-2029 – The KCDP recognises the importance of providing a strong electricity transmission network for the environmental, social and economic viability of the county, and states that EirGrid and ESB will generally be supported in delivering energy transmission projects in the county. The KCDP also specifically mentions the Proposed Development, stating 'The Maynooth 220 kV and Dunstown substations are both electrical substations of regional significance and the Council will seek to support any reinforcement of the Greater Dublin Area between Dunstown and Woodland substations.' (p245).

- Meath County Development Plan 2021 – 2027 (MCDP) – The MCDP emphasises the importance of reliable service provision and infrastructure for sustainable future growth and asserts that the strengthening of the national grid is important to improve security of supply for the domestic, residential and enterprise market as well as attracting high-end enterprise.

- Kilcock Local Area Plan (KLAP) – The Proposed Development is located within the Kilcock Local Area Plan (KLAP) Boundary. There is currently no Kilcock Local Area Plan in force.

- Naas Local Area Plan (NLAP) 2021-2027 – The Proposed Development passes through the functional area of the NLAP. Policy I4 – Energy and Communications, sets out a number of objectives in relation to the energy transmission infrastructure, including supporting the statutory providers of national grid infrastructure. It also seeks to ensure the undergrounding of all electricity, telephone and television cables in the town including the town centre and in residential and amenity areas.

- Sallins Local Area Plan (SLAP) 2016-2022 – The Proposed Development passes through the functional area of the SLAP. The SLAP states that a more sustainable energy sector incorporating power generation and energy efficiency in all sectors is vital for reducing greenhouse gas emissions, requiring a focus on renewable energy generation and improving energy efficiency. It also states, 'The availability of appropriate energy and communications infrastructure is essential for the successful future development of the town'.

The Proposed Development accords with the policies within the respective County Development Plans and Local Area Plans. Both County Development Plans identify the clear need for improved energy grid infrastructure alongside new development, and outline general policies that facilitate grid infrastructure improvements, with the Kildare plan outlining support specifically for the Proposed Development. The respective LAPs also express support for such improvements to the electrical grid. Taking this into account, the Proposed Development accords with local planning policy.

6.4 Conclusion

Taking the above into account, as well as the detailed analysis of policy accordance in the accompanying Planning Report, and in light of the other environmental considerations as laid out in this report, the Proposed Development is considered to be entirely in compliance with national, regional and local planning policy, and with the principles of proper planning and sustainable development for the areas.

7. Population and Human Health

7.1 Introduction

This chapter considers the potential effects arising from the Proposed Development on population and human health, based on the information presented in Chapter 5 (Project Description) of this PECR.

In relation to population, the assessment considers demographics, land use, economic activity, tourism and recreation, community and amenities, and human health.

The analysis of human health consequently considers those effects associated with relevant environmental disciplines which have been comprehensively addressed elsewhere in this report, including:

- Chapter 8: Air Quality and Climate;
- Chapter 9: Noise and Vibration;
- Chapter 11: Soils, Geology and Hydrogeology;
- Chapter 12: Hydrology;
- Chapter 13: Archaeology, Architectural and Cultural Heritage;
- Chapter 14: Traffic and Transport;
- Chapter 15: Material Assets – Agriculture;
- Chapter 16: Material Assets – Non-Agriculture; and
- Chapter 17: Landscape and Visual.

7.2 Methodology

This assessment focuses on the potential effects of the Proposed Development on population and human health during the construction and operational phases.

7.2.1 Relevant Guidelines, Policy and Legislation

The preparation of the population assessment has had regard to the following guidelines and policy documents. While the Proposed Development does not require an Environmental Impact Assessment, this PECR makes reference to EIA guidance and documents where appropriate.

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, introduced 'human health' as a factor to be considered in EIA.

In terms of policy, Health Ireland – A Framework for Improved Health and Wellbeing 2019-2025 (hereafter referred to as the Healthy Ireland Framework) (Department of Health 2019) provides a roadmap for building a healthier Ireland.

The following guidelines have informed the interpretation of the factors of 'population and human health' assessment, the overall approach, as well as providing the framework from which assessment criteria have been developed for this population and human health assessment.

- Environmental Impact Assessment of Projects. Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA, 2022);
- Human Health: Ensuring a High Level of Protection. A reference paper on addressing Human Health in Environmental Impact Assessment (hereafter referred to as the IAIA and EUPHA Guidance) (International Association for Impact Assessment (IAIA) and European Public Health Association (EUPHA), 2020);
- Institute of Public Health Ireland (IPH) Health Impact Assessment Guidance for Ireland and Northern Ireland (IPH, 2021); and
- Determining Significance for Human Health in Environmental Impact Assessment (Pyper et al. on behalf of IEMA, 2022).

The European Commission's Guidance on the Preparation of the Environmental Impact Assessment Reports (European Commission, 2017) notes that '*human health is a very broad factor*' that is '*highly project dependent*'. It states that:

> '*The notion of human health should be considered in the context of other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study.*'

This assessment has therefore taken account of the relevant guidelines on limit values and thresholds which are listed in Chapter 8: Air Quality and Climate, Chapter 9: Noise and Vibration, Chapter 11: Soils, Geology and Hydrogeology and Chapter 12: Hydrology. The assessment also takes account of the levels and evidence for health effects provided in the Environmental Noise Guidelines for the European Region (WHO Europe, 2018), TII Noise Guidelines (NRA, 2014) and Global Air Quality Guidelines (WHO, 2021).

7.2.2 Data Collection and Collation

A desktop study was undertaken to assess all relevant information. The following data sources and guidance records were used:

- Census 2016, Central Statistics Office www.cso.ie;
- County Kildare Local Economic and Community Plan (LECP) 2016-2021;
- County Meath Local Economic and Community Plan 2023-2029;
- EirGrid Evidence Based Environmental Study 9 Settlement and Landuse (EirGrid, 2016);
- Environmental Protection Agency (EPA);
- Fáilte Ireland www.failteireland.ie;
- GeoDirectory Ireland www.Geodirectory.ie;
- Online Mapping;

- Into Kildare www.intoKildare.ie;
- Kildare County Council;
- Kildare County Council Development Plan (KCCDP) 2023-2029;
- Labour Force Survey, Central Statistics Office www.cso.ie;
- Meath County Council;
- Meath County Council Development Plan (MCCDP) 2021-2027;
- Ordnance Survey of Ireland (OSI) mapping and aerial photography ww.osi.ie; and
- Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Region (1019-2031).

Data collated during the early stages of the Proposed Development, such as the identification of large urban settlements within the project study area, current land use and land zoning for the area, were used in the preparation of this chapter.

7.2.3 Assessment of Effects

In line with the EPA EIA Guidelines, Table 7.1 shows the criteria used in the assessment of effects within this chapter. Table 7.1: Assessment Criteria

Table 7.1: Assessment Criteria

Significance of Effect	Description of Effect
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant Effects	An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment.
Profound Effects	An effect which obliterates sensitive characteristics.

7.3 Baseline Conditions

The Proposed Development is located in Co. Kildare and Co. Meath. The full description of the Proposed Development is outlined in Chapter 5: Project Description.

For the purpose of this chapter, the assessment of the receiving environment has been conducted with regard to the project study area, settlements in which the Proposed Development is situated, as well as those within close proximity to it, which are likely to be influenced. Information on demography, land use, tourism community and amenities, economic activity and employment, and human health have been analysed and considered to ensure a robust understanding of the population within the Study Area.

7.3.1 Study Area

The Study Area lies within the Mid-East Region of Ireland. Project Ireland 2040 describes this region as having experienced high levels of population growth in recent decades, at more than twice the national growth rate. The Proposed Development will be primarily situated in-road with a number of locations off-road in agricultural lands.

The EPA Guidelines (2022) and advice notes identify 'sensitive receptors' as neighbouring landowners, local communities and other parties which are likely to be directly affected by the Proposed Development. In particular, homes, hospitals, hotels and holiday accommodation, schools and rehabilitation workshops and commercial premises are noted. Regard is also given to transient populations including drivers, tourists and walkers.

7.3.2 Demographic Profile

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

Central Statistics Office (CSO) census 2016 data have been used to collate the most recent statistics. While these census statistics are now some seven years old, 2022 results remain preliminary and so having regard to the nature, extent and general pattern of development in the receiving environment, these figures are representative of population and settlement in the identified area.

According to CSO 2016 census data, the population of County Kildare was 222,504 persons, 110,546 of which were male, and 111,958 were female. The population of County Meath in 2016 was 195,044 persons, 96,776 of which were male, and 98,268 were female. Both counties increased by approximately 5.9% since 2011. According to the Eastern and Midlands Regional Spatial and Economic Strategy (RSES), population in the region grew by 15% from 2006 to 2016 exceeding the state average growth rate of 12% over the same period.

The population is estimated to increase further with an overall population growth allocation of 500,000 for the region by 2040. The RSES set out population projections for the counties which are illustrated in **Table 7.2.**

Table 7.2: RSES Population Projections (RSES 2022)

Local Authority	2016	2026 low	2031 high
Kildare	222,500	249,000-254,000 12-14% increase from 2016	259,000-266,500 16-20% increase from 2016
Meath	195,000	216,000-221,000 11-13% Increase from 2016	225,000-231,500 15-19% Increase from 2016

The nearest settlements to the Proposed Development and their populations are illustrated in **Table 7.3**.

Table 7.3: Total Population of the nearest Settlements to the Proposed Development (RSES 2022)

Settlement	Population
Kilcock	6,093
Prosperous	2,333
Sallins	5,849
Naas	21,393

7.3.2.1 Housing

The Eastern and Midlands Regional Area is home to over 800,000 households in 2016 inhabiting almost half of the nation's 4.6 million people, despite covering the smallest in terms of land area across the three regional assemblies.

The number of households in County Kildare grew from 39,041 in 1996 to 73,596 in 2016; a 88% increase, although household size declined during the same period, from an average of 3.4 to 3 persons per household. The number of households in County Meath grew from 31,798 in 1996 to 64,234 in 2016; a 102% increase, although household size declined during the same period, from an average of 3.42 to 3 persons per household.

There are 2,367 residential dwellings located within 300 m of the Proposed Development. Further analysis was carried out and identified that there are 744 residential dwellings located within 200 m of the cable centreline and 443 located within 200 m from the joint bays using their centreline.

Outside of the settlements, much of the population live in linear communities alongside regional and local roads. In addition to residential populations, these settlements host community facilities such as schools, churches, parks, recreational, employment and retail areas.

7.3.3 Land Use

The majority of the underground cable will be installed in the public road network. Off-road sections are proposed at particular locations to avoid constraints. According to Corine Data 2018, the majority of the off-road sections are located in pasture and arable land comprising open agricultural greenfield (refer to Chapter 11: Soils, Geology and Hydrogeology).

A number of areas across Kildare and Meath have been zoned for development, including a number of business and industrial zones such as Ladytown Business Park between Naas and Newbridge and a large tourism-related zone to the south of Kilcock. All of the main settlements have approved applications for strategic housing developments of more than 100 houses, with some developments up to 400 houses some of which have either been constructed, are under construction, or at the pre-development planning stage. Areas of discontinuous urban fabric are associated with the towns/villages of Kilcock, Prosperous, Clane, Naas and Two Mile House. The two substations of Woodland and Dunstown are in relatively remote areas around Two-Mile House and Batterstown. This area is largely agricultural with one area of commercial peat extraction to the north of Prosperous.

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

7.3.4 Tourism and Recreation

Counties Kildare and Meath are located within the Eastern and Midlands region, having the benefit of close proximity to Dublin, providing national and international connectivity. The eastern counties have a very strong tourism and leisure offering, including heritage sites of international importance, infrastructure for outdoor recreation and areas of natural beauty.

Tourism is one of Ireland’s most vital economic sectors. Tourism and recreation are noted as key sectors in both the economic and social development in the Kildare CDP and Meath CDP, providing opportunities for employment and wealth generation, facilities and infrastructure that enhances the quality of life for residents. Kildare’s Tourism Strategy 2022-2026 states that in 2019 tourism contributed €141.6 million to visitor spend and supported 3,823 jobs in tourism in the county.

Fáilte Ireland’s Destination Towns Initiative highlights the importance of maintaining and enhancing the quality of place that visitors experience. Funding has been allocated through the local authorities as part of the €15.5 million ‘Destination Towns’. A list of destination towns has been established and includes Kildare town in County Kildare and Trim in County Meath. The scheme is part of the National Tourism Development which aims to boost the attractiveness and tourism of towns nationwide.

Kildare and Meath have a range of natural and built attractions and a variety of festivals and events aimed at attracting visitors to the counties. Most recently, Failte Ireland funded €395,000 in Meath into the Púca-Halloween festival and Tattersalls International Horse Trials and County Fair national festivals. Festivals and events in Kildare include the Derby Festival, St. Brigid’s Trail, Arthur’s Way Heritage Trail, and Taste of Kildare.

County Meath has traditionally been known as the ‘Royal County’, being the seat of the ancient Kings of Ireland to the Hill of Tara and the birthplace of Ireland’s ancient east (Fáilte Ireland). Some of Ireland’s most important archaeological monuments are located here which attracts a large number of tourists every year.

County Kildare’s major attractions are the equestrian facilities and centres; it is famous around the world for its horse racing at the Irish National Stud, and its picturesque landscapes. Surrounding towns and villages benefit from these attractions and welcome tourists every year. Legend has it that Fionn mac Cumhaill and his warriors ran their horses on the ancient plains of the Curragh, County Kildare. This historic landscape of Ireland’s Ancient East still remains the beating heart of Ireland’s equestrian capital (Into Kildare).

Significant tourism and recreational activities in the counties include festivals and equestrian, golfing, and outdoor adventure activities including angling and water sports.

A number of important tourism centres including castles, racecourses, golf clubs and equestrian centres are located within 300 m of the proposed underground cable centreline.

Significant tourism venues include:

- Larchill Arcadian Gardens (Tourist Destination), Kilcock, Co. Kildare;
- St Bridget's Well (Religious Destination) Calgath, County Meath;
- Firmount House (Events Venue), Firmount Demesne, Co. Kildare; and
- Jigginstown Castle, Naas West, Co. Kildare.

Equestrian facilities also include:

- The Cottage Stud, Kockanally, Co. Kildare;
- Damastown Stud, Ballybrack, Co. Kildare;
- Terr Grove Stud, Painestown, Co. Kildare ; and
- Rheindross Stud, Rathcoffey, Co. Kildare.

These tourist destinations support a number of jobs and aid the growth of the local and regional economy, and this has been considered in the routing of the Proposed Development. There will be no direct impacts to any of the facilities listed above.

7.3.5 Community and Amenities

There are a wide range of publicly accessible community, sports and arts facilities across Kildare and Meath, with nearly two-thirds of these facilities within the urban areas of Kildare County. There is a higher level of facilities in rural areas (per head of population), being primarily driven by the higher number of rural-based sports clubs and facilities (Gaelic Athletic Association (GAA), etc.).

The alignment of the underground cable passes through both rural and urban areas along its length. The closest settlements to the Proposed Development are Kilcock, Prosperous, Sallins and Naas. There are approximately 32 community and 40 commercial receptors located within 300 m of the underground cable route, outlined in Appendix 7.1. All residential, commercial, and community (and recreational) receptors are shown in Figure 7.1. The underground cable route is also routed in close proximity or within a number of built-up areas, such as the western edge of Kilcock, the eastern edge of Prosperous and the western / southern extent of Sallins and Naas.

Community recreation and amenity facilities contribute to the quality of life of the communities they serve. The provision of facilities that cater for the demands of a population and which are accessible to all sectors and age groups is a key component in the creation of successful sustainable communities.

The underground cable passes through a more industrial and larger-scale commercial section of the route around Naas before continuing through the residential community areas of Prosperous, Sallins and Kilcock. A large number of schools, sports and GAA clubs are located around Naas, attracting large numbers of residents from local communities during peak times of sports matches.

7.3.6 Economic Profile

7.3.6.1 Employment

The Eastern and Midland Region is a primary economic engine of the state providing more than one million jobs. The region is described as the economic engine of the state, hosting half of the national employment. According to the most recent CSO 2016 census, 83,259 people were employed in County Meath and 95,947 were employed in County Kildare. **Table 7.4** shows employment by industry in County Kildare and County Meath.

Meath LECP highlighted that the county has proportionately more workers in agriculture/farming compared with the country as a whole. County Kildare LECP states that the highest proportion of the Kildare workforce is employed in the wholesale, retail, transportation and food service sectors, higher than the national average.

Table 7.4: Employment by Industry per county 2016

Industry	County Kildare	%	County Meath	%	National Average %
Agriculture, Forestry and Fishing	3,190	3.3	3,734	4.5	4.4
Building and Construction	5,838	6.1	6,147	7.4	5.1
Manufacturing industries	11,310	11.9	9,568	11.5	11.4
Commerce and Trade	25,524	26.6	20,332	24.4	23.9
Transport and Communications	8,272	8.6	7,975	9.6	8.5
Public administration	6,163	6.4	4,776	5.7	5.3
Professional services	21,919	22.8	17,895	21.5	23.5
Other	13,731	14.3	12,832	15.4	17.8
Total	95,947	100	83,259	100	100

The LECP for both County Kildare and County Meath state that the counties are in the top three from which workers commute into Dublin city and suburbs.

County Meath had a resident workforce of 82,605 persons while the total number of jobs recorded in the county was approximately 50% of this figure at 41,757. A total of 82% of the working-age population are employed, higher than the average for the State and the Greater Dublin Area. The unemployment rate is considerably lower. More than 53% of people commute outside the county as the rapid growth is not matched by the growth of a sustainable employment base, illustrating a clear disparity in the location of jobs in the Municipal Districts.

Kildare had the 6th highest rate of outbound commuters in the State. Of the 95,345 workers residing in Kildare, 39.1% commute to areas outside the county and 33% of Kildare's resident workers are employed in the Dublin Metropolitan Area. Of the key employment settlements within the Study Area, Naas has the largest concentration of jobs, which accounts for 17.5% of all jobs in Kildare.

The labour force will continue to increase, and it will be important to promote employment-generating activities that reflect the education and skills base of both Kildare and Meath's population. The LECP plans seek to foster employment creation and maximise the jobs potential in appropriate locations throughout the counties, to achieve alignment between population and employment opportunities.

7.3.7 Human Health

The following chapters provide detail regarding the baseline environment in terms of air quality, noise, land, water, cultural heritage, traffic, material assets, and landscape:

- Chapter 8 – Air Quality and Climate;
- Chapter 9 – Noise and Vibration;
- Chapter 11 – Soils, Geology and Hydrogeology;
- Chapter 12 – Hydrology;
- Chapter 13 – Archaeology, Architectural and Cultural Heritage;
- Chapter 14 – Traffic and Transport;
- Chapter 15 – Material Assets – Agriculture; and
- Chapter 17 – Landscape and Visual.

7.3.7.1 General Health

The vast majority of the overall populations in Kildare and Meath described their own self-perceived health as 'Very Good' (63%) or 'Good' (26.4%), representing an overall total of 89.4%. This is slightly higher than the national average of 87% responding either 'Very Good' or 'Good' (59.4% and 27.6%, respectively).

Table 7.5 illustrates that the general health of the population living in Counties Kildare and Meath and the health of the local population living in close proximity to the Proposed Development is considered to be higher than the national average.

Table 7.5 General Health of Kildare, Meath and settlements in close proximity to the Proposed Development

	General Health					
County	Very Good	Good	Fair	Bad	Very Bad	Not Stated
Kildare	140,402	58,752	15,064	2,527	549	5,210
Meath	123,170	51,649	13,037	2,019	395	4,774
Settlement	Very Good	Good	Fair	Bad	Very Bad	Not Stated
Kilcock	4,147	1,465	314	43	6	118
Prosperous	1,468	605	161	30	3	66
Sallins	3,905	1,514	291	49	8	82
Naas	13,299	5,889	1,437	293	63	412

Electromagnetic Fields (EMFs) surround any object that is generating, transmitting or using electricity, including appliances, wiring, office equipment, batteries and any other electrical devices. Therefore, electric and magnetic fields are common in modern life. EMFs are invisible and cannot be felt or heard. In many cases, domestic electrical appliances and tools can generate much higher magnetic and electric fields, if in close proximity to a sensitive receptor, than transmission lines at standard separation distances. EirGrid designs, develops and operates the transmission grid in accordance with stringent safety recommendations which are made by national and international agencies. Several of these recommendations come from the International Council on Non-Ionising Radiation Protection (ICNIRP). This is an independent body, funded by public health authorities around the world. ICNIRP has reviewed the safety of EMFs and recommended limits on exposure that are far below levels where adverse effects might occur. Electricity cables have been placed underground in Ireland since the 1960s. There are currently approximately 320 km of underground transmission cables in Ireland, with multiples of this figure of underground cabling associated with the lower-voltage distribution system.

The design of the transmission infrastructure has ensured that the strength of the electric and magnetic fields during operation of the Proposed Development will comply with the ICNIRP and EU guidelines on exposure of the general public to EMF.

7.4 Assessment of Potential Effects

This section provides an assessment of potential effects of the Proposed Development. As previously noted, the assessment of population and human health that might occur on air and water, noise and traffic, are addressed in the relevant environmental topic chapters in this PECR.

7.4.1 Construction Phase

The section considers construction phase effects relating to:

- Demographic and Economic Profile;
- Land Use;

- Tourism, Recreation and Amenities; and
- Human Health and Wellbeing.

7.4.1.1 Demographic and Economic Profile

Potential impacts during construction are the result of combined effects of construction activities leading to reduced amenity and potential health effects as a result of stress and fears, a loss of community cohesion as a result of severance if roads were fully or partially closed and reduced access to facilities. Potential impacts on amenity would occur during construction only as a result of combined noise, air quality, traffic and visual impacts of construction activities.

There will be a temporary increase in economic spend in the local communities during the works as a result of construction workers spending in the area. Construction is not expected to have a permanent impact on the population of the wider environs in terms of the demographic profile (population or housing). It is not anticipated they would be high enough numbers to have a significant impact in the counties with a combined population of more than 400,000 located on the edge of the Greater Dublin Area.

The increasing population in this area and in the Greater Dublin area in addition to economic growth in Ireland supports the requirement for the reinforcement of the transmission network.

7.4.1.2 Land Use

Due to the width of the joint bays and nature of the road network in the area, temporary road or lane closures may be required along the route during the cable laying and joint bay elements of the construction phase. There is potential for temporary negative effects during construction as a result of traffic effects. Passing bays will facilitate vehicle movements around joint bays. Accessibility to private properties and lands will be maintained at all times during the construction.

There is potential for temporary negative effects on housing, land use and facilities during the construction phase of the development as the majority of the underground cable follows the existing road network. However, the potential impact will be temporary in nature.

The presence of the underground cable is unlikely to have an impact on potential future development of industrial and commercial land.

Trees can provide a multitude of economic, environmental, and social benefits to individuals and communities including (but not limited to) visual amenity and landscape value, ecosystem services and habitats. Trees can also hold historic and cultural importance by providing links to the past that create a sense of pace and belongs for individuals and communities. The Proposed development will result in the loss of trees and this is further assessed in Chapter 10 (Biodiversity) and Chapter 17 (Landscape) of this PECR.

7.4.1.3 Tourism, Recreation and Amenities

There will be no direct impact to tourism, recreation, and amenities from the Proposed Development. The routing of the project has been carefully considered to avoid such areas. While amenities such as the Royal Canal and Grand Canal and their towpaths will be crossed, there will be no impacts to the enjoyment of these facilities as the cable will cross by HDD or on an existing bridge. The cable will pass within the grounds of Naas Sport Centre and within the cycleway/footpath of the Sallins Bypass. The impacts to these facilities are assessed in Chapter 17 of this PECR (There will be no permanent significant effects to either facility).

There is potential for temporary disruption to some tourism and recreational amenities as a result of the Proposed Development due to the potential disruption to access, and general disturbance. The cable route will pass the main entrance to the Larchill Arcadian Gardens (approximate chainage 10000), passing along the R125. Details of the proposed traffic management are contained in Appendix 5.1 of this PECR. The section of the R125 in front of the

Larchill Arcadian Gardens and to Kilcock has been fully assessed and because of the width of the road, road closures with local and emergency access will be necessary during parts of the construction phase. See Section 7.5.1 of this chapter for details of the mitigation measures.

The Proposed Development will pass along the R448 to the south of Naas. In the townland of Killashee, approximate chainage 47500, there is a complex of community facilities located just off the regional road. The construction of the cable trench has the potential to result in significant disruption to traffic using the facilities including:

- Killashee National School;
- St David's National School;
- Piper Hill College;
- Gaelscoil Nás Na Ríogh;
- Education and Training Boards;
- Killashee Leisure Centre; and
- Other local business and housing.

This section of the R448 has been assessed to have an average width of 6.9 m and is a busy road in and out of Naas. This is an average figure and there are sections where the road is wider and where there is a large roadside verge. During the construction of the cable trench, it has been assessed that this section of the R448 will be required to be closed with local and emergency access provided. Diversions will be signed, to allow for alternative routes in and out of Naas. See Section 7.5.1 of this chapter for details of the mitigation measures.

There are potential positive impacts to tourism, recreation and amenities locally as a result of the increase in construction workers spending in the area.

7.4.1.4 Human Health

The requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2006, amended, will be implemented and complied with in full during the construction phase of the development. As with any construction project, however, there is still potential for adverse effects associated with the natural environment and nuisance (such as noise and dust emissions). Potential for these effects is discussed separately within the respective chapters.

Potential impacts to human health during construction could occur as a result of combined effects of construction activities leading to reduced amenity and potential health effects as a result of stress and fears and the potential loss of community cohesion as a result of severance if roads were fully or partial closed with reduced access to facilities. There is potential for adverse impact due to the construction of the project, however, these are expected to be short in duration, temporary in nature and mitigation will be implemented using the TMP and CEMP to reduce any stress or disturbance to the local community and environs.

EirGrid designs, develops and operates the transmission grid in accordance with stringent safety recommendations which are made by national and international agencies. Several of these recommendations come from the ICNIRP. This is an independent body, funded by public health authorities around the world. ICNIRP has reviewed the safety of EMFs and recommended limits on exposure that are far below levels where adverse effects might occur.

7.4.2 Operational Phase

As detailed previously, given the nature of the Proposed Development, potential effects on population and human health are associated with the construction phase. However, for completeness, operational phase effects considered include:

- Demographic and Economic Profile;
- Land Use;
- Tourism, Recreation and Amenities; and
- Human Health.

7.4.2.1 Demographic and Economic Profile

There will be no long-term effects on the demographic profile or economic profile during the operational phase of the development due to the 'unmanned' nature of the development.

7.4.2.2 Land Use

The underground cable will require no invasive maintenance work along the cable trench or joint bay locations. Access may be required at joint bays on rare occasions to facilitate cable replacement if a failure occurs.

In general, there will be no long-term effects on land use and facilities during the operational phase of the Proposed Development as the majority of the underground cable will be located in the road. Agricultural land impacts are assessed in Chapter 15 of this PECR.

It is not expected that the Proposed Development will result in a demand for land use or facilities which would impact materially on the Proposed Development area and its environs.

7.4.2.3 Tourism, Recreation and Amenities

It is unlikely there will be a long-term effect on tourism, recreation and amenities during the operational phase due to the nature of the development.

7.4.2.4 Human Health

The potential for adverse effects associated with the natural environment and nuisance (such as noise and dust emissions) are discussed separately within the respective chapters of this PECR.

Concerns relating to EMFs can lead to increased stress and health issues. EirGrid's design standards require all underground cables to operate to existing public exposure guidelines from ICNIRP and as such there should be no direct effect from EMFs related to underground cables, which are therefore unlikely to be a concern for local communities.

7.5 Mitigation Measures

7.5.1 Construction Phase

The design of the Proposed Development has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable.

Construction activities have the potential to create a nuisance and cause disruption. All work will be carried out in compliance with national legislation, and in accordance with best practice guidance, as detailed in the topic-specific chapters of this PECR. The assessment has been informed by the residual impacts reported in Chapter 8: Air Quality and Climate, Chapter 9: Noise and Vibration, Chapter 14: Traffic and Transport, and Chapter 17: Landscape and Visual. The reported residual impacts in these chapters take into account any topic-specific mitigation identified within the respective chapters. No further mitigation is proposed over and above that set out in individual chapters.

A CEMP is included in Appendix 5.4 of this PECR. The CEMP will be developed by the contractor in consultation and agreement with Kildare County Council and Meath County Council. It will be implemented during the construction phase to safeguard the environment, site personnel, and nearby sensitive receptors, i.e. occupiers of residential and commercial properties, from site activities which may cause harm or nuisance. The appointed contractor will be required to liaise closely with local community representatives, landowners and statutory consultees throughout the construction period. This is likely to include circulating information about ongoing activities, particularly those that could cause disturbance, including due to traffic. The appointed Contractor will also implement the Traffic Management Plan included as Appendix 5.1 of this PECR, which will be finally agreed following detailed design with Kildare County Council and Meath County Council to mitigate construction traffic on the public road network. All construction activities, including construction traffic, will be managed through the site CEMP. Specific measures to mitigate effects on human health during the construction phase (i.e. noise and vibration, air quality and climate, hydrology, landscape and visual, and traffic and transport) are dealt with separately in the relevant chapters of this PECR.

Because of the potential for traffic disruption, the construction of the cable trench (Phase 2 – see Chapter 5 for further details) between Chainage 7395 and 14750 may be subject to traffic management measures set out in Chapter 14 which will be agreed with the owners of the Larchill Arcadian Gardens in advance of the construction phase. Phases 1 and 3 of the construction sequence are not affected by this restriction.

Because of the potential for traffic disruption, the construction of the cable trench (Phase 2 – see Chapter 5 (Project Description) for further details) between Chainage 46190 and 51450 may be subject to bespoke traffic management measures during school term times for those schools along the R448. These measures will be agreed with school management in advance of the construction phase. Phases 1 and 3 of the construction sequence are not affected by this restriction.

7.5.2 Operational Phase

The location and nature of the Proposed Development will not have a permanent effect on the population of the area and wider environs. Regular planned maintenance will be infrequent and at the joint bay locations only.

7.6 Residual Effects

There will be temporary disturbance associated with the Proposed Development during construction, but this will be mitigated with the successful incorporation of specific mitigation measures detailed in this PECR. Disruption will include delays to traffic as a result of traffic management. The traffic effects are assessed in Chapter 14: Traffic and Transport, of this PECR; however, there will be temporary slight effects to the population of the area from the resulting traffic delays. Bespoke mitigation measures will be incorporated to avoid impacts to sensitive receptors such as Larchill Arcadian Gardens and schools in the Killashee area. By carefully planning the construction period, impacts to access will be avoided and the effects will be Not Significant to these receptors. No significant adverse long-term residual effects are predicted during the Operational Phase.

7.7 Conclusion

The Proposed Development has fully considered potential effects on Population and Human Health from the outset. Community facilities, tourism sites, towns, villages, businesses and other key receptors have been mapped and avoided where possible through the careful routing of the cable and through the mitigation measures that will be implemented. Bespoke mitigation measures will be implemented at sensitive receptors such as tourism sites and schools to further reduce the impacts. During the construction phase, the key impacts of the Proposed Development will be disruption to traffic while the construction takes place in public roads. Traffic Management will aim to minimise the effects but there will be some disruption to road users and to the communities of the area. These effects will be temporary but have been carefully considered by the project team because of the disruption that may be felt. Further assessment of the traffic effects is provided in Chapter 14: Traffic and Transport, of this PECR. Overall, it is anticipated that through appropriate mitigation and monitoring measures there will be no significant adverse effects on population and human health.

8. Air Quality

8.1 Introduction

This chapter considers the potential effects of construction and operation of the Proposed Development on air quality at sensitive human and ecological receptors. It describes the methodology and guidance used, identifies the potential impacts on considered sensitive receptors, discusses the effects of the potential impacts and provides details of required mitigation to reduce any potential effects.

The key pollutants considered relevant to the Proposed Development are outlined below:

- nitrogen dioxide (NO_2);
- dust[26] emissions from construction activities; and
- particulate matter (PM_{10}, particles with an aerodynamic diameter of 10 microns or less and $PM_{2.5}$, particles with an aerodynamic diameter of 2.5 microns or less).

Any descriptions of the characteristics of the Proposed Development in this chapter should be read in conjunction with Chapter 5 of this PECR.

8.2 Assessment Methodology

8.2.1 Relevant Legislation, Policy and Guidance

8.2.1.1 Ambient Air Quality

Directive 2008/50/EC (European Union, 2008) on ambient air quality and cleaner air for Europe (hereafter 'Ambient Air Quality Directive'), sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health such as particulate matter (i.e. PM_{10} and $PM_{2.5}$) and NO_2. The Ambient Air Quality Directive also sets legally binding limits (i.e. critical levels) for the protection of vegetation (i.e. sulphur dioxide (SO_2) and oxides of nitrogen (NOx)).

The Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) (hereafter 'Air Quality Standards Regulations 2011') (electronic Irish Statute Book (eISB), 2011)) transposes the air quality limit values set out in the Ambient Air Quality Directive into Irish legislation.

Table 8.1 presents the relevant air quality standards and target values for the pollutants relevant to this assessment as prescribed by the European Union (EU) and Irish legislation. For the purposes of report, these standards and target values are collectively referred to as to as Air Quality Standards (AQS).

[26]Solid particles that are suspended in air, or have settled out onto a surface after having been suspended in air. The terms dust and particulate matter (PM) are often used interchangeably, although in some contexts one term tends to be used in preference to the other.

Table 8.1 Relevant Air Quality Standards

Pollutant	Averaging period	Limit value ($\mu g/m^3$)	Basis of application of the limit value	Limit value attainment date
NO_2	One hour	200	Not to be exceeded more than 18 times in a calendar year	1 Jan 2010
	One calendar year	40	-	1 Jan 2010
PM_{10}	24 hours	50	Not to be exceeded more than 35 times in a calendar year	1 Jan 2005
	One calendar year	40	-	1 Jan 2005
$PM_{2.5}$	One calendar year Stage 1	25	-	1 Jan 2015
	One calendar year Stage 2	20	-	1 Jan 2020

The AQSs presented in Table 8.1 are for the protection of human health and only apply at locations of relevant exposure. The Air Quality Standards Regulations 2011 (eISB, 2011) states that:

'*compliance with the limit values directed at the protection of human health shall not be assessed at the following locations:*

- *any locations situated within areas where members of the public do not have access and there is no fixed habitation;*
- *in accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply;*
- *on the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access to the central reservation'.*

8.2.1.2 Guidance

In the absence of specific applicable Irish guidance, best international practice and guidance has been used. The air quality assessment has been completed in accordance with the following guidance:

- Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction (IAQM, 2016);
- Environmental Protection United Kingdom (UK) & IAQM Land-Use Planning & Development Control: Planning for Air Quality (EPUK & IAQM, 2017); and
- IAQM A guide to the assessment of air quality impacts on designated nature conservation sites (IAQM, 2020).

8.2.2 Construction Phase Assessment

8.2.2.1 Dust emissions

Activities carried out on construction sites can give rise to emissions of dust that could cause annoyance to people or damage to vegetation due to the soiling of surfaces. These activities can also lead to increased short-term and long-term concentrations of fine particulate matter (e.g. PM_{10} and $PM_{2.5}$) at off-site locations, which may affect human health, unless the appropriate mitigation measures are implemented. The impacts of dust emissions from works associated with the construction of the Proposed Development need to be addressed in order to identify the required mitigation measures.

The assessment of dust during construction has been carried out using a qualitative risk-based appraisal with reference to the Proposed Development in relation to sensitive receptors, the planned process and site characteristics, as described in the IAQM construction dust guidance (IAQM, 2016).

Based on the IAQM construction dust guidance (IAQM, 2016), the assessment aims to estimate the impacts of both PM_{10} and dust together, through a combined risk-based assessment procedure. The IAQM construction dust guidance (IAQM, 2016) provides a methodological framework but notes that professional judgement is required throughout the assessment to determine the risk of impacts and mitigation requirements. Based on the calculated risk level, the IAQM construction dust guidance (IAQM, 2016) sets out clear requirements for the recommended mitigation measures, which can be used to lessen the impact of dust during the construction phase of the Proposed Development. These mitigation measures to control dust emissions are included in the air quality management strategies set out in the Construction and Environmental Management Plan (CEMP – Appendix 5.4).

It should be noted this assessment does not consider the air quality impacts of exposure to contaminated dust that could arise from the excavation of any contaminated material. Although $PM_{2.5}$ is not specifically included as a parameter within the assessment, the risk levels associated with PM_{10} and any subsequent mitigation measures would also apply to $PM_{2.5}$ as $PM_{2.5}$ is included within the PM_{10} fraction.

Larger dust particles (greater than 30 μm) make up the greatest proportion of dust emission from mineral workings or earthworks and will largely deposit within 100 m of sources (Scottish Office, 1998). Intermediate sized particles (10 μm - 30 μm) are likely to travel further. PM_{10}, including the smaller $PM_{2.5}$ particulates are reported to make up a smaller proportion (approximately 10%) of dust emitted from most workings and the emissions become diluted as they disperse downwind (Ove Arup and Partners, 1995).

IAQM construction dust guidance (IAQM 2016) states that, where appropriate, a site can be divided into 'zones' for the dust risk assessment to allow different mitigation levels to be applied to each zone. As the Proposed Development will consist of several different construction activities at different locations (spanning 52.9 km), four separate construction dust risk assessments have been carried out for the following:

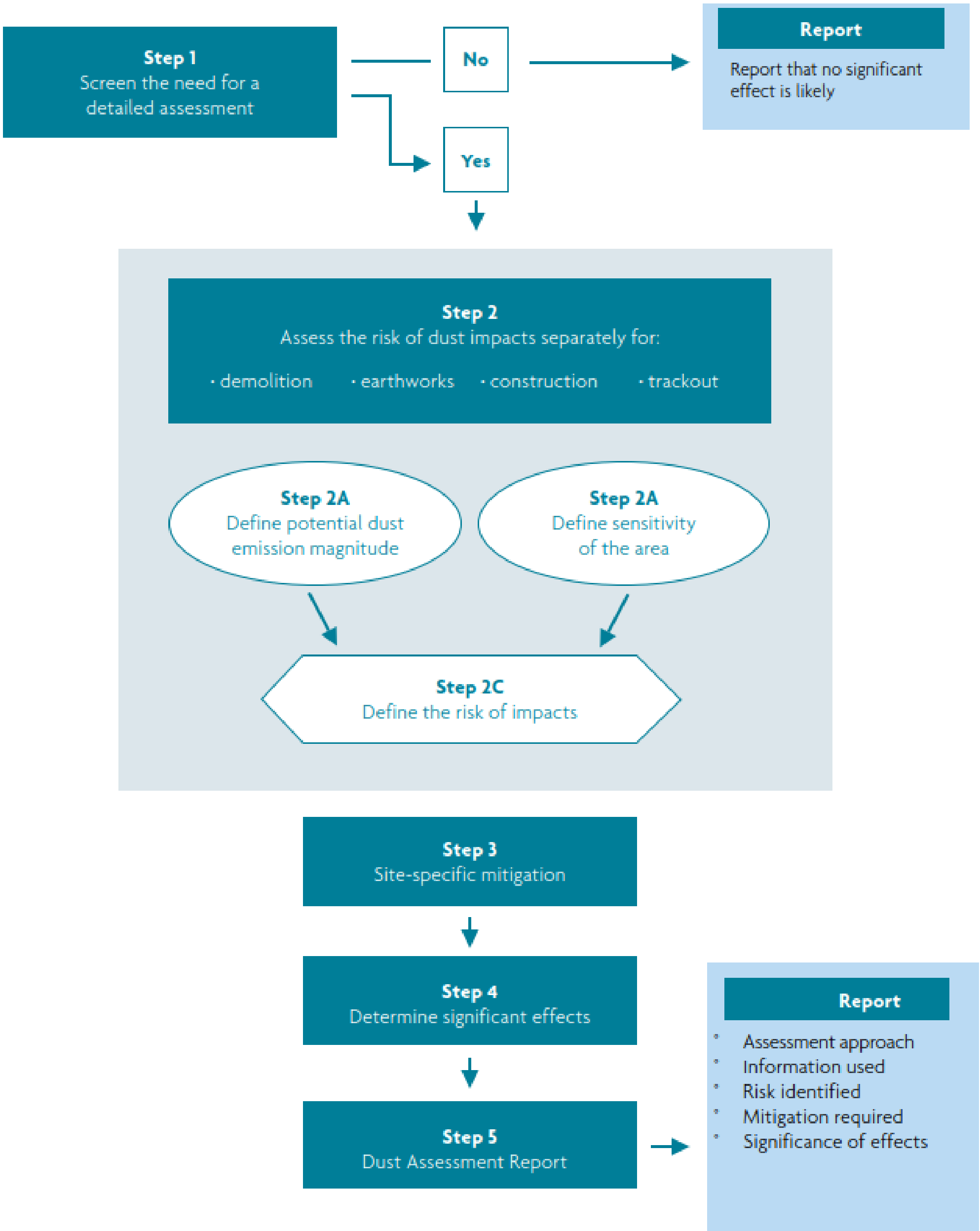
- the excavation of the joint bay and cable trench, and laying of a section of underground ducting and cable;
- the formation of a temporary construction or HDD compound; and
- construction works at the Woodland and Dunstown substations.;

These construction activities represent those activities associated with the Proposed Development, which have the greatest potential for dust generation at source.

8.2.2.2 IAQM methodology

The methodology for the assessment of the construction impacts is based on a five-step approach as set out in Plate 8.1 Structure of the dust risk assessment (IAQM, 2016)

Plate 8.1 Structure of the dust risk assessment (IAQM, 2016)



In accordance with IAQM construction dust guidance (IAQM, 2016), a 'human receptor' refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling, or exposure to PM_{10} over a time period relevant to the air quality objectives. An 'ecological receptor' refers to any sensitive habitat affected by dust soiling. This includes the direct impacts of dust deposition on vegetation or aquatic ecosystems, and the indirect impacts on fauna (e.g. on foraging habitats).

As per IAQM construction dust guidance (IAQM, 2016), an assessment is normally required where there is:

- a human receptor within 350 m of the site boundary or 50 m of the route used by construction vehicles on the public highway, and up to 500 m from the site exit(s).

- an ecological receptor (i.e. habitats that might be sensitive to dust soiling) within 50 m of the site boundary or 50 m of the route used by construction vehicles on the public highway, and up to 500 m from the site exit(s) used by construction vehicles on the public highway.

The key potential construction dust emission sources have been categorised according to the IAQM construction dust assessment method (IAQM, 2016) as demolition, earthworks, construction and trackout. These have been defined as follows:

- Demolition activities: demolition of buildings and associated infrastructure within the site boundary, including the processing and storage of material associated with the demolitions and removal of vegetation, walls and other site clearance activities;

- Earthworks: activities such as establishing site compounds, forming new haul roads and parking area, installing drainage, topsoil stripping and storage of topsoil. Another source would be windborne dust from material stockpiles, storage mounds and exposed areas, which could occur if the wind speed was high enough and the stored or exposed material was dry and friable;

- Construction activities: construction of buildings/infrastructure and associated activities relating to the construction of the site compounds; and

- Vehicle movement and trackout: construction-related vehicles moving on and around the construction areas emitting exhaust particulate matter and re-suspending loose material on the road. There would be the potential for spillage from transferring material around the construction site/areas, and particulates being lifted from open container vehicles by the wind generated from the vehicle movement. Material 'tracked-out' onto the local road network on the wheels of site traffic could also be re-suspended by passing traffic.

The IAQM construction dust methodology provides techniques for three separate dust effects:

- annoyance due to dust soiling;

- harm to ecological receptors; and

- the risk of human effects due to increased exposure to PM10.

The IAQM construction dust guidance (IAQM, 2016) uses a consistent approach to define the risks associated with the construction activities (i.e. demolition, earthworks, construction and trackout) in order to specify the required level of mitigation required to reduce those risks. The risk is defined from the dust emission magnitude (i.e. the scale of the activities being undertaken) and the sensitivity of the area in the vicinity of the Proposed Development (i.e. the number and proximity of sensitive receptors to the Proposed Development, their sensitivity to dust deposition and PM_{10} concentrations, and existing PM_{10} concentrations). Risks are described in terms of there being a low, medium or high risk of dust impacts for each of the four potentially dust-emitting activities (i.e. demolition, earthworks, construction and trackout).

This risk classification would then be used to define the recommended site-specific mitigation to reduce the residual effects of construction dust emissions to a 'not significant' effect. These mitigation measures to control dust emissions are included in the air quality management strategies set out in the CEMP.

A full description of the methodology including further explanation on how the dust emission magnitude and area sensitivity are defined is provided in Appendix 8.1, Volume 3 of this PECR.

8.2.2.3 Construction site plant and machinery emissions

IAQM construction dust guidance (IAQM, 2016) specifies the following in relation to the assessment of emissions to air from construction plant and machinery:

'*Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM*[27]*) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed.*'

The primary construction activities associated with the Proposed Development will require the use of plant and machinery including excavators, cranes and on-site generators.

Based on the likely duration and relatively low number of diesel-powered plant and machinery items that are likely to be required to operate simultaneously at the same location, the potential impact on local air quality at sensitive human and ecological locations in the vicinity of the Proposed Development boundary is considered to be negligible. Therefore, an assessment of emissions from construction plant and machinery is not considered further, from an air quality perspective.

8.2.2.4 Road traffic emissions

The EPUK & IAQM planning guidance (EPUK & IAQM, 2017) sets out screening criteria for identifying roads where there is the potential for a significant effect on local air quality, and identifying the need for an air quality assessment. The criteria are based on changes in road traffic flows.

As per the EPUK & IAQM planning guidance (EPUK & IAQM, 2017), an assessment of traffic emissions would be required where:

- the change in heavy duty vehicles (HDV)[28] flow is greater than 25 annual average daily traffic (AADT) within or adjacent to an air quality management area (AQMA) or greater than 100 AADT[29] elsewhere; and
- the change in light duty vehicle (LDV)[30] flows is greater than 100 AADT within or adjacent to an AQMA or greater than 500 AADT elsewhere.

Road links where the change in traffic flows exceed these thresholds are considered to be 'affected' roads. The study area for the assessment of potential air quality effects from road traffic generated by the project would include sensitive receptors within 200 m of the 'affected' roads (for example human receptors such as residential properties), or sensitive vegetation or ecosystems (such as designated ecological habitats).

Affected roads in relation to ecological receptors are identified using the IAQM guidance on designated nature conservation sites (IAQM, 2020), based on the following changes in road traffic flows:

- the change in AADT of greater than 1,000; or
- the change in HDV flows of greater than 200 (as an AADT).

[27] On-site plant has been defined by IAQM as non-road mobile machinery. The plant will also be used on road for the construction of joint bays and the cable trench. It is understood that the definition means that this type of plant would not normally travel by road because of its tracks. They are usually delivered to site by trailer.
[28] HDV - goods vehicles + buses >3.5 tonnes (t) gross vehicle weight).
[29] AADT - represents the total number of vehicles that passed the specific point in a year divided by 365.
[30] LDV - cars and small vans <3.5 t gross vehicle weight).

8.2.3 Operational Phase Assessment

8.2.3.1 Road traffic emissions

The methodology of the assessment of operational road traffic emissions is the same as that set out in Section 8.2.2.4 for the construction phase.

8.2.4 Assumptions and Limitations

The following assumptions have been made as part of the assessment.

- Volumes of cut and fill required for the Proposed Development were based on dimensions provided within this chapter.
- The IAQM construction dust guidance (IAQM, 2016) recommends that the receptor distance is based on the distance from the source rather than the works boundary. This study was undertaken on the basis that all activities (i.e. demolition, earthworks, construction and trackout) could take place at the edge of the Proposed Development works boundary. This represents a conservative assumption, as in practice most activities would not take place at the edge of the works boundary, thus increasing the distance between the source and the receptor.
- This study is based on information available at the time of writing and may be subject to change as the final design details are developed. However, where required, a precautionary approach has been taken and at this stage, it is considered that the information provided is sufficient to identify the likely risks due to dust emissions from activities associated with construction of the Proposed Development.

8.3 Receiving Environment

8.3.1 Overview

Information on existing air quality in Ireland can be obtained from the Environmental Protection Agency (EPA) (EPA, 2023) which undertakes monitoring at a number of locations across the country. For the purpose of air quality, Ireland is split into four main regions:

- Zone A: Dublin conurbation;
- Zone B: Cork conurbation;
- Zone C: 23 cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise; and
- Zone D: Rural Ireland, i.e. the remainder of the state excluding zones A, B and C.

8.3.2 Background Air Concentrations

The Proposed Development is located primarily within Zone D – Rural Ireland, with the exception of where the cable route traverses Naas, County Kildare, which encroaches Zone C – cities and large towns.

The closest monitoring site to the Proposed Development within Zone D is located in Edenderry (Edenderry library, County Offlay), approximately 21 km northwest of the cable route at its closest point. Table 8.2 presents the annual mean NO_2, PM_{10} and $PM_{2.5}$ monitoring results from this site in 2021 (EPA, 2023). It should be noted the annual mean concentrations monitored at this monitoring site are well below the respective national AQS.

Table 8.2 Monitored concentrations at Edenderry library, County Offlay monitoring location

Site name	Location		AQS	2021 Annual mean concentration ($\mu g/m^3$)
	Lat	Long		
Edenderry	53.3425°N	-7.0475°E	40 (NO_2) 40 (PM_{10}) 20 ($PM_{2.5}$)	8.8 (NO_2) 17.8 (PM_{10}) 17.8 ($PM_{2.5}$)

8.4 Assessment of Effects

8.4.1 Construction Phase

8.4.1.1 Dust emissions

A construction dust risk assessment has been undertaken to allow the most appropriate risk level and mitigation to be assigned to each construction activity described above. The specific locations selected are based on the number and proximity of sensitive receptors to the respective planning application boundary.

As dust emissions from the Proposed Development will only occur during the construction phase, all effects from the construction dust emissions are described as either temporary or short-term.

The dust emission magnitude and sensitivity descriptors for the construction dust assessments are presented in Appendix 8.1.

Excavation of the cable trench and laying of a section of underground cable

The majority of the underground cable routes will be installed within the existing public road network. Off-road (cross-country) routes are proposed at particular locations to avoid constraints.

During the cable trenching works, different construction methods such as trenched and trenchless techniques will be used. The trench will be approximately 1.5 m in width and 1.3 m in depth relative to existing ground level in public road and approximately 1.7 m in depth on private lands. The depth could be deeper depending on the utility crossings. These trenches will then be filled before moving on to the next section of the cable route.

A 100 m section of the cable route was considered for the assessment between chainage 45000 and 45250 and is located on the Primrose Gardens, approximately 1 km east of the neighbourhood of Jigginstown. This location was selected for the assessment as it is a location with the highest number of sensitive receptors nearby. The risk of dust impacts at all other chainages, with less receptors nearby, would be less than the risk identified for this section, therefore any identified mitigation for this assessment would be sufficient for the rest of the route.

It should be noted other construction activities associated with the cable trench and route include temporary laydown areas, passing bays and joint bays. These activities are likely to experience similar dust emission magnitudes to the cable trench and route. Therefore, separate construction dust assessments have not been undertaken as the mitigation measures recommended are also appropriate for the associated activities.

Table 8.3 presents a summary of the dust emission magnitude assigned to each construction activity associated with the excavation and construction of the cable trench and route.

Table 8.3 Dust emission magnitude – excavation and construction of the cable trench and route

Activity	Dust emission magnitude	Justification
Demolition	Small	For the considered 100 m section of the cable route, the total volume of existing structures to be demolished will be <20,000 m^3. Demolition activities are likely to be <10 m above ground level.
Earthworks	Small	For the considered 100 m section of the cable route, the total site area will be <2,500 m^2. There are likely to be fewer than five units of heavy earth-moving equipment active at any one time and total material moved <20,000 tonnes.
Construction	Small	For the considered 100 m section of the cable route, the total building volume will be <25,000 m^3.
Trackout	Medium	For the considered 100 m section of the cable route, the total number of outward HDV movements is predicted to be between 10 and 50 per day.

The next step is to determine the sensitivity of the area. The area surrounding this section of the cable route is primarily residential in nature with residential properties within 50 m of the planning application boundary.

Plate 8.1 presents the dust assessment buffers used for determining the proximity of sensitive receptors for the worst-case location and the trackout routes associated with this section of the cable route.

Plate 8.2 Cable trench and route construction buffers and trackout buffers

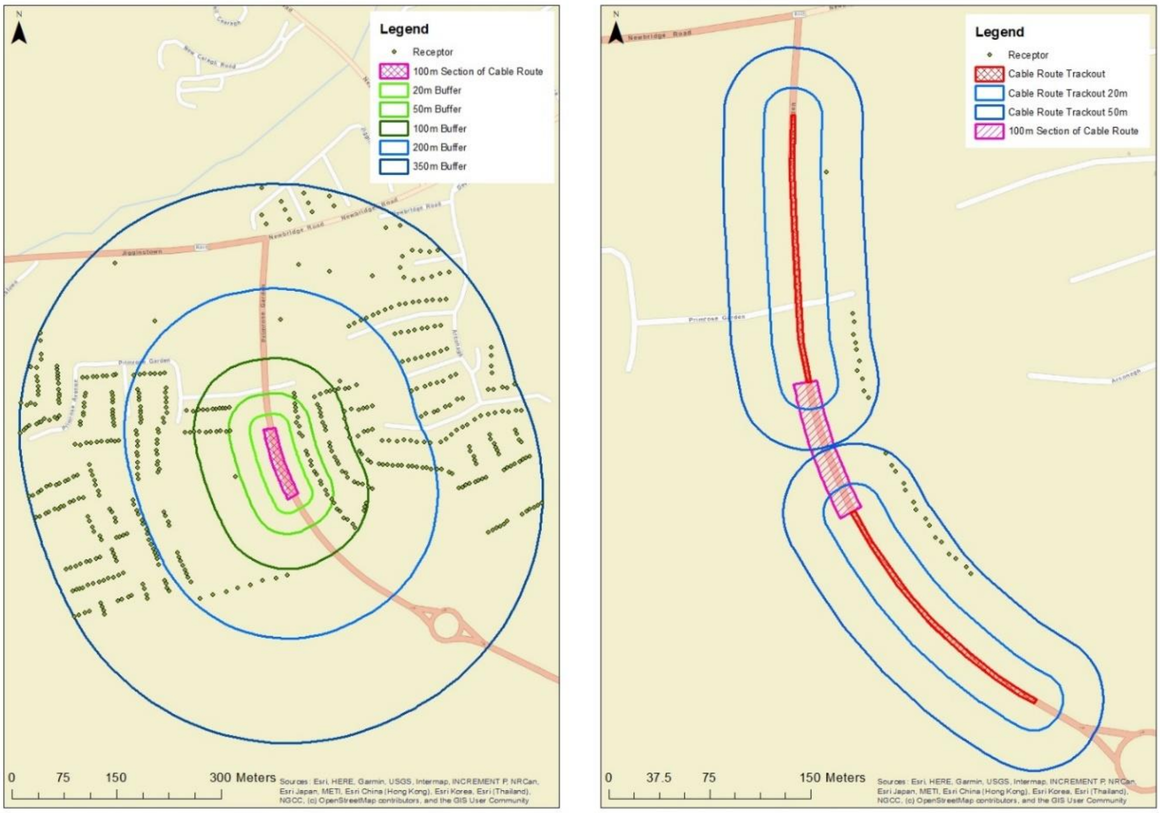


Table 8.4 presents the sensitivity of the area to effects caused by construction activities associated with the excavation of the cable trench and construction of the cable route.

Table 8.4 Sensitivity of the area to dust soiling effects and human health impacts - cable trench and route

Activity	Dust soiling impacts		Health effects of PM_{10}	
	Sensitivity assigned	Justification	Sensitivity assigned	Justification
Demolition	Medium	There are between 10 and 100 residential receptors within 50 m of the planning application boundary.	Low	Based on the number of receptors in proximity of the considered section of the cable route and the background PM_{10} concentration applied (see Table 8.2) the sensitivity of the area for human health impacts is categorised as low for all stages.
Earthworks	Medium		Low	
Construction	Medium		Low	
Trackout	Medium	There are 10 to 100 residential receptors within 50 m of the potential routes used by construction vehicles on the public highway, up to 200 m from the site exit(s).	Low	

At the considered section of cable route, there are no designated ecological receptors within 50 m of the planning application boundary nor within 50 m of the carriageway up to 200 m from the site exit(s). However, the cable route does cross the Royal Canal and Grand Canal proposed national heritage area (pNHA) approximately 200 m north of the assessed section and has been included in the assessment as a conservative approach.

The Royal Canal and Grand Canal is a man-made waterway linking the River Liffey at Dublin to the River Shannon near Tarmonbarry. A number of different habitats are found within the canal boundaries including hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The hedgerow, although diverse, is dominated by Hawthorn (*Crataegus monogyna*). On the limestone soils of the midlands, Spindle (*Euonymus europaeus*) and Guelder-rose (*Viburnum opulus*) are present.

Table 8.5 presents the sensitivity of the area to ecological effects caused by construction activities associated with the excavation of the cable trench and construction of the cable route.

Table 8.5 Sensitivity of the area to ecological effects – cable trench and route

Activity	Ecological impacts	
	Sensitivity assigned	Justification
Demolition	Low	Based on the proximity and value of the site's ecological assets and in the line with IAQM construction dust guidance (IAQM, 2016), the Royal Canal and Grand Canal pNHA is considered a Low sensitivity receptor for all stages.
Earthworks	Low	
Construction	Low	
Trackout	Low	

Using the dust emission magnitudes for the various activities in Table 8.3 and the sensitivity of the area provided in Table 8.4 and Table 8.5, the risks associated with the excavation of the cable trench and construction of the cable route are provided in Table 8.6 for dust soiling, human health and ecological impacts.

Table 8.6 Summary of the risk of construction dust activity at cable trench and route

Risk	Demolition	Earthworks	Construction	Trackout
Dust soiling	Low risk	Low risk	Low risk	Low risk
Health effects	Negligible risk	Negligible risk	Negligible risk	Low risk
Ecological	Negligible risk	Negligible risk	Negligible risk	Low risk

The results in Table 8.6 indicate that for potential dust soiling impacts, there is predicted to be a low risk from all activities associated with the construction of the Proposed Development. For potential human health impacts, there is predicted to be a negligible to low risk for all stages.

At Royal Canal and Grand Canal pNHA, there is predicted to be a negligible to low risk of dust impacts from the Proposed Development.

It would therefore be necessary to adopt an appropriate level of good practice mitigation measures to reduce the risks of causing a significant effect to amenity, human health or nearby ecological receptors. This would also prevent or reduce potential dust or PM_{10} (and $PM_{2.5}$) emissions which are associated with health impacts such as exacerbating existing health conditions including asthma and other lung conditions.

Formation of a Temporary Construction or HDD Compound

Temporary construction compounds will be used at different locations along the cable route and may provide offices, welfare facilities and storage for construction materials. The areas of the compounds are outlined in Chapter 5 of this PECR. The temporary construction compound selected for assessment is between chainage 30500 and 31000 and is located approximately 1.2 km east-northeast of the town of Prosperous.

Table 8.7 presents a summary of the dust emission magnitude assigned to each construction activity associated with the temporary construction compound.

Table 8.7 Dust emission magnitude for temporary construction compound

Activity	Dust emission magnitude	Justification
Demolition	N/A	No demolition works are anticipated.
Earthworks	Medium	Although the total material moved is likely to be less than 20,000 tonnes, as the total site area is between 2,500 m^2 and 10,000 m^2, a medium magnitude has been assigned.
Construction	Small	The total volume of construction is anticipated to be <25,000 m^3.
Trackout	Medium	The total number of outward HDV movements is expected to be between 10 and 50 per day.

The next step is to determine the sensitivity of the area. The area surrounding the assessed construction compound is primarily rural in nature with sporadic residential properties within 350 m of the planning application boundary.

Plate 8.3 presents the dust assessment buffers used for determining the proximity of sensitive receptors and the trackout routes associated with the temporary construction compound.

Plate 8.3: Temporary construction compound construction buffers and trackout buffers

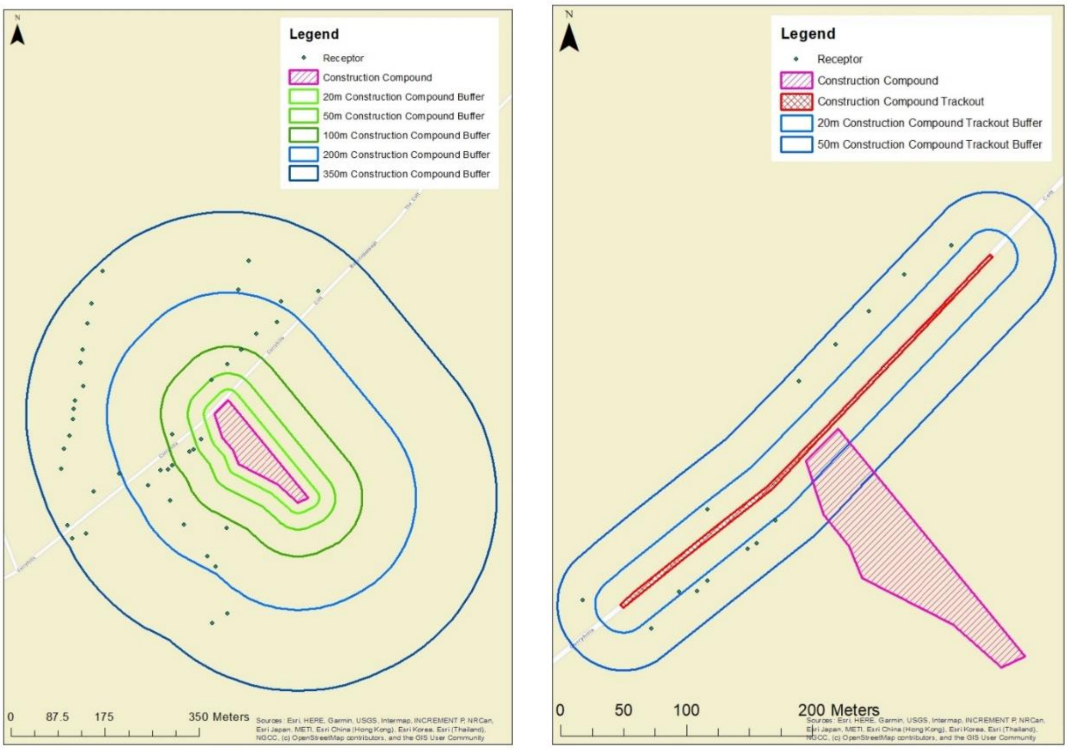


Table 8.8 presents the sensitivity of the area to effects caused by construction activities associated with the formation of the temporary construction compound. At the assessed temporary construction compound, there are no ecological receptors within 50 m of the planning application boundary nor within 50 m of the carriageway up to 200 m from the site exit(s). Therefore, the effects on ecological impacts have not been considered further in this assessment.

Table 8.8 Sensitivity of the area to dust soiling and human health impacts – temporary construction compound

<table>
<tr><th rowspan="2">Activity</th><th colspan="2">Dust soiling impacts</th><th colspan="2">Health effects of PM_{10}</th></tr>
<tr><th>Sensitivity assigned</th><th>Justification</th><th>Sensitivity assigned</th><th>Justification</th></tr>
<tr><td>Demolition</td><td>n/a</td><td>No demolition activities are anticipated.</td><td>n/a</td><td>No demolition activities are anticipated.</td></tr>
<tr><td>Earthworks</td><td>Low</td><td rowspan="2">There are between 1 and 10 residential receptors within 50 m of the planning application boundary.</td><td>Low</td><td rowspan="3">Based on the number of receptors in proximity of the considered construction compound and the background PM_{10} concentration applied (see Table 8.2) the sensitivity of the area for human health impacts is categorised as low for all relevant stages.</td></tr>
<tr><td>Construction</td><td>Low</td><td>Low</td></tr>
<tr><td>Trackout</td><td>Medium</td><td>There are between 1 and 10 residential properties within 20 m of the potential routes used by construction vehicles on the public highway, up to 200 m from the site exit(s).</td><td>Low</td></tr>
</table>

Using the dust emission magnitudes for the various activities in Table 8.7 and the sensitivity of the area provided in Table 8.8, the risks associated with the formation of the assessed temporary construction compound are provided in Table 8.9 for dust soiling and human health impacts.

Table 8.9. Summary of the risk of construction dust activity at temporary construction compound

Risk	Demolition	Earthworks	Construction	Trackout
Dust soiling	n/a	Low risk	Negligible risk	Low risk
Health effects		Low risk	Negligible risk	Low risk

The results in Table 8.9 indicate that for potential dust soiling impacts, there is predicted to be a low risk from earthworks and trackout activities and a negligible risk from construction activities. For potential human health impacts, there is predicted to be a negligible to low risk for all relevant stages.

It would therefore be necessary to adopt an appropriate level of good practice mitigation measures to reduce the risks of causing a significant effect to amenity and human health. This would also prevent or reduce potential dust or PM_{10} (and $PM_{2.5}$) emissions which are associated with health impacts such as exacerbating existing health conditions including asthma and other lung conditions.

Dunstown Substation

Dunstown substation will be the location for the final termination of one end of the Proposed Development between Chainage 52500 and 52850. It should be noted that although a construction compound and laydown area will be allowed for within the substation's existing boundary fencing, this assessment only considers the construction of the substation.

Table 8.10 presents a summary of the dust emission magnitude assigned to each construction activity associated with the construction of Dunstown substation.

Table 8.10 Dust emission magnitude for Dunstown substation

Activity	Dust emission magnitude	Justification
Demolition	N/A	There will be no demolition.
Earthworks	Medium	Although the total site area is >10,000 m^2, the total material to be moved is likely to be between 20,000 tonnes and 100,000 tonnes. Therefore, a medium magnitude has been assigned.
Construction	Small	The total volume of construction is expected to be <25,000 m^3.
Trackout	Medium	The total number of outward HDV movements is expected to be between 10 and 50 per day.

The next step is to determine the sensitivity of the area. The area surrounding the proposed Dunstown substation is primarily agricultural in nature with sporadic residential properties within 350 m of the planning application boundary.

Plate 8.4 presents the dust assessment buffers used for determining the proximity of sensitive receptors and the trackout routes associated with the Dunstown substation.

Plate 8.4 Dunstown substation construction buffers and trackout buffers

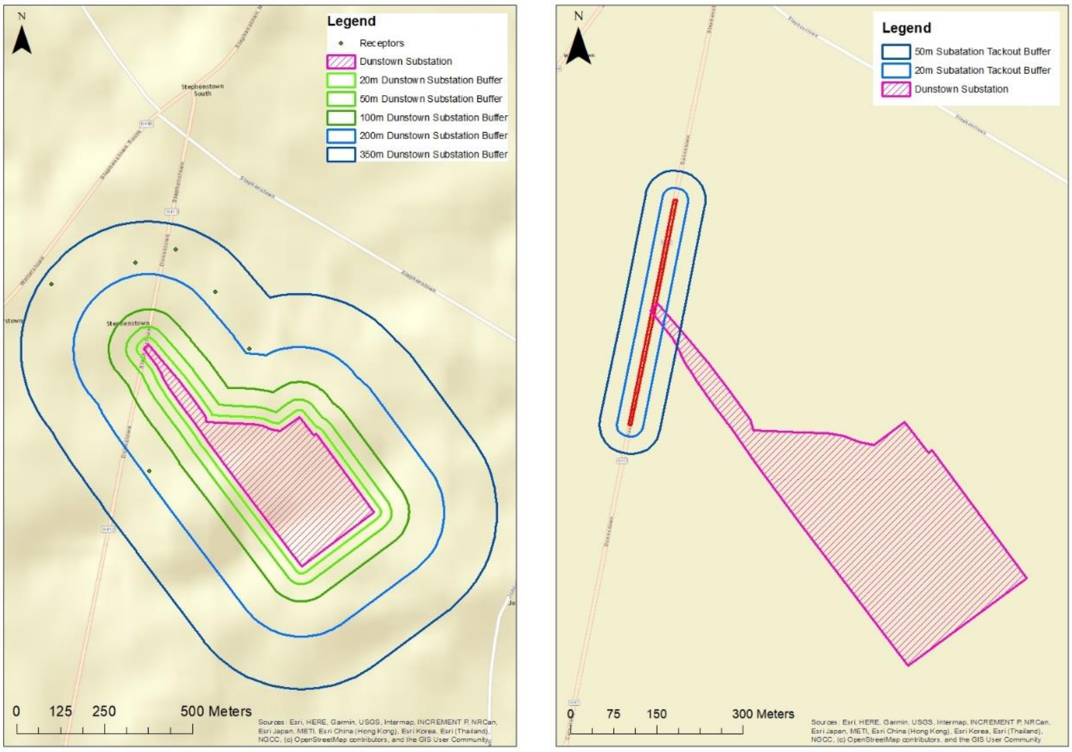


Table 8.8.11 presents the sensitivity of the area to effects caused by construction activities associated with the Dunstown substation. At the Dunstown substation, there are no designated ecological receptors within 50 m of the planning application boundary nor within 50 m of the carriageway up to 200 m from the site exit(s). Therefore, the effects on ecological impacts have not been considered further.

Table 8.8.11. Sensitivity of the area to dust soiling and human health impacts - Dunstown substation

Activity	Dust soiling impacts		Health effects of PM_{10}	
	Sensitivity assigned	Justification	Sensitivity assigned	Justification
Demolition	N/A	No demolition activities are anticipated.	N/A	No demolition activities are anticipated.
Earthworks	Low	There are between 1 and 10 residential receptors within 350 m of the planning application boundary	Low	Based on the number of receptors in proximity of the considered section of the cable route and the background PM_{10} concentration applied (see Table 8.2) the sensitivity of the area for human health impacts is categorised as low for all stages.
Construction	Low		Low	
Trackout	n/a	There are no sensitive human receptors within 50 m of the potential routes used by construction vehicles on the public highway, up to 200 m from the site exit(s).	n/a	There are no sensitive human receptors within 50 m of the potential routes used by construction vehicles on the public highway, up to 200 m from the site exit(s).

Using the dust emission magnitudes for the various activities in Table 8.10 and the sensitivity of the area provided in Table 8.8.11, the risks associated with the Dunstown substation are provided in Table 8.12 for dust soiling and human health impacts.

Table 8.12 Summary of the risk of construction dust activity at Dunstown substation

Risk	Demolition	Earthworks	Construction	Trackout
Dust soiling	N/A	Low risk	Negligible risk	n/a
Health effects		Low risk	Negligible risk	

The results in Table 8.12 indicate that for potential dust soiling impacts, there is predicted to be a negligible to low risk from all relevant activities associated with the construction of the Dunstown substation. For potential human health impacts, there is also predicted to be a negligible to low risk for all relevant stages.

It would therefore be necessary to adopt an appropriate level of good practice mitigation measures to reduce the risks of causing a significant effect to amenity and human health. This would also prevent or reduce potential dust or PM_{10} (and $PM_{2.5}$) emissions which are associated with health impacts such as exacerbating existing health conditions including asthma and other lung conditions.

Woodland Substation

Woodland substation will be the location for the start of one end of the Proposed Development (i.e. Chainage 0). Table 8.13 presents a summary of the dust emission magnitude assigned to each construction activity associated with the construction of Woodland substation.

Table 8.13 Dust emission magnitude for Woodland substation

Activity	Dust emission magnitude	Justification
Demolition	N/A	There are no demolitions as part of the Proposed Development
Earthworks	Small	Although the total site area is >10,000 m^2, the total material to be moved is likely to be less than 20,000 tonnes. Therefore, a small magnitude has been assigned.
Construction	Small	The total volume of construction is expected to be <25,000 m^3.
Trackout	Medium	The total number of outward HDV movements is expected to be between 10 and 50 per day.

The next step is to determine the sensitivity of the area. The area surrounding the proposed Woodland substation is primarily agricultural in nature with the existing Portan converter station and substation adjacent to the southern Planning Application Boundary.

Plate 8.1 presents the dust assessment buffers used for determining the proximity of sensitive receptors and the likely trackout route associated with the Woodland substation. Although Plate 8.1 indicates the receptor representing Portan converter station and substation as being outside of the trackout buffer area, the Portan converter station and substation carpark is within the trackout buffer and has been included accordingly.

Plate 8.1 Woodland substation construction buffers and trackout buffers

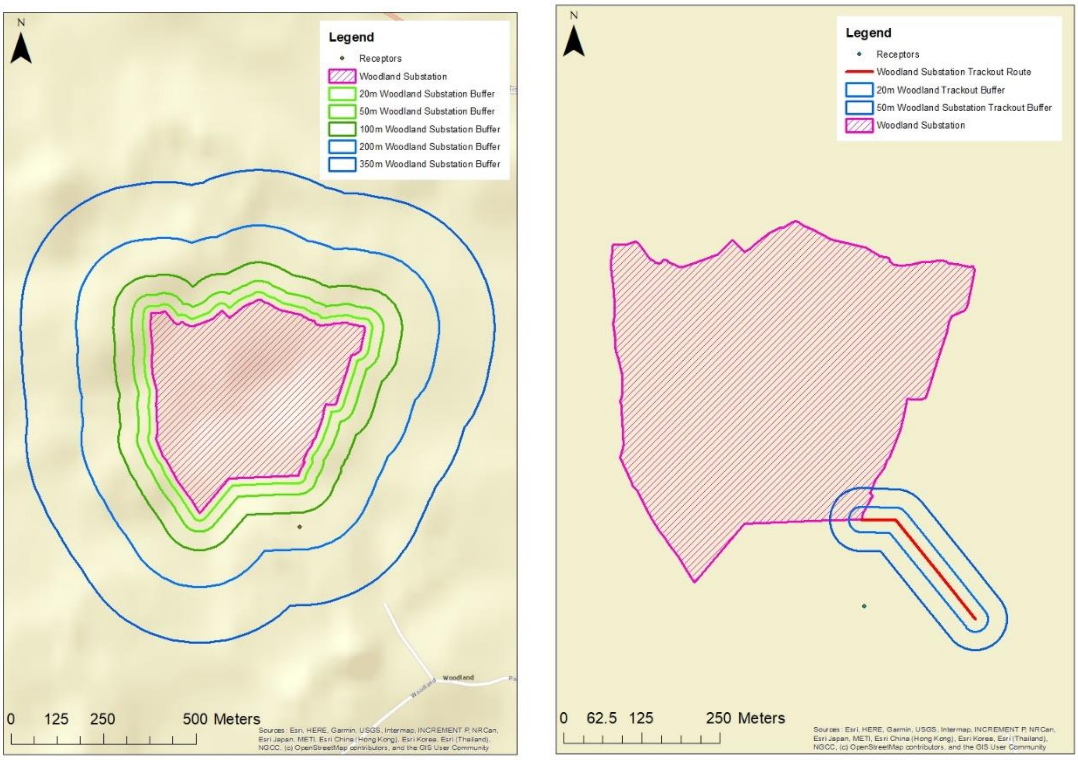


Table 8.14 presents the sensitivity of the area to effects caused by construction activities associated with the Woodland substation. At the Woodland substation, there are no designated ecological receptors within 50 m of the planning application boundary nor within 50 m of the carriageway up to 200 m from the site exit(s). Therefore, the effects on ecological impacts have not been considered further.

Table 8.14 Sensitivity of the area to dust soiling and human health impacts – Woodland substation

Activity	Dust soiling impacts		Health effects of PM_{10}	
	Sensitivity assigned	Justification	Sensitivity assigned	Justification
Demolition	N/A	No demolition activities are anticipated.	N/A	No demolition activities are anticipated.
Earthworks	Low	There are between 1 to 10 human receptors (representing Portan converter station and substation) within 350 m of the planning	Low	Based on the number of receptors in proximity of the considered section of the cable route and the background PM_{10} concentration
Construction	Low		Low	

Activity	Dust soiling impacts		Health effects of PM_{10}	
	Sensitivity assigned	Justification	Sensitivity assigned	Justification
		application boundary		applied (see Table 8.2) the sensitivity of the area for human health impacts is categorised as low for all stages.
Trackout	Low	There are between 1 and 10 human receptors (representing Portan converter station and substation) within 50 m of the potential routes used by construction vehicles on the public highway, up to 200 m from the site exit(s).	Low	

Using the dust emission magnitudes for the various activities in Table 8.13 and the sensitivity of the area provided in Table 8.14, the risks associated with the Woodland substation are provided in Table 8.15 for dust soiling and human health impacts.

Table 8.15 Summary of the risk of construction dust activity at Woodland substation

Risk	Demolition	Earthworks	Construction	Trackout
Dust soiling	N/A	Negligible risk	Negligible risk	Low risk
Health effects		Negligible risk	Negligible risk	Low risk

The results in Table 8.15 indicate that for potential dust soiling impacts, there is predicted to be a negligible to low risk from all relevant activities associated with the construction of the Woodland substation. For potential human health impacts, there is also predicted to be a negligible to low risk for all relevant stages.

It would therefore be necessary to adopt an appropriate level of good practice mitigation measures to reduce the risks of causing a significant effect to amenity, human health or ecological receptors. This would also prevent or reduce potential dust or PM_{10} (and $PM_{2.5}$) emissions which are associated with health impacts such as exacerbating existing health conditions including asthma and other lung conditions.

8.4.1.2 Road Traffic Emissions

Anticipated construction traffic is a maximum of nine HDVs for the assessed 100 m cable route, seven HDVs for the assessed temporary construction compound, 32 HDVs for the Dunstown substation and 43 HDVs for the Woodland substation. The increase in traffic movements associated with the construction phase will be less than the threshold for requiring an air quality assessment as set out in Section 8.2.2.4. Therefore, the change in the concentrations of pollutants at sensitive human and ecological receptors is likely to be negligible.

8.4.2 Operational Phase

8.4.2.1 Road Traffic Emissions

Apart from occasional maintenance, there are very few traffic movements associated with the operational phase of the Proposed Development. The increase in traffic movements associated with the operational phase is likely to be less than the threshold for requiring an air quality assessment. Therefore, the change in the concentrations of pollutants at sensitive human and ecological receptors is likely to be negligible.

8.5 Mitigation and Monitoring Measures

8.5.1 Construction Phase

8.5.1.1 Dust Emissions

Good practice dust mitigation measures to manage the generation of dust at source will be undertaken, as per the IAQM construction dust guidance (IAQM, 2016). These mitigation measures, which are based on the overall low risk for potential dust soiling, human health and ecological impacts, include the following:

- Communication:
    - Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager;
    - The head or regional office contact information will be displayed.
- Site management:
    - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
    - Make the complaints log available to the local authority when asked;
    - Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.
- Monitoring:
    - Carry out regular site inspections to monitor compliance with the CEMP, record inspection results, and make an inspection log available to the local authority when asked;
    - Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. Regular site inspections to monitor compliance with the CEMP will be carried out and inspection results will be recorded.
- Preparing and maintaining the site:
    - Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
    - Avoid site run-off of water or mud.

- Operating vehicles/machinery and sustainable travel:
  - Ensure all vehicles switch off engines when stationary – no idling vehicles;
  - Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Operations:
  - Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
  - Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.;
  - Use enclosed chutes and conveyors and covered skips;
  - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. Cutting, grinding or sawing equipment will only be used where fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction.

8.5.2 Operational Phase

Based on the findings of the assessment, it is not considered necessary to implement additional mitigation measures.

8.6 Residual Effects

With the dust mitigation measures, the dust impacts associated with the construction phase of the Proposed Development are not likely to generate significant effects at nearby receptors. It should be noted that the measures taken forward from this assessment will be reviewed on a regular basis during construction to ensure that they are appropriate for the works taking place, and any complaints will be considered.

8.7 Conclusion

This chapter provides an assessment of the potential effects on air quality arising from the construction and operation of the Proposed Development.

The potential impact on local air quality, at sensitive human and ecological locations in the vicinity of the Proposed Development, associated with emissions from plant and machinery and associated vehicle traffic are anticipated to be negligible.

A qualitative assessment of construction dust effects has been undertaken for the different construction activities associated with the Proposed Development. The construction activities selected represent those activities which have the greatest potential for dust generation at source. The locations chosen along the cable route represent those with the highest number of sensitive receptors within 350 m of the respective planning application boundary.

Based on the matrix of relationships between sensitivity of the area and the dust emission magnitude, it is considered that overall, there is a low risk for potential dust soiling impacts at human receptors. There is the potential for infrequent, short-term episodes when baseline dust deposition rates could be increased by an amount that residents could perceive. With regard to human health, there is a negligible to low risk as there is limited potential for emissions of PM_{10} and $PM_{2.5}$ to increase baseline concentrations to a value that is above the AQS values set for the protection of human health.

At Royal Canal and Grand Canal pNHA, there is predicted to be a negligible to low risk of dust impacts from the Proposed Development.

IAQM construction dust guidance (IAQM, 2016) notes that with the application of good practice mitigation measures of the type available for use on the Proposed Development, the environmental impact would not lead to significant effects at any off-site receptor. IAQM construction dust guidance (IAQM, 2016) also notes that, even with a rigorous package of mitigation measures in place, such as those taken forward from this assessment and included in the air quality management strategies set out in the CEMP, occasional impacts may occur. The CEMP would provide a framework by which the level of mitigation is adapted to respond proactively to the changing risk of dust emissions, so that significant effects are prevented.

As the air quality effects associated with the Proposed Development are not significant and ambient pollutant concentrations are well below the relevant AQSs, no exceedances of AQSs are anticipated.

8.8 References

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9. Noise and Vibration

9.1 Introduction

This chapter considers noise and vibration arising from the Proposed Development and the corresponding effects on noise and vibration-sensitive receptors based on information presented in Chapter 5: Project Description, and Chapter 6 (Planning) of the PECR.

This assessment considers the potential for the following activities to give rise to noise and vibration effects:

- Construction activity within the Planning Application Boundary (PAB), including open cut trenching, joint bays and passing bays, cable pulling and jointing, reinstatement, HDD, site haul routes and temporary construction compounds;

- Construction vehicle movements on public highways and access routes; and

- Operational aspects of the Proposed Development, including the upgrade to the Woodland and Dunstown substations.

The likely effects associated with the above activities on human receptors (i.e. dwellings, schools, hospitals, places of worship and other noise-sensitive locations are considered within this chapter).

The main sources of noise and vibration will be during the construction phase of the Proposed Development. The construction noise and vibration assessment has been undertaken based on the effects of the construction activities that are expected to be required, based on experience of construction of these types of electricity and civil infrastructure development.

9.2 Methodology

9.2.1 Legislation and policy

The Environmental Noise Regulations (ENR)[31] transposes EU Directive 2002/49/EC[32] (commonly referred to as the Environmental Noise Directive) for the strategic control of environmental noise in Ireland.

Nuisance due to noise is dealt with by the Environmental Protection Agency Act S.I. No. 7/1992 (as amended), and the Environmental Protection Agency Act, 1992 (Noise) Regulations, 1994 S.I. No. 179/1994. The Protection of the Environment Act 2003 S.I. No.27/2003 (as amended) requires Best Available Techniques in controlling noise as a result of human activity 'which may be harmful to human health or the quality of the environment, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment'.

Other policy documents relevant to the assessment include:

- Kildare County Council Third Noise Actions Plan 2019-2023[33]

- County Meath Noise Action Plan 2019[34]

[31] Environmental Noise Regulations, 2006 (S.I. No. 140/2006) and European Communities (Environmental Noise Regulations) 2018 (S.I. No. 549/2018).
[32] The European Parliament and the Council of the European Union, 2002. Directive 2002/49/EC of 25 June 2002 relating to the assessment and management of environmental noise.
[33] Kildare County Council Third Noise Action Plan 2019-2023. (Kildare County Council, 2019).
[34] County Meath Noise Action Plan 2019. (Meath County Council, 2019).

9.2.2 Guidance

The key guidance documents used in this assessment are:

- BS 5228-1:2009+A1:2014 'Noise and vibration control on construction and open sites. Part 1 – Noise'[35] - used for all construction noise calculations and assessment;

- BS 5228-2:2009+A1:2014 'Noise and vibration control on construction and open sites. Part 2 – Vibration'[36] - Assessment of the likelihood of significant effects as a result of ground-borne vibrations, has been carried out using the guidance contained within this standard.

Other guidance referred to in this assessment includes the following:

- National Roads Authority Guidelines for Treatment of Noise and Vibration in National Road Schemes[37]

- Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration[38]

- Calculation of Road Traffic Noise[39] (CRTN).

9.2.3 Study Area

The study area for the assessment of construction noise is 300 m from the cable route or any other area used for construction including HDD compounds, construction compounds and works to the substations.

The study area for the construction vibration assessment is 100 m from the Proposed Development as vibration effects due to the proposed types of construction activity are not known to occur beyond this distance.

The construction traffic noise study area is defined as 50 m from the carriageway edge of any public roads where there is the potential for an increase in Basic Noise Level (BNL) of 1 dB(A) or more. The procedure for calculating a BNL is set out by the 'Calculation of Road Traffic Noise' (CRTN) document.

9.2.4 Construction Noise

The potential noise effects from the Proposed Development have been assessed according to British Standard (BS) 5228 'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise' (2009+A1:2014).

A detailed plant list for each construction activity has been developed in conjunction with the project construction engineers, including the likely duration of the various activities.

Noise levels have been predicted for each noise-sensitive receptor in the study area for each construction activity. Where activities varied over time, or moved geographically, this has been taken into account by predicting a series of daily noise levels in order for the variation in noise levels to be characterised.

Baseline noise monitoring has not been carried out at construction noise receptors since the use of the most stringent thresholds from BS 5228-1 have ensured that a conservative and proportionate assessment has been achieved. The most stringent BS 5228-1 thresholds are known as Category A and are set out in Table 9.1.

[35] BS 5228-1:2009+A1:2014 'Noise and vibration control on construction and open sites. Part 1 - Noise' (BSI, 2014).
[36] BS 5228-2:2009+A1:2014 'Noise and vibration control on construction and open sites. Part 2 – Vibration' (BSI, 2014).
[37] National Roads Authority Guidelines for Treatment of Noise and Vibration in National Road Schemes. (TII, 2004).
[38] Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration, Revision 2. (Highways England, 2020).
[39] Calculation of Road Traffic Noise (CRTN). Department of Transport Welsh Office. (HMSO, 1988).

Table 9.1: Construction noise thresholds – Category A BS 5228-1

Assessment category and threshold value period	Threshold value in decibels (dB) L_{Aeq}
	Category A
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65
Evenings and weekends	55
Night-time (23:00 to 07:00)	45

Table 9.2 presents the magnitude of impact scale for construction noise based on guidance from LA 111 which has been developed from assessment criteria set out in BS 5228-1.

Table 9.2 Construction noise magnitude scale

Magnitude of Impact	Construction noise level
Major	Above or equal to BS 5228-1 Category A threshold +5 dB
Moderate	Above or equal to BS 5228-1 Category A threshold and below BS 5228-1 Category A +5 dB
Minor/ Negligible	Below BS 5228-1 Category A threshold

A major or moderate magnitude of impact is considered potentially significant while a minor or negligible impact is considered not significant. Other factors such as the number of receptors affected, and the duration and character of the impact have also been considered. LA 111 provides the following criteria for impact duration for the purposes of assessing significance due to the impact of construction noise:

- A period of 10 or more days or nights of working in any 15 consecutive days or nights; or
- A total number of days exceeding 40 in any six consecutive months.

A minor or negligible magnitude of impact in respect of construction noise is considered not significant.

The indicative construction programme is presented in Chapter 5. The overall length of the construction period is 42 months with construction due to begin, subject to obtaining planning permission, in Quarter 1 of 2025 and finish at the end of Quarter 3 2028. All works are expected to take place during normal working hours, i.e. weekdays and Saturday mornings, and any works outside normal working hours must have prior approval from the local authority.

The construction activities have been divided into two categories:

- Those that remain in a fixed location, for example an HDD compound or a joint bay; and
- Those where the activities move geographically, for example the enabling works or the trenching and ducting activities.

The construction activities will be phased and full details of the phasing works are presented in Chapter 5. The basic elements of the construction phases are as follows:

- Enabling works;
- Phase 1: Installation of passing bays and joint bay structures;
- Phase 2: Excavation and installation of ducts; and

- Phase 3: Installation of cables.

Based on the programme information presented in Chapter 5, the following durations are set out in terms of assessing the construction noise impact from fixed work locations:

- The duration of the installation of each joint bay and each passing bay structure (Phase 1 of the works) will be around seven days. Installation of the joint bays and passing bays structures is expected to start at the beginning of construction (Q2 2025) and last until Q1 2028, a period of around 36 months.

- The duration of the construction of each temporary construction compound will be around 90 days, though they will be in operation for the full 42 months of the construction period. Construction of the compounds is likely to begin in Q1 2025. These works will be carried out during the enabling works phase.

- The duration of each HDD construction works will be around 60 days. Construction is likely to begin in Q3 2025 and be undertaken during Phase 2 of the works.

- Construction of installation and jointing of cables (Phase 3 of the works) is likely to begin in Q3 2026 and last around 21 months.

Based on the programme information presented in Chapter 5, the following rates of progress are anticipated for construction activities which move geographically:

- Enabling (devegetation) works are expected to progress at a rate of 50 m per day. Construction is likely to begin in Q1 2025 and last one to two months.

- Excavation and installation of ducts (Phase 2 of the works) are expected to progress at a rate of 50 m per day. Construction is likely to begin in Q3 2025 and last around 24 months.

Construction noise levels have been predicted using the CadnaA noise prediction software. Two separate noise models have been constructed, one for the fixed works and another for the works which move geographically.

For the fixed works model, noise sources have been positioned in the approximate centre of the works areas to represent the plant and equipment operating during each construction activity. The distances between the sensitive receptors and the construction areas have been calculated based upon supplied Ordnance Survey Ireland (OSi) Prime 2 data. Construction area locations have been identified using the latest available drawings at the time of assessment. The sensitivity of the receptor has been identified using the OSi Prime 2 data. Contour data were obtained from the Earth Data website (https://www.earthdata.nasa.gov/technology/lidar) and all buildings have been assumed to be 6 m high. Free field predictions have been made, which have been converted to façade levels (+3 dB) through post-processing of the results. Receiver points have been positioned 1.5 m above ground to represent ground floor noise levels. First floor predictions have been made at 4.0 m above ground. Ground cover between noise sources and receivers has been assumed as fully reflective.

For the moving works model, flat terrain between noise sources and receiver points has been assumed and no screening objects have been included within the noise model. Ground cover between noise sources and receivers has been assumed as fully reflective. All noise sources are assumed to be operating at a height of 2 m above ground level, and noise predictions at receiver points have been made at 1.5 m (ground level) and 4.0 m (first-floor level) above ground. The predicted noise levels from the noise model have been included within an analysis tool that calculates noise levels at each sensitive receptor, due to works at the closest of each construction activity. The tool assesses whether a receptor is likely to exceed the BS 5228-1 Category A threshold noise levels (65 dB on weekdays and Saturday mornings) and for a period of 10 or more days in any 15 consecutive days or a total number of days exceeding 40 in any six consecutive months.

A list of construction activities and plant/equipment has been developed using the information in Chapter 5 along with additional information gathered from the engineering team and experience of similar projects. Table 9.3 presents a list of the construction activities and plant items along with the percentage on-time and noise level taken from BS 5228-1.

Table 9.3 Construction Activities and Items of Plant

Activity	Item of Plant (BS 5228-1 Ref)	% On-time	Sound Power L_w dB
Enabling Works (Removal of vegetation, etc)	Tracked Excavator (C.2.14)	40	107
	Circular Bench Saw (C.4.71)	20	113
Trenching and Ducting	Tracked Excavator (C.2.14)	50	107
	Concrete Mixer Truck (C.4.27)	30	107
	Lorry (C.2.34)	50	108
	Backhoe mounted hydraulic breaker (C.5.1)	25	116
Joint Bays and Passing Bays	Tracked Excavator (C.2.14)	50	107
	Concrete mixer truck (C.4.20)	25	108
	Concrete pump and cement mixer truck (discharging) (C.4.24)	25	95
	Vibratory Roller (C.5.20)	20	103
	Asphalt Paver (and tipper lorry) (C.5.31)	20	105
Cable Pulling and Jointing High Voltage	Tracked Excavator (C.2.14)	50	107
	Telescopic Handler (C.4.54)	30	107
	Wheeled Loader (C.4.13)	30	99
	Diesel Generator (C.4.83)	100	93
Cable Pulling and Jointing High Voltage	Tracked Excavator (C.2.14)	50	107
Reinstatement	Articulated Dump Truck (C.4.1)	40	109
	Wheeled Excavator (C.4.12)	40	105
	Vibratory Roller (C.5.25)	30	103
	Asphalt Paver (and tipper lorry) (C.5.31)	25	105
Horizontal Directional Drilling (HDD)	Cable Percussion Drilling Rig (C.2.43)	40	102
	Directional Drill (Generator) (C.2.44)	100	105
	Wheeled Backhoe Loader (C.4.66)	30	97
Haul Road	Lorry (C.2.34)	50	108
	Dozer (C.2.11)	50	103
Construction Compound	Tracked Excavator (C.2.14)	40	107
	Diesel Generator (C.4.76)	100	89

Activity	Item of Plant (BS 5228-1 Ref)	% On-time	Sound Power L_w dB
	Telescopic Handler (C.4.54)	30	107
	Dozer (C.2.11)	40	107
	Vibratory Roller (C.5.25)	30	103
Substation Works	Tracked Excavator (C.2.14)	40	107
	Diesel Generator (C.4.76)	100	89
	Vibratory Roller (C.5.25)	25	103
	Telescopic Handler (C.4.54)	30	107

9.2.5 Construction Vibration

The potential vibration effects from the Proposed Development have been assessed according to BS 5228 'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2 Vibration' (2009+A1:2014).

For the vibration calculations, ground compaction has been considered as a possibility everywhere within the Planning Application Boundary and vibratory piling as a possibility at all HDD compounds which represents the worst-case scenario. Vibration levels experienced during construction will be influenced by factors including the number of surface layers, the thickness, density and stiffness of surface layers, the depth of the water table, the topography of the site and the operating frequency of the plant.

Table 9.4 presents the magnitude of construction vibration impacts for human perception at residential receptors which have been adapted from LA 111 and BS 5228-2.

Table 9.4 Construction vibration magnitude scale for human perception at residential receptors

Magnitude of Impact	Construction noise level
Major	Above or equal to 10.0 mm/s peak particle velocity (PPV)
Moderate	Above or equal to 1.0 mm/s PPV and below 10.0 mm/s PPV
Minor	Above or equal to 0.3 mm/s PPV and below 1.0 mm/s PPV
Negligible	Below 0.3 mm/s PPV

A major or moderate magnitude of impact indicates that there is the potential for a significant effect to occur. However, the duration of the works, the number of receptors affected, and the character of the impact should also be considered. As for noise, a significant vibration effect is likely if the following periods are exceeded:

- A period of 10 or more days of working in any 15 consecutive days; or
- A total number of days exceeding 40 in any six consecutive months.

A minor or negligible construction vibration impact is considered not significant.

LA 111 recommends that the risk of structural damage due to construction vibration is also considered by reference to criteria set out in BS 7385-2[40]. Based upon this British Standard, BS 5228-2 and the professional experience of the assessment team, the criteria presented in Table 9.5 have been adopted.

[40] BS 7385-2 Evaluation and measurement for vibration in buildings Guide to damage levels from groundborne vibration. (BSI, 1993).

Table 9.5: Construction vibration criteria to prevent cosmetic damage to buildings

Time period	Potentially vulnerable building	Structurally sound building
All time periods	3.0 mm/s PPV	6.0 mm/s PPV

Vibration predictions during vibratory compaction have been made using the prediction formulae presented in Table E.1 of BS 5228-2. This section presents the data inputs, assumptions and predictions. Predictions of vibration levels during compaction have been undertaken using technical data from a BOMAG BW211 Soil Compactor. This is a large single drum compactor with an operating weight of 13 tonnes, gross power of 98kW and a compaction width of 2.1 m.

Plate 9.1 shows the resultant peak particle velocity (PPV) vibration levels predicted for steady state and start up / run down (transient) compaction with 50% and 5% scaling factors, denoting the probability of the predicted value being exceeded.

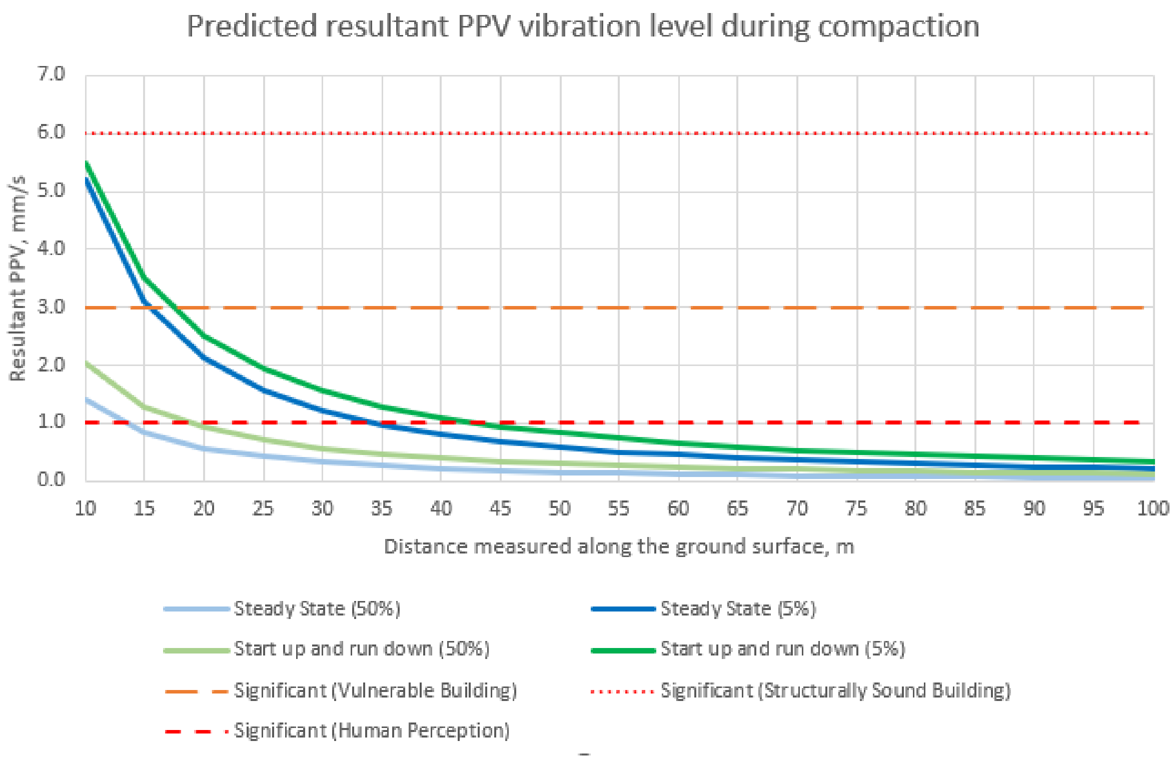


Plate 9.1 Predicted resultant PPV vibration level during compaction

As Plate 9.1 shows, during steady state working and at a distance of approximately 14 m, there is a 50% probability of 1.0 mm/s PPV being exceeded, with a 5% probability of 1.0 mm/s PPV being exceeded at a distance of approximately 35 m. During the transient start up and run down conditions, the distances at which 1.0 mm/s PPV is predicted to be exceeded, are approximately 20 m (50% probability) and 45 m (5% probability).

Plate 9.2 presents the resultant PPV vibration levels predicted for steady state and start up / run down (transient) during HDD works with 50% and 5% scaling factors, denoting the probability of the predicted value being exceeded. The only input parameter for the prediction method adopted (Table E.1 of BS 5228-2) was the distance measured along the ground surface. All other conditions are included in the constants and scaling factors within the empirical calculation.

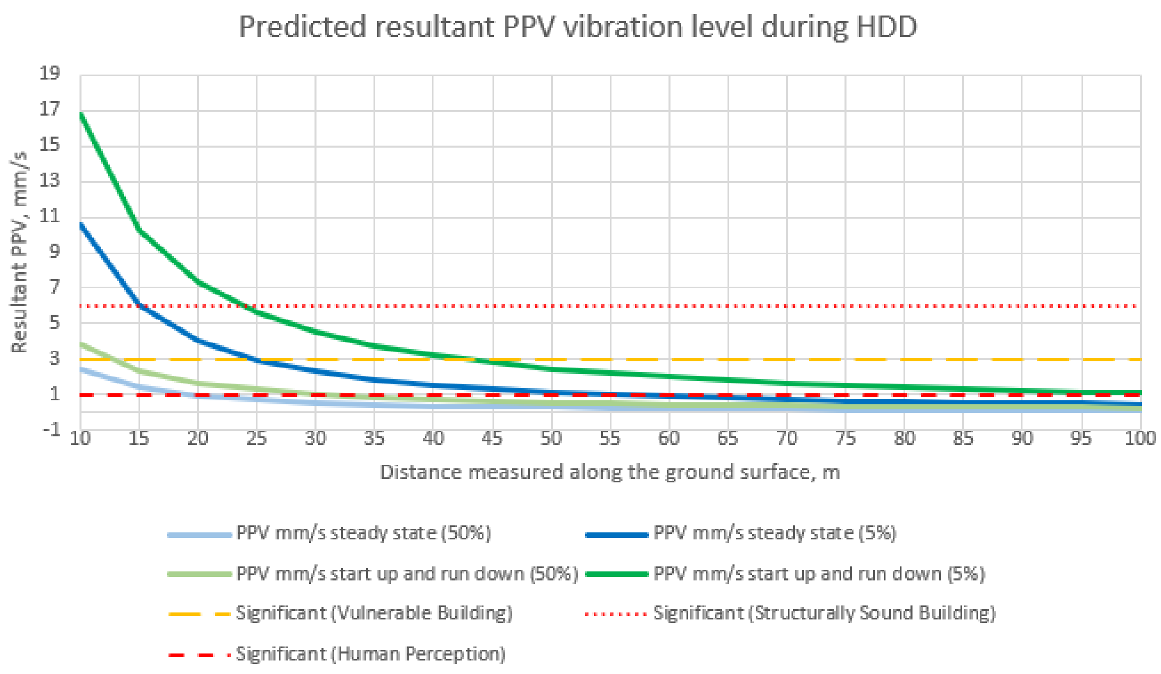


Plate 9.2 Predicted resultant PPV vibration level during HDD

During steady state working, and at a distance of approximately 18 m, there is a 50% probability of 1.0 mm/s PPV being exceeded, with a 5% probability of 1.0 mm/s PPV being exceeded at a distance of approximately 55 m. During the transient start up and run down conditions the distances at which 1.0 mm/s PPV is predicted to be exceeded are approximately 30 m (50% probability) and 100 m (5% probability).

9.2.6 Construction Traffic Noise and Vibration

A number of traffic diversions are required to facilitate the proposed construction works. All traffic flow data have been provided by the project traffic and transport team and are presented in Chapter 14 Traffic and Transport. Construction traffic noise predictions have been undertaken using the CRTN methodology to predict the BNL at each road on the day with the largest number of construction vehicles to ensure the worst-case effects are presented.

The calculations included the following assumptions in accordance with CRTN:

- Speed of 88 km/hr;
- Impervious road surface; and
- No allowance for road gradient.

Table 9.6 presents the magnitude of impact for construction traffic noise. A minor, moderate or major impact indicates the potential for a significant effect while a negligible impact indicates that a significant effect is unlikely.

Table 9.6 Magnitude of impact for construction traffic noise

Magnitude of Impact	Change in Basic Noise Level (BNL resulting from construction traffic noise)
Major	Greater than or equal to 5.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Minor	Greater than or equal to 1.0 and less than 3.0
Negligible	Less than 1.0

9.2.7 Operational Noise and Vibration

Underground cables are not considered a noise source because soil covering the cables acts as an insulator preventing any significant noise emission above the ground. Therefore, operational noise impacts are not expected as a result of the underground cabling element of the Proposed Development. However, there is the potential for a permanent increase in environmental noise at local receptors close to upgraded/extended substations during the operation of the Proposed Development. At both Woodland and Dunstown substations compensation reactors are to be installed as part of the Proposed Development which have the potential to produce audible levels of noise. An assessment has been carried out using the NG4 Guidance Note for Noise[41] to predict whether the reactors are likely to result in permanent noise impacts at receptors close to the substations.

Operational vibration due to the Proposed Development is considered to be negligible because the plant to be installed does not generate significant vibration during operation and it is considered that, due to the distance between the equipment and the nearest sensitive receptors, there is no potential for any vibration effect to occur.

9.2.8 Sensitive Receptors

Receptors that are particularly sensitive to noise and/or vibration have been identified using guidance from 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' and LA 111. Examples of such receptors are dwellings, schools, hospitals, places of worship, heritage buildings, special habitats, amenity areas in common use and designated quiet areas. Counts have been made up to 300 m from the Proposed Development using guidance from 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes'.

Both the TII noise guidelines and LA 111 note that receptors may have various sensitivities to noise, but do not specifically define a sensitivity scale.

Many of the guidance documents used by the assessment present different assessment criteria for different receptor types. The sensitivity of receptors has therefore been considered when selecting the assessment criteria used to describe the magnitude of impact. It is therefore not necessary to define a separate sensitivity scale for noise receptors.

9.3 Baseline Conditions

9.3.1 Introduction

Baseline noise levels are likely to vary along the Proposed Development with higher noise levels closer to transport infrastructure and during peak periods of transport activity. The main noise source is likely to be from road traffic noise. The route crosses the M4 and the M7 and other regional roads including the R156, the R125, the R158, the R148, the R407, the R408, the R403, the L2002, the R409 and the R448. Other noise sources include rail noise. Railway lines include the Dublin to Cork line south of Sallins and the Dublin to Galway line at Kilcock.

[41] Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4). (Environmental Protection Agency Office of Environmental Enforcement, 2016).

No baseline noise surveys have been undertaken for this assessment because the approach has been to use the most stringent threshold values to assess the construction and operational noise impacts from the Proposed Development.

9.3.2 Strategic Noise Maps

Strategic noise maps[42] have been produced under the requirements of the Environmental Noise Directive by the Environment Protection Agency (EPA) for road, rail and airport noise. The road noise maps show the strategic noise mapping of roads, which were identified as those roads exceeding the flow threshold of 3 million passages per year, in the form of noise contours for the L_{den} (day, evening, night) period and the L_{night} period for Dublin and Cork agglomerations and the major roads outside the agglomerations. The rail noise maps show the strategic noise mapping of rail, identified as those railway lines exceeding the flow threshold of 30,000 vehicle passages per year, in the form of noise contours for the L_{den} (day) and L_{night} (night) periods for Dublin and Cork agglomerations and the major roads outside the agglomerations. The airport noise maps show the strategic noise mapping of airports, in the form of noise contours for the L_{den} (day) and L_{night} (night) periods for Dublin and Cork agglomerations airports.

The strategic noise mapping shows road traffic noise levels are high at receptors in the following parts of the study area and are likely to be exposed to noise levels exceeding the BS 5228-1 Category A thresholds:

- The M4 to the south-west of Kilcock (e.g. in the Commons South and Commons West areas);
- Where the route follows the R407;
- Where the route joins the R403 east of Prosperous;
- Where the route crosses the M7 in the northern area of Naas;
- Osberstown Millennium Park including Naas Community College;
- Where the route crossed the R445 Newbridge Road;
- Where the route follows the Naas South Ring Road; and
- Where the route follows the R448 Kilcullen Road affecting receptors (including schools and dwellings).

The strategic noise maps show that rail noise levels are elevated where the route crosses the Dublin-Cork railway line west of Sallins. The route does not cross any location where strategic airport noise mapping contours are present.

9.3.3 Woodland Substation

Woodland substation is located in a rural area around 2 km from the village of Batterstown in County Meath. The closest sensitive receptor is located over 500 m from the substation. The main noise source in the area is likely to be from the transformers on the substation and road traffic noise.

9.3.4 Dunstown Substation

Dunstown substation is located in a rural area around 2 km from the village of Two Mile House in County Kildare. The closest sensitive receptor is located on the R412 around 250 m from the substation. The main noise source in the area is likely to be from the transformers on the substation and road traffic noise.

9.3.5 Temporary Construction Compounds

There are a total of six construction compounds associated with the Proposed Development.

[42] Environmental Protection Agency (EPA) Strategic Noise Maps https://gis.epa.ie/EPAMaps/. Accessed February 2023.

The construction compound closest to Woodland substation at Ch. 3250 is located around 120 m from the R156 in a rural area. The noise environment is likely to be mainly from road traffic noise. The closest sensitive receptor is located around 60 m from the compound.

The construction compound located at Ch. 11000 is in a rural area next to the R125. The noise environment is likely to be dominated by road traffic noise. The closest sensitive receptor is located around 20 m from the compound.

The construction compound located at Ch. 21000 is in a rural area next to the R407. The noise environment is likely to be dominated by road traffic noise. The closest sensitive receptor is located around 90 m from the compound with outbuildings acting as a barrier between the compound and the receptor.

The construction compound located at Ch. 31000 is around 600 m from the village of Prosperous next to the R408. The noise environment here is likely to be dominated by road traffic noise. The closest sensitive receptor is located around 37 m from the compound.

The construction compound located at Ch. 35750 is in a rural area next to the L2002. The noise environment is likely to be mainly from road traffic noise. The closest sensitive receptor is located around 80 m from the compound.

The laydown areas at Chainage 39750, off the Osberstown Road, are located either side of the railway line. These compounds will not be used for the storage of materials or for site offices, but will be used to facilitate the works required on the railway bridge on the Sallins Bypass. The northern compound (No. 6) is approximately 0.2 ha in size and the southern compound (No. 7) is approximately 0.3 ha in size. The closest sensitive receptor is located around 20 m from the southern compound.

The construction compound located at Ch. 52000 is located around 800 m from Dunstown substation next to the R448. The noise environment is likely to be dominated by road traffic noise. The closest sensitive receptor is located around 20 m from the compound.

There will be a laydown area within the Dunstown substation as shown in the planning drawings, but as that area is within the existing substation site, it is not included in this list.

9.3.6 HDD Compounds

HDD is proposed at key crossings where there are significant constraints. There will be a launch and reception pit either side of the drilling and those temporary HDD compounds will be within the planning application boundary. There are six HDD sites proposed along the cable route:

- HDD1 Ch. 15000 – Crossing of the Rye Water to the west of the R158. The noise environment is dominated by road traffic noise. The closest sensitive receptor is located around 107 m away.
- HDD2 Ch. 15380 – Crossing of the Grand Canal and Dublin-Sligo railway line, to the west of Kilcock. The noise environment is mainly from road traffic noise with rail noise also present. The closest sensitive receptor is located around 59 m away.
- HDD3 Ch. 16640 – Crossing of the M4 Motorway to the south of Kilcock. The noise environment is dominated by road traffic noise. The closest sensitive receptor is located around 210 m away.
- HDD4 Ch. 22000 – Crossing of the Lyreen tributary of the River Liffey along the R407. The noise environment is dominated by road traffic noise. The closest sensitive receptor is located around 18 m away.
- HDD5 Ch. 37100 – Crossing of the River Liffey north of Sallins. The noise environment is mainly from road traffic noise. The closest sensitive receptor is located around 68 m away.
- HDD6 Ch. 44600 – Crossing of the Grand Canal in Naas. The noise environment is made up mainly of road traffic noise. The closest sensitive receptor is located around 32 m away.

9.3.7 Joint Bays

The joint bays are located on average every 745 m along the cable route and there are 70 joint bays in total. The noise environment is expected to be dominated by road traffic noise particularly in the in-road sections.

9.3.8 Passing Bays

Passing bays are temporary traffic mitigation measures and are located at 33 of the in-road joint bays. The noise environment at the passing bays is likely to be dominated by road traffic noise.

9.3.9 Sensitive Receptor Counts

Table 9.7 shows the noise and vibration sensitive receptor counts within the 300 m study area associated with the Proposed Development. There are a total of 2,301 receptors within 300 m, made up mainly of dwellings but also other sensitive receptors including primary and secondary schools, a health centre and a nursing home.

Table 9.7 Sensitive Receptor count from the Proposed Development

Buffer Distance	Number of Dwellings	Number of Other Sensitive Receptors	Total Number of Receptors
0-20 m	31	0	31
20-50 m	334	2	336
50-100 m	372	2	374
100-200 m	720	2	722
200-300 m	835	3	838
Total	2,292	9	2,301

9.4 Assessment of Potential Effects

9.4.1 Construction Noise

Construction noise levels from the fixed works have been predicted at each receptor in the study area using CadnaA noise modelling software. Table 9.8 presents a summary of the receptors which exceed the 65 dB threshold for each construction activity, the magnitude of impact, the corresponding duration of the works and the determination of significance. As a worst case some activities close to each other may run concurrently and where this is the case, this has been taken into account. There are no receptors within 500 m of Woodland substation so no noise predictions have been undertaken at this location.

Table 9.8 Summary of receptors exceeding 65 dB threshold for weekdays and Saturday mornings

Receptor	Construction Activity	Highest Predicted noise level (dB L_{Aeq},T)	Magnitude of Impact	Duration of works	Determination of significance
R70568	HDD4 Crossing of the Lyreen tributary of the River Liffey along the R407	70	Moderate	60 days	Significant
R70713	HDD4 Crossing of the Lyreen tributary of the River Liffey along the R407	70	Major	60 days	Significant
R70718	HDD4 Crossing of the Lyreen tributary of the River Liffey along the R407	68	Moderate	60 days	Significant
R70708	HDD4 Crossing of the Lyreen tributary of the River Liffey along the R407	67	Moderate	60 days	Significant
R66012	HDD5 Crossing of the River Liffey north of Sallins	67	Major	60 days	Significant
R138303	Joint Bay 67	76	Major	7 days	Not significant
R136021	HDD6 Crossing of the Grand Canal in Naas and Joint Bay 60	67	Moderate	60 days	Significant

Table 9.8 shows that for HHD4 and HDD5 the weekday and Saturday morning threshold of 65 dB has been exceeded, the magnitude of impact is either moderate or major and the duration of works is expected to be for a period of more than 10 days in any 15-day period. Therefore, the effects during construction are significant. Plates 9.3 and 9.4 show the location of receptors expected to experience significant effects during construction works at HDD4 and HDD5, respectively.

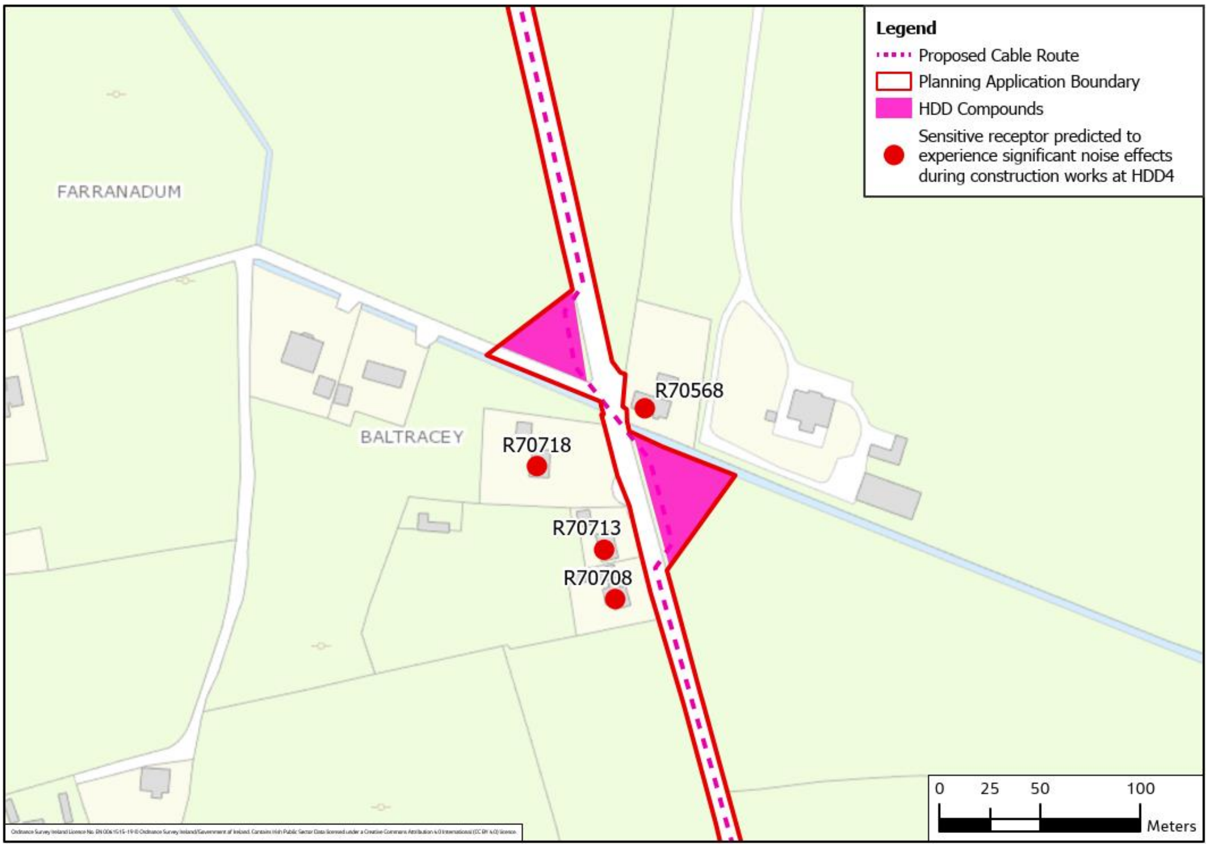


Plate 9.3 Noise-sensitive receptors predicted to experience significant effects during construction works at HDD4

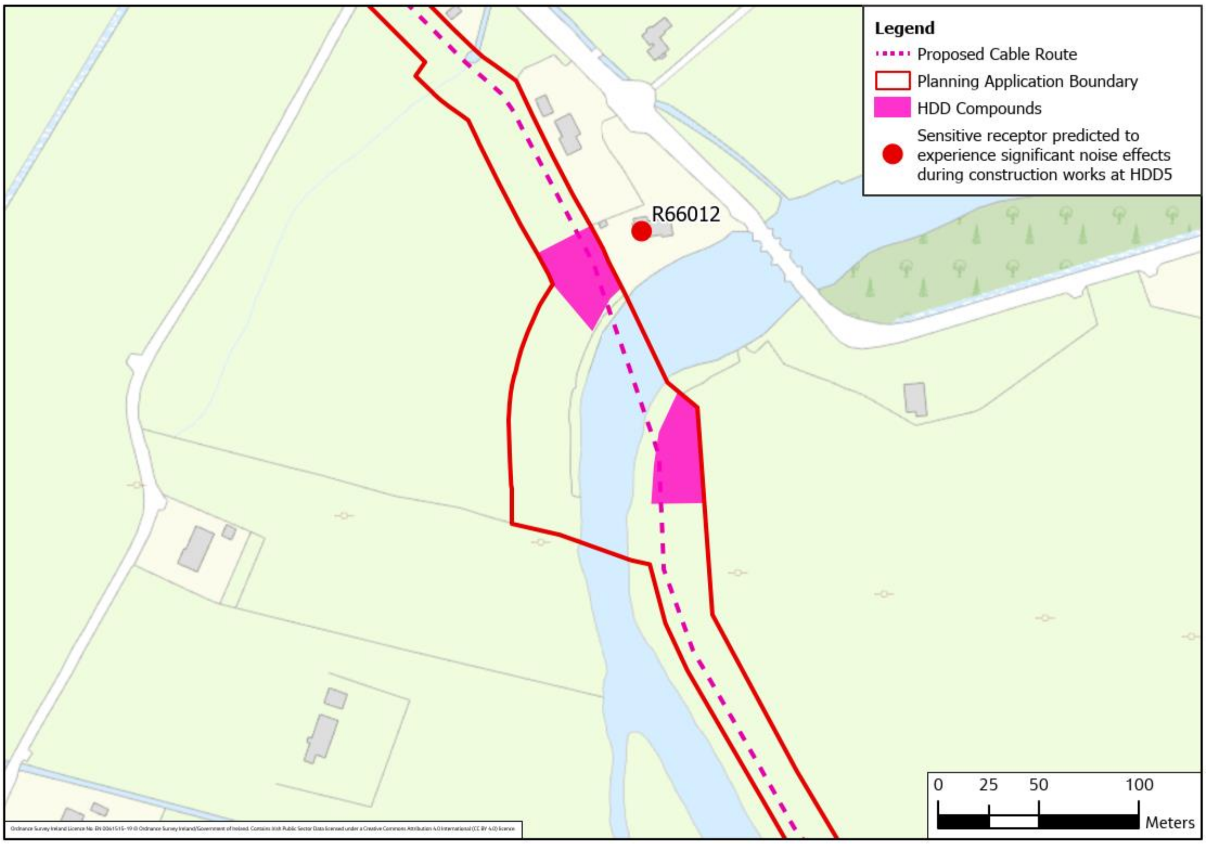


Plate 9.4 Noise-sensitive receptors predicted to experience significant effects during construction works at HDD5

The highest noise level associated with the construction of the joint bays is at Joint Bay 67 with predicted noise levels of 76 dB and a major impact. However, the effects are not considered to be significant as the duration is less than 10 days in any 15-day period.

A significant construction noise impact is expected at sensitive receptors as a result of works to Joint Bay 60 and HDD6 Crossing of the Grand Canal. Noise levels exceed the weekday and Saturday morning threshold and the impact is moderate. Works are due to last for a period of approximately 60 days therefore significant effects are likely.

Plate 9.5 shows the location of receptors expected to experience significant effects during construction works at HDD6 and Joint Bay 60.

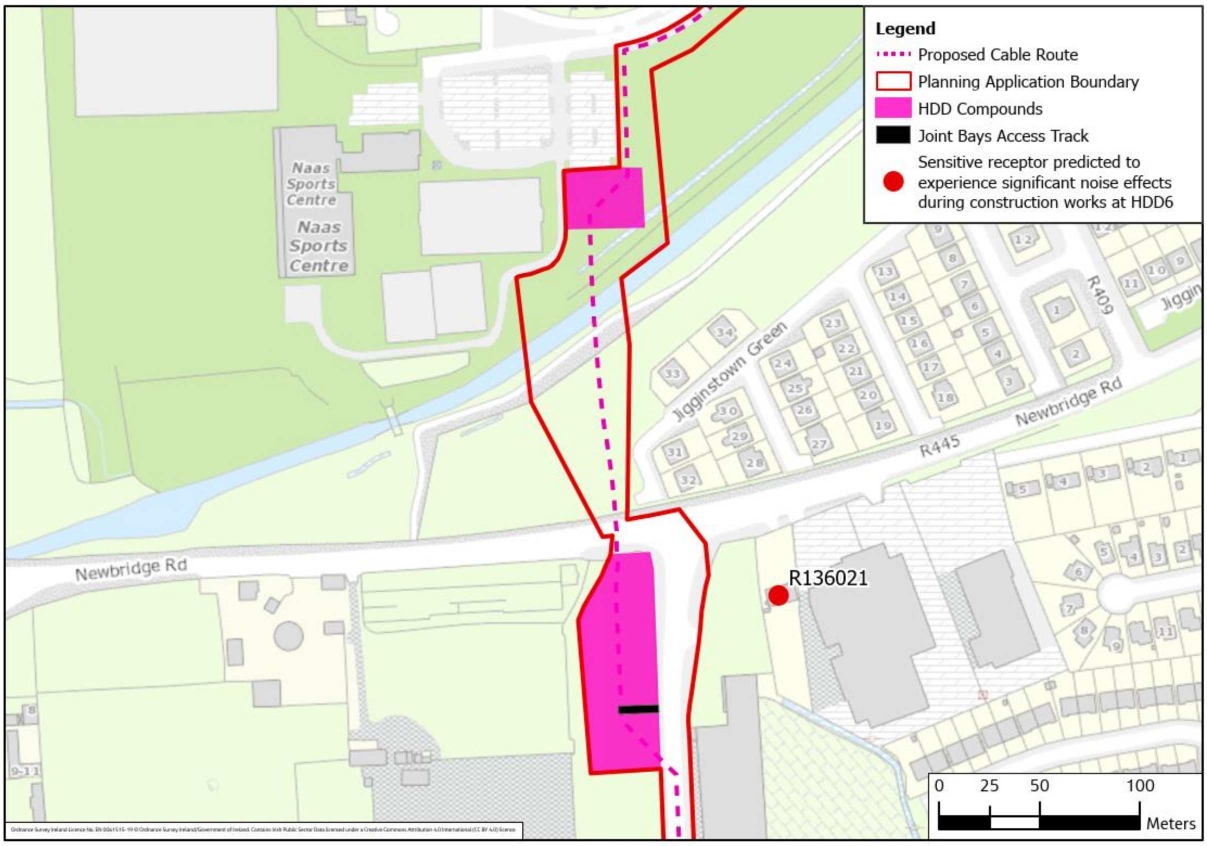


Plate 9.5 Noise-sensitive receptors predicted to experience significant effects during construction works at HDD6 and Joint Bay 60

Construction noise levels for the works which progress at a daily rate have been calculated for the enabling works phase and Phase 2 of the works. The highest noise levels predicted during the enabling works phase was 79 dB while the highest noise level during Phase 2 was 83 dB. Both levels are above the weekday and Saturday morning threshold and a major impact. However, as the works are expected to progress at a rate of 50 m a day, the 10 days in any 15-day period is not likely to be exceeded and is therefore not significant.

9.4.2 Construction Vibration

During construction of the Proposed Development the main activities likely to result in perceptible vibration levels are Vibratory Compaction and HDD. Table 9.9 shows the potential impacts from vibratory compaction. The results are based upon a 5% probability of the relevant thresholds being exceeded.

Table 9.9 Potential Impacts from Vibratory Compaction

Vibratory Compaction	Threshold (mm/s PPV)	Distance from work site (m)	Number of receptors potentially affected	Magnitude	Significance
	Human Perception at Residential Receptors				
Steady State	0.3	35-80	374	Minor	Not Significant
	1	6-35	210	Moderate	Not Significant as works will be completed in less than 10 days.
	10	<6	0	Major	Not Significant as works will be completed in less than 10 days.
Transient (start up and run down)	0.3	45-115	517	Minor	Not Significant
	1	6-45	331	Moderate	Not Significant as works will be completed in less than 10 days.
	10	<6	0	Major	Not Significant as works will be completed in less than 10 days.
	Cosmetic Damage for Buildings				
Steady State	3	10-16	0	-	-
	6	<10	0	-	-
Transient (start up and run down)	3	10-18	0	-	-
	6	<10	0	-	-

Table 9.9 shows that impacts relating to human perception at residential receptors are not considered to be significant. This is because, although the impact is moderate, the works will be completed in less than 10 days, therefore the effects are considered not significant. In terms of cosmetic damage, there are no buildings anticipated to experience cosmetic damage as a result of vibratory compaction.

Table 9.10 shows the potential impacts from vibratory piling at HDD works. The results are based upon a 5% probability of the relevant thresholds being exceeded.

Table 9.10 Potential Impacts from HDD works

Vibratory Compaction	Threshold (mm/s PPV)	Distance from work site (m)	Number of receptors potentially affected	Magnitude	Significance
	Human Perception at Residential Receptors				
Steady State	0.3	55-115	51	Minor	Not Significant
	1	11-55	7	Moderate	Potentially significant as works will take around 60 days to complete
	10	<11	0	Major	No receptors affected therefore not significant
Transient (start up and run down)	0.3	105-255	432	Minor	Not Significant
	1	16-105	37	Moderate	Potentially significant as works will take around 60 days to complete
	10	<16	0	Major	No receptors affected therefore not significant
	Cosmetic Damage for Buildings				
Steady State	3	15-25	0	-	-
	6	<15	0	-	-
Transient (start up and run down)	3	24-42	0	-	-
	6	<24	0	-	-

Table 9.10 shows that vibration impacts from HDD works related to human perception at residential receptors are potentially significant given the works are expected to take 60 days to complete. HDD vibration impacts related to cosmetic damage to buildings are not likely to occur as a result of the construction works.

9.4.3 Construction Traffic and Proposed Diversions

The traffic data, BNLs and the expected construction traffic noise change are presented in Table 9.11. The calculations show that the highest traffic noise change is 0.5 dB which is a negligible magnitude of impact. Therefore, no adverse impacts are expected in relation to construction traffic on surrounding roads.

Table 9.11 Construction Traffic Data

Road Link	Construction Stage 2025: Base			Construction Stage 2025: Base + Construction Traffic			Construction Traffic Noise Change
	AADT	% HGV	BNL	AADT	% HGV	BNL	
1 Woodland	4,095	8.5	65.8	4,181	9.6	66.1	0.3
2 R156	8,894	8.5	69.2	9,046	10.0	69.5	0.3
3 Mullagh	3,526	8.5	65.1	3,548	11.0	65.6	0.5
4 R125 North	958	8.5	59.5	1,018	7.2	59.5	0.0
5 R125 South	2,892	8.5	64.3	2,936	10.1	64.6	0.3
6 R158	7,526	8.5	68.4	7,560	11.2	68.9	0.5
7 Balfeaghan	11,494	8.5	70.3	11,534	11.3	70.7	0.4
8 R148	10,963	8.5	70.1	10,993	11.4	70.5	0.4
9 M4	17,724	8.5	72.2	17,746	11.6	72.7	0.5
10 R407 North	12,072	8.5	70.5	12,076	11.7	71.0	0.5
11 R407	9,115	8.5	69.3	9,269	10.0	69.6	0.3
12 R408	3,996	8.5	65.7	4,098	9.3	65.9	0.2
13 Curryhills	5,715	8.5	67.2	5,737	11.3	67.7	0.5
14 R403	7,892	8.5	68.6	7,928	11.2	69.1	0.5
15 L2002 North	3,824	8.5	65.5	3,884	10.1	65.8	0.3
16 Millicent Demesne	3,780	8.5	65.4	3,798	11.2	65.9	0.5
17 L2002 South	3,780	8.5	65.4	3,810	10.9	65.9	0.5
18 Castlesize	10,983	8.5	70.1	11,027	11.3	70.5	0.4
19 Sallins Bypass	10,469	8.5	69.9	10,511	11.3	70.3	0.4
20 Mills	11,319	8.5	70.2	11,347	11.5	70.7	0.5
21 Osberstown Road	10,491	8.5	69.9	10,515	11.5	70.4	0.5
22 M7	10,491	8.5	69.9	10,513	11.5	70.4	0.5
23 Millennium Parkway	11,388	8.5	70.2	11,474	10.9	70.7	0.5
24 R409	7,141	8.5	68.2	7,169	11.3	68.7	0.5
25 Grand Canal	10,290	8.5	69.8	10,312	11.5	70.3	0.5
26 R447	13,439	8.5	71.0	13,469	11.5	71.4	0.4
27 R448	8,806	8.5	69.1	8,892	10.6	69.5	0.4
28 R448 South	9,663	8.5	69.5	9,693	11.4	70.0	0.5
29 Stephenstown	2,575	8.5	63.8	2,593	10.9	64.2	0.4
30 R412	1,670	8.5	61.9	1,694	10.2	62.2	0.3
31 Dunstown	1,670	8.5	61.9	1,810	6.4	61.9	0.0

9.4.4 Operational Phase Considerations

Once constructed the majority of the Proposed Development will make no noise. However, compensation reactors are to be installed as part of the works at the Woodland and Dunstown substations. Noise data for the proposed reactors show the maximum noise levels from the reactors is 70 dB. There are no receptors within 500 m of the Woodland substation therefore no impacts are anticipated at the Woodland substation. There is a receptor around 290 m from the Dunstown substation and a noise model has been used to calculate the noise level from the reactor at this receptor. Refer to Table 9.12 for the results of the predicted noise level at the closest receptor along with night-time noise criterion taken from NG4 Guidance Note for Noise.

Table 9.12 Operational noise assessment Dunstown substation

Distance to Closest Receptor	Noise level predicted from reactor at closest receptor	Night-time noise criterion (23:00 to 07:00)
290 m	20 dB(A)	35 dB(A)*
* Taken from NG4 Guidance Note for Noise Table 1 for areas of low background noise		

Table 9.12 shows that the predicted noise levels at the closest receptor are comfortably below the 35 dB night-time noise criterion therefore no operational impacts are anticipated.

9.5 Proposed Mitigation

The construction works shall comply with the recommendations of BS 5228-1, and the mitigation measures that will be implemented include the following:

- Noise barriers will be installed around the HDD compounds:
  - HDD4 Ch. 22000 – Crossing of the Lyreen tributary of the River Liffey along the R407. The closest sensitive receptor is located around 18 m away. Noise barriers will be placed on the perimeter of both the launch and reception HDD compounds to screen the receptors identified in Plate 9.3;
  - HDD5 Ch. 37100 – Crossing of the River Liffey north of Sallins. The closest sensitive receptor is located around 68 m away. Noise barriers will be placed on the northern perimeter of the HDD compound on the western bank of the River Liffey to screen the receptors identified in Plate 9.4;
  - HDD6 Ch. 44600 – Crossing of the Grand Canal in Naas. The closest sensitive receptor is located around 32 m away. Noise barriers will be placed on the northern perimeter of the southern HDD compound to screen the receptors identified in Plate 9.5;
  - The noise barriers will be within the Planning Application Boundary. The exact location, height and type of noise barriers to be installed will be confirmed pre-construction;
- BS 5228-1 states that a noise barrier which blocks the line of sight between the source and the receptor would result in an approximate attenuation of 10 dB which would reduce the effects to be not significant;
- The Contractor will be obliged to comply with Local Authority controls on noise and vibration during construction. This will include (but will not be limited to) setting limits to control noise and vibration from construction activities, implementing the necessary mitigation measures while adopting best practicable means, and carrying out any noise or vibration monitoring where significant adverse effects need to be monitored. The location of the noise barrier will be set out and agreed in advance of the works and designed to keep noise levels within the limits;
- The routing, depth, locations, and drilling types of the proposed HDD works have been carefully selected to avoid effects. Structural surveys will be completed pre-construction at all structures that will be crossed or that are within 50 m of the HDD locations. These locations will be monitored during the HDD works, and the surveys will be repeated post-construction. In the extremely unlikely event of repairs being required, these will be immediately undertaken in agreement with the structure owner;
- During the HDD works, constant monitoring by the specialist drilling team will be carried out. The volume of cuttings produced will also be monitored to ensure that no over-cutting takes place and that hole cleaning is maintained. The nature of the cuttings will also be monitored to understand the ground conditions as the drilling progresses. Technical mitigation measures will be applied to the drilling equipment to reduce any vibrational issues. The CEMP will be updated pre-construction with further information about HDD monitoring

when the Contractor is appointed and will be agreed with stakeholders including the Local Authorities, TII, Waterways Ireland, and Irish Rail;

- The Contractor will develop and implement a stakeholder communications plan prior to the commencement of construction which will facilitate community engagement;
- Selection of plant and equipment, construction methods and programming. Only plant conforming with or exceeding relevant national or international standards, directives or recommendations on noise or vibration emissions would be used. Construction plant will be maintained in good condition with regards to minimising noise and vibration emission;
- Plant will be operated and maintained appropriately, with due regard for manufacturer recommendations. All vehicles, plant and equipment will be switched off when not in use;
- Careful selection of routes and programming for the transport of construction materials, spoil and personnel to reduce the risk of increased noise and vibration impacts during construction;
- Vehicle and mechanical plant/equipment used for the works will be fitted with effective exhaust silencers, to be maintained in good working order and operated in a way that minimises noise emissions;
- Construction plant and activities will be positioned to minimise noise at sensitive locations;
- Equipment that breaks concrete by pulverising or similar, rather than by percussion, will be used where practicable;
- Mufflers shall be used on pneumatic tools;
- Works will be programmed to minimise the need for working outside normal working hours;
- Unnecessary revving of engines will be avoided and equipment will be switched off when not required;
- Plant and vehicles will be started-up sequentially rather than all together;
- Drop height of materials will be minimised;
- Rubber linings will be used in, for example, chutes and dumpers to reduce impact noise;
- Any plant, such as generators, which are required to operate before 07:00 or after 19:00 will be surrounded by an acoustic enclosure or portable screen;
- Low vibratory or non-vibratory plant will be used when working close to a vibration sensitive receptor; and
- Vibratory equipment will be started up and turned off as far away from sensitive receptors as practicable.

9.6 Residual Effects

Mitigation measures will ensure that construction noise effects are not likely to be significant at any sensitive receptor in the study area.

Consultation will be undertaken with the residents of these properties to ensure they understand the nature and duration of these effects, and the measures that will be put in place to manage and reduce them.

The effects of construction noise and vibration can be mitigated by good public relations and community liaison. Residents who are kept aware of the reasons for construction works, the expected duration of elevated noise or vibration and the date at which it will stop are generally more accepting of it than if the noise commences without warning or explanation and appears to be continuing for an indefinite period. Wherever works are in close proximity to noise-sensitive receptors, community engagement will be undertaken.

In addition, during the ongoing evolution of the plant list and programme, all opportunities will be taken to reduce noise levels at these two receptors by adopting best practicable means.

In terms of vibratory compaction, no significant vibration effects are anticipated in relation to human perception at residential receptors nor in relation to cosmetic damage at buildings. Vibration effects as a result of the HDD works are anticipated to be significant in relation to human perception at residential receptors but not in relation to cosmetic damage at buildings.

9.7 Conclusion

A noise and vibration assessment has been undertaken on the Proposed Development in line with relevant standards. Mitigation measures, including noise barriers around the HDD compounds, will ensure that construction noise effects are not likely to be significant at any sensitive receptor in the study area.

Standard good practice mitigation measures, including a risk assessment and community engagement, will ensure that vibration effects are not likely to be significant at any sensitive receptor in the study area. The CEMP, which forms part of this PECR, contains mitigation measures for construction noise and vibration to ensure there are no significant effects at sensitive receptors in the study area.

No noise impacts are anticipated as a result of construction traffic on surrounding roads.

The operational noise assessment concluded that no significant noise and/or vibration effects will occur as a result of the Proposed Development.

10. Biodiversity

10.1 Introduction

This chapter describes the nature and extent of the Proposed Development's receiving environment. It also provides an assessment of its potential biodiversity (ecological) impacts and the mitigation measures that are required in the avoidance of significant adverse effects as a result of the construction and operation of the Proposed Development.

An Appropriate Assessment (AA) screening of the Proposed Development was produced and a Natura Impact Statement (NIS) was completed and accompanies this application. A summary of the key findings of these assessments are provided in this report.

The planning application pack contains the following reports, documents, and plans:

- Planning Application Form and associated notices and drawings;
- PECR (including Construction and Environmental Management Plan (CEMP);
- AA Screening Report; and
- Natura Impact Statement.

10.2 Methodology

10.2.1 Introduction

An ecological impact assessment was carried out to determine the likelihood of significant adverse effects on ecological habitats and species of interest. The ecological impact assessment provides a description of the existing ecological environment, the potential effects likely to occur due to the Proposed Development as well as an assessment of the significance of such effects from an ecological perspective.

A separate AA Screening Report (Jacobs, 2023a) and Natura Impact Statement (NIS) (Jacobs, 2023b) has been prepared for the Proposed Development (which is included as part of the planning application pack) which focuses on the European Designated Sites and the Qualifying Interests / Special Conservation Interests for which such sites are designated. The NIS concluded that, with mitigation measures adopted, there will be no adverse effects on the integrity of any European sites, either alone or in-combination with other plans or projects. Mitigation for the effects of the Proposed development and enhancement in the form of planting of species rich hedgerows in place of species poor is provided in Section 10.5 and residual effects after mitigation are provided in Section 10.6.

10.2.2 Legislation and Policy

The assessment of the likely impacts of the Proposed Development on ecological resources has considered legislation and policy documents. Whilst this is not an exhaustive list of all legislation and policy documents, it contains those that are most relevant for the purposes of preparing this chapter of the PECR. The European Communities (EC) (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011 (as amended) contain additional relevant provisions such as for invasive species, and licensing of Annex IV species.

10.2.3 International and National Legislation

The following international legislation is relevant to the Proposed Development:

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended); hereafter the 'Habitats Directive';
- Council Directive 2009/147/EC on the Conservation of Wild Birds (as amended); hereafter the 'Birds Directive'; and
- Directive 2000/60/EC; EU Water Framework Directive.

The following national legislation is relevant to the Proposed Development:

- Wildlife Act, 1976 (as amended) and Wildlife (Amendment) Act (2000) (as amended); referred to hereafter collectively as the Wildlife Acts. At national level these are the principal pieces of legislation for the protection and control of activities that may harm wildlife;
- Planning and Development Act 2000 (as amended). This Act is the basis for land use planning in Ireland. Under this legislation, mandatory objectives for the conservation of natural heritage and for the conservation of European Sites must be included in development plans (usually implemented at local authority level);
- European Communities (EC) (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011 (as amended); hereafter the 'Birds and Habitats Regulations'. The transposition of the Habitats and Birds Directives into Irish law is through this legislation. Regulations (49 and 50) that deal with invasive species (those included within the Third Schedule) are also included;
- Flora (Protection) Order, 2022. Species of plant which receive protection under Section 21 of the Wildlife Act, 1976 are listed in this legislation; and
- Inland Fisheries Acts 1959 to 2017, hereafter referred to as the Fisheries Acts.

10.2.4 Policy and Planning Documents

The following national policies are relevant to the Proposed Development:

- National Planning Framework: Ireland 2040;
- National Development Plan 2021-2030;
- Ireland's 4th National Biodiversity Action Plan: Draft for Public Consultation (Department of Housing, Local Government and Heritage); and
- County Kildare Hedgerow Survey Report 2006 – includes aim to assess the data collected and produce recommendations that promote the conservation of the resource.

The following county level policies are relevant to the Proposed Development

- The Kildare County Development Plan 2023-2029; Chapter 12 'Biodiversity and Green Infrastructure';
- Biodiversity policies from the Kildare County Development Plan (page 394) are as follows:
  - Policy BI P4: Ensure that any new development does not have a significant adverse impact, incapable of satisfactory mitigation on plant animal or bird species which are protected by law.

- Policy BI P5. Identify and conserve locally important biodiversity sites which contribute to the overall ecological network of County Kildare.
- Policy BI P6. Recognise the important contribution trees and hedgerows make to the county biodiversity resource, climate mitigation, resilience, and adaptation.
- Objectives BI O26 to BI O33 in Kildare County Development Plan (page 399) relate to hedgerows and trees.
- Policy BI P8. Ensure that Kildare's wetland and watercourses are retained for their biodiversity, climate change mitigation properties and flood defence and flood protection vales and at a minimum achieve and maintain at least good ecological status for all wetlands and watercourses in the county by, at the latest 2027 in line with the Water Framework Directive and Ramsar Convention.

- Meath County Development Plan 2021-2027
  - Policy HER POL 27. To protect, conserve and enhance the County's biodiversity where appropriate;
  - Policy HER POL 28. To integrate in the development management, process the protection and enhancement of biodiversity and landscape features wherever possible, by minimising adverse impacts on existing habitats (whether designated or not) and by including mitigation and/or compensation measures, as appropriate; and
  - Policies HER POL 37 to HER POL 42 consecutively on hedgerows (Chapter 8).

The Proposed Development does not overlap with locations subject to Community Biodiversity Action Plans in Co. Meath, listed on the Meath County Council website[43].

10.2.5 Approach and methodology

The ecological impact assessment comprised a desk-based study and field surveys which are set out in Section 10.3 below. The Zone of Influence (ZoI) for the Proposed Development varied according to the ecological receptor and is described in Section 10.2.6 below The methodologies used to collate information on the baseline biodiversity environment are shown in Appendix 10.1, Volume 3.

The guidance used below was used to identify potential ecological receptors and to inform field survey and ecological assessment. These resources are listed below

- A Guide to Habitats in Ireland (Fossitt, 2000, reprinted 2007);
- Bat Mitigation Guidelines for Ireland – version 2 (Marnell, Kelleher and Mullen, 2022);
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.) (Collins 2016);
- The Bat Workers' Manual, 2nd Edition (Mitchell-Jones & McLeish, 2004);
- Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (National Roads Authority (NRA), 2006a);
- Bird Monitoring Methods (Gilbert et al., 1998);

[43] https://www.meath.ie/council/council-services/heritage-architectural-conservation/heritage/heritage-plans-policies-and-guidelines/biodiversity-plans/community-biodiversity-action-plans

- Ecology of the White-clawed Crayfish. Conserving Natura 2000 Rivers Ecology Series No. 1. English Nature, Peterborough (Holdich, 2003);
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2008a);
- Aerial imagery (ESRI);
- Environmental Impact Assessment of Projects, Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017);
- Hedgerow Appraisal System – Best Practice Guidance on Hedgerow Survey, Data Collation and Appraisal (Foulkes et al., 2013);
- Guidance on Assessing the Impacts of Development on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (SEPA, 2017);
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009);
- Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA, 2008b);
- Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (NRA, 2006b);
- Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads. Transport Infrastructure Ireland (TII) (2010);
- The Irish Bat Monitoring Programme 2015-2017. Irish Wildlife Manuals, No. 103. (Aughney et al., 2018);
- The Status of EU Protected Habitats and Species in Ireland. Volume 1. Summary Overview. (National Parks and Wildlife Service (2019a);
- The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments. Volume 2. (National Parks and Wildlife Service (2019b);
- The Status if EU Protected Habitats and Species in Ireland. Volume 3. Species Assessments. (National Parks and Wildlife Service, 2019c);
- The Irish Vegetation Classification (Perrin et al., 2018);
- The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No. 78 (O'Neill et al., 2013);
- The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats. Irish Wildlife Manuals, No. 102 (Martin et al., 2018); and
- Monitoring guidelines for the assessment of petrifying springs in Ireland. Irish Wildlife Manuals, No. 94 (Lyons and Kelly, 2016).

Field surveys were undertaken by Jacobs between October 2021 and January 2023 informing the PECR and are summarised in Table 10.1 below.

Table 10.1: Ecological surveys informing the PECR

Species/Habitat	Survey methodology/target species	Survey date(s)
Habitat Survey	Habitat classification (Fossitt, IVC etc.)	June 2022 to October 2022 (weeks commencing: 06.06.2022, 27.06.2022, 11.07.2022, 18.07.2022, 22.08.2022, 05.09.2022, 26.09.2022, 12.10.2022)
Habitat Suitability Assessment	Reptile and amphibian	December 2021 to June 2022 (weeks commencing 13.12.21; 27.6.22)
	Terrestrial invertebrate (marsh fritillary)	December 2021 to June 2022 (weeks commencing: 13.12.21, 27.6.22)
	Fish, white-clawed crayfish	June 2022 to October 2022 (weeks commencing: 06.06.2022, 27.06.2022, 11.07.2022, 18.07.2022, 22.08.2022, 05.09.2022, 26.09.2022, 12.10.2022)
Birds	Winter Bird Surveys	October 2021 to April 2022 (weeks commencing: 11.10.2021, 01.11.2021, 06.12.2021, 10.01.2022, 07.02.2022, 07.03.2022, 11.04.2022)
	Hen harrier winter roost surveys	October 2021 to March 2022 (weeks commencing: 11.10.2021, 18.10.2021, 01.11.2021, 06.12.2021, 10.01.2022, 07.02.2022, 07.03.2022)
	Breeding bird surveys	March to May 2022 (Week commencing: 28.03.2022, 25.04.2022, 23.05.2022, 30.05.2022)
Bats	Identification of potential roost features (PRFs) in trees/buildings	February 2022 to September 2022 (weeks commencing: 21.02.22, 21.03.22, 06.06.22, 15.07.22, 22.08.22, 05.09.22)
	Static detector surveys	May 2022 to August 2022 (weeks commencing: 16.05.2022, 23.05.2022, 30.05.22, 06.06.2022, 27.06.2022, 04.07.2022, 18.07.2022, 25.07.2022, 01.08.2022, 08.08.2022)
	Emergence/re-entry surveys (structures and trees)	May 2022 to July 2022 (weeks commencing: 16.05.2022, 23.05.2022, 30.05.2022, 06.06.2022, 17.06.2022, 18.07.2022, 25.07.2022)
Mammal Survey	Mammal species other than bats i.e. otter, badger, red squirrel, etc.	October 2021 to April 2022
Smooth newt	eDNA Sampling for smooth newt at waterbody 19 (WB19) and west of WB04	August 2022 – October 2022 (weeks commencing: 08.08.2022, 19.09.2022, 10.10.2022)
Fish	eDNA Sampling for Atlantic salmon and European eel	August 2022 – September 2022 (weeks commencing: 08.08.2022, 19.09.2022)
Aquatic Invertebrates	eDNA Sampling for white-clawed crayfish	August 2022 – September 2022 (weeks commencing: 08.08.2022, 19.09.2022)

10.2.6 Study Area

The study area extent of surveys varied across the Proposed Development based upon the key infrastructure along the Proposed Development and the likely significant effects on the receiving environment during construction and / or operation. Surveys were carried out for each of the biodiversity receptors as listed in Table 10.2 within the study areas specified and focused on assessing potential impacts within the Zone of Influence[44] (ZoI) of the Proposed Development.

Table 10.2: The Study Areas For Ecological Receptors

Ecological Receptor	Study Area Description
Terrestrial Habitats	A corridor along the Proposed Development where works are proposed and habitats that could be directly or indirectly affected during construction / operation. Habitats within a minimum of 150 m of the

[44] *'The 'zone of influence' for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries.'* (CIEEM, 2019)

Ecological Receptor	Study Area Description
(Including rare and / or protected flora, and non-native invasive plant species[45])	Proposed Development were mapped using a combination of survey and aerial photographs. All hedgerows / tree lines at proposed joint bays were inspected and where vegetation could be impacted / lost, e.g., narrow roads.
Wintering birds	Wintering bird surveys were carried out for all the route options as a preferred route was not available at that time. Each of the four route options (See Chapter 4 of this PECR for further details) was surveyed to 800 m on either side of the option from vantage points and drive-by. This was considered the distance in which birds count be directly or indirectly affected by construction/operation operations. Therefore, some birds were recorded up to 9 km away from the Proposed Development and are included in the results to provide as much data as possible. The survey focused on areas of suitable habitat for foraging / roosting winter birds, including waterbodies and wetlands.
Breeding birds	A corridor along the Proposed Development where works are proposed, and in locations where breeding birds could be directly or indirectly affected during construction / operation. Transect surveys undertaken predominantly within a 250 m survey corridor however, extended outside of the 250 m corridor on occasions. The surveys focused on areas of suitable bird nesting habitat.
Bats	Only trees / structures potentially directly impacted by the Proposed Development during construction / operation were surveyed for potential bat roosts. Trees with identified bat roost potential were subject to emergence / return surveys.
Fauna species **(other than bats, i.e. otter, badger, other small mammals, amphibians, reptiles, terrestrial invertebrates and fish)**	A corridor of approximately 100 m from the Proposed Development was surveyed for fauna species that could be directly or indirectly affected during construction/operation of the Proposed Development. The study area extended to 150 m from the Proposed Development and beyond if required (i.e. along watercourses hydrologically linked to the Planning Application Boundary (PAB)).
Aquatic habitats assessment	Watercourse crossing points and a minimum of 100 m to either side of the Proposed Development where possible were visually assessed for their potential to support fish of conservation interest and white-clawed crayfish. Assessments identified sites that had appropriate habitat to support different age classes of fish and in particular for spawning and juvenile nursery areas. White-clawed crayfish habitat was assessed for features that provide suitable refuge such as substrates large enough to provide cover and not armoured. eDNA sampling was carried out at six watercourses within the study area.
eDNA sampling	Following the aquatic habitats assessment, eDNA samples was undertaken at eleven waterbodies (rivers / tributaries) considered to have the potential to support the following species: • Atlantic salmon; • European eel; • White clawed crayfish; eDNA sampling for smooth newt was also undertaken at WB05 (a pond) and WB19 (Baltracey Tributary of the Lyreen)
Marsh fritillary	Habitats within c. 100 m of the Proposed Development were assessed for their suitability to support marsh fritillary butterfly. Incidental sightings of marsh fritillary and other terrestrial invertebrates of conservation interest were recorded where present.

[45] Non-native invasive plant species are not considered as KERs, as they can result in negative effects on biodiversity and it is in that context they are included within the impact assessment.

10.2.7 Scoped out surveys

The following surveys were scoped out:

Amphibians and Reptiles. Amphibian and reptile presence / potential absence surveys were scoped out. Habitat suitability was used as a proxy for species presence with the exception to two smooth newt (*Lissotriton vulgaris*) eDNA surveys which were undertaken at waterbody 19 (WB19) and WB05. Amphibians and reptiles are assumed present where suitable habitat is found within the study area unless otherwise stated.

Bats. Structures / trees not directly impacted were not subjected to survey. Only structures / trees to be directly impacted were subject to survey and as no structures were impacted none were surveyed.

Aquatic Receptors. An aquatic habitat assessment was undertaken to identify the presence of suitable habitat for aquatic species. No electrofishing, invertebrate or macrophytes surveys were carried out. A combination of existing Water Framework Directive (WFD) publicly available data along with data record searches was used to inform decision making.

Marsh Fritillary. Surveys for marsh fritillary (*Euphydryas aurinia*), comprised checks for the presence of devil's bit scabious (*Succisa pratensis*) which is the caterpillar's preferred foodplant. No searches for larval webs or adult butterflies were carried out. The species is assumed present where suitable habitat is found within the study area unless otherwise stated.

10.2.8 Consultation

Consultation on the Proposed Development has been undertaken for several years – please see Chapter 3 of this PECR for further details. During this Step 5, consultation was undertaken with National Parks and Wildlife Service (NPWS) and with Inland Fisheries Ireland (IFI).

10.2.9 Difficulties Encountered in Compiling Information

General: Surveys were limited at times due to access constraints. Lack of access to certain land packages may have limited the selection of trees with bat roost potential, identification of mammal signs such as badger setts and required habitat surveys to be undertaken via binoculars and desk-based reviews.

Ecological surveys are limited by a variety of factors which affect the presence of flora and fauna; for example, climatic variation, season and species behaviour. Evidence of protected species is not always present during a survey. This does not mean that a species is absent; hence the surveys also record and assess the suitability of habitats to support species, and (where appropriate, for species with dynamic distributions) further pre-construction confirmatory surveys are proposed to verify any locations requiring additional mitigation. Ecological surveys provide evidence of ecological activity for a snapshot of time. No major limitations were encountered in gathering data. It is considered that the baseline data collected is sufficient to inform a robust and thorough assessment of potential impacts.

Bat survey limitation: Location 10 was only surveyed once due to cattle being present in the fields on two occasions when surveys were scheduled. These surveys were not rescheduled due to time constraints, but static detectors were placed at the location on two different occasions and one dusk emergence survey was carried out. Bat surveys were cancelled due to poor weather conditions at times, however, each of these was rescheduled and carried out later.

Wintering birds limitation: Where surveys were carried out from inside cars driving along busy roads some birds may well have been missed. There were no limitations due to site access or weather. Two hen harrier surveys at vantage points were cancelled due to weather conditions and were not rescheduled.

Breeding birds limitation: Transects 4, 7, 10, 11 and 17 were not walked due to land access issues. These transects were changed to vantage point surveys at each location and all surveys were carried out without limitations due to weather. For Transect 1, the cable route subsequently changed and as a result none of the records lie within 250 m of the updated route.

Watercourses: Watercourses surveyed during summer 2022 were initially found to be dry due to the persistent heatwave across Ireland. These surveys were reorganised and carried out later.

Tree value: The classification of mature and veteran trees to assist in determination of the level of residual impact was carried out by desk-based inspection of freely available aerial and street view imagery, rather than from field survey.

Lakes and ponds: Osberstown attenuation pond is a constructed waterbody along the M7, approximately 50 m to the east of Millennium Park on the north-west suburbs of Naas (grid reference: N 88162 21266), but which was not possible to survey given protective boundary fencing. This will be surveyed prior to construction as part of mitigation measures.

Habitat survey: Not all the habitats within the survey boundary were visited during field surveys. Where there were gaps these were addressed using desk based aerial imagery. Presence of invasive species at such locations will be addressed through pre-construction surveys.

10.3 Ecological Baseline

The following section describes the existing ecological environment within the Zone of Influence (ZoI) of the Proposed Developments. Data on this 'ecological baseline' was obtained from a combination of desk-based review and field surveys. The ZoI varied according to the ecological receptor as shown in Table 10.2. The methodologies used to collate information on the ecological baseline are described in Appendix 10.1.

10.3.1 Desk study

10.3.1.1 European designated sites

Applying the source-pathway-receptor model, eight European sites were potentially within the ZoI of the Proposed Development due to their connectivity (proximity / ecological / hydrological etc). These sites are listed below, and shown on Figure 10.1, Volume 4.

- Ballynafagh Bog SAC (Site code 000391).
- Ballynafagh Lake SAC (Site code 001387).
- Mouds Bog SAC (Site code 002331).
- Rye Water Valley/ Carton SAC (Site code 001398).
- Poulaphouca Reservoir SPA (Site code 004063).
- Pollardstown Fen SAC (Site code 000396).
- River Boyne and River Blackwater SAC (Site code 002299).
- River Boyne and River Blackwater SPA (Site code 004232).

The eight European designated sites potentially within the ZoI and Qualifying Interest habitats and species for which these sites are designated are shown in Table 10.3 below. This report uses the term Qualifying Interest for European sites rather than Species of Conservation Interest.

Table 10.3 European Designated Sites within the ZoI of the Proposed Development

Site Name and nearest distance to the Proposed Development	Site Code	SCI Habitats *indicates a priority habitat under the Habitats Directive	SCI Species
Ballynafagh Bog SAC 1.6 km west	000391	[7110] Active raised bogs [7120] Degraded raised bogs still capable of natural regeneration [7150] Depressions on peat substrates of the Rhynchosporion	N/A
Ballynafagh Lake SAC 2.8 km west	001387	[7230] Alkaline fens	[1016] Desmoulins whorl snail (*Vertigo moulinsiana*) [1065] Marsh fritillary (*Euphydryas aurinia*)
Moulds Bog SAC 6.0 km west	002331	[7110] Active raised bogs [7120] Degraded raised bogs still capable of natural regeneration [7150] Depressions on peat substrates of the Rhynchosporion	N/A
Rye Water Valley / Carton SAC 7 km south	001398	[7220] Petrifying springs with tufa formation (*Cratoneurion*)*	[1014] Narrow-mouthed whorl snail (*Vertigo angustior*) [1016] Desmoulins whorl snail (*Vertigo moulinsiana*)
Poulaphouca Reservoir SPA 8.0 km east	004063	N/A	[A043] Greylag goose (*Anser anser)* [A183] Lesser black-backed gull (*Larus fuscus*)
Pollardstown Fen SAC 9 km west	000396	[7210] Calcareous fens with Cladium mariscus and species of the *Caricion davallianae** [7220] Petrifying springs with tufa formation (*Cratoneurion*)* [7230] Alkaline fens	[1013] Geyers whorl snail (*Vertigo geyeri*) [1014] Narrow-mouthed whorl snail (*Vertigo angustior*) [1016] Desmoulins whorl snail (*Vertigo moulinsiana*)
River Boyne and River Blackwater SAC 14.2 km west	002299	[7230] Alkaline fens [91E0] Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	[1099] River lamprey (*Lampetra fluviatilis*) [1106] Atlantic salmon (*Salmo salar*) [1355] Otter (*Lutra lutra*)
River Boyne and River Blackwater SPA 14.2 km	004232	N/A	[A229] Kingfisher (*Alcedo atthis*)

10.3.1.2 Nationally designated sites

Natural Heritage Areas (NHAs) are designated under the Wildlife (Amendment) Act 2000 and encompass nationally important semi-natural and natural habitats, landforms and geomorphological features. In addition to NHAs there are proposed NHAs (pNHAs). These are also sites of significance for wildlife and habitats and were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. Proposed NHAs are offered protection in the interim period under the county or city development plans which requires that planning authorities give due regard to their protection in planning policies and decisions.

Hodgestown Bog, the only NHA in the vicinity is located c3.69 km west of the Proposed Development. There are seven pNHA potentially within the ZoI of the Proposed Development all of which are shown in Figure 10.2A, Volume 4 and in Table 10.4 below. The Proposed Development directly crosses the Royal Canal pNHA at Kilcock and crosses the Grand Canal pNHA at two locations, once at Sallins and once at Naas. Table 10.4 below lists these designated sites, their distance from the Proposed Development boundary, and includes a site description outlining each site's ecological interest.

Table 10.4: Natural Heritage Areas (NHA) and Proposed Natural Heritage Areas (pNHA) in the vicinity of the Proposed Development

Site Name	Distance (km) and direction	Summary Site Description (from Site Synopsis)	Hydrological connectivity (Y/N)
NHA			
Hodgestown Bog HNA	3.69 west	The site comprises a raised bog that includes both areas of high bog and cutover bog. This raised bog was originally part of a much larger area of bog that has now been cutover and reclaimed for forestry and agriculture	None
pNHAs			
The Royal Canal pNHA	0	The canal pNHA comprises the central channel and the banks on either side of it. Its ecological value lies in the diversity of species it supports along its linear habitats than the presence of rare species. Habitats within the canal boundaries include hedgerows, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The rare and protected opposite-leaved pondweed *Groenlandia densa* (Flora Protection Order 01987) is present at one site in Dublin. The stonewort *Tolypella intricate* (a stonewort listed as Vulnerable in the Red Data Book) is present in the canal in Dublin.	Yes, the works cross the Royal Canal
Grand Canal pNHA	0	The Grand Canal pNHA comprises the canal channel and the banks on either side of it. Its ecological value lies in the diversity of species it supports along its linear habitats than the presence of rare species. Habitats within the canal boundaries include hedgerows, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The diversity of the water channel is high on the eastern section of the Main line between Summit level at Lowtown and Inchicore. The rare and protected opposite-leaved pondweed *Groenlandia densa* (Flora Protection Order 01987) is present in a number of sites in the eastern section of the Main Line between Lowtown and Ringsend Basin in Dublin.	Yes, the works cross the Grand Canal.
Liffey Valley Meander Belt pNHA	0.42 south-east	The Liffey Valley Meander Belt site is located 1 km to the west of Ballymore Eustace, Co. Kildare. Located on the north bank of the river the site is an ash woodland which is grazed and contains a variety of tree and herb	None

Site Name	Distance (km) and direction	Summary Site Description (from Site Synopsis)	Hydrological connectivity (Y/N)
		species. A calcicolous seepage line is present at the based of the sloping site and the ash wood merges with a marsh wetland at this point.	
Liffey at Osberstown pNHA	0.78 west	This site is a good example of riverside vegetation, with two scarce plants. Although cleared of woodland in 1983, remnants may remain, or regeneration may have occurred.	None
Ballynafagh Bog pNHA / SAC	1.64 west	This site is a raised bog situated about 1 km west of Prosperous in Co. Kildare. This pNHA is also a SAC selected for its raised bog, degraded raised bog and its rhynchosporion vegetation.	Works are proposed at Maynooth Road, which, at grid reference N 83909 28033 lies 220 m from a tributary which flows, after 2.0 km, into a watercourse running along the southern boundary of Ballynafagh Bog SAC. This tributary crosses Maynooth Road at N 83742 27890. There is no hydrological link between the pNHA / SAC and the Proposed Development due to the distance between the Proposed Development and where the tributary crosses Maynooth Road.
Donadea Wood pNHA	1.88 west	This site is located about 6 km north of Prosperous in Co. Kildare. It is the old demesne woodland of Donadea Castle. The soil of the area is glacial drift. The entire site has been planted with a mix of deciduous and coniferous trees.	None (Clonshanbo flows from this pNHA) and crossed the Proposed Development downstream of the pNHA).
Ballynafagh Lake pNHA/SAC	2.67 west	Ballynafagh Lake is located about 2 km north-west of Prosperous in Co. Kildare. It is a shallow alkaline lake with some emergent vegetation. This pNHA is a SAC selected for its alkaline fens, desmoulin's whorl snail (*Vertigo moulinsiana*) and marsh fritillary butterfly (*Euphydryas aurinia*)	None

10.3.1.3 Other Nationally Important Sites

Harristown Common candidate(c) NHA (grid reference 288100, 213100) lies approximately 113 m, to the west of the Proposed Development at its nearest location. Foss and Wilson carried out a habitat survey of this site (2012) and gave it a value of 'nationally important' following their survey. They reported that the alkaline fen on site corresponded to EU habitat type Alkaline fens (7230). Habitats recorded on site where:

- 7230 Alkaline fens. The survey description states that the area of alkaline fen was being grazed by Highland cattle that the site appeared to be drying out somewhat. Channels run through site with fen flushes. Ridges run through the northern half of the site which is where gorse increases, and scrub is frequent. Man-made pool at eastern end. An area of only PF1 was identified to the north of L6073 road and a mixture of PF1 and GS4 to the south.
- Main Fossitt habitats on site were:
  - FL8 Other artificial lakes and ponds
  - FW4 Drainage ditches
  - GS2 Dry meadows and grassy verges

- GS4 Wet grassland
- PF1 Rich fen and flush
- WS1 Scrub

No other Annex 1 habitats, with the exception of alkaline fens, was recorded by NPWS within the ZoI and no other Annex I habitats were recorded during Jacobs surveys.

10.3.1.4 WFD and Waterbodies

The Waterbodies (WB) crossed by the Proposed Development are shown in Table 10.5 below and illustrated in Figure 3 of the Appropriate Assessment Screening Report (Jacobs, 2023a). The table shows all waterbodies in the study area and the river waterbody Water Framework Directive (WFD) status for the 2016-2021 monitoring period, and the risk rating where available (Environmental Project Agency (EPA) Maps web site, 2023).

Table 10.5. Waterbodies Within the Study Area and Water Framework Directive Status

Waterbody Number (WB)	Waterbody Name	Waterbody Location – Grid Reference	EU Code	WFD Status 2016-2021	Risk Rating
WB01	Tributary of the Tolka 020	N 95028 46797	IE_EA_09T010600	Moderate	At risk
WB02	Dunboyne Stream_010	N 94782 46269	IE_EA_09D040500	Poor	At risk
WB03	Rye Water_030	N 93930 45180	IE_EA_09R010400	Poor	At risk
WB04	Jenkinstown stream_010	N 91730 45313	IE_EA_09J010950	Moderate	At risk
WB05	Pond	N 90677 45988	N/A	N/A	N/A
WB06	Jenkinstown Stream_010	N 90246 45483	IE_EA_09J010950	Moderate	At risk
WB07	Jenkinstown Stream_010	N 89775 43468	IE_EA_09J010950	Moderate	At risk
WB08	Jenkinstown Stream_010	N 89661 43153	IE_EA_09J010950	Moderate	At risk
WB09	Unassigned stream	N 89419 43023	N/A	N/A	N/A
WB10	Rye Water_020 (Brides Stream)	N 89243 42178	IE_EA_09R010300	Good	Under review
WB11	Newtownmoyaghy Stream tributary of Rye Water_020	N 89076 40939	N/A	N/A	N/A
WB12	Rye Water_020 (Padistown)	N 88410 40767	IE_EA_09R010300	Good	Under review
WB13	Rye Water_010	N 88065 40613	IE_EA_09R010100	Moderate	At risk
WB14	Royal Canal	N 87874 40210	IE_09_AWB_RCMLE	Good	Under review
WB15	Lyreen_010	N 86262 37369	IE_EA_09L020035	Poor	At risk
WB16	Drainage ditches	N 86442 36490	N/A	N/A	N/A
WB17	Drainage ditches	N 86592 36149	N/A	N/A	N/A
WB18	Drainage ditch	N 86589 36154	N/A	N/A	N/A
WB19	Lyreen_010 (Baltracey Trib Lyreen)	N 86673 35787	IE_EA_09L020035	Poor	At risk
WB20	Tributary of Lyreen_010	N 86754 35459	N/A	N/A	N/A
WB21	Drainage ditches	N 86823 35188	N/A	N/A	N/A
WB22	Clonshanbo_010	N 87176 33938	IE_EA_09C030300	Poor	At risk
WB23	Drainage ditches	N 87298 33417	N/A	N/A	N/A
WB24	Clonshanbo_020	N 86916 31840	IE_EA_09C030600	Poor	At risk
WB25	Kilmurry_010	N 86272 30537	IE_EA_09K260890	Poor	Under review

Waterbody Number (WB)	Waterbody Name	Waterbody Location – Grid Reference	EU Code	WFD Status 2016-2021	Risk Rating
WB26	Tributary of Kilmurray_010	N 86151 30369	N/A	N/A	N/A
WB27	Liffey_130	N 84449 28586	IE_EA_09L011600	Good	Not at risk
WB28	Tributary of Liffey_130	N 84283 28429	N/A	N/A	N/A
WB29	Liffey_130	N 84425 28283	IE_EA_09L011600	Good	Not at risk
WB30	Tributary of Slate_010	N 84237 27559	N/A	N/A	N/A
WB31	Liffey_130	N 84807 27542	IE_EA_09L011600	Good	Not at risk
WB32	Liffey_120	N 87519 25081	IE_EA_09L011500	Good	Not at risk
WB33	Drainage ditch	N 87844 24820	N/A	N/A	N/A
WB34	Drainage ditch	N 87950 24710	N/A	N/A	N/A
WB35	Liffey_120	N 88001 24231	IE_EA_09L011500	Good	Not at risk
WB36	Liffey_120	N 88281 24006	IE_EA_09L011500	Good	Not at risk
WB37	Liffey_120	N 88110 23008	IE_EA_09L011500	Good	Not at risk
WB38	Grand Canal	N 88152 22604	IE_09_AWB_GCMLE	Good	Not at risk
WB39	Liffey_110	N 88249 21068	IE_EA_09L011300	Good	Under review
WB40	Liffey_110	N 87711 20395	IE_EA_09L011300	Good	Under review
WB41	Liffey_110	N 87394 20021	IE_EA_09L011300	Good	Under review
WB42	Grand Canal	N 88288 19245	IE_09_AWB_GCMLE	Good	Not at risk
WB43	Liffey_100	N 88310 18467	IE_EA_09L011200	Good	Under review
WB44	Drainage ditch	N 88077 15749	N/A	N/A	N/A
WB45	Dunstown Stream	N 87555 12433	N/A	N/A	N/A
WB46	Tributary of Liffey_120	N 88017 24231	N/A	N/A	N/A

Several drainage ditches, some wet and some dry, were identified predominantly along field boundaries in the vicinity of the Proposed Development. It should be noted, however, that these contained water intermittently.

10.3.1.5 Habitats

There were no desk study records of Annex I habitats within the study area defined in Table 10.2. The walkover survey noted a potential Annex I grassland which was subject to further study which established that this was not Annex 1 habitat (see Appendix 10.3, Volume 3).

10.3.1.6 Records of protected and notable species

Records of legally protected, rare and / or notable species within 2 km of the Proposed Development are listed in Table 10.6 below.

Table 10.6: Records of protected, rare and other notable flora and fauna within 2 km of the Proposed Development (data from National Parks and Wildlife Service and the National Biodiversity Data Centre, accessed December 2022)

Common Name	Scientific Name	Protection[46]	Conservation Status Mammals[47]; Birds[48]; Amphibian, reptile, and freshwater fish[49];
Barn swallow	*Hirundo rustica*	WA	Birds of Conservation Concern – Amber List
Black-headed gull	*Larus ridibundus*	WA	Birds of Conservation Concern – Red List
Brown long-eared bat	*Plecotus auritus*	HDIV, WA	Least concern
Common coot	*Fulica atra*	BDIII, WA	Birds of Conservation Concern – Amber List
Common frog	*Rana temporaria*	WA	Least concern
Common pheasant	*Phasianus colchicus*	BDIII, WA	Least concern
Common pipistrelle	*Pipistrellus pipistrellus*	HDIV, WA	Least concern
Common snipe	*Gallinago gallinago*	BDIII, WA	Birds of Conservation Concern – Amber List
Common starling	*Sturnus vulgaris*	WA	Birds of Conservation Concern – Amber List
Common swift	*Apus apus*	WA	Birds of Conservation Concern – Amber List
Common wood pigeon	*Columba palumbus*	BDIII, WA	Least concern
Daubenton's bat	*Myotis daubentonii*	HDIV, WA	Least concern
Eurasian badger	*Meles meles*	WA	Least concern
Eurasian curlew	*Numenius arquata*	WA	Birds of Conservation Concern – Red List
Eurasian red squirrel	*Scirus vulgaris*	WA	Least concern
European otter	*Lutra lutra*	HDII, HDIV, WA	Near threatened
Glutinous snail	*Myxas glutinosa*	N/A	Endangered
House martin	*Delichon urbicum*	WA	Birds of Conservation Concern – Amber List
House sparrow	*Passer domesticus*	WA	Birds of Conservation Concern – Amber List
Lesser black-backed gull	*Larus fuscus*	WA	Birds of Conservation Concern – Amber List
Lesser bulin	*Merdigera obscura*	N/A	Endangered
Lesser noctule	*Nyctalus leisleri*	HDIV, WA	Near threatened
Little egret	*Egretta garzetta*	BDI, WA	Least concern
Little grebe	*Tachybaptus ruficollis*	WA	Birds of Conservation Concern – Amber List
Mallard	*Anas platyrhynchos*	BDIII, WA	Least concern
Marsh fritillary	*Euphydryas aurinia*	HDII	Vulnerable
Mute swan	*Cygnus olor*	WA	Birds of Conservation Concern – Amber List
Natterer's bat	*Myotis nattereri*	HDIV, WA	Least concern
Northern lapwing	*Vanellus vanellus*	WA	Birds of Conservation Concern – Red List
Pine marten	*Martes martes*	WA	Least concern
Red deer	*Cervus elaphus*	WA	Least concern

[46] HDII/IV = Habitats Directive Annexes II/IV/V; WA = Wildlife Acts; BD IIII = Birds Directive Annexes I/II/III;

[47] Marnell, F., Looney, D. and Lawton, C (2019). Ireland Red List No.12: Terrestrial Mammals. National Parks and Wildlife Service, Department of Culture, Heritage and Gaeltacht, Dublin, Ireland.
[48] Birds of Conservation Concern in Ireland (Gilbert *et al.* 2021);
[49] Amphibian, reptile and freshwater fish red list (King *et al.* 2011).

Common Name	Scientific Name	Protection[46]	Conservation Status Mammals[47]; Birds[48]; Amphibian, reptile, and freshwater fish[49];
Sand martin	*Riparia riparia*	WA	Birds of Conservation Concern – Amber List
Sky lark	*Alauda arvensis*	WA	Birds of Conservation Concern – Amber List
Soprano pipistrelle	*Pipistrellus pygmaeus*	HDIV, WA	Least concern
Tufted duck	*Aythya fuligula*	BDIII, WA	Birds of Conservation Concern – Amber List
West European hedgehog	*Erinaceus europaeus*	WA	Least concern
Yellowhammer	*Emberiza citrinella*	WA	Birds of Conservation Concern – Red List

Table 10.7: Records of protected, rare and other notable flora and fauna within 150 m of the Proposed Development (data from National Parks and Wildlife Service and the National Biodiversity Data Centre, accessed March 2023)

Species Group	Common Name	Scientific Name	Protection[50]	Conservation Status Mammals[51]; Birds[52]; Amphibian, reptile, and freshwater fish[53];
Lower Plants	N/A	*N/A*	No notable or protected species found within 150 m of development.	N/A
Higher Plants	N/A	*N/A*	No notable or protected species found within 150 m of development.	N/A
Invertebrates	Large red tailed bumble bee	*Bombus lapidarius*	N/A - notable	Near threatened
Fish	N/A	*N/A*	No notable or protected species found within 150 m of development.	N/A
Amphibians	N/A	*N/A*	No notable or protected species found within 150 m of development.	N/A
Reptiles	N/A	*N/A*	No notable or protected species found within 150 m of development.	N/A
Birds	Common Snipe	*Gallinago gallinago*	BDIII, WA	Birds of Conservation Concern – Amber List
Birds	Eurasian curlew	*Numenius arquata*	WA	Birds of Conservation Concern – Red List

[50] HDII/IV = Habitats Directive Annexes II/IV; WA = Wildlife Acts; BD I/III = Birds Directive Annexes I/III;

[51] Marnell, F., Looney, D. and Lawton, C (2019). Ireland Red List No.12: Terrestrial Mammals. National Parks and Wildlife Service, Department of Culture, Heritage and Gaeltacht, Dublin, Ireland.

[52] Birds of Conservation Concern in Ireland (Gilbert *et al.* 2021);

[53] Amphibian, reptile and freshwater fish red list (King *et al.* 2011).

Species Group	Common Name	Scientific Name	Protection[50]	Conservation Status Mammals[51]; Birds[52]; Amphibian, reptile, and freshwater fish[53];
Birds	Lesser black-backed gull	*Larus fuscus*	WA	Birds of Conservation Concern – Amber List
Birds	Little egret	*Egretta garzetta*	BDI, WA	Least concern
Birds	Little grebe	*Tachybaptus ruficollis*	WA	Birds of Conservation Concern – Amber List
Birds	Mallard	*Anas platyrhynchos*	BDIII, WA	Least concern
Birds	Mute swan	*Cygnus olor*	WA	Birds of Conservation Concern – Amber List
Birds	Yellowhammer	*Emberiza citrinella*	WA	Birds of Conservation Concern – Red List
Terrestrial mammals	Daubenton's bat	*Myotis daubentonii*	HDIV, WA	Least concern
Terrestrial mammals	Lesser noctule	*Nyctalus leisleri*	HDIV, WA	Least concern
Terrestrial mammals	Common pipistrelle	*Pipistrellus pipistrellus*	HDIV, WA	Least concern
Terrestrial mammals	Soprano pipistrelle	*Pipistrellus pygmaeus*	HDIV, WA	Least concern
Terrestrial mammals	Eurasian badger	*Meles meles*	WA	Least concern
Terrestrial mammals	European otter	*Lutra lutra*	HDII, HDIV, WA	Near threatened
Terrestrial mammals	Pine marten	*Martes martes*	HAV, WA	Least concern
Terrestrial mammals	West European hedgehog	*Erinaceus europaeus*	WA	Least concern

Birdwatch Ireland returned the following a number of incidental winter bird records at two locations in the vicinity of the Proposed Development. One record was from the Waterstown, Co. Kildare area which is located to the west of Sallins town and 30 m to the west of the Proposed Development route. Six records were from the Lakelands area within Naas Town which is located 330 m from the Proposed Development route. Both locations are within the project survey area and these records are included in Table 10.8 below.

Table 10.8 Incidental winter bird records at Waterstown and Lakelands Naas

(Column 5 shows the number of birds comprising 1% of the national population and column 6 shows the number of birds comprising 1% of the international population of each species)

Site Code	Site Name	Winter	Species	1% National	1% International	Sep	Oct	Dec	Jan	Feb	Mar
0SS10	Waterstown near Sallins	2015/16	Whooper swan	150	340					10	
0S397	Lakelands Naas	2018/19	Mute swan	90	100	12	4	10	8	6	8
S397	Lakelands Naas	2018/19	Mallard	280	53000	42	60	50	45	22	32
0S397	Lakelands Naas	2018/19	Little grebe	20	4700	4	2	6		2	4
0S397	Lakelands Naas	2018/19	Moorhen			11	9	10		4	3
0S397	Lakelands Naas	2018/19	Black-headed gull			29	15	103	19	33	28
0S397	Lakelands Naas	2018/19	Herring gull			2		1			1

Hen harrier

The closest designated site for hen harrier to the Proposed Development is Slive Bloom SPA which is 49 km to the west of the Proposed Development. Hen harrier can range widely in the winter months and outside of the breeding season (late-July to March). They have a core range of 2 km with a maximum range of 10 km (Scottish Natural Heritage (SNH), 2016). Hen harrier roost communally in the winter months and can use a wide variety of habitats for winter roosting. Suitable winter roosting habitats are present within the vicinity of the Proposed Development. Hen harrier is listed on Annex 1 of the Birds Directive (Directive 2009/147/EC) and is amber listed on the Birds of Conservation Concern in Ireland (Gilbert *et al.*, 2021). Hen harriers are highly susceptible to disturbance and are particularly vulnerable during the winter due to the short days and limited foraging time. A disturbance event could cause a roosting individual to be flushed causing exposure to weather elements, unnecessary energy expenditure and exposure to predators.

The desk study returned multiple records for hen harrier within 2 km of the Proposed Development. The most recent record within 2 km of the Proposed Development is from 2011, where a large extent of the Proposed Development lies within several 10 km survey squares. More recent records were also returned (2017 – 2021) within 10 km of the Proposed Development. To Note - these record returns encompassed all four potential options, before a preferred option was chosen, and as such includes a larger area and the preferred option reported for all other receptors.

Fish (lampreys, Atlantic salmon, European eel, brown trout)

The study area is hydrologically linked to two main river catchments, River Tolka, located to the north of the Proposed Development, and the River Liffey which flows west and then north from Poulaphouca Reservoir through Kildare and Clane before heading east at Leixlip towards Dublin.

One of the major tributaries of the River Liffey is the Rye Water which flows through the Rye Water Valley / Carton SAC. Although there are no QI fish species of the SAC, it is noted for its spawning habitat for Atlantic salmon and trout and the presence of white-clawed crayfish (*Austropotamobius pallipes*). The River Liffey catchment has historically suffered from water quality issues and some of those issues remain today. Furthermore, the river is subject to habitat fragmentation due to the many obstacles and barriers, with twenty on the main channel alone. Nevertheless, the main channel and its tributaries do provide spawning and nursery opportunity for salmon and trout with the middle reaches of the River Liffey considered important area for both species. With the exception of the River Morell, most of the tributaries in the middle reach are narrow (<3 m wide) and short and support low densities of trout and salmon. Brown trout were recorded in 22 main stem survey sites and all five tributary rivers (Lemonstown, Millstream, Ladyswell, Morell (Hartwell and Painestown) and Gollymochy during electrofishing surveys undertaken on the River Liffey in 2021 (Delanty *et al.*, 2022). Salmon were also recorded but in lower densities and at less sites.

Lamprey sp. Were recorded on Gollymochy and Ladyswell tributaries whilst eels were recorded on seven main stem sites. Other fish species encountered included minnow (*Phoxinus phoxinus*), stoneloach (*Barbatula barbatula*), pike (*Esox lucius*), gudgeon (*Gobio gobio*), roach (*Rutilus rutilus*) and three-spined stickleback (*Gasterosteus aculeatus*).

The Tolka River which has headwaters near Dunboyne and Dunshaughlin flows through agricultural land in the upper reaches towards urban development in the lower catchment. Significant pressures which impact fish populations include man-made barriers and poor water quality. Low densities of salmon, trout, lamprey and eels are present within the catchment. Other species include minnow, stoneloach and three-spined stickleback (Matson *et al*., 2018)**.**

Freshwater pearl mussel

The NPWS *Margaritifera* Sensitive Area Map was consulted for the desk study (NPWS, 2017[54]). The proposed development is not within any freshwater pearl mussel catchments (FWPM). The nearest WPM catchment is Barrow (outside ZoI) which has ‘catchments with previous records of *Margaritifera*, but current status unknown’.

White-clawed crayfish

White-clawed crayfish have been recorded on the River Liffey from the upper catchment at Naas (south of the Proposed Development) to middle and lower catchments at Clane, and tributaries including the Rye Water (NBDC, 2022). These records are shown in Table 10.9, below.

[54] Margaritifera Sensitivities Area Map: https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=2fae3c393baa4b79b7dfb1e3c19f3fab

Table 10.9 Records of white-clawed crayfish within 5 km of the Proposed Development boundary (NBDC, 2022)

Watercourse (South to North) Nearest distance to Proposed Development	NGR	Year	Catchment	WFD Sub catchment	Downstream connectivity	Same catchment at Project
River Liffey (4.6 km south-east)	N922103	2013	Liffey and Dublin Bay	Liffey	No	Yes
River Liffey (2.93 km west)	N842194	2010	Liffey and Dublin Bay	Liffey	No	Yes
River Liffey at Castlekeely Ford (1.52 km east	N869216	2013	Liffey and Dublin Bay	Liffey	No	Yes
River Liffey at Clane (1.33 km north-east	N880270	2016	Liffey and Dublin Bay	Liffey	Yes (WB29)	Yes
Morell River (Tributary of Liffey)	N927288	2016	Liffey and Dublin Bay	Liffey	No	Yes
Rye Water at Maynooth (4.21 km west)	N930394	2016	Liffey and Dublin Bay	Rye Water	Yes (WB12 and WB13)	Yes

Invasive species

Records of floral and faunal invasive species (NBCD) are shown in Table 10.10, below.

Table 10.10 Records of Invasive species within 2 km of the Proposed Development boundary (NBCD 2022)

Common Name	Scientific Name	Species group	Designation	Impact
American mink	*Mustela vison*	terrestrial mammal	Regulation S.I. 477 (Ireland)	High
Brown rat	*Rattus norvegicus*	terrestrial mammal	Regulation S.I. 477 (Ireland)	High
Budapest slug	*Tandonia budapestensis*	mollusc	N/A	Medium
Cherry laurel	*Prunus laurocerasus*	flowering plant	N/A	High
Common garden snail	*Cornu aspersum*	mollusc	N/A	Medium
Eastern grey squirrel	*Sciurus carolinensis*	terrestrial mammal	EU Regulation No. 1143/2014 Regulation S.I. 477 (Ireland)	High
European rabbit	*Oryctolagus cuniculus*	terrestrial mammal	N/A	Medium
Fallow deer	*Dama dama*	terrestrial mammal	Regulation S.I. 477 (Ireland)	High
Greater, white-toothed shrew	*Crocidura russula*	terrestrial mammal	N/A	Medium
Japanese knotweed	*Reynoutria japonica*	flowering plant	Regulation S.I. 477 (Ireland)	High
Jenkins' spire snail	*Potamopyrgus antipodarum*	mollusc	N/A	Medium
New Zealand flatworm	*Arthurdendyus triangulatus*	flatworm	N/A	High
Parrot's-feather	*Myriophyllum aquaticum*	flowering plant	EU Regulation No. 1143/2014 Regulation S.I. 477	High
Spanish bluebell	*Hyacinthoides hispanica*	flowering plant	Regulation S.I. 477 (Ireland)	N/A
Sycamore	*Acer pseudoplatanus*	flowering plant	N/A	Medium
Three-cornered garlic	*Allium triquetrum*	flowering plant	Regulation S.I. 477 (Ireland)	Medium

10.3.2 Field survey results

10.3.2.1 Habitats

Habitats recorded across the study area are described below and shown in Figure 10.2A, Volume 4.

Habitats within the study area comprised a combination of natural, semi-natural and artificial habitats. No Habitats Directive Annex 1 habitats were recorded within the study area. An incidental record of devils-bit scabious was found at one location on Harristown Common (see Marsh Fritillary butterfly Section 10.3.2.10), within an area of wet grassland/fen, close to Dunstown substation at the south of the Proposed Development. The dominant habitats throughout the study area comprised improved agricultural grassland bordered by hedgerows. The habitat types recorded within the study area are as follows:

- Depositing lowland rivers (FW2);
- Canals (FW3);
- Drainage ditches (FW4);
- Improved agricultural grassland (GA1);
- Amenity grassland (GA2);
- Dry calcareous grassland (GS1);
- Dry meadows and grassy verges (GS2);
- Wet grassland (GS4);
- Arable crops (BC1);
- Building or Artificial (BL3);
- Spoil and bare ground (ED2);
- Recolonising bare ground (ED3);
- Reed and large sedge swamps (FS1);
- Scrub (WS1);
- Hedgerows (WL1);
- Treeline (WL2);
- Broadleaved woodland (WD1);
- Mixed broadleaved / conifer woodland (WD2);
- Conifer plantation (WD4);
- Wet willow-alder-ash woodland (WN6);
- Scattered trees and parkland (WD5); and
- Other artificial lakes and ponds (FL8).

Hedgerows (WL1)

Hedgerows were present lining the roadside along the majority of the cable route and in certain off-road sections of the Proposed Development route. Hedgerows were primarily in good condition and were dominated by hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), ash (*Fraxinus excelsior*), bramble (*Rubus fructicosus*), dog rose (*Rosa canina*) and cherry laurel (*Prunus laurocerasus*).

Broadleaved woodland (WD1)

Broadleaved woodland habitat was present in small areas predominantly in the northern extend of the project route. These habitats primarily consisted of ash, sessile oak (*Quercus petraea*), silver birch (*Betula pendula*), beech (*Fagus sylvatica*), hazel (*Corylus avellana*) and sycamore (*Acer pseudoplatanus*).

Scrub (WS1)

Areas of scrub habitat were present at the northern extend of the project route in close proximity to Kilcock Town and at the southern extent of the route. Scrub habitats consisted primarily of bramble, blackthorn, hazel, hawthorn, willow (*Salix* sp.), ivy (*Hedera helix*), thistle species (*Cirsium spp*.) and foxtail (*Alopecurus pratensis*).

Treeline (WL2)

Trees lines were present along the extend of the project route and in road and off-road sections of the Proposed Development route. Treelines typically consisted of ash, hazel, hawthorn, sessile oak, pedunculate oak (*Quercus* *robur*), sycamore and horse chestnut (*Aesculus hippocastanum*). Treelines along road edges typically had a hedgerow understory and there was evidence of ash dieback along the entire extent of the Proposed Development.

Depositing lowland rivers (FW2)

Several watercourses within the study area fall within this habitat category including the River Liffey, the Rye Water and the River Lyreen.

River Liffey Catchment

The Proposed Development crosses the main stem River Liffey (at WB37) and a number of its small and medium sized tributaries. The River Liffey had a variety of in-stream habitat features with flow types including run / riffle / pool sequence with slack areas and a mixture of substrates providing suitable habitat for different fish species of different age classes. Several tributaries such as the Lyreen, Clonshanbo and Baltracey include headwater reaches which were small and shallow which provide a mix of substrates and flows suitable for fish. Other unnamed watercourses were ephemeral, had been dredged and over deepened and provided few substrates for spawning or fish refuge. The River Liffey catchment waterbodies had vegetation typical of FW2, for example heavily vegetated banks with Himalayan balsam (*Impatiens glandulifera*), sedges and occasional willow species (Salix sp.). Emergent species such as common reeds (*Phragmites australis*), and floating vegetation such as pondweeds (*Potamogeton spp*.) were also present.

Rye Water Catchment

The Proposed Development crosses the Rye Water (at WB13) and a small tributary on the north outskirts of Kilcock (at WB12). The river was approximately 2 m wide at this point with good habitat including run/riffle flows and a variety of substrates. There was a high potential for salmonids, eels and white clawed crayfish to be present in this area. The Rye Water catchment waterbodies also had vegetation typical of FW2, such as emerging common reeds and sedges along the banks.

Several smaller watercourses, such as the Brides Stream (which the Proposed Development crosses WB10), were present in this area but were heavily modified, straightened and were culverted under roads or fields with limited potential for fish or invertebrates species of conservation concern. The Jenkinstown Stream had a mixture of habitats ranging from poor with in-stream features not suitable for fish to moderate with adequate flows and substrates that are suitable for fish. Two of the water crossing locations were polluted on the day of the surveys.

Canals (FW3)

Two of the watercourses within the study area fall within this habitat category, the Grand Canal and the Royal Canal, which are described below.

- The Grand Canal: The Proposed Development crosses the Grand Canal at WB38 and WB42 At these locations in the south of the Proposed Development the surrounding landscape was urban development. The straightened walled canal was approximately 8 m wide and 1 m deep with emergent vegetation such as common reeds, timothy (*Phleum pratense*), willowherb (*Epilobium sp*.) and common vetch (*Vicia sativa*) on either bank. Substrates were dominated by mud and silt. Free floating vegetation such as duckweed (*Lemnoideae sp*.) were also present, which is typical of FW3 canals.

- The Royal Canal: The Proposed Development crosses the Royal Canal at WB14 (north-west of Kilcock). At this location, the walled canal was approximately 1.5 m deep with clay / organic substrates not suitable for spawning. Emergent macrophytes were present typical of FW3 canals such as reeds and a sedge species (*Carex sp*.). Free floating macrophytes were also present such as water lilies (*Nymphaea sp.)*.

Drainage ditches (FW4)

A number of drainage ditches both wet and dry were recorded (waterbodies WB01, WB02, WB03, WB04, WB06, WB09, WB12, WB14, WB19, WB22, WB27, WB29). Several of these ephemeral ditches were not on the EPA maps tool application and were mostly associated with areas flowing alongside roads and housing developments or farmland drains. Many were heavily modified, artificial, straightened, narrow and dredged for flood prevention. Habitat features recorded stagnant water, shallow water depths and had vegetation and detritus covering the substrates Several were culverted under roads and fields and although hydrologically linked to larger downstream tributaries, many were dry when surveyed and unsuitable for fish or invertebrates. These had wetland vegetation typical of FW4 drainage ditches such as meadowsweet (*Filipendula ulmaria*) at WB19 and common reeds at WB29.

Dry meadows and grassy verges (GS2)

Small areas of dry meadow and grassy verge habitat were present along the project route. Roadside verges are mown to allow for vehicle drive visibility. These habitats are characterised by a variety of grass species including false oat-grass (*Arrhenatherum elatius*), Yorkshire fog (*Holcus lanatus*) and cock's foot (*Dactylis glomerata*). Further species include common knapweed (*Centaurea nigra*), white clover (*Trifolium repens*) and meadow foxtail (*Alopecurus pratensis*).

Wet grassland (GS4)

Wet grassland habitats were present in small areas through the northern and central extends of the project route. These habitats are present in areas of poorly drained pastureland and are grazed by cattle and sheep in some areas. Abundant species present in these habitats included soft rush (*Juncus effusus*), meadow sweet (*Filipendula ulmaria*), crested dogstail (*Cynosurus cristatus*) and marsh thistle (*Cirsium palustre*).

Improved agricultural grassland (GA1)

Improved agricultural grassland is the dominant habitat form within the study area along the project route. These agricultural fields are managed for hay production or grazed intensively by sheep and cattle. These habitats are dominated by perennial rye grass (*Lolium perenne*), Yorkshire fog, thistle sp., common nettle (*Urtica dioica*), crested dogstail and chickweed (*Stellaria media*).

Arable crops (BC1)

As the majority of the project route is in agricultural areas, arable crop habitats were present throughout the route. These habitats are managed for the production of cereal, root, lead, energy and / or fibre crops. Cereal crops such as barley and oats dominated the habitats used for arable crops along the project route.

Amenity grassland (GA2)

These habitats include playing fields and green areas within housing estates. Habitat within housing estates showed evidence of ornamental planting and regular cutting regimes. Small areas of amenity grassland were present through the project route with a particular prevalence in Nass Town. These amenity grassland habitats were dominated by daisy (*Bellis perennis*), plantains (*Plantago* sp.), yarrow (*Achillea millefolium*), and red clover (*Trifolium pratense*).

Building or Artificial (BL3)

This habitat classification includes all domestic, agricultural, industrial and community buildings and also includes areas covered by artificial surfaces such as roads. As over 80% of the project route is within road this habitat is dominant throughout the footprint of the Proposed Development. This habitat is also prevalent near and in built up urban areas such as Naas Town and is present at the Dunstown and Woodland substations.

Spoil and bare ground (ED3)

Small areas of recolonising bare ground were present through the project route and were particularly prevalent near urban areas

Recolonising bare ground (ED3)

Small areas of recolonising bare ground were present through the project route and were particularly prevalent near urban areas of Kilcock and Naas Town. These are areas of bare or disturbed ground, often in derelict sites, with over 50% vegetation cover. Vegetation recorded in these areas included common nettle, dandelion (*Taraxacum* sp.) and knotgrass (*Polygonum aviculare*).

Reed and large sedge swamps (FS1)

One area of reed and large sedge swamp was identified on the banks of the Royal Canal to the west of Naas Town. The Proposed Development will cross this area of the canal. The habitat was dominated by common reed (*Phragmites australis),* rosebay willowherb (*Chamaenerion angustifolium*) and silverweed (*Potentilla anserina*).

Conifer plantation (WD4)

There were three examples of conifer plantations along the Proposed Development. All three plantations were in close proximity to one another and were located to the northeast of Prosperous Town. These habitats were made up of over 75% conifer species for commercial use and are planted with a mix of pine species (*Pinus* sp.), larch species (*Larix* sp.) and spruce species such as sitka spruce (*Picea sitchensis*) and Norwegian spruce (*Picea abies*).

Wet willow-alder-ash woodland (WN6)

There was one habitat area of wet willow-alder-ash woodland located to the northeast of Prosperous Town. This habitat is made up of willow, alder and ash tree species, common reed, common nettle, dogwood (*Cornus sangunea*) and horse-tail (*Equisetum sp.*) with the Ballynagappagh River running through it. The woodland is not considered to be Annex I as the wet woodland has been planted.

Mixed broadleaved / conifer woodland (WD2)

There was one small area of mixed broadleaved / conifer woodland along the project route which was located to the northeast of Prosperous Town. This was an immature plantation of sequentially planted trees with drains every 10 m and a mixed understory of common nettle and bramble.

Scattered trees and parkland (WD5)

There were two examples of this habitat located to the southwest of Naas Town and at the Dunstown substation. These habitats were in a small park area, planted with wildflowers, within a housing estate and in a small area to the east of the Dunstown substation.

Dry calcareous and neutral grassland (GS1)

Areas of dry calcareous grassland were present at the northern extend of the project route, in particular around the Woodland substation. This grassland comprised of foxtail (Alopecurus pratensis), cock's foot (*Dactylis glomerata*), perennial rye grass (*Lolium perenne*), creeping buttercup (*Ranunculus repens*), meadow buttercup (*Ranunculus acris*), soft rush (*Juncus effusus*), bush vetch (*Vicia sepium*), meadow vetchling (*Lathyrus pratensis*), knapweed (*Centaurea nigra*), ragwort (*Jacobaea vulgaris),* greater plantain (*Plantago major*), self heal (*Prunella vulgaris*), thistle sp. and common nettle sp. GA1 was scattered within the GS1 in localised areas and was characterised by areas more densely dominated by perennial rye grass. None of these species are rare or notable or are strong indicators of calcareous grassland.

Other artificial lakes and ponds (FL8)

There was a pond at WB5, where eDNA sampling for smooth newt was carried out at. Osberstown attenuation pond is a recently constructed waterbody along the M7, approximately 50 m to the east of Millennium Park on the northwest suburbs of Naas (grid reference: N 88162 21266), but which was not possible to survey given protective boundary fencing.

Ground Water Dependent Terrestrial Ecosystems (GWDTE)

Wet grassland (GS4) and wet willow-alder- woodland (WN6) are Ground Water Dependent Ecosystems (GWDTE). These GWDTE were recorded at a number of locations and those that were within 250 m of the Proposed Development are shown in Figure 10.2A, Volume 4 and detailed in Table 10.11. Further information is presented in Chapter 11.

Table 10.11 Locations of ground water dependent ecosystems in relation to the Proposed Development

GWDTE site number (*potential connectivity)	Location of GWDTE in relation to the nearest landmark	GWDTE Distance from route	Grid ref
1	1.4 km west of Prosperous	236 m south	N 84745 27498
2*	Western suburb of Naas	0 m along the route to the west Naas.	N 88044 19009
3.1	Adjacent to Dunstown substation GWDTE is part of Harristown cNHA	Cable route is 240 m west of PF1 rich fen and flush habitat, part of Harristown cNHA (edge of route width) at south of site.	N 87763 12623
3.2	770 m north of the boundary of Dunstown substation GWDTE is part of part of Harristown cNHA	Cable route is 233 m north-west of G4 wet grassland, part of Harristown cNHA at south of site.	N 87773 12748
4	2.7 km southwest of Batterstown	On route (passes through wet grassland field)	N 94394 46764
5*	Northwest suburb of Naas	0 m immediately adjacent. East of Naas. Grassland	N 88410 21146
6*	0.28 km south of Rathcoffey	0 m adjacent	N 87094 31950
7	0.94 km south of Rathoffey	100 m east of the route	N 87055 31761
8	2.43 km northeast of Kilcloon	100 m east of the route.	N 94527 45746
9	0.67 km west of the western suburns of Sallins	On the route	N 88022 22987
10	1.45 km east of Prosperous	0 m adjacent	N 84713 27284
11	0.36 km west of Prosperous	0 m adjacent	N 84760 27409

Habitat Condition Assessment

No Annex I habitats were identified during the desk study. However, one meadow was identified during the initial walkover survey as a potential Lowland hay meadow (i.e. an Annex I grassland) and required a further more detailed survey. This meadow was located at the northern extent of the Proposed Development approximately 2.2 km south of Woodland substation. A condition assessment of this meadow took place on 5th May 2022 to assess the species present, including indicators or grassland quality, within three 2 x 2 m plots, which included the surrounding 20 m area.

The plot data were analysed using ERICA (Perrin *et al.*, 2018) and found the meadow to resemble an improved grassland rather than an Annex 1 Lowland hay meadow. All three plots gave the community type as Yorkshire fog (*Holcus lanatus*) – perennial rye grass *(Lolium perenne*) and the group type as creeping bent (*Agrostis stolonifera*) – creeping buttercup (*Ranunculus repens*). Overall, the three plots included one high quality indicator for lowland hay meadow (yellow rattle *Rhinanthus minor*), two positive indicators (ribwort plantain *Plantago lanceolata* and meadow foxtail *Alopecurus pratensis*) and two negative indicators (perennial rye grass *Lolium perenne* and white clover *Trifolium repens).* The results are summarised in Table 10.12 and shown in full in Appendix 10.3, Volume 3.

Table 10.12 Summary of three grassland plots taken to establish the grassland community type

Plot Number	Grid Reference	ITM Reference	Community (ERICA code)	Group	Notes on species composition
Q1	N 94318 45695	X: 694261 Y: 745718	*Holcus lanatus – Lolium perenne* (Erica code GL2)	*Agrostis stolonifera – Ranunculus repens*	Includes: two positive indicators and one negative indicator
Q2	N 94349 45747	X: 694292 Y: 745770	*Holcus lanatus – Lolium perenne (*Erica code GL2)	*Agrostis stolonifera – Ranunculus repens*	Includes: one high quality indicator, two positive indicators and two negative indicators.
Q3	N 94328 45850	X: 694270 Y: 245850	*Holcus lanatus – Lolium perenne* (Erica code GL2)	*Agrostis stolonifera – Ranunculus repens*	Includes: one high quality indicator, one positive indicator and one negative indicators.

10.3.2.2 Fauna

Wintering birds

The winter bird surveys recorded infrequent occurrences of bird species across the 800 m study area, the results of which are summarised in Table 10.13, below. Initially the survey area was larger than 800 m to encompass all four proposed route options. The results in Table 10.13 show the birds within 800 m of the preferred route option (i.e. the Proposed Development). The wintering bird surveys recorded a total of 21 species across the study area, including six species listed as SCI for SPAs within 50 km, two Annex I species, four Red listed bird species and ten Amber list bird species.

Table 10.13 below provides a summary of the findings of the winter bird surveys with respect to those species which are of highest conservation concern, and were recorded during winter bird surveys:

- Special Conservation Interests (SCI) of wintering populations of SPAs in the potential ZoI of the Proposed Developments and those further way.
- Species listed under Annex I of the Birds Directive (2009/147/EC).
- Red and Amber BoCCI species listed for their wintering populations.

The results of the winter bird surveys are shown in Figure 10.3, Volume 4 and Appendix 10.2, Volume 3.

Table 10.13: Birds of Conservation Concern Recorded during the Winter Bird Survey

Common name/Latin name/BTO Code	Peak count	Distribution in the study area	Conservation Importance		
			BoCCI	**Annex I**	**Nearest SPA designated for SCI species, with nearest distance to Proposed Development**
Black-headed gull ***Chroicocephalus ridibundus* (BH)**	300	Recorded across the study area on 14 occasions primarily foraging / loafing in lakes / ponds in aggregations ranging from 1 to 45 birds. The majority of records were in waterbodies away from the Proposed Development.	Amber	-	South Dublin Bay and River Tolka Estuary SPA (c25.4 km)
Lesser black backed gull ***Larus fuscus* (LB)**	42	Recorded twice foraging in fields.	Amber	-	Poulaphouca Reservoir SPA (c8 km)
Cormorant ***Phalacrocorax carbo* (CA)**	1	Recorded on one occasion along the Grand Canal.	Amber	-	-
Coot ***Fulica atra* (CO)**	10	Concentrated within several ponds and lakes across the study area.	Amber	-	-
Herring gull ***Larus argentatus* (HG)**	2	Recorded on eleven occasions mainly in flight or foraging in ponds or fields.	Amber	-	The Murrough SPA (c44 km)
Mallard ***Anas platyrhynchos* (MA)**	50	Recorded foraging / loafing frequently mainly within ponds and lakes.	Amber	-	Dundalk Bay SPA (c47.4 km NW)
Golden plover *Pluvialis apricaria* (GP)	7	Recorded on one occasion within the study area feeding in recently sown winter barley.	Red	Yes	North Bull Island SPA (28.7 km SW)
Linnet ***Carduelis cannabina* (LT)**	90	Recording on two occasions in flight and foraging in fields / marginal re-colonising land.	Amber	-	-
Kingfisher ***Alcedo atthis* (KF)**	1	Recorded on two occasions along the River Liffey. Both records were observed from the Sallins Bypass bridge.	Amber	Yes	The River Boyne and River Blackwater SPA (18.7 km NW)
Mute swan ***Cygnus olor* (MS)**	9	Recorded frequently within lakes and ponds. Resident birds.	Amber	-	-
Kestrel ***Falco tinnunculus* (K.)**	1	Recorded hunting on two occasions.	Red	-	-
Redwing ***Turdus iliacus* (RE)**	110	Recorded on two occasions foraging on stubble.	Red	-	-
Snipe ***Gallinago gallinago* (SN)**	10	Recorded twice within wet/ rank grassland.	Red	-	-
Teal ***Anas crecca* (T.)**	9	Recorded on two occasions within ponds.	Amber	-	North Bull Island SPA (28.7 km)

'-' means not recorded/not applicable

Six bird species listed as wintering SCIs for SPAs in the vicinity were recorded during the survey: black-headed gull, lesser black backed gull, herring gull, mallard, golden plover and teal. The nearest SPA to any SCI population, is the Poulaphouca Reservoir (8 km distant), for which lesser black-backed gull is an SCI species and is within the foraging range of this species (however, 82% of the works are proposed to take place within the road and the habitat within and adjacent to the Proposed Development is unsuitable for them as it comprises predominantly trees and hedgerows). Kingfisher and golden plover were the only bird species recorded that are listed on Annex I of the Birds Directive (2009/147/EC). Four Red listed bird species were recorded: golden plover, kestrel, redwing and snipe. Ten Amber list bird species were recorded: black-headed gull, lesser black backed gull, cormorant, coot, herring gull, mallard, linnet, kingfisher, mute swan and teal.

Hen-harrier winter roost survey

Vantage point surveys for roosting hen harrier within 2 km of the Proposed Development were conducted monthly between October 2021 and March 2022. No hen harrier observations were recorded during the surveys. Several other notable and protected species were recorded during the VP surveys, shown in Table 10.14.

Table 10.14: Protected and notable species recorded during VP surveys

Common name	Scientific name	Conservation Status
Lapwing	*Vanellus vanellus*	Red list
Golden plover	*Pluvialis apricaria*	Red list, Annex 1
Merlin	*Falco columbarius*	Amber list, Annex 1
Peregrine	*Falco peregrinus*	Special Conservation Interest (SCI of Wicklow Mountains SPA)
Snipe	*Gallinago gallinago*	Red list
Whooper swan	*Cygnus cygnus*	Amber list, Annex 1

All incidental records were recorded outside the ZoI / study area for the main wintering bird survey and included either birds in flight or utilising bog habitats away from the Proposed Development. Since no hen harrier are known to utilise winter roosting habitat within 2 km of the Proposed Development, no disturbance impacts to winter roosting hen harrier are predicted. Therefore, no significant effects on winter roosting hen harrier are predicted from the construction or operational phase of the Proposed Development and hen harrier will not be considered further in this PECR.

Breeding birds

Three visits for breeding bird surveys were carried out across seventeen transects and a total of 54 species were recorded, including two Annex I species, seven Red listed bird species and 14 Amber listed bird species. The breeding bird results are tabulated in Table 10.15 below and shown in Figure 10.4, Volume 4.

Table 10.15: Breeding bird species of Conservation Concern or listed on Annex I of the Birds Directive recorded within the study area

Common name	Scientific name	Minimum number of breeding territories Visit 1	Minimum number of breeding territories Visit 2	Minimum number of breeding territories Visit 3	BTO Breeding Evidence	BOCC	Birds Directive	Nearest SPA designated for Breeding SCI Populations
Cormorant	*Phalacrocorax carbo*	1	0	0	Non-breeding	Amber	-	Skerries Island SPA, 40 km from proposed development
Goldcrest	*Regulus regulus*	11	19	13	Confirmed breeding	Amber	-	No breeding populations are SCIs of Irish SPAs
Grey wagtail	*Motacilla cinerea*	0	0	6	Probable breeding	Red	-	No breeding populations are SCIs of Irish SPAs
Greenfinch	*Chloris chloris*	3	4	0	Probable breeding	Amber	-	Not Designated for any SPAs
Herring gull	*Larus argentatus*	0	2	0	Non-breeding	Amber	-	River Nanny Estuary and Shore SPA, 30 km from proposed development
House martin	*Delichon urbicum*	0	0	19	Probable breeding	Amber	-	No breeding populations are SCIs of Irish SPAs
House sparrow	*Passer domesticus*	43	21	27	Probable breeding	Amber	-	No breeding populations are SCIs of Irish SPAs
Kingfisher	*Alcedo atthis*	1	2	0	Possible breeder	Amber	Annex I	River Boyne and River Blackwater SPA, 29 km from proposed development
Lapwing	*Vanellus vanellus*	4	3	2	Probable breeder	Red	-	Termoncarragh Bay SPA, 230 km

Common name	Scientific name	Minimum number of breeding territories Visit 1	Minimum number of breeding territories Visit 2	Minimum number of breeding territories Visit 3	BTO Breeding Evidence	BOCC	Birds Directive	Nearest SPA designated for Breeding SCI Populations
								from proposed development
Linnet	*Linaria cannabina*	0	5	3	Probable breeder	Amber	-	No breeding populations are SCIs of Irish SPAs
Little egret	*Egretta garzetta*	0	0	1	No-breeding	-	Annex I	No breeding populations are SCIs of Irish SPAs
Mallard	*Anas platyrhynchos*	3	19	2	Confirmed breeding	Amber	-	No breeding populations are SCIs of Irish SPAs
Meadow pipit	*Anthus pratensis*	2	9	4	Probable breeding	Red	-	No breeding populations are SCIs of Irish SPAs
Mute swan	*Cygnus olor*	0	1	3	Probable breeding	Amber	-	No breeding populations are SCIs of Irish SPAs
Skylark	*Alauda arvensis*	1	1	1	Possible breeder	Amber	-	No breeding populations are SCIs of Irish SPAs
Snipe	*Gallinago gallinago*	0	1	0	Non breeder	Red	-	No breeding populations are SCIs of Irish SPAs
Starling	*Sturnus vulgaris*	47	44	87	Probable breeding	Amber	-	No breeding populations are SCIs of Irish SPAs
Swallow	*Hirundo rustica*	0	4	28	Probable breeding	Amber	-	No breeding populations are SCIs of Irish SPAs
Swift	*Apus apus*	0	0	9	Non-breeding	Red	-	No breeding populations are SCIs of Irish SPAs

Common name	Scientific name	Minimum number of breeding territories Visit 1	Minimum number of breeding territories Visit 2	Minimum number of breeding territories Visit 3	BTO Breeding Evidence	BOCC	Birds Directive	Nearest SPA designated for Breeding SCI Populations
Willow warbler	*Phylloscopus trochilus*	2	20	8	Probable breeding	Amber	-	No breeding populations are SCIs of Irish SPAs
Woodcock	*Scolopax rusticola*	0	1	0	Non-breeding	Red	-	No breeding populations are SCIs of Irish SPAs
Yellowhammer	*Emberiza citrinella*	2	3	0	Possible breeding	Red	-	No breeding populations are SCIs of Irish SPAs

Bats

Identification of bat Potential Roost Features

The ground level assessments identified a total of 74 trees and six individual groups of trees to have potential roost features (PRF) for bats, as follows:

- 25 trees and one beech tree group were assessed as having high potential to support roosting bats;
- 46 trees and five groups of trees were assessed as having moderate potential to support roosting bats; and
- three trees were assessed as having low potential to support roosting bats.

These trees are shown in Figure 5, Appendix 10.6. The buildings within the survey area did not have features suitable for roosting bats, and therefore had negligible potential to support bats.

Static detector surveys

Static detectors were deployed along the Proposed Development at twelve locations with potential to support roosting, commuting and foraging bats. Habitat descriptions at each static location are shown in Table 10.16. The percentage breakdown of the total number of passes of bats recorded at each static location is shown in Figure 10.5 Volume 4, and the average number of passes per night by each species in each deployment for each of these locations is provided in Table 10.16. The static detectors recorded for 139 nights in total, across the ZoI of the Proposed Development.

Table 10.16: Habitat description at each static detector location

Static bat detector location number	Irish Grid Reference	Description of habitat
Location 1	N 88212 16261	Static located in treeline dominated by ash and beech trees with hawthorn understorey. Agricultural field to the east of treeline and R448 road to the west.
Location 2a	N 87530 25055	Static located in treeline to the east of Millicent Road. Treeline dominated by ash, hawthorn and oak. Agricultural field to the east of treeline and Longtown_Demesne watercourse to the south.
Location 2b	N 87647 24996	Static located in residential garden, with immature tree line of ash and mature treeline of sycamore and ash to the east. Longtown_Demesne watercourse adjacent to the north.
Location 3	N 87557 25586	Static located within mature tree line of oak, ash and hawthorn with Millicent Road to the east and agricultural field to the west.
Location 4	N 84984 27268	Static located in hedgerow dominated by blackthorn, and hazel. Hedgerow boarders agricultural field to the south and R403 road to the north.
Location 5	N 86082 30256	Static located in hedgerow dominated by blackthorn, hawthorn and goat willow with frequent mature ash trees interspaced along hedgerow. Hedgerow borders agricultural field to the northeast and rural road to the southwest.
Location 6	N 87253 32602	Static located in treeline dominated by mature ash trees. Treeline borders the R407 road to the west and a large agricultural field to the east.

Static bat detector location number	Irish Grid Reference	Description of habitat
Location 7	N 89391 44485	Static located in stand of mature ash trees bordered by hedgerow dominated by hawthorn and blackthorn. Agricultural field adjacent to treeline to the east and R125 road to the west of treeline.
Location 8	N 90639 46208	Static located in treeline dominated by oak, beech and ash. Residential properties with large hedges and treelines are located to the south of static with R125 road in between. Agricultural field located directly to the north.
Location 9	N 91876 45515	Static located in treeline of sycamore, ash and elder with low hedge of bramble, blackthorn and hawthorn. An abandoned residential property is to the northwest of the static with small areas of grassland and treeline surrounding it. R156 road is directly adjacent to the treeline to the southeast.
Location 10	N 94191 45411	Static located on treeline of ash and oak with agricultural fields surrounding the treeline. Low hedge of hawthorn present.
Location 11	N 84068 27871	Static located in treeline bordering agricultural fields. Treeline dominated by ash, oak, ivy and hawthorn.

The static detectors recorded the following species:

- Common pipistrelle *Pipistrellus pipistrellus;*
- Soprano pipistrelle *Pipistrellus pygmaeus;*
- Nathusius' pipistrelle *Pipistrellus nathusii;*
- Leisler's bat *Nyctalus leisleri;*
- Brown long-eared bat *Plecotus auritus;* and
- Unidentified *Myotis spp.*

The proportion of bat activity recorded for each bat species for all the static locations based on their average number of passes per night is shown in Chart 1. In summary, bat activity was recorded for at least six species along the Proposed Development comprising common pipistrelle (66%), soprano pipistrelle (17%), Leisler's bat (14%) *Myotis spp.* (1%), *Pipistrellus* sp. (1%), brown long-eared bat (<1%) and unconfirmed species (<1%).

Brown long-eared bat was recorded at locations three, four and six. *Myotis spp.* were recorded in relatively low numbers at all locations apart from location eight where no calls were recorded. All other species were recorded (at various activity levels) at all sites.

In summary (Chart 2), bat activity was recorded across all 12 locations with the most activity recorded at location 8 (25%) and the least recorded at Site 2 (1.5%).

There were no Annex II Lesser Horseshoe bat species recorded during the static survey period, as the ZoI of the Proposed Development is outside the range for the species

Chart 1: Proportion of average passes per night of bat activity associated with each bat species recorded between May and August 2022.

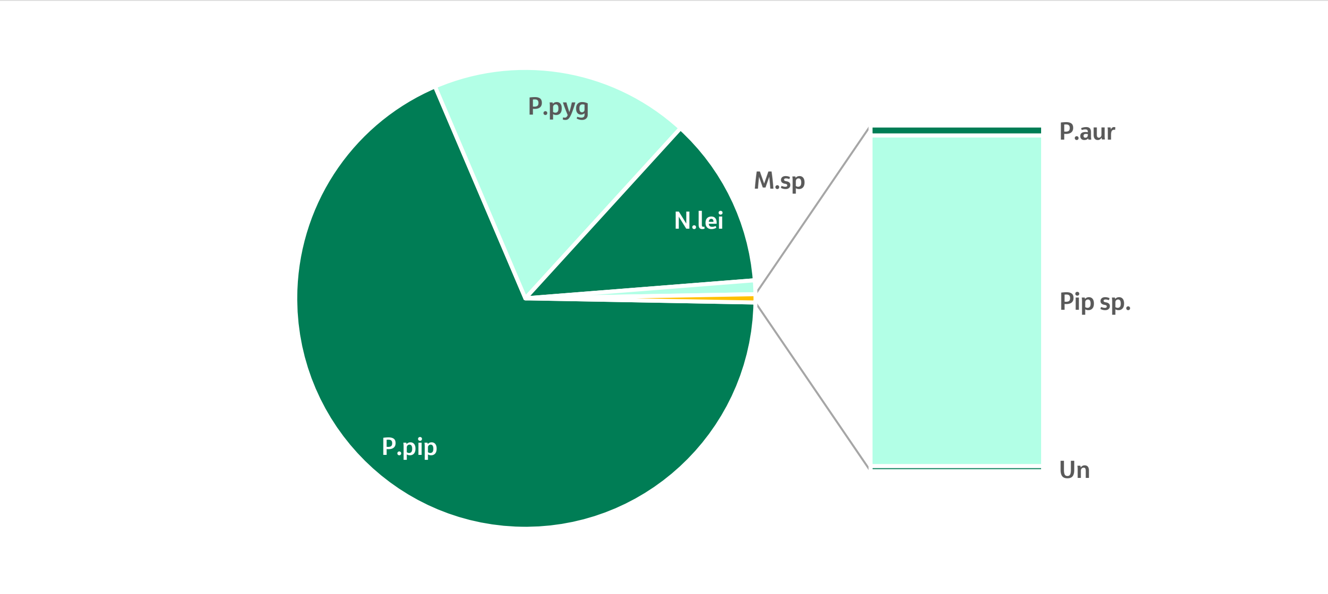
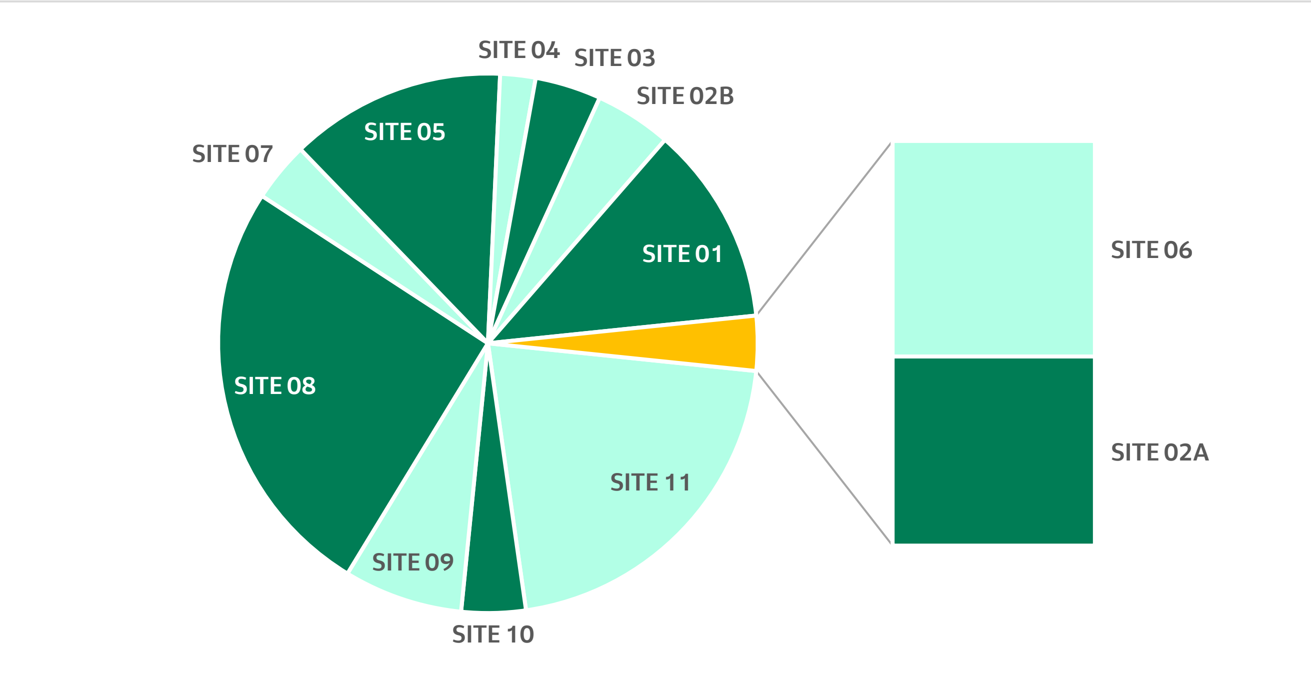


Chart 2: Proportion of average passes per night of bat activity associated with each static bat detector location surveyed between May and August 2022.



Emergency / re-entry surveys

No bat roosts were recorded in any trees. Bat foraging was relatively constant along the treelines surveyed, see Table 10.17 for a summary of bat species recorded at each location. The hedgerows and treelines are considered to provide suitable foraging and commuting habitat for common bat species present within the study area i.e. common and soprano pipistrelle and Leisler's bat. *Myotis* spp were also recorded.

Table 10.17 Summary of bat species recorded flying outside trees but not emerging or re-entering trees during emergence / re-entry surveys (- indicated No)

Location	Bat species recorded flying outside trees but not emerging or re-entering during emergence / re-entry surveys						
	P.pip	P.pyg	P sp.	N.lei	M sp.	P.aur	P.nat
Site 01	YES	YES	-	YES	YES	YES	-
Site 02A	YES	YES	-	YES	YES	-	-
Site 02B	YES	YES	-	YES	YES	YES	-
Site 03	YES	YES	-	YES	YES	YES	-
Site 04	YES	YES	-	YES	-	YES	-
Site 05	YES	YES	-	YES	-	YES	YES?
Site 06	YES	YES	-	YES	YES	YES?	-
Site 07	YES	YES	-	YES	YES	-	-
Site 08	YES	YES	-	YES	YES	-	YES
Site 09	YES	YES	-	YES	-	YES	-
Site 10	YES	-	-	YES	YES	-	YES
Site 11	YES	YES	-	YES	YES	-	YES

Mammals (Otter and Badger)

Otter

Suitable habitats for resting, commuting and foraging otter were recorded throughout the survey area, including wet drainage ditches, lowland rivers and broadleaved woodland. One potential otter holt was identified during the 2021/22 survey season which falls within the Planning Application Boundary and an otter slide was recorded upstream from the potential holt, as follows (Figure 10.7, Volume 4).

- A potential otter holt was recorded along the River Liffey at approximately ITM E687929 N724445 (this grid reference lies along the route the proposed HDD where it crosses the River Liffey, WB35). This was a single hole on a bank overgrown with ivy. The entrance to the holt was well worn.

- A single otter slide close to the bank of the River Liffey at approximately ITM E687940, N724511 (this grid reference lies approximately 16 m east of the cable route.

Badger

Habitat suitable for badger to excavate their setts was present within the survey area, including areas of scrub and broadleaved woodland. Hedgerows, treelines, grassland and broadleaved woodland all provide suitable foraging and commuting habitats for badger.

Multiple signs of badger were recorded throughout the survey area, including prints, latrines, snuffle holes, a live sighting, four potential badger holes, three inactive outlier setts and two active main setts. One potential badger hole and one badger sett, which was identified as an active main sett at the time of survey, were recorded within the Proposed Development area. Further to this, two potential badger holes were identified within 30 m of the Proposed Development area (see Table 10.18). A confidential figure has been produced for badgers (Figure 10.6) but is not being published.

Table 10.18: Badger Survey Results

Sign Number	Sign	Distance from Planning Application Boundary (PAB)	Survey notes
1	Potential sett	Within PAB	Disused. Overgrown vegetation but path and potential bedding present.
2	Sett	32 m from PAB	Active main sett. Main entrance behind thick hedge and dry ditch on other side. Field side one entrance and evidence of two crowning holes. Well-worn badger path within scrub behind fence. Fresh spoil heap.
3	Sett	40 m from PAB	Active main sett. 11 m from sett no. 2. Flattened surroundings.
4	Sett	50 m from PAB	Disused. One entrance. Appears to have been filled in.
5	Sett	Within PAB	Disused. Six entrances. Debris in tunnels. Was active during an earlier survey but disused when most recently surveyed.
6	Latrine and tracks	Within PAB	Badger latrine on edge of arable field, looks to be mammal track leading from field into hedgerow.
7	Sighting - Alive- two adults	Within PAB	Two adults observed during bat survey. Both travelled along hedge from the east at 21:45 with one passing through hedge opening at oak tree and the other spooked towards drain. Prints noted along tramline towards field gate also.
8	Latrine	6 m from PAB	Badger latrine near margin of field.
9	Potential sett	61 m from the PAB	One entrance under ash tree. No field signs for badger around entrance, no rabbit droppings. Possibly fox or badger.
10	Sett	150 m from PAB	Active main sett. 13 entrances, mammal paths and fresh bedding found.
11	Prints	Within PAB	Badger print in mud along road. Badger latrine found 93 m from works in this same location.

Mammals (other protected small mammals)

A dead red squirrel was recorded within the PAB (see Figure 10.7, Volume 4). Although red squirrel typically prefers conifer woodland habitat, of which none was recorded within the survey area, they can be found in broadleaved woodland which was recorded within the survey area.

Other protected mammals such as the Irish stoat, Irish hare and hedgehog are likely to be present within the study area within the areas of suitable habitat (i.e. agricultural fields bordered by hedgerows, treelines, etc.). Hedgehog have been recorded within 2 km of the study area previously. Pygmy shrews are potentially present in the wet grassland.

Amphibians and Reptiles

During the multi-disciplinary walkover surveys, no incidental sightings of amphibians were recorded across the survey area. Although no direct observations of amphibians were recorded, habitats for common frog (*Rana temporaria*) and smooth newt were identified and are likely to be widespread across the study area, in particular near wetter areas of fields, tall herb swamps and scrub. The wet ditches and ponds identified throughout the survey area could provide adequate breeding habitat for these amphibians.

Two eDNA surveys were carried out to determine the presence or likely absence of smooth newt WB05 and at WB19; WB05 was an ephemeral pond and WB19 was at the Lyreen, a tributary of the River Lyreen. The results of the eDNA surveys were negative for smooth newt, indicating it is likely absent at both these waterbodies. The full results of the eDNA surveys are shown in Appendix 10.4, Volume 3 and the locations of the waterbodies sampled is shown in Figure 10.8, Volume 4.

During the multi-disciplinary walkover surveys, no incidental sightings of common lizard were recorded across the survey area. Although no direct observations of reptiles were recorded, lizards are likely to be widespread across the study area where suitable habitat exists. This includes breeding habitat such as scrub, hedgerows, dry meadows and grassy verges. Stonewalls, which offer suitable basking and hibernation habitat, were also identified within the study area.

Fish

At or near to waterbody crossings points, or at smaller watercourses, a visual assessment was carried out over a 200 m stretch of the waterbodies' potential to support fish of conservation interest (Atlantic salmon, European eel and lampreys). Of the 46 waterbodies assessed, the majority of waterbodies (29) were assessed to have little supporting habitat and / or showed signs of pollution (cloudy water and / or fine grey sediments covering the substrate). Seventeen were considered to have the potential to support protected and notable fish species due to presence of supporting habitat (variety in sediment sizes and refugia, silt beds for juvenile lamprey and unpolluted water). Due to the high quality of supporting habitat and absence of pollution, five were assessed as having high potential to support protected and notable species such that HDD will be used to cross these waterbodies and as such did not require eDNA sampling. Where an assay was available eDNA was carried out at the remaining eleven waterbodies. No assay is currently available for lamprey. Supporting habitat for lamprey, in the form of silt beds, was present in a tributary of the River Liffey (WB32) and a tributary of the Tolka (WB01 although the Proposed Development does not cross this latter waterbody. Waterbody assessments are presented in Appendix 10.4, Volume 3 and locations of Waterbodies sampled is shown in Figure 10.8, Volume 4.

The summary of the positive result of the eDNA surveys for fish is as follows:

- Atlantic salmon was present on Rye Water_020_Padinstown (WB12) and Jenkinstown Stream_010 (WB08); and

- European eel was present at Jenkinstown Stream_010 (WB08) and two tributaries of the River Liffey (WB 32 and WB46).

White-clawed crayfish

White-clawed crayfish occurs in areas with relatively hard, mineral rich water on calcareous and rapidly weathering rocks. It is found in a wide variety of environments including canals, streams, rivers lakes, reservoirs and water filled quarries. It is typically found in watercourses of 0.75 to 1.25 m deep but may occur in very shallow streams (about 5 cm deep) and in deeper rivers (2.5 m deep). The species typically occupies cryptic habitats under rocks and submerged logs, among tree roots, algae, and macrophytes, although it usually emerges to forage for food. Juveniles may be found among cobbles and detritus. Adults may burrow into suitable substrates, particularly in the winter (Holdich, 2003).

The results of the eDNA sampling confirmed the presences of white-clawed crayfish in the following two waterbodies:

- WB46 (tributary of the River Liffey); and
- WB32 (tributary of the River Liffey) which lies 1.7 km north-west of Castlefen.

The full results of the white-clawed crayfish eDNA surveys are shown in Appendix 10.10.

Marsh fritillary butterfly

Marsh fritillary (*Euphydryas aurinia*) is listed on Annex II of the EU Habitats Directive. The species has a wide but patchy distribution across Ireland (Phelan *et al*, 2021). It has experienced a population decline due to loss of suitable habitat. It is more common in the midlands and west of Ireland. Marsh fritillary adult butterflies feed on plants including buttercups (*Ranunculus* spp.), common knapweed and tormentil. However, caterpillars are monophagous and only feed on devil's bit scabious (DBS) (*Succisa pratensis*). Marsh fritillary is found in damp or heathy grassland dominated by tussock forming grasses. Despite known long distance dispersal (Zimmerman *et al*., 2011) adults rarely fly more than 50-100 m but a small proportion can disperse further (Butterfly Conservation, Marsh Fritillary factsheet). The nearest SAC designated for this species is Ballynafagh Lake SAC, which lies 1.6 km to the west of the Proposed Development at its nearest location, and well beyond the expected dispersal range of this species.

Marsh fritillary was not recorded during the site visits, although its main food source devil's bit scabious was recorded at one location on Harristown Common (Grid Reference N 87879 12976), which lies c462 m from the Proposed Development at its nearest location and 17 km from Ballynafagh Lake SAC at its nearest point. The location of the devil's bit scabious is well beyond the footprint of the Proposed Development and separated from it by an amenity sports pitch.

Invasive plant species

The following Third Schedule invasive species were recorded in the 2022 survey. Locations are shown in Figure 10.9 Volume 4.

- Himalayan balsam (*Impatiens glandulifera)* along route of Proposed Development between chainage (ch) 37000 and 37250 at N 87990 24456. Chainage along the cable route is shown in Figure 2, Appendix B of the Appropriate Assessment Screening Report (Jacobs, 2023a). Two other stands noted at ch 39000 (at N 87995 23009 and N 88030 22991) c50 m west of the Proposed Development. There could be more in this vicinity, unrecorded; and
- Giant rhubarb (*Gunnera tinctoria*) – ornamental planting by a pond, c. 120 m from cable route.

Other non-Third Schedule species that were recorded and are reported for completeness only are as follows:

- Montbretia (*Crocosmia crocosmilflora)* – in garden;
- Buddleia (*Buddleja* sp) – in garden;
- Cotoneaster *(Cotoneaster* sp.) – in hedgerow c. 15 m from cable route; and
- Sycamore – dispersed throughout the Proposed Development (not included on Figure 9, Appendix 10.11 for that reason).

Such non-scheduled populations are not known to pose risk of impact to protected species or those of conservation concern.

10.3.2.3 Evaluation

The key ecological receptors in this report have been valued within a defined geographical context (international, national, county, local importance), taking cognisance of the methodology described in CIEEM's Guidelines for Ecological Impact Assessment in the UK and Ireland (2018). The categories of ecological receptor valuation are defined in Appendix 10.3 (NRA, 2009) where local importance of a receptor is further defined as 'higher' or 'lower'. The value of the ecological receptors described in this report are shown in Table 10.19, below. Receptors with a value of less than local importance (lower value), are not considered to be 'Important Ecological Feature' and are not included in this PECR. However, it does not mean they have no ecological value, rather that they are widespread, unthreatened and resilient to project impacts and will remain viable and sustainable during construction and operation.

All designated areas for nature conservation that lie within the ZoI of the Proposed Development are considered to be KERs given that they are sites selected specifically for biodiversity conservation and are potentially at risk of impacts from the Proposed Development. Those designated areas for nature conservation that lie beyond the ZoI of the Proposed Development are not considered to be at risk of impact and are therefore, not considered to be KERs.

Non-native invasive plant species are not considered as an Important Ecological Feature, as they can result in negative effects on biodiversity and it is in that context they are included within the impact assessment.

Table 10.19 Ecological Evaluation of Important Ecological Features. Those important for this project are shown in grey.

Ecological Receptor	Ecological Valuation	Important ecological feature for this project
Designated Areas for Nature Conservation		
Ballynafagh Bog SAC	International Importance	No
Ballynafagh Lake SPA	International Importance	No
Moulds Bog SAC	International Importance	No
Rye Water Valley / Carton SAC	International Importance	Yes
Poulaphouca Reservoir SPA	International Importance	No
Pollardstown Fen SAC	International Importance	No
River Boyne and River Blackwater SAC	International Importance	No
River Boyne and River Blackwater SPA	International Importance	No
Depositing lowland rivers (FW2)	International Importance – connection to the Rye Water Valley / Carton SAC	Yes
Hodgestown Bog cHNA	National Importance	Yes
The Royal Canal pNHA	National Importance	Yes
Grand Canal pNHA	National Importance	Yes
Liffey Valley Meander Belt pNHA	National Importance	No
Liffey at Osberstown pNHA	National Importance	No
Ballynafagh Bog pNHA / SAC	National Importance	No
Donadea Wood pNHA	National Importance	No
Ballynafagh Lake pNHA/SAC	National Importance	No
Harristown Common cNHA	National Importance	Yes
Hedgerows (WL1) species rich	County Importance	Yes
Hedgerows (WL1) species poor	Local Importance (Higher Value)	Yes
Broadleaved woodland (WD1)	Local Importance (Higher Value)	Yes
Scrub (WS1)	Local Importance (Higher Value)	Yes
Treeline (WL2)	Local Importance (Higher Value)	Yes
Canals (FW3)	Local Importance (Higher value)	Yes
Drainage ditches (FW4)	Local Importance (Higher Value)	Yes
Dry meadows and grassy verges (GS2)	Local Importance (Higher Value)	Yes
Wet grassland (GS4)	Local Importance (Higher Value)	Yes
Recolonising bareground (ED3)	Local Importance (Higher Value)	Yes
Reed and large sedge swamps (FS1)	Local Importance (Higher Value)	Yes

Ecological Receptor	Ecological Valuation	Important ecological feature for this project
Designated Areas for Nature Conservation		
Wet willow-alder-ash woodland (WN6)	Local Importance (Higher Value)	Yes
Mixed broadleaved / conifer woodland (WD2)	Local Importance (Higher Value)	Yes
Dry calcareous grassland (GS1)	Local Importance (Higher Value)	Yes
Improved agricultural grassland (GA1)	Local Importance (Lower Value)	No
Arable crops (BC1)	Local Importance (lower value)	No
Amenity grassland (GA2)	Local Importance (Lower Value)	No
Building or Artificial (BL3)	Local Importance (Lower Value)	No
Coniferous plantation (WD4)	Local Importance (Lower Value)	No
Scattered trees and parkland (WD5)	Local Importance (Lower Value)	No
Other artificial lakes and ponds (FL8)	Local Importance (Lower Value)	No
Non-native invasive plant species	N/A	Yes
SCI bird species	International Importance	Yes
European eel	National Importance	Yes
Marsh fritillary	County to National Importance	No
White-clawed crayfish	County Importance	Yes
Freshwater pearl mussel	County Importance	No
Otter	County Importance	Yes
Atlantic salmon	County Importance	Yes
Lamprey spp.	County Importance	Yes
All other Red, Amber or Green listed bird species (non-SCI breeding populations)	Local Importance (Higher Value)	Yes
Bats	Local Importance (Higher Value)	Yes
Badger	Local Importance (Higher Value)	Yes
Other small mammal species protected under the Wildlife Acts	Local Importance (Higher Value)	Yes
Smooth newt	Local Importance (Higher Value)	Yes
Common frog	Local Importance (Higher Value)	Yes
Common lizard	Local Importance (Higher Value)	Yes
Other fish species (including trout)	Local Importance (Lower Value)	Yes

10.4 Assessment of Effects

This section, assessment of effect, describes the potential impacts of the Proposed Developments on Important Ecological Feature using the broad categories outlined in Table 10.20 below during construction and / or operation of the Proposed Development.

All Impacts in this Section of the Report are Described in the Absence of Mitigation.

Table 10.20 Potential impact types and effects, receptors impacts and ZoI impact can occur

Potential Impact and Effect	Potential receptor	Zone of Influence – Likely area over which impact could occur
Direct habitat loss due to vegetation removal associated with land take including earth banks, removal of mature trees and hedgerows. **Habitat loss results in disturbance / displacement / fragmentation / degradation** **Effects are temporary or permanent during construction and / or operation**	Protected sites / designated sites Terrestrial and aquatic habitats Terrestrial and aquatic species	Land under the footprint of the Proposed Development including access routes and compounds.
Changes in water quality from hydrological impacts **Effects are temporary during construction**	Aquatic plant and animal species	Changes in surface water quality from the Proposed Development associated with contaminated water run-off, including bentonite slurry from HDD, are assessed downstream of the Proposed Development / waterbody crossings, but the potential spatial extent of effects is difficult to quantify due to the significant variables including the varying concentrations / types of contaminants which could be released during construction / operation (e.g. sediment, hydrocarbons etc) the resilience of different receiving waterbodies (i.e. assimilative capacity) and the sensitivity of the receiving waters.
Direct mortality **Effects are permanent during construction**	Terrestrial species	Land within the footprint for the Proposed Development, including construction compounds, HDD platforms and access routes.
	Aquatic plant and animal species	Includes all freshwater species under the footprint of the Proposed Development and downstream of the proposed waterbody crossings.
Spread of invasive non-native species resulting in habitat degradation. **Effects are temporary or permanent during construction and operation**	Protected sites/designated sites; Sensitive habitats; Terrestrial species; Aquatic plant and animal species	Land within and adjacent the footprint for the Proposed Development. Proposed Development footprint, access routes, construction compounds and HDD works areas.
Disturbance from noise, light and vibration for example impacting foraging/roosting SCI birds	Terrestrial species	Generally assessed within 500 m of the Proposed Development (e.g. for wintering birds) but can be a significantly lower distance (e.g. 150 m for otter and or badger resting places).

Potential Impact and Effect	Potential receptor	Zone of Influence – Likely area over which impact could occur
Effects are temporary during construction		
Human / machinery presence resulting in disturbance to highly sensitive bird species at significant distance from works. **Effects are temporary during construction**	Bird species	Generally assessed within 500 m of the Proposed Development (e.g. for wintering birds).

10.4.1.1 Assessment of Construction Effects

European designated sites

An NIS has been prepared that addresses in detail the potential for adverse effects on the integrity of Rye Water Valley/Carton SAC (Jacobs, 2023b).

The AA screening concluded that there is no potential for LSEs on the River Boyne and River Blackwater SPA, designated for kingfisher, given the overland distance of 14 km at the closest point and lack of hydrological connectivity (being in a separate catchment) / ecological connectivity this SPA.

The following sites were considered to be outside the ZoI for the following reasons:

- Ballynafagh Bog SAC is located 1.6 km west at its nearest point and designated for habitats. No potential for LSE's was identified due to lack of a hydrological link to the SCI habitats of this SAC;
- Ballynafagh Lake SAC is located 2.8 km west at its nearest point and is designated for alkaline fen, whorl snail land marsh fritillary. No potential for LSE on whorl snail or fen was identified due to lack of hydrological connectivity. The food plant of marsh fritillary was recorded at one location in the study area, but this was c17 km from this SAC, and well beyond the furthest distance this butterfly in known to migrate (7.6 km). Therefore, there are considered to be no LSE for this SAC;
- Mouds Bog SAC is located 6 km west at its nearest point and designated for habitats. There is no potential for LSE due to lack of a hydrological link to the QI of this SAC;
- Pollardstown Fen SAC is located 9 km west of the Proposed Development and designated for habitats and whorl snails. Given the overland distance and lack of hydrological/ hydrogeological connectivity / ecological connectivity there are considered no LSE;
- Poulaphouca Reservoir SPA is located 8 km east of the southern extent of the Proposed Development. It is designated for greylag goose and lesser black-backed gull. Greylag geese are usually present at coastal sites. Given lesser-back headed gulls have a preference for the coast, and many agricultural fields are available between the SPA and the Proposed Development, no LSE for this SPA is expected; and,
- River Boyne and River Blackwater SAC is located 14.2 km at its nearest point and designated for habitats and lamprey, Atlantic salmon and otter. There is no potential for LSE due to lack of a hydrological link to the QI of this SAC.

Rye Water Valley/Carton SAC

The Proposed Development is hydrologically linked to the Rye Water Valley/Carton SAC by the following waterbodies:

- WB03 (Cullendragh);
- WB04 (Jenkinstown Stream);
- WB09 (un-named ditch flows into Rye Water);
- WB10 (Bride Stream);
- WB12 (un-named ditch, flows into Rye Water);
- WB13 (Rye Water);
- WB26(un-named ditch, flows into River Lyreen);
- WB16 (River Lyreen);
- WB20 (un-named ditch, flows into River Lyreen); and
- WB22 (Baltracey River, flows into River Lyreen).

The shortest hydrological distance between the Proposed Development and Rye Water Valley/Carton SAC is c8.15 km, commencing at Kilcock (Rye Water, WB13). The qualifying interest features of this SAC are petrifying springs with tufa formation and the species narrow mouthed whorl snail (*Vertigo angustior*) and Desmoulin's whorl snail (*Vertigo moulinsiana*). In the absence of mitigation,

- three out of nine attributes of the conservation objectives of the petrifying springs,
- three out of four attributes of narrow mouthed whorl snail and
- four out of six attributes of Desmoulin's whorl snail were considered to have the potential to be undermined by a hydrologically linked pollution event.

Therefore, there is potential for negative effects on the SAC from a pollution event.

Nationally designated sites

One NHA Hodgestown Bog NHA, seven pNHAs and a cNHA are in the vicinity of the Proposed Development. These sites are designated for a variety of habitats and species including bogs, canals, woodlands and whorl snail. Due to the nature of the Proposed Development, lack of hydrological links and distance of site there is no potential for significant impacts on a number of these sites. For example, Ballynafagh Bog pNHA is discussed in Section 10.4.1.1 as it is also a SAC. As the Proposed Development have no hydrological connectivity to this pNHA, there is no potential for indirect significant effects on this site. With the exception of Grand Canal pNHA, the Royal Canal pNHA and Harristown Common cNHA none of the other pNHAs/cNHA listed in Table 10.4 have hydrological connectivity to the Proposed Development and due to their distance away, the Proposed Development is unlikely to have a significant effect on this protected area.

There is potential for Grand Canal pNHA and Royal Canal pNHA to be impacted by bentonite slurry during HDD activities as the cable route crosses underneath both protected areas (at WB38 and WB43 for the Grand Canal pNHA and WB14 for the Royal Canal). Harristown Common cNHA is a GWDTE and as such there may be changes in hydrology due to trenching given that this GWDTE habitat is approximately 200 m away at its closest point. The geohydrological assessment for GWDTE notes that small adverse impacts to groundwater quality at secondary receptors such as GWDTE and watercourses were predicted, especially where the receptor is in close proximity/ adjacent to the cable route. Further from the cable route elsewhere within the 1 km study area negligible impacts to groundwater quality are predicted. Therefore, it is unlikely that there would be any impacts to Harristown Common cNHA given that is not in proximity or adjacent to cabling trenches.

The description for the Grand Canal pNHA states that the diversity of the water channel is high on the eastern section of the Main line between Summit level at Lowtown and Inchicore and that the rare and protected opposite-leaved pondweed *Groenlandia densa* is present in the eastern section. This includes the canal stretch at WB38 and WB43 The Plant Atlas stats that *G. densa* requires clear, base rich water and is more frequent in canals than lakes and rivers[55]. Therefore, it is likely that this stretch is sensitive to bentonite slurry from HDD entering the canal, which could result in turbidity, as well as pH changes. *G. densa* is also sensitive to eutrophication and slurry input could increase the nutrient supply. A likely significant effect could result from the HDD on the Grand Canal pNHA.

The Royal Canal pNHA appears less sensitive to HDD than The Grand Canal pNHA, since its description does not refer to sensitive plant species in the vicinity of the Proposed Development, but only in the vicinity of Dublin, which is outside the project's ZoI.

There is potential for negative effects from pollution on both Royal Canal and the Grand Canal pNHA and from habitat degradation on Harristown Common cHNA.

Habitats

The landscape the Proposed Development crosses is predominantly agricultural, comprising arable fields and improved grassland. In non-urban areas approximately 70 to 80% of the route is lined with hedges (comprising species-rich and species-poor hedges) and / or mature trees on one or both sides of the road in some sections. Within the joint bays and passing bays, the length of hedgerow comprising species rich is 2,782.47 m and species poor comprises 715.68 m. Total number of mature trees lost could be up to 190, with 58 of those comprising veteran trees. This is a worse-case scenario. In areas where loss is not certain were roads are narrow (at or less than 5 m wide) 95 trees may be lost with 52 of those mature and 43 veteran trees meaning that total of mature trees lost in a best-case scenario would be 95 trees.

The habitats within 150 m of the route are described in Section 10.3.2.1 and their locations are shown in Figure 10.2A Volume 4. To accommodate the trenches, joint bays and passing bays for the underground cable there will need to be significant removal of hedgerows, road verge and loss of trees, including mature trees, which are lining the road network along the cable route. Where trees line both sides of the road and where the road width is narrow (~ 5 m) trees on both sides could be impacted due to roots extending beneath the road which cannot be avoided.

[55] Groenlandia densa | Online Atlas of the British and Irish Flora (brc.ac.uk)

Table 10.21 below shows the habitat types (with Fossitt habitat codes) that may be lost, either temporarily or permanently, within the planning application boundary (and includes area and percentage loss along with the significance of the loss. There is potential for negative effects from loss of habitat.

Table 10.21: Habitat areas (with Fossitt habitat codes) within the Planning Application Boundary (PAB), showing areas that will be lost in the absence of mitigation

Habitat	Areas/Linear Features within PAB	Permanent Habitat loss – - Permanent Access Tracks, - Joint Bays & Hardstanding, - 5 metre permanent easement - 15 metre permanent easement (Woodland – R156 section only) - 20 metre permanent easement at HDD Locations	Temporary Habitat Loss – All remaining areas within PAB that are not permanently affected	% Permanent Habitat lost with PAB	Likely significant effect (Yes/No)
Habitats in Ha					
BC1 - Arable crops	12.52	1.26	9.41	10	No
BL3 - Buildings and artificial surfaces	86.69	21.14	18.37	24	No
ED2 - Spoil and bare ground	0.87	0.09	0.28	10	No
ED3 - Recolonising bare ground	0	0	0	0	No
FS1 - Reed and large sedge swamps	0.02	0	0.02	0	No
FL8 - Other artificial lakes and ponds	0	0	0	0	No
GA1 - Improved agricultural grassland	27.32	6.52	17.51	24	No
GA2 - Amenity grassland (improved)	2.28	0.22	0.59	10	No
GS1 - Dry calcareous grassland	12.67	0	12.57	0	No
GS2 - Dry meadows and grassy verges	6.76	0.67	1.15	10	No
GS4 - Wet grassland	1.52	0.78	0.74	51	Yes
WD1 - (Mixed) broadleaved woodland	2.26	0.51	1.23	23	Yes
WD2 - Mixed broadleaved/conifer woodland	0.35	0.07	0.17	20	No

Habitat	Areas/Linear Features within PAB	Permanent Habitat loss – - Permanent Access Tracks, - Joint Bays & Hardstanding, - 5 metre permanent easement - 15 metre permanent easement (Woodland – R156 section only) - 20 metre permanent easement at HDD Locations	Temporary Habitat Loss – All remaining areas within PAB that are not permanently affected	% Permanent Habitat lost with PAB	Likely significant effect (Yes/No)
WD4 - Conifer plantation	0.15	0.01	0.12	7	No
WN6 - Wet willow-alder-ash woodland	0	0	0	0	No
WS1 - Scrub	0.86	0.44	0.36	51	Yes
WS2 - Immature woodland	0.18	0	0.18	0	No
Habitats in km					
FW2 - Depositing/ lowland rivers	0.14	0	0.14	0	No
FW3 - Canals	0.09	0	0	0	No
FW4 - Drainage ditches	3.19	0.18	3.02	6	Yes
WL1 - Hedgerows	33.07	1.29	See * below	4	Yes
WL2 - Treelines	26	2.79	See * below	11	Yes

*To Note: The calculation of affected habitats is based on the Planning Application Boundary for the Proposed Development. As shown in the planning drawings and figures associated with this PECR, the Planning Application Boundary covers a wide area and includes long lengths of hedgerows and treelines. The cable route is 82% in-road (approximately 43 km) and most of the affected roads have hedgerows and trees in the verge. With the exceptions of WL1 (hedgerows) and WL2 (treelines) where there is potential for temporary loss of 31.78 km and 23.21 km respectively, these areas have been included in the above table; however, it is very unlikely that all of the areas will be affected. The proposed cable trench is 1.5 m wide, and in the majority, the cable trench will be constructed without impact to the roadside hedgerows and trees. For the purposes of calculating potential habitat loss to linear features, a highly conservative method was used in that a 2.5 m buffer was applied to the PAB to take into account differences between land folio boundaries and actual habitat field data results to ensure that no linear features were missed. The above table is a worst case assessment, and it is expected that the actual impacts will be significantly lower. Given the likelihood that calculation of potential loss of WL1 and WL2 is much higher than actual loss, the figures for each were not included in the Table 10.21. However, with the proposed mitigation and compensation there will be a significant net gain of 130% in hedgerows and trees (see Section 10.5.4.5) as a result of the Proposed Development.

Waterbodies

Notable watercourses where HDD is proposed are the Rye Water (WB13), the Royal Canal (WB14), the River Liffey (WB33), the Grand Canal (WB41) and the River Lyreen (WB19). Eleven watercourses are proposed to be crossed in-road (i.e. using an existing structure) and a further 16 watercourses crossed by a diversion from in-road to off-road trench. There are six watercourses crossed by trench in an off-road section. Further details of the waterbody crossing methods are provided in the Design Framework (Jacobs, 2023c).

There is potential for negative effects due to pollution from bentonite slurry, run-off, sedimentation, chemical spillage for all waterbodies crossed by the Proposed Development during in-stream trenching and during HDD activities or general construction activities. These include the waterbodies described under European Designated sites where these are hydrologically linked to the Rye Water Valley/Carton SAC. The waterbodies crossed are shown in Figure 2, Appendix B of the NIS (Jacobs, 2023b).

Pollution can result in habitat loss, fragmentation, changes in hydrology and degradation, and there is potential for negative effects from a pollution event.

Ground Water Dependent Terrestrial Ecosystems (GWDTE)

Wet grassland and wet willow-alder- woodland are GWDTE). There is a risk of excavation during trenching interfering with groundwater yield, quality or flow direction where groundwater is required to be abstracted. Guidance by the Scottish Environmental Protection Agency (SEPA) states that excavations greater than 1 m pose a risk to GDWTE up to 250 m away and less than 1 m depth GWDTE up to 100 m away there is a risk where such excavation would also require the abstraction of water. The depth of the excavation is c. 1.3 m to1.7 m and as such there is a risk to GWDTE sites that needs to be considered. Further information is presented in Chapter 11 which notes that small negative impacts to groundwater quality at secondary receptors such as GWDTE are predicted, especially where the receptor is in close proximity/ adjacent to the cable route. Further from the cable route elsewhere within the 1 km study area negligible impacts to groundwater quality are predicted.

There is potential for negative effects on GWDTE habitats resulting in potential habitat loss or degradation.

Wintering birds (including SCI species)

The desk study found that greylag goose wintering at Poulaphouca Reservoir were in the vicinity at distances of between 5 to 17 km from the Proposed Development. Jacobs' 2023 survey did not record any greylag goose. Most records during Jacobs' wintering birds survey were from round several ponds or lakes, none of which will be impacted by the proposed development. The remaining records were of birds in flight or occasionally foraging in agricultural fields.

During the winter bird surveys, six bird species listed as wintering SCIs for SPAs in the vicinity were recorded in the study area. The nearest SPAs designated for these SCI species are as follows:

- Lesser black backed gull (Poulaphouca Reservoir SPA, c8 km to the west of the Proposed Development);
- Golden plover (North Bull Island SPA, 28 km SW of the Proposed Development);
- Teal (North Bull Island SPA, 28.7 km SW of the Proposed Development).
- Black-headed gull (South Dublin Bay and River Tolka Estuary SPA, c25 km to the west of the Proposed Development);
- Herring gull (The Murrough SPA, c44 km east of the Proposed Development); and

- Mallard (Dundalk Bay SPA, c47.4 km NW of the Proposed Development);

The only bird species recorded within the ZoI that are listed on Annex I of the Birds Directive: were:

- Kingfisher (The River Boyne and River Blackwater SPA (18.7 km NW of the Proposed Development); and
- Golden plover (as above).

It is unlikely given the distances from the nearest SPAs and species core foraging ranges (SNH, 2016) that many of the SCI species recorded in the study area would be associated with any of the SPAs listed above with the exception of lesser black backed gull as Poulaphouca Reservoir SPA (c.8 km distant).

Disturbance

The works will involve excavating and laying of an underground cable and as a result, habitats immediately under the footprint and either side of the cable excavation are the predominant habitats affected. There will also be temporary disturbance during construction. Treelines, hedgerows and scrub and to lesser extent arable and grassland field margins will be impacted, particularly at joint bays. Typically, the linear habitats do not support wintering birds. Where the Proposed Development extends into surrounding farmland margins it has been shown during surveys that these areas do not support wintering birds. Indeed, no wintering birds were recorded in the footprint of the Proposed Development. The majority of winter bird records were concentrated around several ponds and lakes (Figure 3, Appendix 10.4) none of which will be impacted through habitat loss from the Proposed Development. Of the 142 records within the study area 90 records were within Lakelands pond, Naas (grid reference N 89326 18712) which is c.347 m from the Proposed Development at it nearest point and Osberstown attenuation pond along the M7 (grid reference: N 88162 21266), which is c. 190 m from the Proposed Development. Lakeside pond is outside the 300 m suggested by Cutts *et al*. (2013) as the 300 m ZoI for noise and visual disturbances. Osberstown Pond is, however, within the 300 m distance for noise and visual disturbance.

There is potential for negative effects from disturbance.

Habitat loss

The remaining winter bird survey records were of birds in flight or occasionally foraging in agricultural fields. The Proposed Development will not traverse across any habitats utilised by wintering birds. As the habitat under the footprint of the Proposed Development (predominantly road surface, roadside verge and field margins) was either deemed unsuitable to support winter birds or was not recorded as being used by wintering birds during the surveys habitat loss as a result of the Proposed Development is unlikely to result in a negative significant effect at any geographic scale.

Pollution

Lakelands Pond, Nass is not hydrologically connected to the Proposed Development, so no pollution effects on this waterbody are likely, and no negative effects on the birds using the reservoir. Osberstown attenuation pond is hydrologically connected to the Proposed Development by a drainage ditch (WB39), with the EPA name of ‘Oldtown_Demesne’.

There is therefore potential for pollution entering this waterbody to reach Osberstown attenuation pond.

Breeding Birds

Habitat loss

The Proposed Development will result in the loss of breeding bird nesting and foraging habitat, and displacement of breeding birds, particularly due to impacts to trees and hedgerows as shown in

Table 10.21.

The habitat areas that will be lost as a result of the Proposed Development are common in the locality but there would still be a potentially negative effect.

Habitat fragmentation

Signs of kingfisher breeding were searched for during the breeding bird surveys. Only the River Liffey had kingfisher present at the time of surveying. Kingfisher was recorded on two occasions along the River Liffey, from Sallins Bypass Bridge, during Survey 1 and Survey 2 (see Figure10.4 for location observations). Subsequent watches upstream and downstream of the Sallins Bypass bridge crossing recorded no kingfisher nests and bankside habitats around the proposed cable crossing point were too unstable to support kingfisher nests. The River Liffey does, however, support commuting and foraging kingfisher, but not associated with the SPA. None of the habitats to be lost are unique to the locality and, either individually or collectively, are not likely to support a significant proportion, or the only population, of any given breeding bird species locally. Neither will the temporary works likely impede commuting or foraging on kingfisher flightpaths or foraging ability beyond the crossing point and not in the long term.

Disturbance

No waterbody or wetland of ecological importance will be impacted by the Proposed Development. The majority of waterbodies are not expected to be significantly impacted by disturbance during the Proposed Development as a result of existing screening through vegetation, infrastructure and topographical. Although a temporary decline in overall breeding bird abundance could potentially occur at a very local level (i.e. the footprint of the Proposed Development), this is unlikely to affect the local range of the breeding bird species present in these habitats nor is it likely to affect the ability of these breeding bird populations to maintain their local populations in the long-term.

The noise, vibration, increased human presence and the visual deterrent of construction traffic associated with site clearance during construction will disturb breeding bird species and is likely to displace them from habitats within and adjacent to the Proposed Development boundary. Breeding bird disturbance impacts are similar to disturbance impacts to wintering birds, above. Increased noise levels during construction may disturb bird species affecting bird abundance and occurrence in the locality. Although it is not possible to quantify the magnitude of this potential impact it could potentially extend for several hundred metres from the Proposed Development. Given the temporary to short-term nature of the construction works, disturbance or displacement effects will also be over a relatively short-term and are therefore not likely to affect the conservation status of red or amber species breeding bird species in the long term.

There is, however, the potential for negative effects to breeding birds in the short term.

Pollution

A pollution event during construction could change the water quality and reduce the prey availability of kingfisher at and downstream of the pollution event. Kingfisher diet is predominantly fish, although they will also eat aquatic insects, freshwater shrimps and tadpoles (Royal Society for the Protection of Birds (RSPB), 2020). The breeding birds survey also recorded the waterbirds grey heron, little egret, moorhen, mute swan, reed bunting and reed warbler, whose foot source could be affected by water pollution.

There is potential for negative effects from a pollution event.

Mortality

The Proposed Development poses a mortality risk to breeding birds associated with destruction of nests during vegetation clearance. If site clearance works were to be undertaken during the bird breeding season (i.e. March to August, inclusive) it is likely that nest sites holding eggs or chicks will be destroyed and birds killed.

No breeding bird SCI were recorded in the footprint of the Proposed Development. Birds recorded during the 2022 survey are shown in Table 10.15 and shown in Figure 10.4, Volume 4. Mortality of birds during site clearance works is not predicted to affect the conservation status of any of the breeding bird species present within the study area at any geographic scale, however, mitigation measures will be incorporated to avoid mortality impacts.

There is potential for negative effects from vegetation clearance resulting in mortality to breeding birds.

Bats

Mortality

No bat roosts were recorded within the construction footprint, and therefore no direct impacts on known roosts are predicted. The Proposed Development will require the felling of approximately 90 mature trees with moderate to high roosting potential. As bats switch tree roosts regularly, there is a risk that bats might colonise trees within which none were recorded previously in the 2022 survey season. Therefore, without mitigation (i.e. pre-construction surveys), there is a risk that roosts could be lost and bats killed, injured or disturbed, leading to a breach of legislation. The precise character of the potential impact would depend on the species and number of bats affected.

There is potential for negative effects from vegetation clearance resulting in mortality to bats

Habitat loss

The overall effect on bats from losses of foraging habitat differs according to individual species. Generally, larger impacts would be expected for habitat specialists and / or those species with smaller feeding ranges, such as brown long-eared bats (woodland specialists) and *Myotis* bats (bats of woodland and waterbodies) or where habitat is located near a roost.

The works will involve excavating and laying of an underground cable and will result in the removal of habitats immediately under the footprint and either side of the cable excavation. The majority of the Proposed Development is 'in-road' therefore the habitat under the footprint is predominantly road surface, roadside verge, treelines, hedgerows and scrub, and to a lesser extent arable and grassland field margins. These habitats provide foraging opportunities for bats. As bats have large foraging ranges (with core sustenance zones around roost sites ranging between 2 km to 3 km for the bats recorded within the study area) the loss of these habitats is unlikely to lead to significant negative effects on roosts. Core sustenance zones for the bats recorded during static surveys and the emergence-re-entry surveys are as follows (Collins, 2016):

- Common pipistrelle: 2 km;
- Soprano pipistrelle: 3 km;
- Leisler's bat: 3 km;
- Grey long-eared bat: 3 km; and
- Nathusius' pipistrelle: 3 km.

However, the loss of hedge and trees could lead to severance effects. Works will lead to permanent gaps (where cables are overlain by permanent access tracks) of up to 4 m wide, but temporary gaps (where no permanent roads are required, and over-cable planting is viable) could require gaps in hedgerow of up to 30 m wide (i.e. the width of the planning application boundary).

There is potential for negative effects from habitat loss resulting in severance habitats for bats.

Disturbance

Construction activities will result in noise, lighting and vibration in habitats within and adjacent to the Proposed Development, although no roosts have been recorded within these areas. The footprint of the Proposed Development is largely along existing roads that all have some form of lighting. However, off-road sections are currently unlit. Pipistrelle bats are relatively tolerant of disturbance such as noise and lighting, as are Leisler's which are often observed hunting insects that are attracted by street lighting. *Myotis* and *Plecotus* bat species are relatively intolerant of noise and lighting.

There is potential for negative effects from disturbance to bats.

Mammals (otter and badger)

Otter

Mortality, disturbance and pollution

Otters are likely to be present within the study area of the Proposed Development, with one suspected holt and one otter slide identified during the field surveys. There is optimal commuting, foraging and resting habitat for otter throughout the survey area, however, the majority of habitat to be impacted by the construction works is considered sub-optimal for otter as it comprises hedgerows, tree lines and agricultural land away from watercourses. Disturbance or direct mortality to this species could arise from the construction works. Additionally, a pollution event from the works may impact on water quality and reduce otter prey availability.

There is potential for negative effects from mortality, disturbance and pollution for otter.

Badger

Mortality, habitat loss and disturbance

Badgers are known to be present within both the survey area and within the footprint of the Proposed Development as field signs, two potential badgers holes, two inactive outlier setts and three active main setts, were recorded during field surveys (Table 10.18).Two of the active setts are within 50 m of the Proposed Development (sign number 2, and 3, Table 10.20), which therefore have potential to be negatively affected and require a licence. There is one potential badger hole within the PAB (sign 1, Table 10.20), one disused badger hole within the PAB (sign 5, Table 10.20) and one disused badger hole 50 m from the PAB. One active sett lies 150 m from the PAB (sign 10, Table 10.20) and one potential sett 61 m from the PAB. There is optimal foraging and commuting badger habitat within the survey area and the loss of badger habitat arising from construction would have an insignificant impact on the locally available suitable habitat for badger, particularly given how common and widespread suitable habitats for badger are. Disturbance and direct mortality towards badger could arise from the construction works, as it has potential to disrupt commuting routes between foraging grounds by creating obstacles and hazards.

There is potential for negative effects from mortality and disturbance for badger.

Mammals (other protected small mammals)

Mortality

Habitat with the potential to support a variety of small mammal species recorded or likely to be present within the survey area. Construction works is unlikely to result in any significant level of mortality to the larger and more mobile species such as red squirrel, as they can migrate away from the works. Squirrels breed in winter, which is when trees are scheduled to be felled, so breeding squirrels could be affected by the works. It is also probable that vegetation clearance may result in mortality to the smaller mammals such as pygmy shrew if present, since small mammals have less ability to disperse. The potential effect would be expected to be greater during the breeding season when juveniles would be present in burrows (April-October), or in the case of hedgehog, impacts may be greater during their hibernation period (November-March). Impacts would be in the short term and would only occur during construction works.

There is potential for negative effects from mortality for small mammals.

Amphibian and Reptiles

Mortality and disturbance

No amphibian or reptile species were recorded within the study area during field surveys and there were no breeding ponds with habitat connectivity within 500 m of the Proposed Development. However, terrestrial habitat with the potential to support both amphibians and reptiles could be lost as part of construction works, which will require the removal of habitats within the footprint of the Proposed Development. Given the relatively small amount of habitat required to be cleared, it is unlikely that the site clearance works would have a significant impact on the locally available suitable habitat for these species, particularly given how common and widespread suitable habitats for these species is. Nevertheless, construction works could lead to disturbance and direct mortalities of these species, particularly during the hibernation (November- February) or breeding season (January-July). *There is potential for negative effects from mortality and disturbance to amphibians.*

Fish

The River Liffey catchment including the Rye Water sub-catchment throughout the study area, contains a variety of riverine habitats suitable for fish and is a productive catchment, despite apparent water quality issues in some smaller tributaries. The Tolka River also has suitable in-stream fish habitat and has recorded low densities of fish species of conservation concern. Overall although there were supporting habitats for a variety of fish species of different age classes may of the smaller watercourses showed signs of pollution.

Jacobs eDNA sampling confirmed the presence of:

- Atlantic salmon in the Rye Water (WB12) and Jenkinstown Stream (WB08).
- European eel was confirmed to be present in the Jenkinstown Stream_010 (WB08) and two tributaries of the River Liffey (WB 32 and WB46), see Figure 10.8 Volume 4.

However, as fish populations can be naturally highly variable over time and the migratory behaviour and life history of salmon and eel can affect their presence or absence in a particular watercourse from one year to the next, it is important to consider that these species may be present in a catchment where survey results have previously recorded their likely absence.

Mortality

Fish may be directly or indirectly impacted by construction activities when working in water. Such activities including plant machine works and excavations can cause mortality whilst inappropriate in-stream timing of works can impact fish during spawning and fish emergence periods. Dewatering activities or temporary channel diversions which may be required to lay the cable can strand fish.

Without mitigation there is a risk of fish mortality.

Habitat loss, fragmentation or changes in hydrology

Temporary loss of habitat will occur in the footprint of construction works within aquatic habitats. Works can remove habitat beneficial to fish and includes in-stream habitat such as gravel / cobble substrates and woody debris and bankside vegetation which provides cover. Dewatering activities or temporary channel diversions which may be required to lay the cable can strand fish or create barriers to upstream and downstream migrations and cause habitat fragmentation. Changes in hydrology can occur during in-stream works where streams are bunded or when incorrect stream reinstatement has been carried out. This may cause alterations though erosion, deposition and sediment suspension, which in turn could affect water quality and distribution of habitats.

There is potential for negative effects from habitat loss, fragmentation or changes in hydrology to fish species.

Pollution

Pollution of watercourses can occur when construction activities can lead to the release of contaminated surface water run-off, fine sediments and hydrocarbons (e.g. fuel, oils). There is also the potential for bentonite break out (or slurry run-off from launch pits) to contaminate watercourses where HDD is taking place of the following watercourses: Rye Water (WB13), unnamed drain of the Lyreen/Liffey (WB20) and the River Liffey (WB35). These can impact different life stages of fish with some species more sensitive to pollution than others.

There is potential for a pollution event (release of contaminated surface water run-off and sediments) into watercourses during construction to result in negative effects on fish species.

Disturbance

Noise and vibration caused by construction activities within or in close proximity to aquatic habitats have the potential to cause physical injury to fish in the immediate area. Salmonid eggs are also sensitive to mechanical shock and eggs buried in gravels may be impacted if spawning areas are nearby.

A disturbance event in watercourses during construction has the potential to have a negative effect on fish species.

White-clawed crayfish

Pollution

White-clawed crayfish were recorded from Jacobs' eDNA survey on WB32 (Longtone_Demesne, a tributary of the River Liffey and WB46 (River Liffey). The desk study has records of WCC in the River Liffey at Clane, with hydrological connectivity to cable crossing at WB29 and Rye Water at Maynooth with hydrological connectivity to cable crossing at WB12 and WB13 (Table 10.9).

Construction activities including HDD, vegetation and soil striping, site drainage, plant movement and construction of structures may cause a pollution event from the potential release of contaminated surface water run-off, fine sediments and hydrocarbons at these WBs which could affect WCC within the River Liffey catchment including the Rye Water.

There is potential for negative effects from pollution to white-clawed crayfish.

Mortality, disturbance, habitat loss/degradation

Site preparation and construction works involving cable laying across watercourses may cause disturbance or the permanent damage or loss of in-stream crayfish habitat. Activities including dewatering operations, trenching, construction of retaining walls and bankside works including regrading and tree removal may remove crayfish habitat or cause mortality.

There is potential for negative effects from mortality and disturbance and loss or degradation of habitat for white-clawed crayfish.

Invasive species

Habitat loss/degradation

The following Third Schedule invasive species were recorded in the 2022 survey.

Himalayan balsam (*Impatiens glandulifera)* was present along the route of the Proposed Development between chainage (ch) 37000 and 37250 at N 87990 24456. This location lies within the Proposed Development's Planning Application Boundary and approximately 40 m for the HHD launch platform on the west bank of the River Liffey. The species is also present in the same vicinity as the infestation above, but c70 south of the Planning Application Boundary at N 87999 24353. There were two other stands recorded at ch 39000 (at N 87995 23009 and N 88030 22991), c50 m west of the Proposed Development. The nearest location is 16 m to the west of the Planning Application Boundary, and the most distant was on an in-river island approximately 50 m west of the Planning Application Boundary.

There is potential for negative effects from disturbance (and spread) of Himalayan balsam resulting in the loss or degradation of habitat.

Giant rhubarb (*Gunnera tinctoria*) – ornamental planting by a garden pond, c120 m from cable route. There is no potential for negative effects from disturbance to giant rhubarb given the distance from the Proposed Development.

10.4.1.2 Assessment of Operation Effects

The effects of operation of the Proposed Development are expected to be minimal on the Important Ecological Features, with most of the impacts to them occurring during the construction stage. Along most of the route, the road will be reinstated for public use, and vegetation removed will be reinstated, except at joint bays, along permanent access tracks, and where over-cable planting is not technically viable due to asset risk.

Habitat loss

The width of the joint bays and the nature of the road network in the area means that road closures and diversions will be required in some areas along the route during maintenance operations. There is no potential for negative effects from habitat loss during these works as replacement vegetation planting will be positioned so that no removal would be necessary (except in the case of unexpected and/or emergency maintenance).

It will be necessary to provide permanent access for infrequent use to all off-road joint bays during the operational phase. These will be stoned access tracks. The topsoil will be stripped and taken off site to a suitably licensed facility. The tracks will be filled with approximately 300 mm of fill material and finished to approximately 100 mm above ground level. There are 10 no. separate access tracks which are provided for 13 no. joint bays: 1 to 4; 8; 10; 15; 21; 42; 50; 54; 60 and 70 (please see Chapter 5 of this PECR for their locations). There is potential for negative effects from loss at these locations. However, these have been assessed under permanent loss during construction and as such are not described further here.

Mortality, pollution, habitat degradation and / or fragmentation

Should unexpected and/or emergency maintenance of the cable be required during the operational phase, excavation would be required, and this could occur on and / or off-road. As per the construction phase there is the potential for the same negative effects to occur to Important Ecological Features as noted in the relevant section above. *There is potential for negative effects from mortality and disturbance and loss or fragmentation of habitat for IEF.*

10.5 Mitigation Measures

This section sets out mitigation measures envisaged to avoid, prevent, reduce or, if possible (having regard for third-party landowners) offset any identified significant adverse effects on the KERs environment and, where appropriate, identify any proposed monitoring arrangements. It covers both the Construction and Operational Phases.

10.5.1 Pre-construction Surveys and Reporting

10.5.1.1 Ecological Clerk of Works

An on-site Ecological Clerk of Works (ECoW) will be appointed by the Contractor to carry out pre-construction surveys (see below) to ensure that the baseline is current and, where required, will implement appropriate mitigation measures as needed. The ECoW will be on site for any works deemed sensitive, i.e. within or near protected European sites or watercourses linked to such sites. Where sensitive habitats or species could be impacted, the ECoW will be on site to implement all mitigation measures as described below. The ECoW will have demonstrate experience and will be a member of a professional body such as CIEEM or similar.

10.5.1.2 Pre-construction Surveys

In advance of enabling works, the Contractor's ECoW will complete pre-construction confirmatory surveys of selected ecological features whose distribution is dynamic over time, and which are known to have potential to occur within the ZoI of the PAB. Any of the small number of areas that could not be surveyed during baseline data collection will also be surveyed at this time. These surveys will update the findings of the surveys completed between October 2021 and October 2022 (survey dates as detailed in Table 10.1), and include the following:

- Bat trees previously identified as having roosting potential and within the ZoI;
- Otter breeding/resting sites within the ZoI of the PAB (minimum 50 m, up to150 m at HDD sites, where access allows; noting that guidance recommends 20 m for non-breeding sites);
- Badger setts within the ZoI of the PAB (minimum 50 m, up to 150 m at HDD locations where access allows);
- Squirrel (grey and red), where dreys are identified within trees to be felled within the PAB;
- Amphibians and reptiles: a pre-construction survey will be undertaken by the ECoW of previously identified area suitable to host these species: reptile habitat (dry calcareous grassland, dry meadows and grassy verges and recolonising bare ground) and of amphibian habitat (drainage ditches, wet grassland and reed and sedge swamps) within the PAB. A suitable safe receptor site will be pre-identified, and if amphibians or reptiles are found the ECoW will translocate animals if necessary to the suitable receptor habitat; and
- Invasive species within the PAB.

Bat surveys will be carried out in accordance with guidance from Marnell *et al*. (2022) and NRA (2006a). Surveys may comprise inspection of roost features at height using a mobile elevating work platform and will be carried out by a licensed bat worker where appropriate.

All surveys will be undertaken by suitably qualified ecologists with demonstrable experience in the survey and assessment of the feature.

10.5.1.3 Reporting

The results of pre-construction confirmatory surveys will inform the refinement of mitigation measures (if required) in the Contractor's method statements, and all results will be incorporated into the Contractor's constraint mapping.

Survey reporting and mapping will be provided to the Developer's Ecologist (ESB), EirGrid's Planning and Environmental Unit (PEU) within the Chief Infrastructure Office, and to any prescribed bodies as additionally required by any planning conditions.

10.5.2 Construction Phase

10.5.2.1 Site-Wide Mitigation Measures

A number of site-wide mitigation measures will be applied across the Proposed Development to avoid the impacts associated with pollution of watercourses and impacts to small mammal species, amphibians and breeding bird species. In addition to this, there are mitigation measures specific to the various Proposed Development elements, detailed in Section 10.5.3.

The contractor's ECoW will give toolbox talks to all site personnel to highlight any environmental sensitivities and the boundaries of sensitive habitats. Toolbox talks will include findings of pre-construction surveys on baseline changes and any adaptive mitigation measures required. During sensitive works, e.g. in-stream works, the contractor's ECoW will supervise the works and propose adaptive mitigation measures in response to, for instance, extreme weather events (amber and red Met Eireann weather warnings) or new mitigation requirements arising from pre-construction surveys. Method statements in relation to trenched crossings will be agreed with IFI prior to the start of works. No sensitive works will be permitted without the prior approval of the ECoW.

Pollution Control

The measures set out below will be implemented to ensure that there will be no pollution of surface water during the construction phase of the Proposed Development. The measures will be incorporated into the contractor's CEMP and developed in accordance with the following guidance documents and legislation:

- CIRIA C532 Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams *et al.*, 2001);
- CIRIA C648 Control of Water Pollution from Linear Construction Projects: Technical Guide (Murnane *et al.*, 2006a);
- CIRIA C649 Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane *et al.*, 2006b);
- CIRIA C692 Environmental Good Practice on Site (Audus *et al.*, 2010);
- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA, 2005).

Mitigation measures with respect to accidental pollution are focused on prevention, safeguarding the approach to the storage and handling of materials, and managing vehicles during the temporary construction phase.

Control of Silt-Laden Runoff

Specific measures to control silt will be implemented at each of the Proposed Development infrastructure sites. Surface water run-off at the construction sites will be managed to prevent silt-laden surface water flowing into surface water receptors:

- The contractor will ensure no deleterious discharges are released from construction sites to the nearby waterbodies during construction. If a discharge to a watercourse is necessary, the water will pass through a swale or silt buster prior to discharge. Levels of suspended solids in any discharge will be no greater than

25 mg/l as per IFI guidance (2016), and flows will be controlled to levels appropriate to the receiving water. It is possible that such a discharge may require a licence under the Water Pollution Acts 1977 & 1990, as amended, and the Arterial Drainage Act 1945 & 1995, as amended. The Contractor will liaise with the regulatory authorities at an early stage to determine the need for licences and include the appropriate application time required in any construction programme;

- Silt fences will be erected along the boundary of water bodies to prevent any silt-laden run-off from impermeable surfaces, temporary or permanent, as well as spoil heaps within the construction working width;
  - double silt fencing will also be applied to areas where concrete pouring is to be undertaken and where there is a risk to European designated sites;
  - silt fences will be installed downgradient of the potential source of the silt/sediment;
  - the silt curtain will contain the area where silted waters are being generated and will terminate on high ground;
  - they will be constructed using permeable filter fabric (Hy-Tex Terrastop silt fence or similar) rather than a mesh material;
  - its base will be embedded at least 15 cm into the ground and staked at 2 m intervals;
  - the vegetated turves will be peeled back and not detached from the ground, the materials inserted and the turves replaced to hold the base in place;
  - the silt fence will be inspected regularly by the ECoW and contractor, and in particular following heavy rainfall;
  - silt fences will remain in situ until the vegetation on the disturbed ground is re-established;
  - the fence will not be pulled from the ground, but cut at ground level and the stakes/posts removed;
  - should water build up behind the fences, the sediment will settle to the bottom. Water can be released, but sediments will remain;
  - two lines of silt fencing will be installed in sensitive areas, based on the ECoW's professional judgement;
  - a record of its installation, inspection and removal will be maintained by the ECoW; and
  - Reinstatement of any banks affected by silt-laden run off during construction will be reinstated back to pre-development conditions.

Stock piling of Materials

The following measures will be implemented for the stockpiling of materials. During construction, mobilisation sites will either be cleared in stages to prevent bare earth being exposed for prolonged periods, or the bare earth would be immediately covered in a gravel/plastic covering to reduce the likelihood of sediment-laden run-off following rainfall events. Stripped soil will be stockpiled more than 10 m away from the surface interceptor drain. Stockpiles will be in a dry zone that is not subject to flooding (i.e. outside 1:100 flood extent (1% Annual Exceedance Probability)). The following measures will be put in place by the Contractor for stockpiling of material:

- Temporary stockpiles will be located away from drains and watercourses. Stockpiles will not be located within 10 m of a watercourse;
- For watercourse crossings, stockpiles will not be located anywhere within the crossing working area;
- Stockpiles will be managed to prevent siltation of watercourse systems through run-off during rainstorms with the final measures to be determined by the Contractor. These will include the following measures or equivalent measures:
    - Allowing vegetation to establish on the exposed soil;
    - Providing silt fences or straw barriers at the toe of the stockpile to mitigate run-off during rain events;
    - Surrounding stockpiles with cut-off ditches to contain run-off;
    - Directing any run-off to the site drainage system or filter drains along the construction working width and to the settlement pond (or other) treatment systems; and
    - Providing bunds or another form of diversion to keep run-off from entering the stockpile area.

Storage of materials

The following measures will be implemented for storage of materials:

- All oil and diesel storage facilities will be at least 30 m from any watercourse, including surface water drains, and outside the 1:100 flood extent (1% Annual Exceedance Probability);
- Spill kits and drip trays will be provided for all equipment and at locations where any liquids are stored and dispensed;
- Storage areas for solid materials, including waste soils, will be designed and managed to prevent deterioration of the materials and their escape (via surface run-off or wind blow);
- Storage areas will be kept secure to prevent acts of vandalism that could result in leaks or spills; and
- All containers of any size will be correctly labelled, indicating their contents and any hazard warning signs.

Spills

The following measures will be implemented across the site to prevent spills:

- fuel tanks, drums and mobile bowsers (and any other equipment that contains oil and other fuels) will have a secondary containment, for example double-skinned tanks;
- all tanks, drums and mobile bowsers will be located in a sealed impervious bund with sufficient capacity to contain at least 25% of the total volume of the containers or 110% of the largest container, whichever is the greatest;
- storage areas will be covered, wherever possible, to prevent rainwater filling the bunded areas;
- fuel fill pipes will not extend beyond the bund wall and will have a lockable cap secured with a chain;

- where fuel is delivered through a pipe permanently attached to a tank or bowser:
  - the pipe will be fitted with a manually operated pump or a valve at the delivery end which closes automatically when not in use;
  - the pump or valve will be fitted with a lock;
  - the pipe will be fitted with a lockable valve at the end where it leaves the tank or bowser;
  - the pipework will pass over and not through bund walls;
  - tanks and bunds will be protected from vehicle impact damage;
  - tanks will be labelled with contents, capacity information and hazard warnings; and
  - all valves, pumps and trigger guns will be turned off and locked when not in use. All caps on fill pipes will be locked when not in use.
- suitable precautions will be taken to prevent spillages from equipment containing small quantities of hazardous substances (for example, chainsaws and jerry cans) including:
  - each container or piece of equipment will be stored in its own drip tray made of a material suitable for the substance being handled; and
  - containers and equipment will be stored on a firm, level surface.
- For deliveries and dispensing activities, the Contractor will ensure that:
  - site-specific procedures are in place for bulk deliveries; and
  - delivery points and vehicle routes are clearly marked.
- emergency procedures will be displayed, and suitably sized spill kits will be available at all delivery points, and staff will be trained in these procedures and the use of spill kits.

Fuel and oil leaks from vehicles and plant

The use of vehicles and plant poses similar risks to those posed by storage of liquids. Fuel and oil may leak from such equipment which may enter drains and/or watercourses, as well as contaminating the ground itself. The following measures will be implemented to reduce this risk:

- vehicles and plant provided for use on the site will be in good working order to ensure optimum fuel efficiency, and will be regularly inspected to ensure they are free from leaks;
- sufficient spill kits will be carried on all vehicles;
- vehicles and plant will be regularly maintained to ensure that they are working at optimum efficiency and are promptly repaired when not in good working order;
- vehicles and plant will not park near or over drains; and
- refuelling of vehicles and plant will be carried out on hard standing, using drip trays to ensure no fuel can contaminate the ground outside of the bunded areas.

Concrete

If concrete is required on site, the following measures will be implemented to reduce risks associated with concrete pouring:

- when working in or near the surface water and the use of introduced materials, e.g. oil, cannot be avoided, alternative materials such as biodegradable oils shall be used;
- placing of concrete in or near watercourses will be carried out only under the supervision of the ECoW;
- there will be no hosing of concrete, cement, grout or similar material spills into surface water drains. Such spills shall be contained immediately, and run-off prevented from entering the watercourse;
- concrete waste and wash-down water will be contained and managed on-site to prevent pollution of all surface watercourses; and
- washout from concrete lorries will not be permitted on-site and will only take place at the batching plant (or other appropriate facility designated by the manufacturer).

Nesting birds

Unless suitable mitigation is adopted (see next paragraph), hedgerows, trees and scrub will not be removed within the bird breeding season, generally taken to be between 1 March and 31 August, to avoid impacts on nesting birds.

Where this seasonal restriction cannot be adhered to, habitats that need to be removed will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. The ecologist will demarcate a suitable buffer around an active nest and clearance within this area will be postponed until the chicks have fledged. A suitable exclusion zone will be established by the ECoW. Bird deterrents (e.g. flicker tape/compact discs will be tied to habitat confirmed without nests and the habitat will be cleared within three days of the inspection; otherwise, repeat inspections will be required to confirm the continued absence of nesting birds. If vegetation is to be cleared in the breeding season (under supervision of an ecologist), it will be chipped, removed or covered (ideally) on the same day to prevent birds from nesting. Planting of woodland, hedgerow and grassland habitats within the PAB as detailed in the landscape drawings will provide suitable compensatory habitat for the breeding bird species recorded within the study area. Once established, this will provide nesting habitat for breeding birds displaced as a result of the Proposed Development

Squirrels

Squirrels breed in winter (young born February to April) when trees are generally proposed to be felled (i.e. outside the bird nesting season). Even if adults vacate their dreys, if present, young could be killed. Dreys are often distinguishable from bird nests as dreys are constructed in the main upper tree trunk (not upper thinner terminal branches). Dreys are not usually in isolated trees, and typically have leaves attached to twigs. Grey squirrels are a scheduled invasive species widespread in the environs of the Proposed Development site. Red squirrels are a nationally protected species with a patchy distribution in the environs of the Proposed Development site.

Where pre-construction surveys identify potential dreys at risk from felling, vantage point watches (for individual trees) or transects (for hedgerows/groups of trees) will be conducted to visualise squirrels and identify if the squirrel is grey (invasive) or red (protected). Surveys are best conducted in the early morning, during the summer months. Where visualisations are inconclusive, hair tube surveys may be required, following the method in NRA (2009). As grey squirrels are a scheduled invasive species, confirmed grey squirrel dreys can be felled without mitigation. In the event that confirmed or suspected red squirrel dreys require felling, felling will only be carried out from October to January, in consultation with the NPWS, who may require a licence, subject to survey findings.

Roosting bats

Although no bat roosts were known to be present, to avoid the risk of killing and injuring bats during construction, all trees to be removed will be subject to pre-construction surveys. Any roosts recorded would be felled under a derogation licence, which would require mitigation measures, such as the provision of an alternative roost (bat box) in a suitable, undisturbed location, away from the construction works, either within the Planning Application Boundary where works have been carried out or on third-party lands, and with the agreement of landowners. The loss of trees with high potential for roosting bats will be mitigated for on a 3-to-1 ratio with bat boxes, and moderate potential trees will be mitigated on a 2-to-1 ratio with bat boxes. A range of models will be used, suited to the species recorded within the study area, and for different seasons. The boxes will be erected in a suitable location. It may be necessary for temporary lighting to be provided at construction compounds for security purposes. Temporary lighting would need to be controlled and directed in order to mitigate any potential impacts to bats as advised by the appointed ECoW.

Mammals (otter)

Following the pre-construction survey methods (Section 10.5.1), the following general mitigation measures for otter will be implemented:

- any excavations will be covered at night to prevent otter from falling in or becoming trapped;
- should any otter be observed within the PAB or should any evidence of otter activity be found during the works, works must cease immediately and the ECoW contacted for advice;
- should a non-breeding otter holt or rest site be identified, a buffer zone of 30 m will be implemented around the feature. Where a resting place is confirmed to be a natal site this would increase to 150 m; and
- TII's Guidelines for the Treatment of Otters will be followed at all times as necessary.

Further surveys, mitigation and licensing may be required to lawfully proceed if impacts to otter cannot be avoided.

Mammals (badger)

Following the pre-construction survey methods (Section 10.5.1), the following general mitigation measures for badger will be implemented:

- any excavations will be covered at night to prevent badger from falling in or becoming trapped;
- if badgers are found to be present, any works within 30 m of a sett will be supervised on-site and full-time by a suitably qualified ecologist (extended to 50 m during the breeding season for a main sett where there is breeding activity);
- breeding setts will not be interfered with or disturbed during the badger breeding season (December to June inclusive);
- only the use of hand tools will be permitted within 20 m of an active sett;
- no heavy machinery will be used within 30 m of a sett except under licence;
- during the breeding season, none of the above works will be undertaken within 50 m of active setts nor blasting (if required) within 150 m of active setts. Should this not be possible, an experienced ecologist will be contacted for advice on how best to proceed;

- night-time working will be restricted as far as possible within 100 m of a sett;
- the use of noisy plant and machinery near badger setts will cease before sunset; and
- any spoil heaps will be sited at a minimum distance of 30 m from setts.

Small mammals

Removal and clearance of vegetation may affect small mammal species if present in these habitats. The following measures will be adhered to in order to minimise impacts to small mammal species:

- any excavations will be covered at night to prevent small mammals from falling in or becoming trapped;
- working at night will be prohibited where specific tasks such as vegetation removal and clearance are to be carried out and will be information by the ECoW;
- any lights will be turned off after working hours;
- noise levels will not exceed permissible levels for construction works (70 dB(A)) based on Guidelines for the Treatment of Noise and Vibration in National Road Schemes (NRA, 2004); and
- post construction, the site will be re-vegetated.

Amphibians and reptiles

Removal and clearance of vegetation may affect amphibians or reptiles if present in these habitats. The following measures will be adhered to, to minimise impacts on amphibians or reptiles:

- a toolbox talk will be carried out to ensure all site personnel are aware of these protected species and their mitigation requirements;
- vegetation will be cleared in two stages, during the reptile and amphibian active season, following the completion of the toolbox talk:
    1) A hand-search by a licensed ECoW for any animals present within vegetation to be cleared, followed by a first cut of vegetation down to 210 mm above ground-level using hand tools;
    2) A second hand-search of vegetation by an ECoW for any animals present, followed by the second cut of vegetation to ground-level (or as close as practicable).
- if any reptiles are found during pre-construction surveys or during works, they will be captured and translocated by a suitably qualified and experienced ecologist under licence to a previously identified receptor site.
- where practicable in the context of construction, water levels will be maintained in any watercourses potentially used by amphibians; and
- habitat reinstatement will re-create, except in areas of permanent hardstanding, the former habitats within the PAB.

Invasive Plant Species

The mitigation measures described below follow the recommendations set out in the *Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads* (TII, 2010):

- all staff will be informed of the presence of Himalayan balsam and any other invasive species through toolbox talks;
- exclusion zones will be established where necessary to prevent the spread of invasive species;
- no machinery will be allowed within exclusion zones other than where necessary to undertake treatment measures;
- any plant material and soil-containing plant material must be disposed of in accordance with the TII (2010) guidelines; and
- care will be taken near watercourses to ensure that material that contains flower heads, seeds or cuttings of any invasive species will be disposed of correctly and not enter watercourses.

10.5.3 Specific mitigation measures

10.5.3.1 European designated sites

The NIS for the Proposed Development (Jacobs 2023b) found that, in the absence of mitigation, likely significant effects on the Rye Water Valley/Carton SAC could not be excluded, because this SAC is hydrologically connected to the PAB by the following waterbodies: WB03 (Cullendragh); WB04 (Jenkinstown Stream); WB09 (un-named ditch, flows into Rye Water); WB10 (Bride Stream); WB12 (un-named ditch, flows into Rye Water); WB13 (Rye Water); WB26(un-named ditch, flows into River Lyreen); WB16 (River Lyreen); WB20 (un-named ditch, flows into River Lyreen); WB22 (Baltracey River, flows into River Lyreen).

Mitigation measures to protect the Rye Water Valley/Carton SAC from water pollution are described in the NIS (Jacobs 2023b) and in the site-wide mitigation measures above (Section 10.5.2.1).

10.5.3.2 Nationally designated sites

In addition to the site-wide waterbody mitigation measures in Section 10.5.2, the following mitigation relating to HDD will be put in place where it crosses the Grand Canal pNHA and the Royal Canal pNHA to prevent bentonite drilling fluid release entering these canals:

- when using HDD, the drilled cuttings will be flushed back by the drill fluid flowing via nozzles in the drill bit, to the surface, where they will be separated from the fluid fraction for disposal. A comprehensive closed-loop drilling fluid mixing and circulation system with recycling capability will be used to minimise the volume of fluids required on site;
- the shaft and borehole will be kept at least 50 m away from any watercourse where possible. However, given that the shaft will be kept as short as possible to reduce the risk of the drilling machine becoming stuck, it may not be possible to keep 50 m from a watercourse. In this case, a bunded area will be created around the temporary working space to prevent slurry washing into the SAC in the case of accidental release;
- use will be constantly monitored by the contractor through materials balance calculations, pressure monitoring in the lines and above ground visual assessment of the works. The pressure will be lowered, if

necessary, to prevent a breakout. Bentonite pumping will stop immediately if any sudden drop in pressure is detected which could indicate a bentonite breakout;

- biodegradable drilling mud formulation and management for the conditions and best practice drilling practices will be adhered to by the contractor at all times; and
- the contractor will prepare an emergency action plan as part of the CEMP which will include containment, control and clean-up measures in the event of drilling fluid release into the environment. Containment measures include installing interception devices (e.g., silt fence, staked straw bales, sediment curtains, collection sumps).

10.5.3.3 Otter

The mitigation measures described below follow the recommendations set out in the *Guidelines for the Treatment of Otters during the Construction of National Road Schemes* (NRA, 2008)

One potential otter holt was identified within the PAB during the field surveys (see Figure 6, Appendix 10.7). The hole showed no signs of otter use, but due to its location near to the river there was high potential for use.

Prior to the works, the potential holt may become active. To confirm the holt status, the holt will be monitored under licence for a minimum of five days using remote cameras. Should the holt be determined to be inactive, works can proceed under the supervision of an ECoW. Should the holt be determined to be active, a buffer zone will need to be established as agreed with the ECoW.

10.5.3.4 Badger

The mitigation measures described below follow the recommendations set out in the *NRA Guidelines for the Treatment of Badgers during the Construction of National Road Schemes* (NRA, 2006).

During the baseline surveys, it was identified that seven badger setts/potential badger setts could be impacted by the Proposed Development, including five within 50 m of the PAB and two between 61 and 150 m (see Table 10.20 and on Figure 7, Appendix 10.8).

Of the seven setts, there are three active setts: one at 32 m, one at 40 m and one at 150 m from the PAB, and four are inactive (all within 61 m of the PAB).

To determine whether a sett is active or inactive, camera traps will be set up to monitor the entrance to the holes for a minimum of five days. If, after five days, there is no evidence that badgers are using the sett, it is presumed inactive and no further actions are required. However, this would only apply if the monitoring was carried out directly prior to the start of works, meaning there was no change to the baseline. The use of the sett may change over time, so if there is a delay of more than 12 months prior to the commencement of the works from the date of the final camera monitoring, then a further badger survey will be undertaken to determine the status of the hole.

No heavy machinery will be used within 30 m of badger setts (unless carried out under licence); lighter machinery (generally wheeled vehicles) will not be used within 20 m of a sett entrance; light work, such as digging by hand or scrub clearance will not take place within 10 m of sett entrances. During the breeding season (December to June inclusive), none of the above works will be undertaken within 50 m of active setts nor blasting or pile driving within 150 m of active setts.

Where a sett needs to be closed, the measures presented in the NRA guidance (2006) will followed in full.

10.5.3.5 Wintering Birds

Water pollution control measures are detailed in Section 10.5.2. Wintering birds recorded at Osberstown Pond could be disturbed if present during works from September to March inclusive, as the pond is within the 300 m distance for noise and visual disturbance as suggested by Cutts *et al*. (2013). The following measures will mitigate disturbance to wintering birds;

- Hoarding/non-transparent visual screening will be erected to hide the construction works. The barrier material will have a mass per unit area exceeding 7 kg/m^2 in accordance with the recommendations of BS 5228 Part 1:2009+A1:2014 Part B.4. Screening will be installed in early September. Erection of fencing later than this could potentially cause further disturbance to the birds. The fencing will be of adequate height to screen the PAB (2–3 m) or as advised by an experienced ecologist and will remain in place for the duration of the works. The ECoW will supervise the erection of the screening (where natural screening cannot be retained) and provide guidance through a toolbox talk ensuring these measures are effective. The ECoW will make regular checks of the screening throughout the works to ensure it is maintained in good condition and working order.

- Habitat disturbance will be limited by controlling the movement of vehicles and personnel. Construction vehicles and personnel will not encroach onto habitats beyond the Proposed Development footprint. To reduce the level of disturbance to wintering birds, construction activities will be restricted to between 07:30 and 19:30 Monday to Friday and between 08:00 and 18:00 on Saturdays.

- All plant used during the construction phase will be the quietest of its type practical for achieving the works. All plant will be operated and maintained in accordance with the manufacturer's recommendations including the use and maintenance of any specific noise reduction measures. At a minimum, the following will be incorporated to reduce the impact further:

    - The use of mufflers on pneumatic tools;
    - Effective exhaust silencers;
    - Sound-reducing enclosures;
    - Pumps and static mechanical plant will be enclosed by acoustic sheds or screens;
    - Machines in intermittent use will be shut down during periods where they are not required.

10.5.3.6 Fish and white-clawed crayfish

Mitigation measures regarding pollution control have been detailed in Section 10.5.2 and in Section 10.5.3.2. These measures have been developed to protect watercourses and the habitats and species that they support and will avoid a reduction in water quality during construction.

The following control measures will be implemented during construction in or adjacent to a watercourse:

- works within and adjacent to watercourses will be conducted during forecast low-flow periods where possible;

- in-stream works will not be carried out in watercourses frequented by salmon or trout during the Annual Close Season. The duration of the season varies regionally within the period from the beginning of October to the end of February, inclusive (IFI, 2016). River and brook lamprey spawn during March to April/May. Translocation (fish rescue) and in-stream works will be undertaken outside of the spawning season for salmonids (salmon and trout) and lamprey (river and brook), generally taken to be summer to early autumn, which would also protect white-clawed crayfish. The timing of works will be considered on a site-specific basis and in agreement with the IFI;

- operation of machinery in-stream will be kept to an absolute minimum. All construction machinery operating in-stream will be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery will be cleaned and checked prior to commencement of in-stream works;
- the design of temporary settlement ponds, the outfalls from these temporary ponds and the construction method statements for their installation will be agreed with IFI prior to construction;
- the area of disturbance of the watercourse bed and bank will be the absolute minimum required for the installation of outfalls/culverts;
- any dewatering flows will be directed to the construction drainage system and to the settlement pond (or other) treatment system;
- sediment mats/silt traps or similar will be located immediately downstream of the works within and adjacent to the watercourses. These will be inspected daily, maintained and cleaned regularly by the ECoW during the course of site works. Diversion of water to and from a temporary diversion channel will only take place during the period March to September (IFI, 2016) or as agreed with the IFI;
- small check dams will be constructed in the cut-off watercourse to trap any sediment, and a sediment trap will be provided immediately downstream of the diversion to the existing watercourse; and
- where in-stream bed material is to be removed, coarse aggregates, if present, will be stockpiled at least 10 m away from the watercourse for replacement following reinstatement of a watercourse channel.

Watercourse banks affected during construction in/near a watercourse will be reinstated back to pre-development conditions.

Where open trenching is proposed, site restoration works will be carried out following completion of the crossing, in agreement with IFI. These works may include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation. Open cut trenching works will not be carried out during extreme rainfall or high flow events. Met Éireann provides a five-day weather forecast via its website (www.met.ie), and works will not take place during orange and red weather warnings unless agreed with the ECoW. Unless otherwise agreed with IFI (for fish) and/or the NPWS (for white-clawed crayfish), any element of the works requiring in-stream works will be restricted to the fisheries open season (i.e. restricted to July to September inclusive). Where white-clawed crayfish were confirmed as present (WB46 and WB32), works will be carried out under licence.

Additional measures that will be undertaken to protect fish species and white-clawed crayfish are as follows:

- where in-stream trenching is to be carried out, the area will be dewatered to provide a dry working area;
- netting, sandbags and/or dumpy-bags filled with rock will be installed upstream to prevent fish travelling downstream into the working area;
- fish will be removed from the working area through electrofishing and moved upstream of the dammed area;
- hand searches, under licence, will be conducted at WB46 and WB32 where crayfish were confirmed to be present, and any crayfish found will be removed and moved upstream of the dammed area;

- water will then be over-pumped continually to ensure a dry working area. This must be pumped through a silt buster to avoid sediment from becoming suspended within the watercourse; and
- once construction is completed, the watercourse will be re-wetted under the direction of the ECoW. Water will be released slowly, and silt mats, sediment traps and haybales will be used to avoid a sudden influx of sediment to the system. A silt buster will be used where required.

10.5.3.7 Invasive species

Himalayan balsam was present along the route of the Proposed Development between ch 37000 and 37250 at N 87990 24456, approximately 40 m from the HDD launch platform on the west bank of the River Liffey, and at the same location but approximately 70 m south of the PAB at N 87999 24353. These areas will be fenced off and toolbox talks given to raise awareness. Where this is not possible, biosecurity measures must be carried out as presented in the site-wide mitigation section (Section 10.5.2).

10.5.4 Reinstatement

10.5.4.1 General requirements (all hedgerows)

All planting will be native (only), taking account of the vegetation that has been removed and typical species of the Kildare/Meath landscape.

Unless otherwise agreed with the Developer (ESB) and the local authority, the Contractor will reinstate hedgerows and treelines to a species-rich condition (i.e., five woody species per 30 m), comprising only native species. All other sites will be returned as close as possible to their pre-existing condition, using the same woody species removed, under the supervision and direction of the Contractor’s ECoW.

Hedging/hedgerow plants will be planted as a staggered double row, six plants per metre with 330 mm between rows. Suitable individual protection from browsing animals will be provided by tube, spiral or similar held in place with a short cane. Group protection of new planting may be provided by suitable fencing, but individual plant protection of spirals will be provided to protect against browsing animals. Mulch mats or similar weed suppression materials (restricted to a biodegradable specification) will be used to promote successful establishment.

The Contractor will make orders by the scientific name to ensure native plants are delivered and not a cultivated variety.

Nurseries prefer to grow trees to order, so the Contractor will make the order as soon as possible (up to a year in advance) to ensure the required species and stock specification can be secured.

Consideration will be given to the procurement of planting so that there are suitable lead-in times to ensure that plants are of the right age/height required for when they are planted.

The Contractor will manage the establishment phase of planting (1–2 years) in accordance with online Teagasc guidance (Teagasc, 2020), to include watering in, weed suppression (using biodegradable mulches), and (where required) protection from browsing animals.

Thereafter, the Developer (ESB) will manage plantings from years 3-5 in agreement with the landowner.

10.5.4.2 Specific requirements (hedgerows within the cable easement)

At the time of writing, the latest specification (EirGrid, 2021) stated:

"*The easement area shall be cleared, and kept clear, of trees and other vegetation with deep root systems as these may damage the cable*".

All planting from the edges of the easement to the edges of the PAB will be replanted.

EirGrid has not confirmed known precedence for safely planting trees or shrubs over High Voltage Underground cables.

A Draft Planting Strategy is under development for restricted low shrub planting within the cable easement, including the potential use of a high performing Root Barrier Membrane.

This Draft Planting Strategy is undergoing Risk Assessment, in conjunction with a review of international best practice.

If approved, by EirGrid and ESB, the Planting Strategy would complement the commitment to Offsite Compensatory Planting for permanent hedgerow loses within the footprint of permanent surfaced areas.

The risk assessment may conclude that easement planting cannot be delivered while guaranteeing cable performance and security.

Therefore, applying a precautionary principle, in this assessment offsite compensatory planting is assumed for all permanent losses within the easement (Section 10.5.4).

10.5.4.3 Specific requirements (semi-natural grasslands)

The Contractor's ECoW will develop site-specific reinstatement plans for all semi-natural habitats (including dry calcareous grassland, dry meadows and grassy verges, and reed and large sedge swamps). These plans will be provided to the Developer's Ecologist (ESB), and the Planning and Environmental Unit in EirGrid's Chief Infrastructure Office. In accordance with the All-Ireland Pollinator Plan, commercial seed mixes will not be sown with the objective of restoring biodiversity. Seeds of certain plant species, such as wildflowers and certain species included in multi-species mixtures, are not subject to the seed certification schemes as implemented by the EU Member States and OECD-designated authorities in respect of third countries (DAFM, 20218). Furthermore, even where harmful weed species are not present, seeds of non-local origin — even if the species are native — introduce new genetic strains which may displace or compromise the local, naturally-occurring flora (Dublin Naturalists Field Club, 2021).

As such, in the site-specific habitat reinstatement plans for semi-natural habitats, the Contractor's ECoW will adopt the following approach, subject to consultation with the NPWS:

1. where it is deemed appropriate to allow habitats to re-vegetate naturally (e.g. roadside verges, where similar habitat is contiguous either side of the construction area), there will be no active seeding of reinstated topsoil;

2. in all other areas, the preferred approach to reinstatement shall be use of locally collected seed from similar habitats;

3. use of commercial seed in semi-natural habitats will only be permitted where local seed is not available, or where local seed establishment has failed, AND if both:

    a. Certified native by the Department of Agriculture, Food, and the Marine; and,

    b. With the written agreement of the NPWS.

10.5.4.4 General requirements (roadside verges and agricultural areas)

Measures for use of seed in grassland reinstatement are as follows:

- commercial seed mixes can be used on road verges but not on semi-natural grassland habitats.
- all seed mixes will be certified native by the Department of Agriculture, Food, and the Marine.
- in agricultural areas, the rate of seeding, time and method of sowing, including the application of fertiliser, will be agreed with an experienced agronomist and will follow the guidance on reseeding (Teagasc, 2014).

10.5.4.5 Compensation (Unrelated to European sites)

An off-site hedgerow compensation strategy has been developed, in light of the urgent biodiversity action required at European and national level, and the hedgerow/tree policy objectives of Kildare County Council (particularly Policy Objectives BI 026, BI 027, BI 028) and Meath County Council (particularly HER POL 37, HER POL 38, HER POL 40).

The strategy will comprise off-site compensatory planting, outside the PAB, to deliver an overall net gain of habitat area. A minimum of 130% compensatory off-site planting will be delivered by the Developer (ESB), in consultation with EirGrid.

The surplus will mitigate the risk of failures and contribute to the reduction of residual effects on mature and veteran trees, which cannot be replaced. Subject to consent, the planting will commence in advance of, or in parallel with, construction works. EirGrid has identified candidate sites in Co. Meath in consultation with a charity partner, who provides compensatory planting options on third-party lands. Whether these candidate sites or other sites are used for compensatory planting, there will be no planting in semi-natural habitats of significant ecological value, which will be verified by the Developer's Ecologist.

While the strategy cannot fully mitigate the loss of mature and veteran trees (see Section 10.6), the proposed surplus of off-site compensation will reduce the significance of residual effects.

10.5.4.6 Monitoring

To ensure that the proposed mitigation measures remain effective, particularly in regard to reinstatement and compensation, the Contractor and ESB will collectively deliver a five-year monitoring landscape aftercare regime.

Sediment mats/silt traps or similar will be located immediately downstream of the works within and adjacent to the watercourses. These will be inspected daily, maintained and cleaned regularly by the independent EnCoW during the course of site works. Diversion of water to and from a temporary diversion channel will only take place during the period March to September (IFI, 2016) or as agreed with the IFI.

10.5.4.7 Reporting

All reinstated or indirectly impacted semi-natural vegetation will be inspected at the completion of construction, at which time the Contractor's ECoW will provide written reports on habitat condition to the Developer's Ecologist (ESB), and EirGrid Planning and Environmental Unit. At that time, the Developer's Ecologist (ESB) will determine what additional steps are required. Additional steps could include replacement tree planting, additional hedge mulch or protection from browsing animals, or sowing of locally harvested seed (using a green hay approach) for semi-natural grasslands).

10.6 Residual Effects

Residual significance is defined as the level of significance of a potential impact following the implementation of mitigation.

Through the implementation of well-established approaches to mitigation, which will be implemented in accordance with best practice guidance, it will be possible to reduce the impacts to local level for all IEFs, except mature trees. Net habitat loss areas are summarised below in Table 10.22.

Table 10.22: Net habitat loss areas of Important Ecological Features after mitigation and before and after compensation

Habitat Description (Fossitt Code)	Net Habitat Loss before compensation		Net Habitat Loss after compensation
	ha	km	
FW4 (Undifferentiated ditches/watercourses)	-	0.20	no change
GS2 - Dry meadows and grassy verges	0.67	-	no change
GS4 - Wet grassland	0.78	-	no change
WD1 - (Mixed) broadleaved woodland	0.51	-	no change
WL1 Hedgerows/WL2 Treelines	-	4.08	+1.22 linear km
WS1 - Scrub	0.44	-	no change
N/A – individual mature trees **(of which veteran)**	95-190* (43-58)*		no change
***Range of trees lost, subject to detailed design and numbers potentially lost following indirect impacts to root systems where ducting laid on local roads**			

There will be short to medium term residual impacts from the loss of hedges until species rich hedgerows are established. There will be a significant residual effect estimated at County significance from the loss of mature trees which will take longer to establish and grow.

10.7 Conclusion

For receptors other than mature trees, residual effects from the Proposed Development will be at local level. Following offsite compensation, there will be a net gain in hedgerow length, however, there will be a residual effect of County significance from the loss of mature trees which will take longer to establish and grow. However, with EirGrid's commitment to monitor mitigation success and embed Nature Inclusive Design into all projects the Proposed Development will ultimately align with Kildare County Development Plan 2023-2029 policies BI P4, BI P5 and BI P6 in particular and Meath County Development Plan 2021-2027 policies HER POL 27, HER POL 28 and HER POL 37 to and including HER POL 42.

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11. Soils, Geology and Hydrogeology

11.1 Introduction

This chapter presents the assessment of risks arising from the Proposed Development to land, soils and hydrogeology. This chapter also provides an assessment of the compliance of the Proposed Development with the Water Framework Directive (WFD) 2000/60/EC, in terms of groundwater.

This assessment is based on the Proposed Development as detailed in Chapter 5. This chapter considers the potential effects during construction and operation associated with:

- Land cover;
- Soils and geology; and,
- Hydrogeology.

Environmental control measures and mitigation measures to prevent, reduce and/or offset the anticipated potential effects are presented as appropriate.

The assessment of surface water is presented in Chapter 12 Hydrology, including Flood Risk. The assessment of effects on biodiversity is discussed in Chapter 10 Biodiversity. The assessment of effects on agriculture is discussed in Chapter 15 Material assets – Agriculture.

11.2 Methodology

11.2.1 Relevant Guidelines, Policy and Legislation

The assessment was carried out in accordance with the following guidance and adapted to reflect the nature of the Proposed Development and attributes of the environmental receptors based on professional judgement and experience:

- Institute of Geologists of Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements; and
- National Roads Authority (2009): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

11.2.2 Data Collection

The following data sources have been accessed during the collation of baseline information on the receiving environment with respect to land and land use, soils and geology, and hydrogeology.

- Geological Survey of Ireland (GSI) database (GSI, 2023), accessed January 2023;
- Environmental Protection Agency (EPA) database and mapping (EPA, 2023), accessed January 2023;
- Teagasc Agriculture and Food Development Authority soil maps (Teagasc, 2023), accessed January 2023;
- National Parks & Wildlife Service (NPWS) Public Map Viewer, accessed January 2023; and
- Map of Irish Wetlands, accessed January 2023.

No private water supply abstractions are known to be present in the vicinity of the Proposed Development at the time of writing and so these features have not been considered at this stage of assessment. However, current information is based on initial consultation with landowners by Agricultural Liaison Officers and the presence of private water supply abstractions cannot be conclusively ruled out at this stage. Potential effects on private water supplies will be addressed at a subsequent stage.

A ground investigation (GI) was undertaken covering the proposed route to provide geotechnical and environmental information for input to the design and construction of the Proposed Development.

The GI included boreholes, trial pits, slit trenches, geophysical surveys, soil and rock core sampling, environmental sampling, groundwater monitoring, in situ and laboratory testing and the preparation of a factual report on the findings. Further details regarding the findings of the GI are presented in Section 11.3.6 below.

Information on potential groundwater dependent terrestrial ecosystems (GWDTE) was provided by the ecology team, based on Fossitt habitat surveys conducted by the team between June and October 2022. These surveys were undertaken up to 150 m around the Proposed Development route.

11.2.3 Assessment scope

The study area for the Proposed Development has been defined as the area of the cable route and associated construction requirements (e.g. Access roads and compounds) and the surrounding 1 km from these features. This buffer allows for the identification of receptors outside the location of the physical works, which could potentially be impacted by the works. From a hydrogeology perspective these could be impacted by activities such as change in groundwater levels caused by dewatering or disturbance (in flow and/or quality) of groundwater. These in turn may support receptors such as GWDTEs or provide baseflow to watercourses.

It is not expected that impacts to groundwater and its receptors would extend beyond 1 km from the Proposed Development. In addition to this, impacts to land use, soils and geology will be localised to the works area, and are not expected to extend beyond the 1 km buffer set out above.

11.2.4 Assessment of importance/ sensitivity of receptors

The criteria used for assessing the importance/sensitivity of the geological and hydrogeological environments within the study area are outlined out in Tables 11.1, 11.2 and 11.3.

The importance / sensitivity of the geological receptors was assessed following NRA (2009) Guidance and is displayed in Table 11.1.

Table 11.1: Criteria for Rating Site Importance of Geological Features (from NRA, 2009; IGI, 2013)

• Sensitivity/ Significance	• Criteria	• Typical Examples
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale [1]. Volume of peat and / or soft organic soil underlying alignment is significant on a local or regional scale	Geological feature rare on a regional or national scale. Large existing quarry or pit Proven economically extractable mineral resource
High	Attribute has a high-quality significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale [1]. Volume of peat and / or soft organic soil underlying alignment is significant on a local scale.	Contaminated soil on-site with previous heavy industrial usage [1] Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site). Well drained and / or high fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale [1]. Volume of peat and / or soft organic soil underlying alignment is moderate on a local scale.	Contaminated soil on-site with previous light industrial usage [1]. Small recent landfill site for mixed wastes Moderately drained and / or moderate fertility soils. Small existing quarry or pit Sub-economic extractable mineral resource
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale [1]' Volume of peat and / or soft organic soil underlying alignment is small on a local scale.	Large historical and / or recent site for construction and demolition wastes Small historical and / or recent landfill site for construction and demolition wastes [1]. Poorly drained and / or low fertility soils Uneconomically extractable mineral resource.

Recently published IEMA guidance (IEMA, 2022) provides additional guidance on classifying receptor sensitivity for in situ soils based on soil resource and soil functions, which has also been taken into account and is provided. The IEMA guidance provides examples of UK classifications which differ to classifications in the Republic of Ireland although there is some commonality and these sensitivity classifications have been used within the assessment where appropriate and applicable. Table 11.2 describes the criteria for which soils sensitivity is based.

Table 11.2: Guidance on Rating Soil Receptor Sensitivity and Typical Soil Resource / Function Descriptions (from IEMA, 2022)

Receptor Sensitivity	Soil Resource and Soil Functions
Very High	**Biomass production:** ALC Grades 1 & 2 or LCA Classes 1 & 2. **Ecological habitat, soil biodiversity and platform for landscapes:** Soils supporting protected features within a European site (e.g., SAC, SPA, Ramsar); peat soils; soils supporting a national park, or ancient woodland. **Soil carbon:** Peat soils Soils with potential for ecological / landscape restoration. **Soil hydrology:** very important catchment pathway** for water flows and flood risk management. **Archaeology, Cultural Heritage, Community benefits and Geodiversity:** SAMs and adjacent areas; World Heritage and European designated sites; soils with known archaeological interest; soils supporting community / recreational / educational access to land covered by national park designation. **Source of Materials:** Important surface mineral reserves that would be sterilised (i.e. without future access).
High	**Biomass production:** ALC Grade 3a, or LCA Grade 3.1. **Ecological habitat, soil biodiversity and platform for landscapes:** Soils supporting protected features within a UK designated site (e.g., UNESCO Geoparks, SSSI or AONB, Special Landscape Area and Geological Conservation Review sites); native Forest and woodland soils; Unaltered soils supporting semi-natural vegetation (including UKBAP priority habitats or Section 6 habitats in Wales). **Soil carbon:** Organo-mineral soils (e.g., peaty soils) **Soil hydrology:** Important catchment pathway** for water flows and flood risk management. **Archaeology, Cultural Heritage, Community benefits and Geodiversity:** Soils with probable but as yet unproven (prior to being revealed by construction) archaeological interest: Historic parks and gardens; RIGS; Soils supporting community / recreational / educational access to RIGS and AONBs. **Source of Materials:** Surface mineral reserves that would be sterilised (i.e. without future access).
Medium	**Biomass production:** ALC Grade 3b or LCA Grade 3.2. **Ecological habitat, soil biodiversity and platform for landscapes:** Soils supporting protected or valued features within non-statutory designated sites (e.g., Local Nature Reserves (LNR), Local Geological Sites (LGSs), Sites of Nature Conservation Importance (SNCIs), Special Landscape Areas; Non-Native Forest and woodland soils). **Soil carbon:** Mineral soils **Soil hydrology:** Important minor catchment pathway** for water flows and flood risk management. **Archaeology, Cultural Heritage, Community benefits and Geodiversity:** Soils with possible but as yet unproven (prior to being revealed by construction) archaeological interest; soils supporting community / recreational / educational access to land. **Source of Materials:** Surface mineral reserves that would remain accessible for extraction.
Low	Biomass production: ALC Grade 4 & 5 or LCA Grade 4.1 to 7 or Urban soils. Ecological habitat, soil biodiversity and platform for landscapes: Soils supporting valued features within non-designated notable or priority habitats / landscapes. Agricultural soils.

Receptor Sensitivity	Soil Resource and Soil Functions
	Soil carbon: Mineral soils Soil hydrology: Pathway** for water flows and flood risk management. Archaeology, Cultural Heritage, Community benefits and Geodiversity: Soils supporting no notable cultural heritage, geodiversity no community benefits; soils supporting limited community / recreational / educational access to land. Source of Materials: Surface mineral reserves that would remain accessible for extraction.
Negligible	As for low sensitivity, but with only indirect, tenuous, and unproven links between sources of impact and soil functions.
* All BMV in Wales is considered 'Very High' sensitivity due to the PPW wording *'…significant weight to protect [BMV] from development'*. Only if a development can demonstrate 'overriding need' would MBV grades need to be considered in the sequential test. ** As defined by the site and catchment characteristics according to the professional judgement of a catchment hydrologist.	

The criteria for determining sensitivity of hydrogeological receptors have been adapted from Transport Infrastructure Ireland (TII) NRA (2009). The criteria and examples for each importance status is set out in Table 11.3.

Table 11.3: Criteria for Assessing the Importance of Hydrogeological Features (adapted from NRA, 2009)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	Water feeding GWDTEs with a high or moderate groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) Groundwater supports river or surface water body ecosystem protected by EU Legislation e.g. SAC or SPA status Public potable water supply groundwater abstractions
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river or surface water body ecosystem protected by national legislation – e.g. NHA status. Water feeding GWDTEs of low groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs and SPAs; or water feeding highly or moderately GWDTE with a national priority. Regional potable water source supplying >100 homes or other high volume groundwater usage (such as for bottling plant, large industry or large agricultural farm) Inner source protection area for regionally important water source. Buildings of regional or national importance
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers. Water feeding GWDTEs of low groundwater dependence with a national priority.

Importance	Criteria	Typical Example
		Locally important potable water source supplying >50 homes or used for local activities such as local medium scale industry or medium scale farming. Outer source protection area for regionally important water source. Inner source protection area for locally important water source. Residential and commercial properties
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Water feeding GWDTEs of feeding highly or moderately groundwater dependent GWDTE sites with no conservation designation. Potable water source supplying <50 homes or sustaining local small-scale activity such as small scale farming. Outer source protection area for locally important water source. Unoccupied residential and commercial properties and buildings.
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer. Water feeding GWDTEs of low groundwater dependence with no designation. Back-up private water supply used on an ad-hoc basis or used for secondary activities such as gardening when the main potable supply is provided by another source. Industrial buildings that are currently not utilised, all derelict buildings and infrastructure that serves a single dwelling.

11.2.5 WFD Assessment Methodology

The design of the Proposed Development was screened against the various characteristics for groundwater bodies which can impact both the quantitative and qualitative status of the WFD groundwater body. This will determine whether the works require further assessments to be compliant with the WFD. The following quantitative and qualitative elements of the WFD groundwater bodies have been scoped in for this assessment:

- Impact of groundwater on surface water ecological/quantitative and chemical status test;
- Quantitative and qualitative GWDTE test;
- Quantitative Water Balance;
- Qualitative drinking water protected areas; and
- General chemical test.

Following the assessment, where mitigation can be incorporated to maximise opportunities for enhancement, the activity will be considered to have a very low residual risk and therefore will be compliant with the WFD.

11.2.6 Magnitude of impact

The scale or magnitude of potential impacts depends on both the degree and extent to which the Proposed Development may impact the geological and groundwater receptors during the Construction and/or the Operational Phases.

Table 11.4 describes the assessment of the magnitude of impacts to geological receptors based on IGI guidance (**IGI, 2013**), which can be described as adverse or beneficial.

Table 11.4: Criteria for Assessing the Magnitude of Impact on Geology and Soils (IGI, 2013)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves; Irreversible loss of high proportion of local high fertility soils Removal of entirety of geological heritage feature Requirement to excavate / remediate entire waste site Requirement to excavate and replace high proportion of peat, organic soils and/or soft mineral soils beneath alignment
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Loss of moderate proportion of future quarry or pit reserves Removal of part of geological heritage feature Irreversible loss of moderate proportion of local high fertility soils Requirement to excavate / remediate significant proportion of waste site Requirement to excavate and replace moderate proportion of peat, organic soils and/or soft mineral soils beneath alignment
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Loss of small proportion of future quarry or pit reserves Removal of small part of geological heritage feature Irreversible loss of small proportion of local high fertility soils and/or high proportion of local low fertility soils Requirement to excavate / remediate small proportion of waste site Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature

Hydrogeological receptors use the TII Assessment Guidelines for determining the magnitude of impacts. The TII Assessment Guidelines do not define beneficial impacts in their categorisation of impacts on hydrogeological features, and therefore the magnitude of potential impacts is assessed on a scale of ‘Negligible’ to ‘Large Adverse’. The criteria for determining the magnitude of impacts for hydrogeological receptors are outlined in Table 11.5.

Table 11.5: Criteria for Assessing the Magnitude of Impact on Hydrogeology (TII, 2009)

Magnitude of Impact	Criteria	Typical Example
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Removal of large proportion of aquifer Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems Potential high risk of pollution to groundwater from routine run-off* Calculated risk of serious pollution incident >2% annually† Dewatering effects create significant differential settlement effects on existing infrastructure and buildings leading to extensive repairs required.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer. Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Potential medium risk of pollution to groundwater from routine run-off*. Calculated risk of serious pollution incident >1% annually† Dewatering effects create moderate differential settlement effects on existing infrastructure and buildings leading to consideration of undertaking minor repairs.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Potential low risk of pollution to groundwater from routine run-off*. Calculated risk of serious pollution incident >0.5% annually† Dewatering effects create minor differential settlement effects on existing infrastructure and buildings which may need to be monitored but where repairs may be avoidable.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident <0.5% annually† Dewatering effects create no or no noticeable differential settlement effects on existing infrastructure and buildings

Note:
* DMRB Volume 4, Section 2, Part 1 Road Drainage and the Water Environment, Appendix A, Method C (TII, 2015)
† DMRB Volume 4, Section 2, Part 1 Road Drainage and the Water Environment, Appendix A, Method D (TII, 2015)

11.3 Baseline Conditions

11.3.1 Overview

The study area for assessing the impact of the Proposed Development has been defined as the area of the cable route and the area extending 1 km from this, in addition to any construction compounds or access roads which will have their own 1 km buffer. The 1 km buffer is informed by the design noting that no large-scale dewatering is expected to be required, given the largely shallow nature of the works.

The following sections present a desk-based overview of the baseline conditions of all land use, geological and hydrogeological receptors which lie within 1 km of the cable route and associated working areas (e.g. Access roads and compound areas).

The assessment also includes any WFD groundwater bodies which lie within this 1 km radius.

Consideration of the recently completed GI is presented in Section 11.3.6.

11.3.2 Land Cover

The land and land use baseline encountered across the proposed route may be divided into several land use types for which potential contaminant profiles may be assigned. The baseline land use (from the CORINE 2018 land use dataset) is summarised below in Table 11.6 and displayed in Figure 11.1.

The land use that covers the majority of the Proposed Development is agricultural land used for pasture. Within the areas of pasture there are small patches of non-irrigated arable land. Areas of discontinuous urban fabric are associated with the towns/villages of Kilcock, Prosperous, Clane, Naas and Two Mile House.

Between the towns of Prosperous and Clane are small areas of complex cultivation patterns. Within the northern part of the study area there are also small areas of mixed forest and broad-leaved forests. To the south at Dunstown substation are areas of natural grassland and transitional woodland shrub.

A summary of the land use and approximate locations is provided in Table 11.6.

Table 11.6: Summary of land use types (Corine Landcover, 2018)

Land Use Type	Distribution
Agricultural (pastures)	Located along the majority of the cable route and the surrounding area
Agricultural (non-irrigated arable land)	Located in small sections throughout the pastures, across the entire study area
Mixed Forest	In the northern part of the study area south of Woodland Converter substation
Broad-leaved forest	In the northern part of the study area, west of the cable route
Discontinuous urban fabric	At the towns/villages of Kilcock, Prosperous, Clane, Naas and Two Mile House
Road and rail networks and associated infrastructure	Along the M4 and M7, regional and local road networks. Dublin-Sligo and Dublin-Cork/Limerick railway lines.
Complex cultivation patterns	Between Clane and Prosperous, with a small area north of these towns to the east of the cable route
Peat bogs	West of and within 450 m of the cable route, to the north and northwest of Prosperous
Non-Agricultural vegetated (Sports and leisure facilities)	Small areas south of Clane, east of the cable route
Industrial or commercial units	West of Naas and the cable route
Semi-natural grassland	East of Dunstown substation
Transitional woodland-shrub	West of Dunstown substation

11.3.3 Soils and Geology

There are no Geological Heritage Site present within the study area.

Soils have been identified using Teagasc mapping (Teagasc, 2023). The majority of the study area is underlain by soil types comprised of fine loamy drift with limestone (reflecting the underlying limestone bedrock). These soils are typically >75cm thick. However, some areas in the centre of the study area could have soils with a thickness of 60 to 120cm. Soils described as river alluvium are found across the study area along the courses of the rivers and their floodplains, with the most extensive areas found along the River Liffey in the centre of the study area and the Royal Canal/ Rye Water in the north.

Bedrock and superficial (quaternary) deposits were identified using GIS datasets including 1:100k bedrock and 1:50k Quaternary datasets.

In general, till derived from limestone is the most common quaternary deposit, which is present across the centre and southern part of the Proposed Development. The cable route in the northern part of the Proposed Development (north of the M4) is mainly underlain by till derived from Namurian sandstones and shales. Areas of mapped alluvium and gravels derived from limestone correlate with mapped watercourses and their floodplains. A summary of quaternary deposits within the study area and crossed by the Proposed Development based on the published information is given in Table 11.7.

As the cable runs north to south from Woodland substation to Dunstown substation it crosses multiple bedrock types with some faulting present along the central section of the cable route, mainly in a northwest to southeast orientation. The geology along the route comprises multiple limestone formations, with some mudstone, sandstone and shale formations interbedded. There is an area of Namurian shale sandstones and shales in the northern part of the

Proposed Development (north of the M4). A summary of the bedrock geology along with locations is given in Table 11.7.

Geohazards are identified as any karst features, areas of peat, areas susceptible to landslides/subsidence, or mining and quarrying areas that would need to be considered prior to development. There is no area identified as prone to landslide in the study aera. Given the nature of the bedrock there is the potential for the presence of karst features within the limestone. These include sinkholes, caves, some types of springs and turloughs of which some of these features are mapped within formations present beneath the study area. No karst landforms are shown on mapping to be within the study area but there is potential for these features to be present sub-surface.

Areas of peat are not expected to directly underlie the cable route; however, they are present within the 1 km study area near the centre of the Proposed Development between chainage 27500 to chainage 32000.

No operational quarries have been identified within the 1 km study area based on information available at the time of writing. However, on historic maps three gravel pits and one quarry were identified in the north of the Proposed Development, located rurally in close proximity to the proposed route. The three gravel pits are located on quaternary deposits of gravels derived from limestones, while the quarry is located over an area of exposed shale and sandstone bedrock, surrounded by till derived from Namurian sandstones and shales.

Within the study area and underlying parts of the cable route are areas of sand and gravel of economic value associated mainly with alluvium (undifferentiated) and glaciofluvial sands and gravels (undifferentiated). There are also small areas of ridge or plateau probably with gravel, hummocky kames and kettles and marl, which are considered to be of economic value.

Bedrock deposit of economic value are located throughout the study area and underneath the cable route. These include large areas of high/very high potential granular aggregate, which cover the south of the study area, with small patches in the centre and north. In addition, throughout the study area there are small areas of very high/high potential crushed rock, some of which directly underlie the cable route.

No operational landfills have been identified within the 1 km study area based on information available at the time of writing. However, on historic maps one historical landfill was identified, located rurally in close proximity to the proposed route in the north of the Proposed Development.

The soils and geology baseline is summarised in Table 11.7. The bedrock and quaternary deposit are displayed in Figure 11.1.

Table 11.7: Summary of soils, quaternary deposits and bedrock within the study area

Unit name	Description	Receptor value	Location
Soils			
Straffan	Fine loamy drift with limestones	Low	Majority of study area, to the north and centre
Elton	Fine loamy drift with limestones	Low	Centre of Proposed Development between Prosperous and Clane
River alluvium	Variable clay, silt, sand and gravel	Low	Along watercourses, extensive along River Liffey and Royal Canal/ rye waters
Faoldroim	Fine loamy drift with limestones	Low	Southwest of Naas
Mylerstown	Fine loamy drift with limestones	Low	At Dunstown substation

Unit name	Description	Receptor value	Location
Urban	Made ground of unknown nature	Low	Located at towns/ villages across Proposed Development
Peat	Cut over raised peat, formed from un-decomposed plant material	Medium	Centre of Proposed Development between Prosperous and Clane, and north of Prosperous
Quaternary Deposits			
Till derived from Namurian sandstones and shales	Clay to sand matrix containing variable cobbles and boulders	Low	Covers majority of the Proposed Development from ch 0 to 13500
Gravels derived from limestones	Gravel, variable minor clay, silt or sand content	Medium	Ch 13500 to 15375; ch 35250 to 35750; 37250 to 37875; ch 39000 to 39250; ch 45350 to 49350; ch 49875 to 50000
Alluvium	Variable clay, silt, sand and gravel	Medium	Small sections within the gravels between Ch 14750 to 15375; 36750 to 37250; ch 37875 to 38000; ch 38625 to 39000; ch 41125 to 41375; ch 44500 to 44750; ch 45125 to 45350
Till derived from limestone	Clay to sand matrix containing variable cobbles and boulders, likely to be calcareous	Medium	Ch 15375 to 35250; ch 35750 to 36750; ch 38000 to 38625; ch 39250 to 41125; ch 41375 to 44500; ch 45000 to 45125; ch 49350 to 49875; ch 50000 to 52850
Urban	Made ground of unknown nature	Low	Ch 44750 to 45000
Bedrock			
Lucan Formation	Dark limestone and shale	Low	Northern part of route (from Woodland converter substation) ch 0 to 6500; ch 10000 to 23125
Namurian (undifferentiated)	Shale and sandstone	Low	Ch 6500 to 10000
Tober Colleen Formation	Calcareous shale, limestone conglomerate	Medium	Ch 23125 to 24000
Waulsortian Limestones	Massive unbedded lime-mudstone	Medium	Ch 24000 to 25375; 34250 to 34875; 35000 to 35250; 36875 to 38700
Boston Hill Formation	Nodular and muddy limestone and shale	Medium	Ch 25375 to 34250
Rickardstown Formation	Cherty often dolomitised limestone	Low	Ch 34875 to 35000; 35250 to 36875; 38700 to 43300

Unit name	Description	Receptor value	Location
Ballysteen Formation	Dark muddy limestone, shale	Medium	Ch 43300 to 44800
Feighcullen Formation	Skeletal, oolic and micritic limestone	Low	Ch 44800 to 45800
Quinagh Formation	Lenticular mudstone and coarse siltstone	Low	Ch 45800 to 46250
Carrighill Formation	Calcareous greywacke siltstone and shale	Medium	Ch 46250 to 52850 at Dunstown substation

11.3.4 Hydrogeology

Hydrological receptors include aquifers, abstractions (public and private), groundwater/surface water interactions (baseflow contributions, groundwater dependent terrestrial ecosystems etc.) and karst features. These have been identified using relevant datasets such as historical mapping, Geological Survey maps and observations from habitat surveys.

Aquifer categories describe both resource potential (regionally or locally important; or poor) and groundwater flow type and attenuation potential (through fissures, karst conduits or intergranular). The aquifers are summarised as:

Regionally Important (R) Aquifers:

- Karstified bedrock (Rk);
- Fissured bedrock (Rf);
- Extensive sand & gravel (Rg);

Locally Important (L) Aquifers:

- Sand & gravel (Lg);
- Bedrock which is Generally Moderately Productive (Lm);
- Bedrock which is karstified to a limited degree or limited area (Lk);
- Bedrock which is Moderately Productive only in Local Zones (Ll);

Poor (P) Aquifers:

- Bedrock which is Generally Unproductive except for Local Zones (Pl); and
- Bedrock which is Generally Unproductive (Pu).

In the south of the study area the gravels derived from limestone have been classified as locally important gravel aquifers (Lg).

Bedrock aquifers underlying the majority of the study area are classified as locally important bedrock aquifer which is moderately productive in local zones (Ll). Within the centre of the study area there is a small area which is a locally important bedrock aquifer which is karstified to a limited degree or limited area (Lk). In the southern part of the study area there is an area classified as a regionally important bedrock aquifer (Rk) associated with the Rickardstown Formation.

The productivity of an aquifer was used, as outlined in section 11.3.3, to assign receptor value. A summary of the aquifer types and their importance are displayed in Table 11.8. Figure 11.1 displays the locations of the aquifers.

Table 11.8: summary of aquifer types within the study area

Unit name	Aquifer type	Receptor value	Location
Quaternary Deposits			
Till derived from Namurian sandstones and shales	Not classified	Low	Covers majority of the Proposed Development from ch 0 to 13500
Gravels derived from limestones	Locally important gravel aquifer (Lg) - Significant rejected recharge	Medium	Ch 13500 to 15375; ch 35250 to 35750; 37250 to 37875; ch 39000 to 39250; ch 45350 to 49350; ch 49875 to 50000
Alluvium	Not classified	Low	Small sections within the gravels between Ch 14750 to 15375; 36750 to 37250; ch 37875 to 38000; ch 38625 to 39000; ch 41125 to 41375; ch 44500 to 44750; ch 45125 to 45350
Till derived from limestone	Not classified	Low	Ch 15375 to 35250; ch 35750 to 36750; ch 38000 to 38625; ch 39250 to 41125; ch 41375 to 44500; ch 45000 to 45125; ch 49350 to 49875; ch 50000 to 52850
Urban	Not classified	Low	Ch 44750 to 45000
Lacustrine sediments	Not classified	Low	Do not directly underlie the cable route, but are within study area
Bedrock			
Lucan Formation	Locally important aquifer- bedrock which is moderately productive only in local zones (Ll)	Medium	Northern part of route (from Woodland converter substation) ch 0 to 23125
Namurian (undifferentiated)	Poor Aquifer- bedrock which is generally unproductive except for local zones (Pl)	Low	Ch 6500 to 10000
Tober Colleen Formation	Poor Aquifer- bedrock which is generally unproductive except for local zones (Pl)	Low	Ch 23125 to 24000
Waulsortian Limestones	Locally important aquifer- bedrock which is moderately productive only in local zones (Ll)	Medium	Ch 24000 to 25375; 34250 to 34875; 35000 to 35250; 36875 to 38700
Boston Hill Formation	Locally important aquifer- bedrock which is moderately productive only in local zones (Ll)	Medium	Ch 25375 to 34250

Unit name	Aquifer type	Receptor value	Location
Rickardstown Formation	Regionally important aquifer – karstified (diffuse) (Rkd)	High	Ch 38700 to 43300
	Locally important aquifer – karstified (Lk)	Medium	Ch 35250 to 36875
Ballysteen Formation	Locally important aquifer- bedrock which is moderately productive only in local zones (Ll)	Medium	Ch 43300 to 44800
Feighcullen Formation	Locally important aquifer- bedrock which is moderately productive only in local zones (Ll)	Medium	Ch 44800 to 45800
Quinagh Formation	Poor aquifer- bedrock which is generally unproductive except for local zones (Pl)	Low	Ch 45800 to 46250
Carrighill Formation	Poor aquifer- bedrock which is generally unproductive (Pu)	Low	Ch 46250 to 52850 at Dunstown substation

Within the study area no group water schemes have been identified and there are no public and group supply source protection zones, with the nearest source protection area located over 3 km to the west from the cable route. No other abstraction types have been identified from the information available at this stage. It should be noted that, information on private groundwater abstractions is not available at this stage of assessment, therefore the presence of them close to the Proposed Development and within the 1 km buffer cannot be ruled out at this stage.

No karstic features were identified on mapping within the study area, however, this does not mean that they are not present subsurface. In addition to this no groundwater features such as springs, sinks, spreads, collects or wells have been identified on mapping.

Areas of groundwater vulnerability are mapped throughout the study area. Where present the groundwater vulnerability is mainly high, with localised areas of extreme vulnerability and where rock is at or near the surface/ is karstic. Areas of high groundwater vulnerability are more prevalent in the centre and southern part of the Proposed Development, with high groundwater vulnerability more sporadic in the north. However, there are two areas in the north where the cable route directly crosses areas classified as either extremely vulnerable or rock is at or near the surface/ is karstic.

The Proposed Development crosses multiple watercourses, including the river Liffey at Sallins, which could have interactions with groundwater. Therefore, they can be classed as a groundwater receptor in terms of baseflow contributions. In addition to this the proposed route crosses two canals; the Royal Canal and the Grand Canal. However, groundwater interactions with the canals are likely limited, if the canals are lined.

There are no statutory designated sites located within the study area. However, there are two proposed Natural Heritage Sites (pNHA) along the Royal Canal and Grand Canal which cross the proposed cable route.

Potential groundwater dependent terrestrial ecosystems (GWDTE) have been identified through Fossitt habitat surveys conducted by the ecology team. The survey buffer was up to 150 m from the route in accordance with the extent of the survey buffers identified in Chapter 10. It should be noted however, that this buffer is sufficient to identify potential GWDTE which could be impacted by the Proposed Development as the impacts are expected to be local.

Through the habitat surveys areas of GS4 Wet Grassland and FS1 Reed and large sedge swamp have been identified, which have the potential to contain GWDTE. In total six areas of potential GWDTE have been identified from habitat mapping within the study area. These are summarised in Table 11.9 and displayed on Figure 11.5.

Table 11.9: summary of potential GWDTE based on habitat mapping

GWDTE	GWDTE ID	Habitat type	Receptor value	Location
Cullendragh	GWDTEw2	GS4- wet grassland	Medium	Ch. 2000 to 2400
Kilcock Common West	GWDTEw3 – GWDTEw7	GS4- wet grassland	Medium	Ch. 16500 to 17375
Moortown	GWDTEw8	GS4- wet grassland	Medium	Ch. 26000
Longtown North	GWDTEw9	GS4- wet grassland	Medium	Ch. 32000
Firmount West	GWDTEw10 – GWDTEw12	GS4- wet grassland	Medium	Ch. 33000 to 33250
New Caragh Road	GWDTEw13 and GWDTEw1	FS1 Reed and large sedge swamp	Medium	Ch. 44500 to 44750

11.3.5 WFD Groundwater Bodies

There are eight WFD groundwater bodies within the study area. Details of these groundwater bodies are summarised in Table 11.10 and their status shown in Table 11.11. All the WFD groundwater bodies have a good overall status, with both good quantitative and qualitative status (EPA, 2023). Locations of the WFD groundwater bodies are displayed in Figure 11.4.

Table 11.10: summary of WFD groundwater bodies within the study area

Unit name	Description	Location
Dunshaughlin (IE_EA_G_031)	Productive fissure bedrock	Woodland converter substation to Ch. 875
Dublin (EA_G_008)	Poorly productive bedrock	Ch. 875 to 7125, ch. 7400 to 30750, Ch. 30875 to 34750, ch. 25000 to 35250, ch. 36875 to 38625, Ch. 43250 to 45800
Moynalvy (IE_EA_G_019)	Poorly productive bedrock	Ch. 7125 to 7400
Trim (IE_EA_G_002)	Productive fissured bedrock	Ch. 30750 to 30875
Kildare (IE_SE_G_077)	Poorly productive bedrock	Ch. 31300 Within study area. 509m west of cable at closest point.
Naas (IE_EA_G_027)	karstic	Ch. 34750 to 35000, Ch. 35250 to 36875, Ch. 38625 to 43250
Curragh Gravels East (IE_EA_G_017)	Gravel	Ch. 46500 to Dunstown substation
Kilcullen (IE_EA_G_003)	Poorly productive bedrock	Ch. 45800 to ch 46500

Table 11.11: Status of WFD groundwater bodies

WFD groundwater body	Overall status (2016-2021)	Quantitative status (2016-2021)	Chemical status (2016-2021)
Dunshaughlin (IE_EA_G_031)	Good	Good	Good
Dublin (EA_G_008)	Good	Good	Good
Moynalvy (IE_EA_G_019)	Good	Good	Good
Trim (IE_EA_G_002)	Good	Good	Good
Kildare (IE_SE_G_077)	Good	Good	Good
Naas (IE_EA_G_027)	Good	Good	Good
Curragh Gravels East (IE_EA_G_017)	Good	Good	Good
Kilcullen (IE_EA_G_003)	Good	Good	Good

11.3.6 Ground Investigation

A GI was undertaken along the proposed new cable route from Dunstown 400 kV station in Kildare to the Woodland 400 kV station in County Meath. The GI was contracted to Causeway Geotech Ltd, with site works carried out between 15th August 2022 to the 21st December 2022.

11.3.6.1 GI scope

In summary the GI comprised of the following.

- Sixty-six boreholes including:
    - forty-one light cable percussion boreholes.
    - ten boreholes by light cable percussive extended by rotary follow-on drilling.
    - six boreholes by rotary drilling.
    - nine boreholes by dynamic (windowless) sampling.

- Standpipe groundwater monitoring installations in 22 boreholes;
- Ten machine dug trial pits.;
- Nine slit trenches; and
- A Geophysical survey consisting of Electro Magnetic conductivity and 2D resistivity.

Selected samples were submitted for a suite of geotechnical and chemical testing. The samples selected for chemical testing were variably submitted for the following analysis suite.

- Metals;
- Speciated total petroleum hydrocarbons (TPH);
- Speciated polycyclic aromatic hydrocarbons (PAH);
- BTEX compounds;
- Volatile Organic Compounds (VOCs);
- Polychlorinated biphenyls (PCBs);
- Phenols;
- Organic matter;
- Total Organic Carbon (TOC);
- Cyanides;
- Asbestos screen;
- Sulphate and sulphide;
- Sulphur;

- pH; and
- Waste acceptance criteria (WAC)

Full details regarding the ground investigation are presented in the GI contractors factual report (Causeway 2023).

11.3.6.2 Encountered Geology

Based on review of the GI data in summary the geological strata encountered in stratigraphical order comprised the following.

Topsoil

Topsoil was encountered in the majority of exploratory hole locations ranging in thickness from 0.1 m to 0.7 m, with a typical thickness of 0.3 m. The topsoil typically comprised of brown sandy clay with frequent rootlets.

Made Ground

Made ground/possible made ground was encountered in isolated locations in 14 of the exploratory holes, ranging in thickness (including topsoil where present above the made ground) from 0.2 m to 1.6 m.

The made ground was generally described as consisting of gravelly clay or gravel. Gravelly sand was also less frequently encountered, with the gravels typically consisting of limestone. The majority of the made ground encountered is likely to comprise reworked natural ground given the limited presence of anthropogenic materials. However, four exploratory hole locations encountered made ground with inert anthropogenic materials, comprising either brick, wood or plastic.

Superficial Geology.

Superficial quaternary deposits were identified in exploratory holes underlying the entire Proposed Development route. The deepest confirmed depth of the superficial geology is 11.5 m below ground level (bgl), with the deepest unconfirmed depth being 12.7 m bgl (where the borehole terminated in quaternary deposits).

The superficial quaternary deposits primarily consist of sandy gravelly clay, with a low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth. In addition, gravel is also present, typically recorded as medium dense to dense silty sandy gravel with a low cobble content, primarily comprising limestone, typically beneath the clay and overlying bedrock. However, the gravel is absent over parts of the route where clay directly overlies bedrock.

No peat was identified in exploratory holes along the route alignment.

Given the above the superficial deposits identified by the GI are generally in accordance with the published geological information presented previously.

Bedrock Geology

Bedrock confirmed by coring was encountered in 14 boreholes, while possible bedrock was identified in a further 36 exploratory holes.

The depth to the bedrock confirmed by coring ranges from 2.6 m bgl to 11.5 m bgl and the depth to bedrock (unconfirmed), identified by cable percussion drilling, ranges from 1.2 m bgl to 8.0 m bgl.

Given the above, bedrock is likely to be encountered at a variable depth along the entire cable route.

The bedrock predominantly comprises dark grey to black limestone and no karstic features were identified. The bedrock encountered is generally in accordance with the published geological information presented previously. However, given the spacing of exploratory hole locations the presence of karstic features cannot be entirely ruled out.

11.3.6.3 Hydrogeology

During drilling/excavation 17 groundwater strikes were recorded in 15 locations, from boreholes, window sample holes and trial pits, ranging in depth from 1.5 m bgl to 5.2 m bl. Of these, only four groundwater strikes were recorded at depths of 2 m bgl or less, representing approximately 5% of GI locations. Subsequent Rises in groundwater were recorded in eight of the boreholes ranging in height from 0.1 m to 2.2 m with final resting levels (after 20 minutes) ranging from 1.0 m bgl to 3.9 m bgl. Review of the GI logs indicates that all but three of the groundwater strikes were recorded within granular deposits, beneath overlying less permeable clay within the superficial geology, but frequently overlying directly on bedrock.

Twenty-one boreholes were constructed with groundwater monitoring installations. The GI factual report indicates that 12 boreholes were monitored between 25/10/22 and 27/10/22, of which 10 recorded groundwater ranging in depth from 0.2 m bgl to 2.33 m bgl. Given the positioning of the borehole response zones the data indicates that groundwater is present within bedrock, and superficial gravels.

In summary, the water strike data indicates that groundwater where identified is typically encountered within granular deposits beneath overlying clays (glacial till or alluvium) and that due to some rises being observed after the initial strike, that the groundwater may in some locations be confined by the overlying less permeable strata. Furthermore, borehole monitoring indicates that where the gravel overlies the bedrock that the two groundwater units are likely to be in continuity. The data also corroborates broadly with the published information in identifying the presence of the potentially locally important aquifers within the superficial gravel deposits and the bedrock.

Generally, given the lack of groundwater strikes and their depth, shallow excavations (<1.5 m bgl) proposed for the majority of the route may not encounter groundwater. However, the data also shows that there may be localised areas of shallower groundwater in which shallower excavations may encounter groundwater.

It should, however, be noted that interpretation of the data presented here is a summary of interim GI data and also that there are significant uncertainties/limitations due to the following.

- A limited post GI monitoring period with no repeat monitoring at the present time, means there may be potential significant seasonal variations in groundwater depths not identified to date.
- Not all borehole installations have been monitored to date.
- The inherent gaps in exploratory hole locations mean areas of higher groundwater may not be recorded.
- Limitations inherent in the exploratory hole construction techniques used, means full characterisation of the groundwater regime may not be possible, for example due to.
    - The use of casing in supporting the borehole walls during drilling may seal out groundwater strikes; and
    - The use of water to aid drilling may mean groundwater is not always identified, especially the case with water flush as used in rotary.
    - The placement of response zones within groundwater monitoring installations may not target all water bearing zones.

Given the uncertainties, further evaluation of the groundwater regime, especially where deeper excavations are proposed should be undertaken as part of the detailed design for the works, in order to fully characterise the groundwater regime at critical points along the cable route

11.3.6.4 Chemical testing data

In order to provide an assessment of potential risks to human health and water environment receptors from the soils within the development, an assessment of the soil chemical testing data has been undertaken. The assessment has been done by comparison of the chemical testing with appropriate generic screening criteria, selected in accordance with EPA guidance as detailed below.

Human health Assessment methodology

Total soils chemical testing data for relevant substances were directly compared to published Human Health Assessment Criteria (HHAC) derived in accordance with EPA recommended guidance, based on a public open space (park) land use, which are considered to be protective of long-term risks to human health receptors (future site users). Assessment of human health risks from asbestos within soils was undertaken via screening of all soil samples for the presence of asbestos.

Human Health Results Assessment

Based on the lack of made ground indicative of potential contamination identified by the GI contamination representing a risk to human health is considered very unlikely. This is generally confirmed by the chemical testing whereby contaminants indicative of potential anthropogenic contamination (e.g. hydrocarbons, heavy metals, polychlorinated biphenyl compounds) have generally not been detected or if so at very low concentrations below the HHAC.

A single sample, taken at 0.2 m bgl around chainage 39000 near Sallins, exceeds the HHAC for a number of Polycyclic Aromatic Hydrocarbons (PAH). However, this sample was taken from an area of agricultural land use; the borehole log did not identify the presence of made ground, and the material comprised of topsoil above natural gravels. No other nearby location recorded made ground. As such, the test result is not considered to be representative of a viable risk to human health.

Water Environment Assessment Methodology

The assessment of potential risks from on-site soils to water receptors has been undertaken by comparing the results of the soil leachate testing, with Controlled Waters Screening Criteria (CWSC). The results are compared against two criteria selected in accordance with EPA guidance: Interim Guideline Values - EPA Guideline Values for the Protection of Groundwater in Ireland (IGV) and Groundwater Threshold Values (GTV). The adopted CWSC provide a conservative assessment of the potential risks to water receptors from the site soils.

The GI factual report should be referred to for the original laboratory certificates of results.

Water Environment Results Assessment

A summary of the relevant determinants and samples which exceed either of the CWSC is presented in Table 11.12 below.

Table 11.12: summary results for substances exceeding the CWSC

Analyte	Unit	Interim Guideline Values	Groundwater Threshold Values	Number of Results	Number Exceeding Interim Guideline Values	Number Exceeding Groundwater Threshold Values	Maximum Concentration	Location of Max Concentration
Ammonium	mg/l	0.15	0.065 - 0.175	28	4	17	0.48	2.0 m bgl chainage 26500 at Moortown
Arsenic	ug/l	10	7.5	33	0	1	9.4	0.5 m bgl chainage 15500 at Kilcock
Nickel	ug/l	20	15	33	0	1	17	0.2 m bgl chainage 2000 at Ballymaglassan

As shown on Table 11.12, with the exception of ammonium, only a single sample has been identified at a concentration greater than the CWSC for arsenic and nickel. However, given the following, the sampled soils are not considered to represent a risk to the water environment:

- The inherent conservatism in comparing leachate testing directly with the CWSC, especially given the marginal exceedance of the GTV threshold for both arsenic and nickel; and
- Reference to the borehole logs indicates that both locations are in agricultural land.
- The strata from which both samples were taken comprised of natural ground with no evidence of contamination in overlying strata.

With regard to the ammonium results, the widespread exceedance of the CWS in samples primarily of natural ground indicates that the ammonium concentrations are likely to be indicative of natural background concentrations. The ammonium results are therefore not indicative of the sampled soils representing a risk to the water environment.

Chemical Testing Results Assessment Summary

Assessment of potential risks to human health and the water environment by comparison of the chemical testing with HHAC and CWSC have generally confirmed that risks from site soils are likely to be low. Isolated exceedance of the HHAC and CWSC were identified. However, these results were discounted as being indicative of site soils representing a viable risk, or warranting specific mitigation.

11.4 Assessment of Potential Effects

Both the construction and operational phase activities have the potential to effect land and land use, soils, geology and hydrogeology. These potential impacts are discussed individually below, considering embedded mitigation. Any additional mitigation that may be required beyond embedded mitigation, including any additional monitoring requirements, are discussed in section 11.6.

The design details including embedded mitigation may be found in Chapter 5 of this PECR.

11.4.1 Construction Phase

11.4.1.1 Land cover

Vegetation and topsoil stripping will be required to facilitate the construction of the trench, compound areas and any temporary passing bays. Additionally, for off-road sections of the Proposed Development a 30 m wide temporary working strip is proposed which will also require vegetation and topsoil stripping.

At the off-road locations the land required to install the cable will be unavailable to the landowner throughout the construction period from initial fencing-off to the reinstatement of the land and fence removal. As part of the off-road sections there will be small areas of land loss associated with permanent access tracks for off-road joint bays. These permanent tracks are located mainly on agricultural land used for pasture, which covers the majority of the study area. Therefore, any land loss associated with the permanent access tracks could result in small adverse impacts to smaller landowners but negligible impacts when considering land use as a whole across the study area.

There will be temporary adverse effects to the surface and land use due to the disruption associated with trenching for the cable installation, temporary storage of excavated materials and change of land use at construction compounds. However, given the size of the land use areas directly impacted compared to the land use of the wider study area these impacts are likely to be negligible.

In addition, following the installation of the cable along the route restoration works will be carried out to restore the land back to pre-construction condition, excluding the permanent access tracks. Therefore, any impacts will be temporary for the duration of the construction period.

11.4.1.2 Geology and soils

Disruption to underground soils and subsoil layers during excavation could impact soils physical, chemical and biological characteristics. Given the largely rural setting of the route and the results of the sampling/analysis and risk assessments presented previously, contaminated soils are not anticipated to be encountered along the route. However, there are three historical gravel pits and one historical landfill located rurally near the proposed route in the north. These pits and quarry could potentially be a source of contamination, which could be moblilised during the construction phase. In addition, within urban areas such as Kilcock, Prosperous, Clane and Naas there is the potential for soil contamination to be present. As such, given the spacing of exploratory hole locations and inherent uncertainty associated with environmental sampling of heterogeneous subsurface materials, there remains the potential for encountering unidentified/unforeseen contamination during construction.

Measures set out in the CEMP will reduce the likelihood of contaminant mobilisation, including inclusion of a discovery strategy which sets out how to identify and deal with unexpected ground contamination. However, the measures will not reduce the severity of historical contamination if present. Mobilisation of historical contamination, where present, could lead to small adverse effects locally, especially where deposits of economic value are present.

In addition to geological receptors, any migration of contaminants in soils has the potential to create a localised pollution risk to groundwater and its receptors. These risks are discussed more in section 11.5.1.3 below.

The majority of the study area is underlain by limestone, with at least one karstic formation (Rickardstown Formation). The other limestone units also have the potential to contain karstic features. The mapping of karstic features shows none within the study area, however, this mapping may underestimate the extent of these features and will not show subsurface features which could be present. Data regarding the ground conditions across the Proposed Development are limited and therefore the potential of encountering bedrock near or at the surface is unknown. The excavation of any bedrock may lead to potential instabilities that may be significant, especially if karstic features are encountered. In addition, any excavations which expose karstic features at the surface could provide a pathway for surface water to flow into the exposed bedrock, hence increasing pollution risks to groundwater. Interception of karstic bedrock could therefore lead to localised instabilities and creation of contaminant pathways. Measures set out in the CEMP will reduce such risks, however, any impacts could still result in small to moderate adverse impacts locally. However, as a whole the geological unit is not likely to be significantly impacted.

Nowhere within the study area has been identified as being susceptible to landslides therefore impacts associated with landslides and slope stability are not anticipated. Furthermore, no large-scale dewatering is expected therefore the risks of subsidence are negligible, and if they were to occur would be local to the cable route. Dewatering would only occur in areas of trenching where the groundwater table is shallow and potentially at HDD compounds where some shallow excavation may need to be excavated to create the appropriate working space for the drill. However, any dewatering would be temporary during construction and is not expected to have widespread significant impacts.

The trench crosses multiple economic deposits along the cable route comprising very high/high potential aggregate and crushed rock and sands and gravels. However, the areas directly impacted by the construction activities and proposed construction depths are small relative to the size of the economic deposits as a whole across the study area. Therefore, potential losses in economic deposits across the study area are deemed to be low, resulting in negligible impacts.

11.4.1.3 Hydrogeology

Vegetation and topsoil stripping is required for the trench, temporary passing bays and site compounds (including construction and HDD compounds). For the off-road sections temporary working strips (including access roads) will also require vegetation removal and topsoil stripping.

One construction compound at chainage 35750 lies upon a locally important aquifer (karstified). Whereas the other construction and HDD compounds are located on locally important aquifers (moderately productive in local zones). The compounds along with topsoil stripping for access roads and temporary passing bays could lead to a compaction effect on underlying shallow aquifer units and impact shallow groundwater levels, flows and quality locally. This could lead to small adverse impacts locally to the underlying aquifers, however, at an aquifer scale, impacts are likely to be negligible given the size of the aquifer compared to the working footprint.

Due to the shallow depths of the trenching (1.3 m – 1.7 m) across the majority of the route, working is not expected to occur below the water table. Therefore, no large-scale dewatering is predicted. However, there is the potential for localised dewatering if groundwater levels are shallow at any point along the cable route. Any dewatering required will have a small adverse impact to the underlying aquifers locally and could impact flows to secondary receptors such as potential GWDTE and baseflow contributions to watercourses. Given the uncertainty of groundwater levels across the study area temporary impacts to secondary receptors such as GWDTE and watercourses as a result of dewatering cannot be ruled out.

As a precaution temporary moderate adverse impacts are predicted to GWDTE, especially where the cable route is directly adjacent to and within the potential GWDTE footprint. The cable route is adjacent to (<10 m) or within the footprint of potential GWDTE sites GWDTEw1, GWDTEw3, GWDTEw4, GWDTEw5, GWDTEw8, GWDTEw10 and GWDTEw13. In addition, potential GWDTE sites GWDTEw2, GWDTEw6, GWDTEw9, GWDTEw11 and GWDTEw12 are within 100 m of the cable route and could also be impacted, as a precaution potential adverse impacts are also predicted for these sites at this stage of assessment. However, as identified above, the nature of the cable trench across the majority of the route will not result in significant dewatering.

Where the cable crosses smaller watercourses open cut trenching is proposed which will require the installation of a temporary impermeable barrier to keep the working area dry. Trenching in this area is not expected to be more than 1.7 m below the watercourse bed. However, if the watercourse is groundwater fed then some localised dewatering may be required in the working area to keep it dry. This could change local groundwater flows and levels in the underlying aquifers, and interrupt baseflow contributions to the watercourse resulting in temporary, small adverse impacts at a local scale, however, at an aquifer scale any changes would be negligible.

The water pumped out of the working area will be treated using settlement tanks prior to discharge back to the watercourse. However, there is potential that the water would need to be discharged to ground, for it to naturally drain back into the watercourse. This could lead to small impacts locally on groundwater quality.

In addition, discharges to ground could occur from groundwater dewatering activities, either where the trench is shallow and requires dewatering prior to the installation of the pipe (likely areas of shallow groundwater conditions) or where dewatering is potentially required at trenchless crossings (see below). This could lead to small impacts locally on groundwater quality.

Horizontal directional drilling (HDD) may be required at six locations; at major watercourses (Rye Water, River Liffey and Lyreen tributary of the River Liffey), canals (Royal Canal and Grand Canal) and at the M4. No substantial dewatering is expected to result from HDD activities, except potentially at launch and reception sites, which may require excavation of pits to a depth equivalent to a trench. However, dewatering effects in such cases would be expected to be negligible.

Trenchless crossings also have the potential to release artesian pressures/ water and have the potential to connect two aquifers that are currently not connected which could create a new contaminant pathway and lead to cross contamination. However, information regarding aquifer depths and groundwater levels at the HDD locations is not available at this stage and therefore the above cannot be ruled out. If HDD was to connect two aquifers this could create new contaminant pathways and allow the mixing of different groundwater bodies, leading to small adverse impacts locally but negligible impacts at an aquifer scale.

Changes to groundwater quality from the removal of vegetation and disturbance of ground could lead to increased suspended solid concentrations in the groundwater. In addition to this, the open trench required for the majority of the Proposed Development could create new pathways from the surface into shallow aquifer units impacting groundwater quality. These direct impacts to groundwater could lead to secondary impacts and affect the quality of groundwater discharging to surface waters, including water discharging to GWDTE. However, due to the filtering effect of the unsaturated zone and aquifer material, suspended solids would not migrate to any substantial extent in poorly productive bedrock and would attenuate relatively quickly in the locally important aquifers and potential impacts would be negligible at an aquifer scale. For aquifers with fracture flow, and particularly for flow in aquifers with karstic features, suspended solids can move considerable distances and rapidly. However, only one aquifer unit has been described as karstified (the Rickardstown Formation, in the area between Calne and Naas) and the area of this aquifer which could be impacted is relatively small in comparison to the aquifer as a whole. However, several watercourses run across this aquifer, including the River Liffey. Therefore, any impacts on the aquifer are likely to be negligible but could be small adverse on surface watercourses.

Overall, impacts to groundwater quality through mobilisation of suspended solids and any historical contamination, as well as accidental leaks and spills from construction activities could lead to moderate adverse effects locally at the cable route and associated construction areas. The CEMP will reduce the likelihood of accidental leaks and spills, however, will not reduce the severity if an incident does occur. Small adverse impacts to groundwater quality at secondary receptors such as GWDTE and watercourses are also predicted, especially where the receptor is in close proximity/ adjacent to the cable route. Further from the cable route elsewhere within the 1 km study area negligible impacts to groundwater quality are predicted.

11.4.1.4 WFD Groundwater screening assessment

The groundwater WFD assessment is summarised in Table 11.12. Only elements scoped in (Section 11.2.1) have been assessed.

In general, the scale of the Proposed Development relative to the size of the groundwater bodies as a whole is very small. Therefore, no significant impacts are anticipated to the WFD groundwater bodies. As a result, the Proposed Development is not expected to cause deterioration in the status of any groundwater body either quantitatively or qualitatively.

Table 11.12: Impact assessment for WFD groundwater bodies

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
Cable route trenching and HDD	Dunshaughlin (IE_EA_G_031)	Minor dewatering may be required for the cable route where groundwater is shallow. However, any changes would be short-lived and negligible on a groundwater body scale, therefore there is no potential for significant change to water balance.	No potential GWDTE were identified within this groundwater body therefore no change to quantitative status is expected.	Minor dewatering may be required for the cable route where groundwater is shallow. Any dewatering could indirectly lower water levels in underlying aquifer if the watercourse is in hydraulic continuity with the aquifer, and vice versa. However, this impact is likely to be localised and minimal and at a groundwater body scale any	Information on private groundwater abstractions has not been obtained at this stage, therefore it is unknown if any abstractions lie within the footprint of the cable route or in the wider study area. Impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality	There are several best-practice mitigation measures which would be incorporated for pollution prevention during construction. These measures would reduce the likelihood of contaminating groundwater. Adherence to industry good practice would significantly reduce changes to	No potential GWDTE were identified within this groundwater body therefore no change to qualitative status is expected.	Adherence to industry good practice during construction, as outlined in the CEMP, would significantly reduce changes to groundwater quality, therefore at a groundwater body scale there would be limited to no change in quality status.
	Dublin (EA_G_008)		All identified potential GWDTE lie within this WFD groundwater body (see Section 11.3.4). During construction temporary dewatering along the cable route may be				There are several best-practice mitigation measures which would be incorporated for pollution prevention including managing silt pollution (for suspended solids	

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
			required which could locally alter groundwater flows and levels to potential GWDTE. However, given that the potential GWDTE are not designated sites the quantitative status of the groundwater body will not change significantly as a result of any impacts to these GWDTE.	impacts would be insignificant.	such that additional treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, would ensure no significant changes to groundwater quality and quantity.	groundwater quality, therefore at a groundwater body scale there would be limited to no change in quality status.	transport) during construction. These measures would reduce the likelihood of contaminating groundwater. Therefore, negligible impacts to groundwater quality are predicted as a result of the cable route construction. The potential GWDTE are not designated therefore the qualitative status of the groundwater body will not	

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
							change significantly as a result of any impacts to these GWDTE.	
	Moynalvy (IE_EA_G_019)		No potential GWDTE were identified within this groundwater body therefore no change to quantitative status is expected.	No watercourses located on this groundwater body lie in close proximity to the cable route therefore no changes to the quantitative status are expected.			No potential GWDTE were identified within this groundwater body therefore no change to qualitative status is expected.	
	Trim (IE_EA_G_002)			Minor dewatering may be required for the cable route where groundwater is shallow. Any dewatering could indirectly lower water levels in				

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
				underlying aquifer if the watercourse is in hydraulic continuity with the aquifer, and vice versa. However, this impact is likely to be localised and minimal and at a groundwater body scale any impacts would be insignificant.				
	Kildare (IE_SE_G_077)	Given the distance from the cable route no changes to the quantitative and qualitative status of this groundwater body are predicted						
	Naas (IE_EA_G_027) Curragh Gravels East (IE_EA_G_017) Kilcullen (IE_EA_G_003)	Minor dewatering may be required for the cable route where groundwater is shallow. However, any changes would	No potential GWDTE were identified within this groundwater body therefore no change to quantitative status is expected.	Minor dewatering may be required for the cable route where groundwater is shallow. Any dewatering could indirectly lower water	Information on private groundwater abstractions has not been obtained at this stage, therefore it is unknown if any abstractions lie	There are several best-practice mitigation measures which would be incorporated for pollution prevention during	No potential GWDTE were identified within this groundwater body therefore no change to qualitative status is expected.	Adherence to industry good practice during construction, as outlined in the CEMP, as outlined in the CEMP, would significantly reduce changes

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
		be short-lived and negligible on a groundwater body scale, therefore there is no potential for significant change to water balance.		levels in underlying aquifer if the watercourse is in hydraulic continuity with the aquifer, and vice versa. However, this impact is likely to be localised and minimal and at a groundwater body scale any impacts would be insignificant.	within the footprint of the cable route or in the wider study area. Impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, as outlined in the CEMP, would ensure no	construction. These measures would reduce the likelihood of contaminating groundwater. Adherence to industry good practice would significantly reduce changes to groundwater quality, therefore at a groundwater body scale there would be limited to no change in quality status.		to groundwater quality, therefore at a groundwater body scale there would be limited to no change in quality status.

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
					significant changes to groundwater quality and quantity.			
Access roads and compound areas	Dunshaughlin (IE_EA_G_031)	No significant excavations or dewatering is expected to be required for the site compounds and access roads, therefore there is limited to no potential for significant change to water balance.	No potential GWDTE were identified within this groundwater body therefore no change to quantitative status is expected.	No significant excavations or dewatering is expected to be required for the site compound, therefore no impacts to baseflow to surface waters are predicted.	Information on private groundwater abstractions has not been obtained at this stage, therefore it is unknown if any abstractions lie within the footprint of the site compounds or in the vicinity of the study area. Impacts on drinking water protected areas from this	There are several best-practice mitigation measures which would be incorporated for pollution prevention during construction. These measures would reduce the likelihood of contaminating groundwater. Adherence to industry good practice would	No potential GWDTE were identified within this groundwater body therefore no change to qualitative status is expected.	Adherence to industry good practice during construction, as outlined in the CEMP, would significantly reduce changes to groundwater quality, therefore at a groundwater body scale there would be limited to no change in quality status.
	Dublin (EA_G_008)		All identified potential GWDTE lie within this WFD groundwater body (see Section 11.3.4). No significant excavations or				There are several best-practice mitigation measures which would be incorporated for pollution prevention including	

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
			dewatering is expected to be required for the site compounds and access roads, therefore there is limited potential for change to groundwater flows and levels to potential GWDTE. Additionally, given that the potential GWDTE are not designated sites the quantitative status of the groundwater body will not change as a		activity is unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good practice during construction, as outlined in the CEMP, as outlined in the CEMP, would ensure no significant changes to groundwater quality and quantity.	significantly reduce changes to groundwater quality, therefore at a groundwater body scale there would be limited to no change in quality status.	managing silt pollution (for suspended solids transport) during construction. These measures would reduce the likelihood of contaminating groundwater. Therefore, negligible impacts to groundwater quality are predicted as a result of the cable route construction. The potential GWDTE are not designated therefore the	

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
			result of any impacts to these GWDTE.				qualitative status of the groundwater body will not change as a result of any impacts to these GWDTE.	
	Moynalvy (IE_EA_G_019)		No potential GWDTE were identified within this groundwater body therefore no change to quantitative status is expected.				No potential GWDTE were identified within this groundwater body therefore no change to qualitative status is expected.	
	Trim (IE_EA_G_002)							
	Kildare (IE_SE_G_077)	Given the distance from the cable route no changes to the quantitative and qualitative status of this groundwater body are predicted						
	Naas (IE_EA_G_027)	No significant excavations or dewatering is expected to be required for the site	No potential GWDTE were identified within this groundwater body therefore	No significant excavations or dewatering is expected to be required for the site compound,	Information on private groundwater abstractions has not been obtained at	There are several best-practice mitigation measures which would be	No potential GWDTE were identified within this groundwater body therefore	Adherence to good industry practice during construction, as outlined in the CEMP, would
	Curragh Gravels East (IE_EA_G_017)							

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
		compounds and access roads, therefore there is limited to no potential for significant change to water balance.	no change to quantitative status is expected.	therefore no impacts to baseflow to surface waters are predicted.	this stage, therefore it is unknown if any abstractions lie within the footprint of the cable route or in the wider study area. Impacts on drinking water protected areas from this activity is unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good practice during construction, as outlined in	incorporated for pollution prevention during construction. These measures would reduce the likelihood of contaminating groundwater. Adherence to industry good practice would significantly reduce changes to groundwater quality, therefore at a groundwater body scale there would be limited to no change in quality status.	no change to qualitative status is expected.	significantly reduce changes to groundwater quality, therefore at a groundwater body scale there would be limited to no change in quality status.

Proposed activity	WFD groundwater body	Water balance (quantitative)	GWDTE test (quantitative)	Impact of groundwater on surface water ecological/ quantitative status test	Drinking water protected area (chemical)	General chemical test	GWDTE test (chemical)	Impact of groundwater on surface water ecological/chemical status test
					the CEMP, would ensure no significant changes to groundwater quality and quantity.			
	Kilcullen (IE_EA_G_003)	No access roads or site compounds are planned within the boundary of this WFD waterbody, therefore no changes to the quantitative or qualitative status are expected.						

11.4.2 Operational Phase

11.4.2.1 Land use

All areas where vegetation removal and topsoil stripping has occurred along the trenches and for compounds, temporary access roads and passing bays will be reinstated following installation of the cable, to the standards required. Therefore, no significant operational impacts are predicted to the land use along the majority of the cable route.

However, the cable will require routine maintenance activities along its route, requiring permanent access tracks to off road joint bays. The permanent access tracks will be used during the operational phase to reach off-road sections of the cable for maintenance access. The area of land lost to the permanent access roads is minimal relative to the wider extent of the pasture land use within the study area. Additionally, where possible, the access tracks have been designed along the edges of fields reducing the impact on current land use. Therefore, there could be negligible to small adverse impacts to land use as a result of the permanent access tracks.

11.4.2.2 Geology and soils

No long term significant changes to geology and soils are predicted as part of the Proposed Development. All topsoil removed during construction will be stored and reinstated once the cable route is constructed.

11.4.2.3 Hydrogeology

No long term significant changes to groundwater flows, levels and quality are predicted as part of the Proposed Development. There may be some areas, where the water table is shallow, where small changes to flows are possible due to the presence of sub-surface structures containing the joint bays and cable route. However, these impacts would be very localised and negligible at an aquifer scale.

Permanent access tracks to off-road joint bays could lead to compaction effects which could impact shallow groundwater levels and flows. However, at an aquifer scale these impacts are likely to be negligible to small adverse. Additionally, there is the potential of accidental leaks and spills on the access tracks during the operational phase which could impact groundwater quality. These would be of limited extent but could result in small adverse impacts locally.

The creation of impermeable areas at joint bays and permeant access tracks could locally alter recharge mechanisms. However, the size of any new impermeable areas compared to the size of the aquifers as a whole are negligible resulting in negligible impacts.

Impacts to GWDTE could result from the presence of permanent access tracks and joint bay chambers present within the sites. At GWDTEw2, a joint bay is present within the GWDTE boundary along with an access track which could create localised adverse impacts to groundwater levels and flows which feed potential GWDTE habitats. These habitats are assessed in Chapter 10 (Biodiversity) of this PECR, which has concluded that there will be no significant effects to these GWDTEs. No designated habitats will be affected and the GWDTE habitats identified largely found on agricultural land.

11.5 Mitigation Measures

No significant impacts to land cover or geology are predicted from the Proposed Development. Measures set out in the CEMP will also reduce any risks to the land use and geology.

The following mitigation measures will be implemented prior to the commencement and throughout the duration of the works to limit these impacts:

- Protection of private water supplies:

  - The potential presence of private water supply abstractions will be confirmed through pre-construction surveys. Source and supply assets will be monitored if unforeseen private abstractions are present near the Proposed Development.

  - Replacement water supplies will be provided if necessary.

- Groundwater monitoring and Protection of potential GWDTE sites:

  - While impacts on groundwater levels and flows are predicted to be generally small, in order to prevent potential impacts to GWDTE the potential GWDTE sites identified in Section 11.4.1.3 will be monitored by the ECoW during construction. The ECoW will be on site for any works deemed sensitive, i.e. within or near protected European sites or watercourses linked to such sites. There is the possibility of groundwater ingress from excavations at potential GWDTEs, and where deeper excavations are proposed (HDD sites and any stream crossings deeper than 1.7m). In this case, the Contractor will remove water to facilitate suitable working conditions. The Contractor will overpump intercepted water and treat it via a filter bag (or similar) before discharging it within a suitable vegetated area locally to infiltrate to ground and recharge groundwater.

- Adhere to measures set out in the CEMP.

11.6 Conclusion

After the embedded and proposed mitigation is implemented, no significant impacts to land use, geology and hydrogeology are predicted as a result of the Proposed Development. There will be temporary adverse effects to the surface and land use due to the disruption associated with trenching for the cable installation, temporary storage of excavated materials and change of land use at construction compounds. However, given the minimal extent of the land use areas directly impacted compared to the wider extent of land use within the study area these impacts are likely to be negligible.

The trench crosses multiple economic deposits along the cable route comprising very high/high potential aggregate and crushed rock and sands and gravels. However, the areas directly impacted by the construction activities and proposed construction depths are small relative to the size of the economic deposits as a whole across the study area. Therefore potential losses in economic deposits across the study area are deemed to be low, resulting in negligible impacts. In addition, following the installation of the cable along the route restoration works will be carried out to restore the land back to pre-construction condition, excluding the permanent access tracks. Therefore any impacts will be temporary for the duration of the construction period.

In general the scale of the Proposed Development relative to the size of the groundwater bodies as a whole is very small. Therefore no significant impacts are anticipated to the WFD groundwater bodies. As a result, the Proposed Development is not expected to cause deterioration in the status of any groundwater body either quantitatively or qualitatively.

The Proposed Development is not expected to cause deterioration of the status of any groundwater body or, via groundwater effects, any surface water body under the WFD and is not expected to undermine the attainment of any objectives in the WFD or the attainment by any such water body of good status.

12. Hydrology

12.1 Introduction

This chapter presents the assessment of the potential effects from the Proposed Development on surface water resources based on the project description presented in Chapter 5 of this PECR.

The assessment of effects on biodiversity is discussed in Chapter 10 Biodiversity. The assessment of the effects from the Proposed Development on groundwater resources is presented in Chapter 11 Land, Soils, Geology, and Hydrogeology. A Natura Impact Statement (NIS) also supports this application.

This chapter considers the construction and operational phases of the Proposed Development in relation to:

- Surface water drainage;
- Water supply and wastewater discharge;
- Water Framework Directive (WFD) surface water objectives; and
- Flood risk.

Proposed environmental control measures and mitigation measures are presented as appropriate.

12.2 Methodology

12.2.1 Legislation Context

This chapter has been prepared in accordance with the following legislation:

- European Communities Environmental Objectives (Surface Waters) Regulations 2009 S.I. No. 272 of 2009: (as amended by S.I. No. 296/2009; S.I. No. 327/2012; S.I. No. 386/2015; S.I. No. 77/2019; S.I. No. 277/2016; and S.I. No. 355/2018) which gave effect to Directive 2008/105/EC on environmental quality standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy, i.e. the Water Framework Directive (WFD).
- European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) (as amended by S.I. No. 413/2005; S.I. No. 219/2008; S.I. No. 93/2010; S.I. No. 326/2010; S.I. No. 350/2014; S.I. No. 261/2018; and S.I. No. 166/2022) which gave legal effect to the WFD in Ireland.

The WFD commits EU member states to meet targets for the ecological and chemical status of waterbodies over a given period. The WFD classification scheme for surface water quality includes five status classes: High, Good, Moderate, Poor and Bad based on the biological and supporting physicochemical (nutrients, oxygen condition, temperature, transparency, salinity and river basin specific pollutants (RBSPs)) and hydromorphological quality elements. The biological quality elements are phytoplankton, macrophytes, phytobenthos, benthic invertebrate fauna and fish.

The overall ecological status relates to the biological and physicochemical parameters. Overall ecological status classification for a waterbody is determined, according to the 'one out, all out' principle, by the element with the worst status out of all the biological and supporting quality elements.

Good status means achieving satisfactory quality water, suitable for local communities' drinking, bathing, agricultural, industrial and recreational needs, while maintaining ecosystems that can support all the species of plants, birds, fish and animals that live in these aquatic habitats.

While the overall objective of the WFD is to achieve good status, some waterbodies require extra protection by virtue of their location in a protected area or their function as a drinking water or bathing water. In accordance with the requirements of the WFD and the associated national regulations, a register of protected areas has been set out for each River Basin District in Ireland. The protected areas are identified as those requiring special protection under existing National or European legislation, either to protect the surface water resource or to conserve habitats or species that directly depend on those waters.

The different protected areas included in this register are European drinking water protected areas, designated waters such as fish protected areas and shellfish protected areas, nitrates vulnerable zones, urban wastewater sensitive areas and bathing water protected areas.

The current objective is that all waters (rivers, lakes, groundwater, estuaries, coastal waters, canals and reservoirs) are protected and that measures are put in place to ensure quality of these waters is restored to at least 'good' status or good potential (with some narrow exceptions) by 2027 at the latest. The draft River Basin Management Plan for Ireland 2022-2027 was published in July 2022.

12.2.2 Guidance

This assessment has been prepared in accordance with guidelines established by Transport Infrastructure Ireland (TII) in its Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2009), hereafter referred to as the NRA Guidelines, in terms of the criteria for ranking significance of potential effects. The following guidelines have been adhered to:

- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016);
- Planning for Watercourses in the Urban Environment: A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning (Inland Fisheries Ireland, 2020);
- EirGrid's Ecology Guidelines for Electricity Transmission Projects (EirGrid, 2020); and
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Office of Public Works (OPW), 2009), hereafter referred to as the Flood Risk Guidelines.

The Flood Risk Guidelines aim to integrate flood risk management into the planning process to assist the delivery of sustainable development. They aim to encourage a transparent and consistent consideration of flood risk in the planning process.

The objectives of the Flood Risk Guidelines are given as:

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

The Flood Risk Guidelines categorise flood risk in the form of three flood zones. These flood zones each relate to geographical areas at high, moderate or low flood risk and are therefore assigned as being in flood zone A, B or C, respectively. **Table 12.1** provides a definition of each flood zone.

Flood risk is the chance of a flood occurring in any year, expressed as a percentage For example, a flood event may be described as having a probability of flooding of 1%, which represents a 1 in 100-year event.

The vulnerability of development to flooding depends on the nature of the development, its location and the construction methods used. The classification of different land uses and types of development as highly vulnerable, less vulnerable and water-compatible is influenced primarily by the ability to manage the safety of people in flood events and the long-term implications for recovery of the function and structure of buildings.

Table 12.1 Definition of Flood Zones

Flood Zone	Description
A	Where the probability of flooding from rivers and the sea is highest (greater than 1% for river flooding or 0.5% for coastal flooding).
B	Where the probability of flooding from rivers and the sea is moderate (between 0.1% and 1% for river flooding or between 0.1% and 0.5% for coastal flooding).
C	Where the probability of flooding from rivers and the sea is low (less than 0.1% for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in Zone A or B.

Source: The Planning System and Flood Risk Management, Guidelines for Planning Authorities (OPW 2009)

The Proposed Development is assessed as "*essential infrastructure such as electricity generating power stations and substations*" and therefore, classed as a "*highly vulnerable development*". The Flood Risk Guidelines require that a Justification Test be completed for any highly vulnerable developments which are located within Flood Zone A or Flood Zone B. The planning guidelines describe the two-part test:

- Part 1) the plan making justification test – this is to incorporate flooding into the planning process: identifying the flood risk areas, considering flooding with the overall environmental assessment, and justifying the need for development within Flood Zones A and B, and
- Part 2) development management justification test – where flood risk is present, this part is to present how the development will manage flood risk including consideration that:

  a) the development will not increase flood risk elsewhere and, if possible, will reduce overall flood risk; and

  b) the development proposal includes measures to minimise flood risk to people, property and the economy and the environment as far as reasonably possible and to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures.

12.2.3 Methodology Applied

A desktop qualitative appraisal has been undertaken to identify the baseline characteristics relating to the hydrology of surface waterbodies near the Proposed Development and using existing flood risk mapping from the OPW.

The study area extends to a buffer of 250 m around the Proposed Development. This buffer is in line with study areas for assessing water environment impacts for other linear construction projects.

The key resources used for the purpose of this appraisal were as follows:

- Environment Protection Agency (EPA) (Water Framework Ireland Map viewer) databases (https://www.catchments.ie/) (EPA, 2022a);
- Water Quality in Ireland Report 2016-2021 (EPA, 2022b); and
- OPW Flood Mapping (https://www.floodinfo.ie/map/floodmaps/).

Desktop data has been used to identify surface water features/waterbodies, such as rivers and ponds.

It is possible that some minor drainage ditches located near the works have not been identified in this report, but the mitigation detailed and proposed as part of this application and CEMP will be implemented when dealing with any such features to prevent any potential negative effects.

A flood risk assessment (FRA) has been completed for the Proposed Development (see Appendix 12.1). The FRA has been prepared for the Proposed Development in accordance with the Department of the Environmental, Heritage and Local Government (DEHLG) and the OPW Flood Risk Guidelines.

As part of the PECR process, this assessment considers the flood risk to the development during construction and operation. As the nature of the works will result in relatively minimal changes to the existing ground surfacing, i.e. impermeable or permeable surfaces, no discernable increases are expected in generated run-off volumes which could contribute to increased flooding as a result of the Proposed Development. This assessment has been undertaken through reviewing the OPW flood risk maps and assessing watercourse locations with respect to the development.

The assessment of flood risk is based on existing information at the time of the study and recommendations of climate change allowances by the OPW.

12.3 Baseline Conditions

12.3.1 WFD Catchment Overview

The Proposed Development and the study area are located within the Hydrometric Area (HA) 09 (Liffey and Dublin Bay) water catchment area. The Liffey and Dublin Bay catchment includes the area drained by the River Liffey and by all streams entering tidal water between Sea Mount and Sorrento Point, Co. Dublin, draining a total area of 1,616 km^2. The Liffey catchment contains the largest population of any catchment in Ireland and is characterised by a sparsely populated, upland southeastern area and a densely populated, flat, low-lying area over the rest of the catchment basin.

12.3.2 Surface Water WFD Status

The EPA river dataset is designed as a geometric river network for monitoring management and reporting purposes. The EPA has split up rivers and streams into smaller sections to allow areas to be easily distinguished which are assigned segment codes. The WFD status of the rivers and streams within the study area of the Proposed Development are detailed in Table 12.2. Other watercourses without WFD status are shown in Table 12.3.

Table 12.2: Current classification status for identified WFD water bodies within the study area (Environmental Protection Agency, 2022b).

Waterbody Reference	Chainage	WFD Sub-Catchment	WFD Waterbody Name	WFD Waterbody Code	Ecological Status or Potential (2016 - 2021)	Key Pressures: Elements Causing or with Potential to Cause Less Than Good Status	Proposed Crossing by Proposed Development
WB01	800	Tolka_SC_010	Trib of Tolka_020	IE_EA_09T010600	Moderate	Agriculture	Open Cut Trenching
WB02	1900	Tolka_SC_010	Dunboyne stream_010	IE_EA_09D040500	Poor	Agriculture, Domestic Waste Water	Open Cut Trenching
WB03	3615	Liffey_SC_080	Rye Water_030	IE_EA_09R010400	Poor	Agriculture, Domestic Waste Water, Hydromorphology	Open Cut Trenching
WB04	6000	RyeWater_SC_010	Jenkinstown stream_010	IE_EA_09J010950	Moderate	Agriculture, Domestic Waste Water	Open Cut Trenching
WB07	10700	RyeWater_SC_010	Jenkinstown stream_010	IE_EA_09J010950	Moderate	Agriculture, Domestic Waste Water	Open Cut Trenching
WB08	11180	RyeWater_SC_010	Jenkinstown stream_010	IE_EA_09J010950	Moderate	Agriculture, Domestic Waste Water	Open Cut Trenching
WB10	12370	RyeWater_SC_010	Rye Water_020 (Brides Stream)	IE_EA_09R010300	Good	N/A	Open Cut Trenching
WB12	14400	RyeWater_SC_010	Rye Water_020 (Padistown)	IE_EA_09R010300	Good	N/A	Open Cut Trenching
WB13	15050	RyeWater_SC_010	Rye Water_010	IE_EA_09R010100	Moderate	Agriculture, Domestic Waste Water	Horizontal Directional Drilling (HDD)
WB14	15400	RyeWater_SC_010	Royal Canal	IE_EA_AWB_RCMILE	Good	N/A	HDD

Waterbody Reference	Chainage	WFD Sub-Catchment	WFD Waterbody Name	WFD Waterbody Code	Ecological Status or Potential (2016 - 2021)	Key Pressures: Elements Causing or with Potential to Cause Less Than Good Status	Proposed Crossing by Proposed Development
WB15	19920	Lyreen_SC_010	Lyreen_010	IE_EA_09L020035	Poor	Agriculture, Domestic Waste Water	N/A
WB19	21650	Lyreen_SC_010	Lyreen_010 (Baltracey Trib Lyreen)	IE_EA_09L020035	Poor	Agriculture, Domestic Waste Water, Hydromorphology, Industry	Open Cut Trenching
WB22	23620	Lyreen_SC_010	Clonshanbo_010	IE_EA_09C030300	Poor	Agriculture, Domestic Waste Water, Hydromorphology	Open Cut Trenching
WB24	25800	Lyreen_SC_010	Clonshanbo_010	IE_EA_09C030300	Poor	Agriculture, Domestic Waste Water, Hydromorphology	Open Cut Trenching
WB25	27300	Liffey_SC_050	Kilmurry_010	IE_EA_09K260890	Poor	Agriculture	Open Cut Trenching
WB27	30000	Liffey_SC_050	Liffey_130	IE_EA_09L011600	Good	N/A	N/A
WB29	30400	Liffey_SC_050	Liffey_130	IE_EA_09L011600	Good	N/A	N/A
WB30	31360	Slate_SC_010	Trib of SLATE_010	IE_SE_14S010000	Poor	Extractive Industry, Hydromorphology, Urban Run-off	Open Cut Trenching
WB31	31360	Liffey_SC_050	Liffey_130	IE_EA_09L011600	Good	N/A	N/A
WB32	36150	Liffey_SC_050 / Liffey_SC_060	Longton_Demesne_Trib of Liffey_120	IE_EA_09L011500	Good	N/A	Open Cut Trenching
WB35	37200	Liffey_SC_050 / Liffey_SC_060	Liffey_120	IE_EA_09L011500	Good	N/A	HDD

Waterbody Reference	Chainage	WFD Sub-Catchment	WFD Waterbody Name	WFD Waterbody Code	Ecological Status or Potential (2016 - 2021)	Key Pressures: Elements Causing or with Potential to Cause Less Than Good Status	Proposed Crossing by Proposed Development
WB36	37900	Liffey_SC_050 / Liffey_SC_060	Liffey_120	IE_EA_09L011500	Good	N/A	N/A
WB37	39000	Liffey_SC_050 / Liffey_SC_060	Liffey_120	IE_EA_09L011500	Good	N/A	N/A
WB38	39400	Liffey_SC_060	Grand Canal	IE_09_AWB_GCMLE	Good	Anthropogenic Pressures	N/A
WB39	41510	Liffey_SC_060	Liffey_110	IE_EA_09L011300	Good	N/A	N/A
WB41	42900	Liffey_SC_060	Liffey_110	IE_EA_09L011300	Good	N/A	N/A
WB42	44600	Liffey_SC_060	Grand Canal	IE_09_AWB_GCMLE	Good	Anthropogenic Pressures	HDD
WB43	45330	Liffey_SC_060	LIFFEY_100	IE_EA_09L011200	Good	N/A	N/A
WB46	37600	Liffey_SC_050 / Liffey_SC_060	Trib of Liffey_120	IE_EA_09L011500	Good	N/A	N/A

12.3.3 Non-WFD Classified Surface Water Features

A review of OS mapping has identified 18 minor water features within the study area. These features, including the approximate chainage where interaction is likely, are listed in Table 12.3 below.

Table 12.3: Non-WFD Classified Surface Water Features identified within study area

Waterbody Reference	Chainage	WFD Sub-Catchment	WFD Waterbody Name	WFD Waterbody Code	Ecological Status or Potential (2016 - 2021)	Proposed Crossing by Proposed Development
WB05	7385	RyeWater_SC_010	Pond/watercourse	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching
WB06	8080	RyeWater_SC_010	Jenkinstown stream The Stream is supplemented by ditches	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching
WB09	11400	RyeWater_SC_010	Jenkinstown stream The Stream is supplemented by ditches	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching
WB11	13650	RyeWater_SC_010	Newtownmoy Aghy Stream Trib of RYE WATER_020	Not mapped by EPA	Not mapped by EPA	N/A
WB16	20870	Lyreen_SC_010	Drainage ditches	Not mapped by EPA	Not mapped by EPA	N/A
WB17	21250	Lyreen_SC_010	Drainage ditches	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching
WB18	21300	Lyreen_SC_010	Drainage ditches	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching
WB20	22000	Lyreen_SC_010	Trib of Liffey_010	Not mapped by EPA	Not mapped by EPA	HDD
WB21	22300	Lyreen_SC_010	Drainage ditches	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching

Waterbody Reference	Chainage	WFD Sub-Catchment	WFD Waterbody Name	WFD Waterbody Code	Ecological Status or Potential (2016 - 2021)	Proposed Crossing by Proposed Development
WB23	24150	Lyreen_SC_010	Drainage ditches	Not mapped by EPA	Not mapped by EPA	N/A
WB26	27600	Liffey_SC_050	Trib of Kilmurry_010	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching
WB28	30250	Liffey_SC_050	Trib of Liffey_130	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching
WB33	36650	Liffey_SC_050 / Liffey_SC_060	Drainage ditches	Not mapped by EPA	Not mapped by EPA	N/A
WB34	36900	Liffey_SC_050 / Liffey_SC_060	Drainage ditches	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching
WB40	42300	Liffey_SC_060	Liffey_110	Not mapped by EPA	Not mapped by EPA	N/A
WB44	49000	Liffey_SC_050	Drainage ditches	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching
WB45	52700	Liffey_SC_050	Dunstown	Not mapped by EPA	Not mapped by EPA	Open Cut Trenching

12.3.4 Designated Sites

Designated sites are considered within each waterbody within the Liffey and Dublin Bay catchment. The sites described comprise Nutrient Sensitive Areas, Shellfish Areas, Coastal Bathing Waters, Special Areas of Conservation (SACs), Special Protection Areas (SPAs), proposed Natural Heritage Areas (pNHAs), salmonid rivers and marine bathing waters.

A summary of the WFD Register of Protected Areas is provided in **Table 12.4**.

Table 12.4: Designated Sites within Study Area

WFD Register of Protected Areas Category	Present in Study Area?	Comments
Nutrient Sensitive Areas	Yes	The River Liffey is designated under the UWWT Directive.
Shellfish Areas	No	N/A
Coastal Bathing Waters	No	N/A
SAC	No	Ballynafagh Bog SAC not within study area but rivers associated with SAC are: Slate_010
SPA	No	N/A

WFD Register of Protected Areas Category	Present in Study Area?	Comments
Proposed Natural Heritage Areas	Yes	Royal Canal (Site Code: 002103) Grand Canal (Site Code: 002104)
Salmonid Rivers	No	N/A

12.3.5 Flood Risk

This section should be read with the detailed Flood Risk Assessment in Appendix 12.1. There are a number of potential sources of flood risk to be assessed based on a source-pathway-receptor model. Potential categories of flood risk to a development are described in **Table 12.5** and the risk to the development assessed.

Table 12.5: Sources of Flood Risk

Category	Mechanism	Potential risk to Proposed Development from category of flooding
Fluvial flooding	Exceedance of the flow capacity of the channel of a river, stream or other natural watercourse (which may be culverted in some areas). Fluvial flooding is typically associated with heavy rainfall events, and excess water spills onto the river floodplain.	Proposed Development potentially at risk from a number of local watercourses.
Coastal and tidal flooding	Caused by high astronomical tide, storm surge, wave action, and local bathymetric effects, often in combination. In estuaries and watercourses affected by tide-locking, flooding can occur as a result of high tidal levels and high fluvial flows in combination.	The Proposed Development is outside OPW tidal flood risk areas (www.floodinfo.ie), so is not at risk.
Surface water / overland flow	Water flowing over the ground surface that has not reached a natural or artificial drainage channel. This can occur when intense rainfall exceeds the infiltration capacity of the ground, or when the ground is so highly saturated that it cannot accept any more water.	Rainfall could potentially affect the Proposed Development.
Groundwater flooding	Raised groundwater levels, typically following prolonged rain (that may be slow to recede). High groundwater levels may result in increased overland flow flooding. Normally associated with catchments where porous substrate and/or aquifers exist.	OPW Groundwater flood risk maps (www.floodinfo.ie) indicate no risk of groundwater flooding along the development route. There may be potential for groundwater seepage in areas of high soil permeability, as well as close to the proposed river crossings and riverbanks.
Human/mechanical error	Blockage or overloading of pipes, sewers, canals, and drainage channels or failure of pumping systems. Typically occurs following heavy rainfall or as a result of high water levels in a receiving watercourse.	Blockage could be a potential source of flood risk.

Based on the assessment of potential risk to the Proposed Development from the different categories of flooding (Appendix 12.1), the Proposed Development could potentially be at low risk of flooding from fluvial and surface water in certain locations. There is no known risk from coastal and groundwater flooding. These flood risk sources have been assessed for the Proposed Development during construction and operation and mitigation measures provided where required.

12.4 Potential Impacts

The following sections discuss the potential impacts which could arise as result of the Proposed Development.

12.4.1 Construction Phase

Given the nature of the Proposed Development, the potential for effects on the water environment is for the most part associated with the construction phase and are similar to any civil engineering project. These include potential effects on:

- Surface water quality from sediment run-off, spillages, discharges or physical modification;
- Drainage patterns from formation of impermeable surfaces and working in or near watercourses;
- Water supply and drainage infrastructure; and
- Flood risk.

12.4.1.1 Surface Water Quality

Excavation works and works associated with the creation of passing-bays, the storage of excavated material, vegetation clearance, crossing of watercourses and infilling of trenches can pose a risk to surface water quality through surface water run-off and the release of sediment to watercourses. In addition, surface water quality may be impacted by open-cut trenching either by the direct crossing or crossings close to watercourses. Elevated levels of sediment may potentially impact on water quality by affecting dissolved oxygen, pH, clarity, nutrient levels, and temperature which can all have negative impacts on aquatic species. Also, the construction of below ground structures, such as joint bays, may require dewatering and any associated discharges from groundwater to a surface waterbody may have the potential to affect water quality.

Exposed surfaces of construction vehicles and machinery can erode, and when it rains this eroded material can enter surface water features and potentially have a negative impact on water quality. Access tracks used to facilitate construction may affect surface run-off patterns, creating alternative flow paths and promoting erosion of previously unaffected areas. Also, accidental release of potentially polluting substances such as cement and oils (hydrocarbons) can result in significant effects on the surface water environment and associated aquatic environment.

The release of hydrocarbons from accidental spillages, vehicles and/or machinery may result in a deterioration to water quality including a reduction in dissolved oxygen. This can have a negative impact on any water dependent species present. Hydrocarbons do not dissolve, and so will not dilute into the water until they break down.

Concrete and cement are highly alkaline and fresh concrete has corrosive properties. Concrete wash water is a particularly severe pollutant, as it typically has a high pH (11-12) coupled with extremely high suspended sediment content. In the freshwater environment, pH levels which are elevated beyond natural conditions can have significant effects upon water bodies. There is also the potential for bentonite break out (or slurry run-off from launch pits) to contaminate watercourses where HDD activities are taking place.

In the absence of mitigation measures, there is potential for the Proposed Development to affect water quality.

12.4.1.2 Hydromorphology

A number of watercourses need to be crossed by the Proposed Development. The drainage patterns associated with watercourses confined to existing culverts will not be impacted significantly as a result of the Proposed Development.

Open cut trenching will be carried out in a dry works area. To do this, an impermeable barrier will be installed, the type of which will be tailored to the specific watercourse. The existence of a temporary impermeable barrier to facilitate open cut trenching will have a direct impact on the cross section of the channel. This is likely to give rise to localised but temporary changes in water depth, velocities and sediment erosion and deposition while the barrier remains in situ and in the short-term following removal while sediment erosion and deposition processes return to normal.

The changes to water body hydromorphology may potentially lead to changes in river processes and habitats upstream and downstream, but impacts are not deemed to be significant. Any impacts would be localised and temporary in nature.

The proposed activities may result in localised changes to surface water drainage patterns and restrictions to infiltration of rainfall in soils. Given the largely rural locations of the Proposed Development, existing drainage networks are available and any disturbance will be localised and temporary in duration. Surface water contributions will remain unchanged and will likely discharge to the same catchment. Significant construction phase effects on surface water drainage patterns are not likely.

12.4.1.3 Water Supply and Drainage infrastructure

During the construction phase, there is potential for disruption to services through inadvertent damage caused by works activities. This could lead to water supply issues in terms of quantity and quality losses or complete severance of supply.

During the construction phase, temporary construction compounds will be required along the route. There will be water demands as well as the generation of wastewater. Any wastewater will be tankered off-site to a suitability licensed facility.

12.4.1.4 Flood Risk

Sections of the Proposed Development are partially located within floodplains associated with a number of watercourses located throughout the route corridor. Where the Proposed Deevlopment interacts with watercourses, a crossing will be required by either open trench crossing or by HDD. The larger main watercourses will be traversed by HDD. Most minor watercourses are located outside the OPW flood risk maps for defining Flood Zone B. For minor watercourses and ditches, a trench will be excavated through the watercourse.

Construction activities have the potential to cause blockages and damage within watercourses, which may in turn impact floodplains and reduce their storage capacity, or increase the risk of flooding from a blocked or damaged watercourse.

During the construction of the Proposed Development, there is the potential for surface water flow paths to be altered. This could increase the risk of surface water flooding to the local area.

12.4.2 Operational Phase

12.4.2.1 Surface Water Quality

There is the possibility of some effects on surface water quality during the operational phase of the Proposed Development, primarily during future maintenance. Maintenance of a buried cable would typically involve extraction and replacement of the section of faulty cable. At the above ground locations, potential impacts would include:

- Pollution entering surface water systems from spillages of fuels, lubricants and hydraulic oils that may be used during ongoing maintenance;
- Alterations to the hydrological regime by altering or preventing the natural movement of surface and subsurface flows or by acting as a conduit for new flows that may carry contaminants to the receiving surface water environment.

All maintenance works would be infrequent. As the cables are solid insulation type, there are no sources of pollution, and as they are buried, they will not offer a pathway to any surface water receptors.

Given the nature of the Proposed Development, significant adverse effects on surface water quality during operation are not anticipated.

12.4.2.2 Hydromorphology

Impacts to hydromorphology during operation of the Proposed Development are not anticipated unless works associated with maintenance result in disturbance to watercourses.

12.4.2.3 Water Supply and Drainage infrastructure

As the land will continue to drain as per the existing situation along the cable route, significant adverse effects on water supply and drainage infrastructure because of the Proposed Development are not anticipated.

12.4.2.4 Flood Risk

The Proposed Development is designed to not be vulnerable to flooding; this includes avoidance of Flood Zones A and B where possible. The cable is underground and is designed to be floodable without affecting its operation. During operation, the key vulnerability to the cable is its joints. All joint bays are designed with watertight connections as standard (as these installations are typically underground). The cable route is buried and so will not affect flood flows. The cable route therefore passes the development management justification test. For further detail, please see the Flood Risk Assessment (Appendix 12.1).

12.5 Proposed Mitigation

12.5.1 Construction Phase

12.5.1.1 General

The following mitigation measures will be implemented prior to commencement and throughout the duration of the proposed works:

- Implementation of the CEMP (Appendix 5.4 of this PECR) and the Construction Resource Waste Management Plan (Appendix 5.5) which sets out measures to control and manage activities at the surface to prevent issues such as accidental spillage;
- A full-time on-site Environmental Clerk of Works (EnCoW) will be appointed prior to commencement of works;
- Works will be carried out in accordance with the guidelines set out by Inland Fisheries Ireland in Guidelines on Protecting Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016);
- The Inland Fisheries Ireland Biosecurity Protocol for Field Survey Works will be complied with;
- Works method statements will be agreed with Inland Fisheries Ireland for all watercourse crossings. The works method statement will include details on silt fencing, pH monitoring requirements for in-stream concrete pouring works, and handheld turbidity monitoring for in-stream and HDD works; and

- An adverse weather stop work plan will be developed to ensure that activities with the potential to cause pollution are stopped under certain weather conditions. Certain activities (such as open cut trenching, HDD works) will not be carried out during extreme rainfall or high flow events. Met Eireann (Red, Amber, Yellow) warnings and flood warnings will be monitored daily by the EnCoW.

12.5.1.2 Surface Water Quality Protection Measures

The following surface water quality mitigation measures will be implemented prior to commencement and throughout the duration of the works:

- Activities will be planned in advance and machinery will be managed to ensure that the number of trips is limited to the minimum required at each location. This is because the more times a piece of ground is tracked, the more likely it is that vegetative cover will be removed and ruts will be created that will act as miniature rivers where dirty water will flow;

- Tracking beside streams and tracks will be avoided to avoid damage to the bankside;

- Geotextile or timber matting will be used on soft ground, and in all protected areas;

- A buffer zone of 20 m will be maintained between storage/working areas and sensitive watercourses, such as the River Liffey, taking account of the minimum working area required to facilitate the works;

- Oil or fuel stored in or adjacent to the construction site will be kept in a bunded area (providing 110% capacity of the largest storage unit), 100 m from any watercourse which appears on a 6" OS map of the site. Vehicle maintenance will not occur within 100 m of any watercourse and all machinery will be in good working order, free from any leakage of fuel, oil or hydraulic fluid;

- Reinstatement method statements will be subject to approval by the EnCoW;

- Concrete will be brought to site by covered truck. Wet concrete operations adjacent to watercourses will be minimised, with a minimum separation distance of 10 m. Where unavoidable, these operations will be carried out under supervision of the EnCoW and with suitable mitigation measures in place, such as controlling the leakage of any cement;

- The Contractor will ensure that all concrete truck rinsings/cleaning is undertaken within construction compounds and at least 10 m away from watercourses;

- In order to reduce the risk of contamination arising as a result of spills or leakages, measures including, but not limited to, the following will be employed:

    - All collected waste will be managed in accordance with the Waste Management Act 1996, and associated Regulations;

    - Fuels, chemicals, liquid and solid waste will be stored on impermeable surfaces;

    - Refuelling of plant, equipment and vehicles will be carried out on impermeable surfaces;

    - All tanks and drums will be bunded; and

    - Spill kits will be provided at all compound locations and carried by all crews during underground cable installation works.

- Silt fences (to Hy-Tex Premium specification or similar) and silt traps will be installed prior to commencement of works and will be inspected daily so that they can be adjusted as necessary. The EnCoW will consider the locations for these measures based on the potential for sediment-laden run-off to reach a receiving watercourse.

- Site restoration post works will be carried out, in agreement with Inland Fisheries Ireland. These works may include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation;
- The Emergency Incident Response Plan and environmental control and mitigation measures described in the CEMP will be agreed prior to construction with Inland Fisheries Ireland; and
- Water pumped from dry works areas and any dewatering will be treated using settlement tanks to remove sediment prior to discharge onto grass and allowed to filter back to the watercourse.

12.5.1.3 Silt Control Measures

The following silt control mitigation measures will be implemented prior to commencement and throughout the duration of the works:

- Silt control measures will be used to control silt generated from activities on site and prevent it gaining access to surface drainage which could convey silt to larger streams and watercourses;
- Silt control measures will include silt traps which can be located in small drains where flow is small and silt fences where run-off from large areas needs to be controlled;
- Silt fences will be installed in the working areas and not at the watercourse;
- Access routes will be delineated such that an appropriate set back distance from watercourses is maintained. Where works are to be undertaken adjacent to watercourses the setback distance will be delineated by the EnCoW on site;
- Where distances between the works and watercourse allow, a minimum setback distance of 20 m from the watercourse will be maintained; and
- Where the site is constrained, the best available set back distance will be employed taking account of the minimum working area required to facilitate the works.

Silt Fences

- Silt fences will be installed downslope of the area where silt is being generated on disturbed ground;
- To be effective, the silt fence will contain the area where silt is generated and will terminate on high ground (i.e. an elevated area not in the watercourse);
- Silt fences will be constructed using a permeable filter fabric (e.g. Hy Tex Terrastop Premium silt fence or similar) and not a mesh;
- The base of the silt fence will be bedded at least 15–30 cm into the ground at 2 m intervals. The manufacturer's installation instructions should be consulted prior to installation to ensure the silt fence is appropriately installed to avoid a reduction on performance efficacy,
- Once installed the silt fence will be inspected regularly by the EnCoW, daily during the proposed works, weekly on completion of the works for at least one month, but particularly after heavy rains;
- The integrity of the silt fencing will be checked daily by the EnCoW and after poor weather conditions (rain or wind) and any failures rectified immediately;
- Two lines of silt curtain/fence will be installed, where considered necessary, by the EnCoW;
- Any build-up of sediment along the fence boundary will be removed daily;
- Silt fences will be maintained until vegetation on the disturbed ground has re-established;

- The silt fencing will be left in place until the works are completed (which includes removal of any temporary ground treatment);
- Silt fences will not be removed during heavy rainfall;
- The silt fence will not be pulled from the ground but cutaway at ground level and posts removed; and
- A record of when it was installed, inspected and removed will be maintained by the EnCoW.

Silt Traps

The purpose of the trap is to reduce the level of solids in the slowly flowing water. The silt trap works by allowing a build-up of water behind it, slowing flow and allowing solids to settle out. The following requirements will apply:

- Silt traps will only be placed in drains downstream of working areas where the volume of water flow is expected to be low;
- Silt traps will be made of Terram or similar material, not mesh;
- The trap will be staked into the banks of the drain/watercourse such that no water can flow around the sides;
- The material will be bedded into the drain bed/watercourse to prevent water flowing beneath it;
- The height of the trap will be lower than the bank heights. The upper edge will be fixed to a timber cross piece. This will allow water to overtop the silt trap and not burst through or around it;
- Inspections will be carried out daily during the proposed works, weekly on completion of the works for at least one month, and after heavy rains, and monthly thereafter until bare areas have developed new growth;
- Any build-up of solids will be carefully removed without removing any vegetation growing on the bottom;
- The silt trap will not be pulled from the ground but cutaway at ground level and posts removed; and
- A record of when it was installed, inspected and removed will be maintained by the EnCoW.

12.5.2 Construction Compounds/Laydown areas

All temporary construction compounds will be secured with hoarding/fencing around the compound perimeters as appropriate. Where temporary construction areas are required and existing hardstanding is not available, engineering stone fill will be laid and compacted and maintained as required for the duration of the works. Once the works are completed, the engineered stone fill will be removed, and the land will be reinstated to its original condition or for specific locations with biodiversity value in-line with reinstatement measures outlined in Chapter 10: Biodiversity of this PECR.

Temporary facilities will be provided at the construction compounds including construction phase car parking and welfare facilities and temporary material storage areas as necessary.

Any discharges from temporary welfare facilities will be connected to a sealed holding tank to be emptied and disposed of off-site by a licensed contractor to an approved licensed facility.

Storage of fuel and refuelling will be undertaken within bunded hardstanding areas. Water will be brought to site via tankers as required.

12.5.3 Service Diversions/Interactions

All reasonable measures will be taken to avoid unplanned disruptions to any services during the proposed works. This will include thorough investigations to identify and reconfirm the location of all utility infrastructure within the works areas and implementing procedures to be agreed with utility providers when undertaking works around known infrastructure services.

Service disruptions impacting the surrounding residential, social and commercial properties will be kept to a minimum, only occurring where unavoidable. Prior notification of disruptions will be given to all impacted properties. This will include information on when disruptions are scheduled to occur and the duration of the disruption. Relevant neighbouring parties will be consulted prior to any proposed disruptions.

12.5.4 Open Trench Water Crossings

As with all construction works proposed, no works on watercourses will be allowed to commence until the relevant Risk Assessment Method Statements (RAMS) and pertinent Health and Safety documents are received from the specialist Contractor and are reviewed and agreed by the Client's representative. These Contractor documents will include method statements, open trenching risk assessments and environmental management plans specific to the area where the trenching is to take place. These plans will be submitted by the Contractor to the Employer's Representative on site for review and comment prior to commencing open trench operations. All documentation relating to the proposed works will also be provided to Inland Fisheries Ireland for approval.

All open trench watercourse crossings in salmonid watercourses will take place during the May to September period in order to avoid the period of salmon and trout spawning.

The ground preparation works (such as soil stripping, hardstand formation) adjacent to the watercourse crossing will be carried out in the same manner as that for other works activities. All clean coarse surface material (gravel, cobbles and boulders) on the riverbed or stream will be removed to a depth of 20cm. A thinner layer will be removed if deeper material is mainly clay or sand. These excavated materials will be set back from the watercourse and placed on a geotextile base for use in the reinstatement process following the cable installation.

Where damming and pumping methods are to be used for open trenching, sandbags will be used with an impermeable barrier. Should sites be flumed, the diameter chosen for the flume pipe will accommodate flows at the time with spare capacity to cover that predicted over the period that the works would be expected to last. A clay material will be used around the flume pipe to create a seal.

Material excavated from the trench (and an upstream pump sump if required) will be placed on terram on level ground as far back from the watercourse edge as is practicable and surrounded on its downslope side by a silt fence to prevent material re-entering the watercourse. This material, if deemed suitable, can be used to partially backfill the trench. However, a significant amount will be in excess and will be removed from site under licence. Dewatering of the excavation will be treated on site using settlement tanks before the settled water is returned to the watercourse. A second tank in series with the first will be used if the first is not sufficient to remove enough solids. Pumped over water will be directed to a splash plate to prevent erosion of the riverbed at the downstream side.

The surface coarse substrate which was set aside will be used to reinstate the stream bed after the ducts have been installed and the flume pipe has been removed as well as all the damming materials. All surfaces will be reinstated to the satisfaction of the landowner and re-seeded to assist soil stabilisation. A silt fence will be placed along the riverbank where the works were undertaken in order to prevent solids washed off the works area during heavy rainfall from entering the stream while the surface adequately re-vegetates. This measure will be particularly important at sites which slope to the edge of the watercourse.

Site restoration works will be carried out following completion of any water crossings, in agreement with Inland Fisheries Ireland. These works may include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation. Significant adverse effects in terms of water depth, velocities and sediment erosion/deposition are therefore not anticipated.

12.5.5 HDD Water Crossings

As with all construction works proposed, no drilling works will be allowed to commence until the relevant RAMS and pertinent Health and Safety documents are received from the specialist Contractor and are reviewed and agreed by the Client's representative. These Contractor documents will include method statements, drilling risk assessments and environmental management plans specific to the area where the drilling is to take place. These plans will be submitted by the Contractor to the Employer's Representative on site for review and comment prior to commencing drilling operations.

The specialist drilling team will constantly monitor fluid volume pressure, pH, weight and viscosity during the proposed works. The volume of cuttings produced will also be monitored to ensure that no over cutting takes place and that hole cleaning is maintained. The mud returns will be pumped to the circulation system trailer by a bunded centrifugal pump. The nature of the cuttings will also be monitored to understand the ground conditions as the drilling progresses.

After the initial pilot hole is completed, it will be reused in a number of passes to reach the required bore size to enable the duct lining to be pulled. To ensure that the prevailing geological conditions have suitable cohesion that can maintain the bore during the drilling and reaming process, the specialist drilling team will pay close attention to modelled drag forces during pullback and constantly monitor load stress to ensure that modelled tensile stress, collapse pressures, hoop stress and buckling stress are not exceeded. In addition to the above measures, the rate of drilling progress will be monitored to help identify any voids or changes in strata.

In addition, the Contractor will monitor river/stream flows upstream and downstream of any HDD watercourse crossings. The flow monitoring will be undertaken on a daily basis for five working days prior to the HDD, during the directional drilling and for five working days following completion of the HDD. If a measurable increase in losses from the watercourse to ground is observed in the reach where the HDD took place, bed lining will be undertaken if required by Inland Fisheries Ireland.

12.5.6 Operational Phase

There are no recommended mitigation and monitoring measures during operation of the Proposed Development to reduce the potential impact with respect to hydrology.

12.5.7 Monitoring

The appointed Contractor will ensure that all personnel and visitors to site are encouraged to report visual indications of changes in water quality in any watercourses on site. Ongoing monitoring will be carried out throughout the construction phase of the Proposed Development to ensure that the mitigation measures deployed remain effective.

The Contractor will undertake regular visual inspection of the watercourses on site. The monitoring records will include the following minimum information:

- Antecedent and current weather conditions;
- Current construction activities near and in particular up-stream or up-gradient of the observation point;
- Visual assessment of water colour, turbidity and flow rate;
- Details on any communication, corrective action and/or mitigation undertaken as a result of water quality issues observed.

Certain construction activities (including HDD, open trench crossings, or wet concrete near watercourses) will require constant supervision by the EnCoW. Visual monitoring supported by turbidity monitoring of receiving waters will be conducted by the Contractor's EnCoW for the duration of works.

12.6 Residual Effects

During the construction phase, impacts to watercourses are anticipated to be small adverse but localised and temporary in duration. Disturbed ground will be reinstated post-construction. Operational phase impacts are anticipated to be imperceptible due to the infrequency of maintenance required or the negligible impacts of the permanent infrastructure. Maintenance activities will be carried out predominantly through manholes, and embedded mitigation will ensure that access will result in minimal impacts. Therefore, no residual effects to hydrology are predicted.

Irrespective of the condition of the surface waterbody if it was categorised, with the implementation of the mitigation measures proposed the Proposed Development will not in any way prevent it meeting any objectives under the WFD or prevent any surface waterbodies from reaching good status in the future.

12.7 Conclusion

The Proposed Development and the study area is located within the Liffey and Dublin Bay water catchment area. The Proposed Development crosses 27 watercourses that have been mapped by the EPA, as part of its requirements under the Water Framework Directive. Fourteen of these watercourses have been assessed to have Good Ecological Status; five have Moderate Status; and eight are Poor. An additional 14 watercourses that have not been mapped by the EPA will be crossed by the Proposed Development. These watercourses will be considered to be of Good potential status and mitigation measures will be applied to ensure that the Proposed Development does not affect that potential status.

The Proposed Development crosses several floodplains including those associated with the River Liffey. It is located in Flood Zone C, apart from minor local areas close to watercourses. While flooding was considered in the routing of the Proposed Development, it would not be feasible to entirely avoid floodplains. The nature of the underground cable means that there will be no effects on floodplains post-construction. The cable and joint bays will be designed to be watertight, so there will be no impact from flooding on the Proposed Development. The proposed works at the substations are within existing substation sites and will not affect nor be affected by flooding. Mitigation measures will ensure no significant effects during construction. Works will take account of forecasted high rainfall and any storage of material will be setback from watercourses.

In summary, during the construction phase, impacts to watercourses are anticipated to be small adverse but localised and temporary in duration. Disturbed ground will be reinstated post-construction. No residual effects to hydrology are predicted.

Irrespective of the condition of the surface waterbody if it was categorised, with the implementation of the mitigation measures proposed the Proposed Development will not in any way prevent it meeting any objectives under the WFD or prevent any surface waterbodies from reaching good status in the future.

12.8 References

CIRIA (2001) C532 Control of Water Pollution from Construction Sites: Guidance for consultants and contractors

CIRIA (2015) C741 Environmental good practice on site guide (fourth edition)

EirGrid (2020) EirGrid's Ecology Guidelines for Electricity Transmission Projects

Environmental Protection Agency (EPA) (2022a) Water Quality in Ireland Report 2016-2021

Environment Protection Agency (EPA) (2022b) Water Framework Ireland Map viewer databases (https://www.catchments.ie/) [Accessed in January 2023]

European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009, as amended by S.I. No. 296/2009; S.I. No. 327/2012; S.I. No. 386/2015; S.I. No. 77/2019; S.I. No. 277/2016; and S.I. No. 355/2018)

European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) (as amended by S.I. No. 413/2005; S.I. No. 219/2008; S.I. No. 93/2010; S.I. No. 326/2010; S.I. No. 350/2014; S.I. No. 261/2018; and S.I. No. 166/2022)

European Union (2000) Directive 2000/60/EC Water Framework Directive (WFD)

European Union (2008) Directive 2008/105/EC on environmental quality standards in the field of water policy

Government of Ireland (2005) Greater Dublin Strategic Drainage Study (GDSDS Vol. 2 – New Development)

Government of Ireland (2022) Draft River Basin Management Plan for Ireland 2022-2027

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

Inland Fisheries Ireland (2020) Planning for Watercourses in the Urban Environment: A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning

National Roads Authority (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes

Office of Public Works (OPW) (2009) The Planning System and Flood Risk Management: Guidelines for Planning Authorities

Office of Public Works (OPW) (2023) Flood Mapping (https://www.floodinfo.ie/map/floodmaps/) [Accessed in January 2023]

13. Archaeology, Architectural Heritage and Cultural Heritage

13.1 Introduction

This chapter of the PECR presents the results of the assessment for archaeology, architectural heritage and cultural heritage for the Proposed Development.

In line with guidance in *Cultural Heritage Guidelines for Electricity Transmission Projects* (EirGrid, 2015), cultural heritage has been assessed under the following topics:

- Archaeology – defined as "*the study of past societies through the material remains left by those societies and the evidence of their environment. The 'archaeological heritage' consists of such material remains (whether in the form of sites and monuments or artefacts in the sense of moveable objects) and environmental evidence*" (EirGrid, 2015, page 5);

- Architectural Heritage – comprising "*all structures and buildings (together with their settings and attendant grounds, fixtures and fittings, groups of such structures and buildings and sites), which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest. Architectural heritage is generally visible and has a presence in the landscape which requires assessment*" (EirGrid, 2015, page 6); and

- Cultural Heritage – defined as "*a general term used to describe aspects of the environment and intangible heritage which are valued for their age, beauty, history or tradition. It encompasses aspects of archaeology, architecture, history, landscape and garden design, folklore and tradition and topography. Cultural heritage is expressed in the physical landscape in numerous often interrelated ways*" (EirGrid, 2015, page 6).

Section 13.2 provides the methodology used for the assessment. Section 13.3 presents information on the baseline conditions, and Section 13.4 presents the assessment of the Proposed Development. Proposed mitigation is presented in Section 13.5, and Section 13.6 presents residual effects. An inventory of archaeology, architectural heritage and cultural heritage is also provided in Appendix 13.1.

13.2 Methodology

13.2.1 Relevant Guidelines, Policy and Legislation

This assessment was undertaken based on the following legislation and best practice guidance:

- National Monuments Act 1930 to 2014;

- European Cultural Convention 1954;

- International Council on Monuments and Sites (ICOMOS) International Charter for the Conservation and Restoration of Monuments and Sites 1964;

- United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention Concerning the Protection of the World Cultural and Natural Heritage 1972;

- Convention for the Protection of the Architectural Heritage of Europe (Granada, 1985);

- Convention for the Protection of the Archaeological Heritage of Europe (revised) (Valletta, 1992);

- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999;

- Framework and Principles for the Protection of the Archaeological Heritage (Department of Arts, Heritage, Gaeltacht and Islands (now Department of Culture, Heritage and Gaeltacht), 1999);

- Planning and Development Act 2000 to 2020;
- Convention on the Value of Cultural Heritage for Society (Faro Convention, 2005);
- Code of Practice between the Department of the Environment, Heritage and Local Government and EirGrid (Department of the Environment, Heritage and Local Government and EirGrid, 2009);
- Architectural Heritage Protection Guidelines for Planning Authorities (Department of Arts Heritage and the Gaeltacht, 2011); and
- Cultural Heritage Guidelines for Electricity Transmission Projects (EirGrid, 2015).

Archaeological sites and monuments are protected under the National Monument Act 1930–2014, primarily through inclusion in the Record of Monument and Places (RMP), the Register of Historic Monuments (RHM) and/or by being declared a National Monument. Section 2 of the National Monument Act 1930–2014 defines a National Monument as "*a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic, or archaeological interest attaching thereto*". In addition, Section 8 of the Act states that the Minister may also place a Preservation Order on a monument "*which in his* [the minister's] *opinion is a national monument in danger of being or is actually being destroyed, injured, or removed, or is falling into decay through neglect*". It is illegal to demolish, or remove wholly or in part, a National Monument or disturb the ground within, around or in proximity to a National Monument, without written consent from the Minister (and/or the local authority if they are the owners or guardians).

Section 5 of the National Monuments (Amendment) Act 1987 requires an RHM to be established and maintained. Monuments included on the RHM are afforded statutory protection under this Act, of a similar level to Recorded Monuments (see below).

Section 12 (1) of the National Monuments (Amendment) Act 1994 requires the establishment and maintenance of an RMP. Sites included in the RMP are legally protected and are referred to as Recorded Monuments. The RMP is maintained by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage who have defined Zones of Notification around each Recorded Monument. Zones of Notification do not define the extent of a site but are defined for the purposes of notification to the Minister under Section 12 of the National Monuments Act (1930–2004).

The Sites and Monuments Record (SMR) is the national database of the Archaeological Survey of Ireland (ASI) compiled and maintained by the NMS. The SMR details all sites where a monument is known to the ASI pre-dating AD 1700 and includes a selection of monuments from the post-AD 1700 period. Inclusion on the SMR does not, in itself, confer legal protection.

The Planning and Development Act 2000 sets out the conditions relating to the protection of architectural heritage. Structures of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest are protected under this Act, through their inclusion on the Record of Protected Structures (RPS) and are known as Protected Structures.

The Planning and Development Act 2000, as amended, defines an Architectural Conservation Area (ACA) as "*a place, area, group of structures or townscape, taking account of building lines and heights, that:*

- *is of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest or value, or*
- *contributes to the appreciation of protected structures*" (Planning and Development Act, 2000, Part IV, Chapter II).

Development plans are required to include an objective to preserve the character of an ACA. In considering applications to permit development within an ACA, the effect of a development on the character of an ACA is a consideration for the planning authority. Both the Meath County Development Plan 2021 – 2027 (Meath County Council, 2021) and Kildare County Development Plan 2023 – 2029 (Kildare County Council, 2023) include a list of ACAs protected under the Act.

Undertaken under the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999, the National Inventory of Architectural Heritage (NIAH) is a nationwide survey of architectural heritage including buildings, structures, and historic gardens and designed landscapes. Inclusion on the NIAH alone does not in itself confer legal protection. The NIAH includes an assessment of the significance of structures based on an appraisal of their contribution to architectural heritage. Significance ratings are International, National, Regional, Local and Record Only (NIAH, 2022). Structures which are considered of International, National, and Regional significance are recommended by the Minister to the relevant Local Authority for inclusion in their RPS.

The Survey of Historic Gardens and Designed Landscapes, undertaken by the NIAH, includes the sites of demesne lands from First Edition Ordnance Survey maps and assesses the level of survival and change. These gardens and designed landscapes (GDLs) largely date from the post-medieval period when the lands surrounding large houses assumed an increasingly ornamental role providing a landscape setting for the house.

13.2.2 Study Area

The study area for archaeology, architectural heritage and cultural heritage was defined as the Planning Application Boundary for the Proposed Development plus a 50 m buffer. This study area is large enough to establish a robust baseline as it allows archaeology, architectural heritage and cultural heritage constraints within and immediately adjacent to the Planning Application Boundary (and which could potentially extend into it) to be identified, provides a wider context for these and enables an informed assessment of the possible presence of unknown archaeological remains to be made. As works (the excavation for the cable trench, joint bays, and launch and reception pits for HDD, construction of the passing bays and off-road access tracks, and establishment of construction compounds) could have a direct impact on archaeology, architectural heritage and cultural heritage constraints within the Planning Application Boundary, the study area allows direct impacts on sites within the Planning Application Boundary, or that potentially extend into it, to be identified and assessed.

Indirect impacts could result from changes to the setting of archaeology, architectural heritage and cultural heritage constraints during construction and operation. During construction, the activities that could result in indirect impacts would be restricted to the Planning Application Boundary. In addition, areas disturbed during construction will be reinstated and, apart from joint bay covers and access tracks (in off-road sections), the Proposed Development will be underground during operation. Therefore, indirect impacts are not anticipated beyond 50 m, and the study area as defined allows them to be identified and assessed both during construction and operation.

13.2.3 Data Collection

The following sources of information were consulted to establish the archaeology, architectural heritage and cultural heritage baseline:

- the lists of National Monuments in State Care: Ownership and Guardianship for County Meath[56] and County Kildare[57];
- the list of Preservation Orders held by the National Monuments Service[58];
- the RMP for County Meath (1996) and County Kildare (1996)[59];

[56] https://www.archaeology.ie/sites/default/files/media/pdf/monuments-in-state-care-meath.pdf [accessed 09 January 2023].
[57] https://www.archaeology.ie/sites/default/files/media/pdf/monuments-in-state-care-kildare.pdf [accessed 09 January 2023].
[58] https://www.archaeology.ie/sites/default/files/media/publications/po19v1-all-counties.pdf [accessed 09 January 2023].
[59] https://www.archaeology.ie/publications-forms-legislation/record-of-monuments-and-places [accessed 09 January 2023].

- the SMR for County Meath and County Kildare[60];
- the NIAH survey of County Meath and County Kildare[61];
- the Meath County Development Plan 2021 – 2027 (Meath County Council, 2021), Kildare County Development Plan 2017 – 2023 (Kildare County Council, 2017) and Kildare County Development Plan 2023 – 2029 (Kildare County Council, 2023) for Protected Structures, ACAs and sites on the RHM;
- the Survey of Historic Gardens and Designed Landscapes[62];
- aerial imagery (aerial photographs and satellite imagery; see Section 13.8 for details of the sources consulted). A range of aerial imagery from different dates was used which maximised the potential to identify constraints. Overall ground conditions within the study area were considered to be suitable for the identification of previously unknown constraints;
- historic mapping available online (see Section 13.8);
- placename information and information from the National Folklore Collection, including information from the Schools' Collection (1937–38), via the UCD digital library[63,64];
- Topographical files of the National Museum of Ireland through the online National Museum of Ireland: Finds Database (up to 2010)[65];
- Excavations Bulletin[66] and Transport Infrastructure Ireland (TII) Archaeological Excavation Reports[67];
- Archaeological Inventory of County Meath (Moore, 1987) (an Archaeological Inventory of Kildare has not been published);
- information from public consultation (Traverse, 2022);
- sources held by the National Archives of Ireland and National Library of Ireland (see Section 13.8);
- site inspection and walkover survey (undertaken 24 to 27 January 2023; see Section 13.2.5); and
- bibliographic sources (see Section 13.8).

Some archaeological, architectural heritage and cultural heritage constraints are entered separately on one or more datasets. Where constraints appear on more than one dataset, duplicates have been removed to avoid double counting. These constraints have been included under their designation (or more significant designation) as it affords the constraint legal protection. Where a constraint does appear on more than one dataset, this has been identified in Section 13.3 below and in Appendix 13.1.

A unique reference number was assigned to each constraint identified from the sources listed above. Archaeological constraints are prefixed with 'AY' and architectural heritage constraints are prefixed with 'AH'. Demesne lands are prefixed with 'DL' and undesignated cultural heritage sites are prefixed with 'CH'. Constraints identified from a review of LiDAR data acquired for the Proposed Development are prefixed with 'LI', and townland boundaries are prefixed with 'TB'. Please note, to provide consistency with previous stages of assessment, unique reference numbering has

60 https://maps.archaeology.ie/HistoricEnvironment/ [downloaded 10 January 2023].
61 https://maps.archaeology.ie/HistoricEnvironment/ [downloaded 10 January 2023].
62 https://www.buildingsofireland.ie/resources/ [accessed 10 January 2023].
63 www.loganim.ie.
64 https://digital.ucd.ie/.
65 http://heritagemaps.ie/.
66 https://excavations.ie/.
67 https://repository.dri.ie/catalog.

been retained with new constraints added following subsequent data gathering to inform this PECR, so numbering does not start at '01' or run sequentially.

13.2.4 LiDAR

Jacobs were commissioned by EirGrid to undertake a review of Light Detection and Ranging (LiDAR) data (0.25 m resolution) captured for the Proposed Development. The aim of the review was to inform the archaeology, architectural heritage and cultural heritage baseline by identifying previously unrecorded potential constraints and gathering additional information on known constraints.

LiDAR data were processed, and Digital Elevation Models (DEMs) were produced which were then used to create a number of complementary visualisations. These visualisations were then reviewed, and potential archaeological features were identified, and the locations of known constraints were reviewed to gather additional information about them. In addition, a range of sources were consulted to verify interpretations of the results.

The review of the LiDAR data identified 158 potential constraints, including six previously unrecorded potential constraints that may comprise sites of some significance, providing further information about the archaeology, architectural heritage and cultural heritage baseline and the potential for the presence of unknown archaeological remains. The report on the results of the LiDAR analysis is included in Appendix 13.3.

13.2.5 Site Visit

The baseline for archaeology, architectural heritage and cultural heritage was also informed by a walkover survey and site inspection undertaken between 24th and 27th January 2023.

This involved a drive-through of the Proposed Development, as well as walkover survey of off-road sections where land access was granted, to note topography and current land use, the presence and condition of known constraints and their setting, and to identify previously unrecorded sites and their setting.

13.2.6 Consultation

A meeting was held with the NMS on 19 December 2022 to discuss the Proposed Development, including presenting an overview of the Proposed Development, outcomes of the previous stages of assessment and the preferred route, and the approach to the PECR. The NMS identified the potential for the presence of previously unrecorded archaeological remains in the off-road sections and the archaeological potential of rivers as concerns that should be considered as part of the assessment.

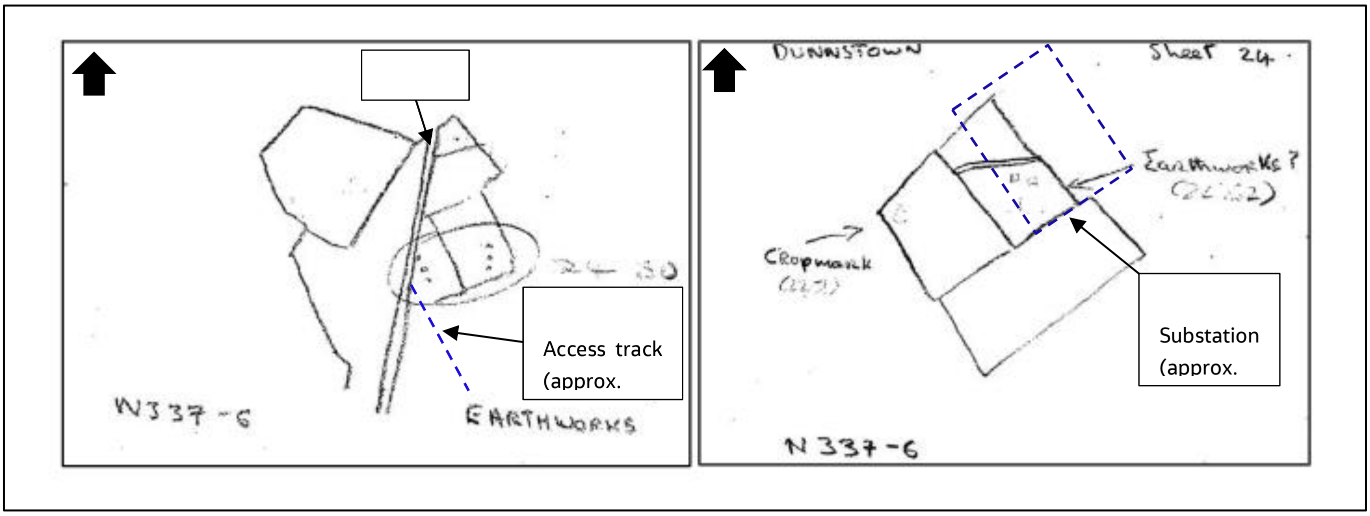
13.2.7 Limitations

Not all areas were accessible during the walkover survey and site inspection; however, baseline data from desk-based sources, including a review of LiDAR data acquired for the Proposed Development (Appendix 13.3), was available and sufficient to inform the assessment for constraints in these locations.

It was not possible to obtain a copy of the aerial photograph (GSI N 337-6) from the Geological Survey of Ireland which shows the locations of the enclosures recorded on the RMP and SMR at Dunstown (AY_46 – 48; AY_53 – 58). However, a sketch from the aerial photograph showing the locations of these is provided in Deery (2022) and is reproduced as Plate 13.1. This was used to locate these enclosures.

These limitations did not reduce the efficacy of the assessment.

Plate 13.1: Sketch showing the locations of enclosures at Dunstown substation (right) and access track (left) (from Deery, 2022)



13.2.8 Assessment Methodology

The assessment was undertaken based on the guidance provided in *Cultural Heritage Guidelines for Electricity Transmission Projects* (EirGrid, 2015).

Direct and indirect impacts during construction and operation have been assessed. Direct impacts are physical impacts on archaeological, architectural heritage and cultural heritage constraints. Indirect impacts usually result from changes to the setting of these constraints, for example from visual intrusion.

The significance of effect was assessed on a five-point scale of Profound, Significant, Moderate, Slight and Imperceptible based on the definitions presented in Table 13.1 and professional judgement.

Table 13.1: Definition of Significance of Effect for Archaeology, Architectural Heritage and Cultural Heritage (from Appendix 2; EirGrid, 2015)

Level of Significance of Effect	Definition
Profound	Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects are generally, but not exclusively, associated with sites and features of national or regional importance [where this has been assessed]. They arise where a cultural heritage asset is completely and irreversibly destroyed by a proposed development.
Significant	An impact which, by its magnitude, duration or intensity alters an important aspect of the environment. An impact like this would be where the majority of the cultural heritage asset would be permanently impacted upon leading to a loss of character, integrity and historical or archaeological data about the asset.
Moderate	A moderate direct impact arises where a change to cultural heritage asset is proposed which though noticeable, is not such that the archaeological, architectural or historical integrity of the structure is compromised and which is reversible. This arises where an historic structure or archaeological feature can be incorporated into

Level of Significance of Effect	Definition
	a modern day development without damage and that all procedures used to facilitate this are reversible.
Slight	An impact which causes changes in the character of the environment which are not significant or profound and do not directly impact or affect a cultural heritage asset.
Imperceptible	An impact capable of measurement but without noticeable consequences on a cultural heritage asset

A summary of the assessment of significant effects (i.e. impacts of Moderate or higher significance of effect) is presented in Section 13.4 below. Appendix 13.2 presents the assessment of significant and non-significant effects and proposed mitigation measures (where applicable) for archaeology, architectural heritage, cultural heritage. Unless otherwise stated, impacts described are negative.

13.3 Baseline Conditions

This section presents baseline conditions for the archaeology, architectural heritage and cultural heritage of the study area.

Further details on individual archaeology, architectural heritage and cultural heritage constraints identified within the study area are provided in Appendix 13.1.

13.3.1 Archaeology

Archaeological constraints identified within the study area comprise:

- one National Monument (AY_39) and three sites with Preservation Orders placed on them (AY_40, AY_42 and AY_43);
- one site on the RHM (AY_13);
- six Recorded Monuments (AY_02, AY_03, AY_24, AY_26, AY_51 and AY_58); and
- 17 sites recorded on the SMR (AY_01, AY_07, AY_27, AY_41, AY_46 - AY_50, AY_52 – AY_57, AY_59, and AY_60).

National Monuments and Preservation Orders

There is one National Monument (AY_39; also a Protected Structure) and three sites with Preservation Orders placed on them (AY_40, AY_42, and AY_43) located within the study area (see Figure 13.1). These form part of the Jigginstown Castle complex. Two further sites with Preservation Orders placed on them (AY_38, AY_44; also a Protected Structure), approximately 146 m and 190 m to the west of the Proposed Development respectively, located outside the study area, also form part of the complex.

Built by the Lord Lieutenant of Ireland, Thomas Wentworth, as a summer residence and to accommodate Charles I on royal visits to Ireland[68], the complex includes the 17th century house (AY_39; Plate 13.2) and gardens (AY_43), enclosed within a large oval enclosure (AY_42). Far from coherent in style, the asymmetrical rubble stone and red and yellow brick buildings include a variety of notable architectural features including mismatched windows, 12 chimneys, and rib and barrel vaulting in the basement (Quirke, 2007). The use of brick was the first in Ireland on such a scale, and employed different types in its construction (Quirke, 2007), with local legend stating men formed a chain from Dublin to Naas and passed the bricks along the line to build the house[69]. The 'Great House' was likely situated within extensive grounds and gardens, with approaches from the north and west (indicated by grand staired entranceways). A survey of 1728 details the '*Demesne to the Great House*' with the '*ruins of the Earl of Stafford's Great House*' as well as areas of arable, meadow and pasture to the north; an orchard, gardens and yards to the west; and a walled paddock to the south and south-west; with a small number of buildings, including the later farmhouse to the west (Moland, 1728). However, an engraving from the early 19th century shows the house in ruinous conditions[70] and a later survey (Hodges and Smith, 1842) shows the surroundings to the house much altered with the Grand Canal (built in the 1780s; CH_113) to the north; the house, identified as '*The Buildings*', to the north-east of '*Jigginstown House*' (the farmhouse); and '*Castle Rag*' (AY_44; Preservation Order; located outside the study area) to the south-west.

[68] https://kildare.ie/Heritage/historic-sites/jigginstown-castle.asp [accessed 06 February 2023].
[69] https://digital.ucd.ie/view-media/duchas:4819384/canvas?manifest=https://data.ucd.ie/api/img/manifests/duchas:4819384 [accessed 06 February 2023].
[70] https://catalogue.nli.ie/Record/vtls000544208 [accessed 02 February 2023].

Plate 13.2: Jigginstown Castle (AY_39; National Monument) to the south of the R445

While some original landscape features remain, including the sunken garden (AY_43) to the south of the main house, modern development, including the expansion of Naas, road network and installation of utilities, has also likely removed features associated with the grounds, such as the old fishpond[71], and there is limited potential for the remains of landscape features to be present in land to the east to the complex given the likely disturbance from a water main and sewer in this location. Nevertheless, archaeological excavations (Licence Number 02E1603) within the complex identified debris associated with the construction of the house[72] and a contemporary midden (AY_41), and archaeological testing to the north-east recovered brick and mortar, and sherds from a 17th–18th century roof tile and a medieval glazed potsherd (1979:13)[73] were also found nearby.

While still a prominent feature of the streetscape, recent modern development, including the junction with the R447, residential development to the south and industrial complexes to the east, have much altered the surroundings of the Jigginstown Castle complex. Traffic noise and movement forms a part of the setting of the complex and views, while limited by mature trees and hedges along the eastern boundary, as well as modern fencing and buildings, are predominantly of the R447 and R445.

Register of Historic Monuments

A total of six sites on the RHM have been identified within the study area.

AY_39, AY_42, and AY_43 form part of the Jigginstown Castle complex and have been described above. Two other sites on the RHM associated with the Jigginstown complex (AY_38 and AY_44) are located outside the study area.

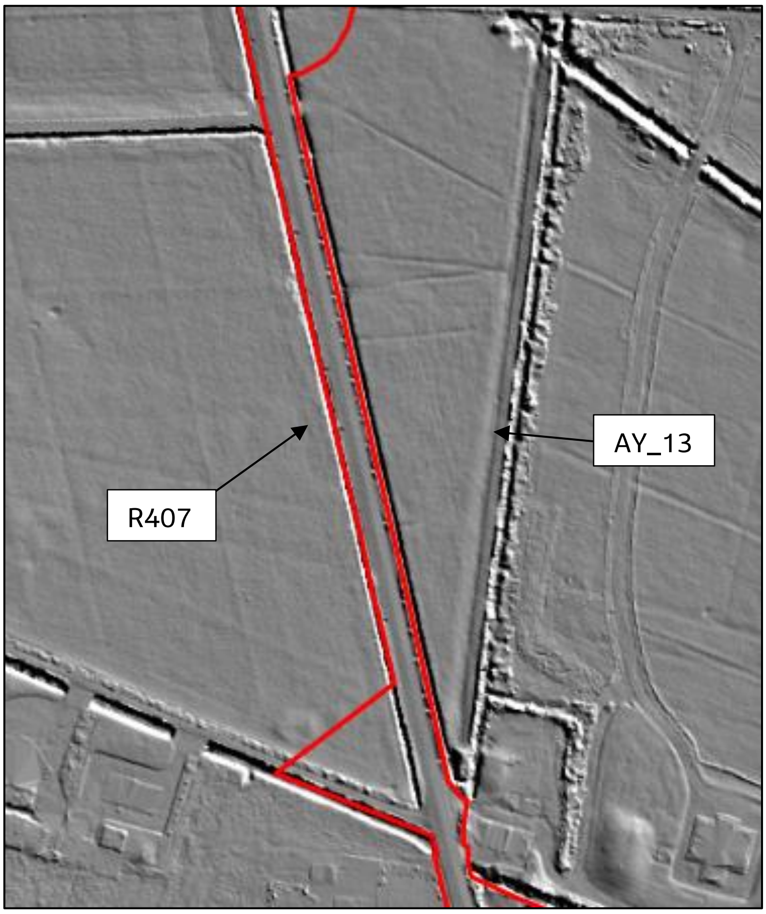
In addition to being recorded on the RHM, linear earthwork (AY_13) is also a Recorded Monument (KD010-001001) and forms the townland boundary between Ballyloughan and Graiguepottle (TB_68). It consists of a bank and ditch, approximately 680 m in length, and is orientated north–south. The ditch is located to the west of an established field

[71] https://kildare.ie/Heritage/historic-sites/jigginstown-castle.asp [accessed 02 February 2023].
[72] https://excavations.ie/report/2002/Kildare/0008231/ [accessed 02 February 2023].
[73] http://excavations.ie/report/2007/Kildare/0017795/ [accessed 02 February 2023].

boundary, in a flat area of pasture, with a low earth bank along its length likely deposited following ditch clearance. Aerial photographs and LiDAR show an ephemeral ditch feature aligned north–south, east of the R407, alongside the current field boundary (Plate 13.3).

Identified as 'The Pale' on the Ordnance Survey 25" map of 1888–1913, and depicted as a narrow trackway, this monument may be part of a boundary constructed by the Anglo-Normans to divide their lands from those held by the Irish. Legislated by parliament in 1460 and 1494–95, a defensive ditch was constructed to protect areas of Meath, Louth, Dublin and Kildare (Clare, 2006; Ellis, 2011). While it is reported local households adjacent to the boundary were required to provide men and tools to construct a double ditch six feet high as part of the defence of English interests (Clare, 2006; Ellis, 2011), it has been suggested that AY_13 was by and large conceptual and may only have been fortified in parts (Lyndon, 1973).

Plate 13.3: Section of the linear earthwork (AY_13; RHM and Recorded Monument) between Ballyloughan and Graiguepottle to the east of the R407 (DTM) (approximately ch. 21,750)



Recorded Monuments

A total of six[74] Recorded Monuments are located within the study area (see Figure 13.1).

A mound (AY_02), comprising a low (approximately 1.6 m in height; ASI 1987) circular earth mound, is located approximately 26 m to the west of the Planning Application Boundary in Calgath. The mound is depicted on historic mapping as a 'Mound' associated with 'Brides Well' (Ordnance Survey 6", 1837–1842) and was topped by a single ash tree[75], also important in pre-Christian tradition (O'Sullivan and Downey, 2006), until recent restoration to the well (AY_01; a site recorded on the SMR; see below) appears to have removed it. While holy wells are usually located near

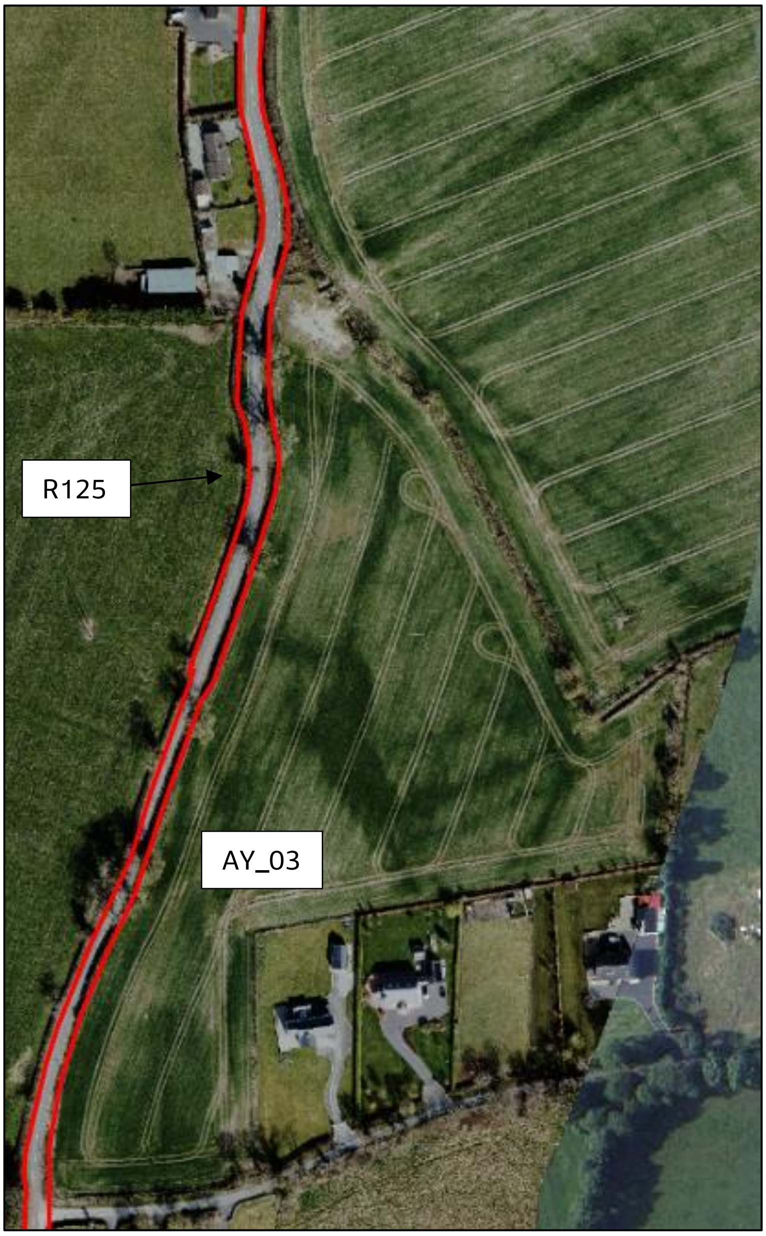
[74] A further Recorded Monument, a linear earthwork (AY_13) is also on the RHM and, to avoid double counting constraints, is described above.
[75] https://digital.ucd.ie/view/duchas:49398 [accessed 06 February 2023].

church sites, no known early churches were identified nearby. The mound is located along the boundary of a small pasture field, identified as 'The Well Field'[76], on a gentle east-facing slope. A modern post-and-rail fence surrounding the well is positioned around the top of the mound and a footpath leads from the R125 to the well from the north-east corner of the field; however, the mound itself is not visible from the road due to a high established hedgerow.

A field system (AY_03) of unknown date is located in fields to the east of the Planning Application Boundary in Calgath comprising the earthwork remains of a series of irregular fields, some of which are not depicted on historic mapping (Ordnance Survey 6", 1837–1842). These features, identified from aerial photographs, are formed by banks and ditches. Aerial imagery shows the field system extending into the large field to the north and includes a circular feature, measuring approximately 34 m in diameter, which could indicate the location of a denuded rath, an enclosed early medieval farmstead, within its associated field system (Plate 13.4). Test trenching in advance of residential development to the south of the field system identified raised field systems.[77] The field system is located within a large irregular arable field to the east of the R125. While three residential properties have been built within the southern boundary of the site, the extensive field system remains legible as cropmarks and ephemeral positive earthworks (also identified from a review of LiDAR data; Appendix 13.3).

[76] https://meathfieldnames.com/meath-fieldnames-fullscreen.html [accessed 06 February 2023].
[77] http://excavations.ie/report/2004/Meath/0012315/ [accessed 06 February 2023].

Plate 13.4: Aerial imagery showing field system (AY_03), including circular feature towards the centre and linear features extending into the field to the north (BlueSky, 2022) (approximately ch.12,750)



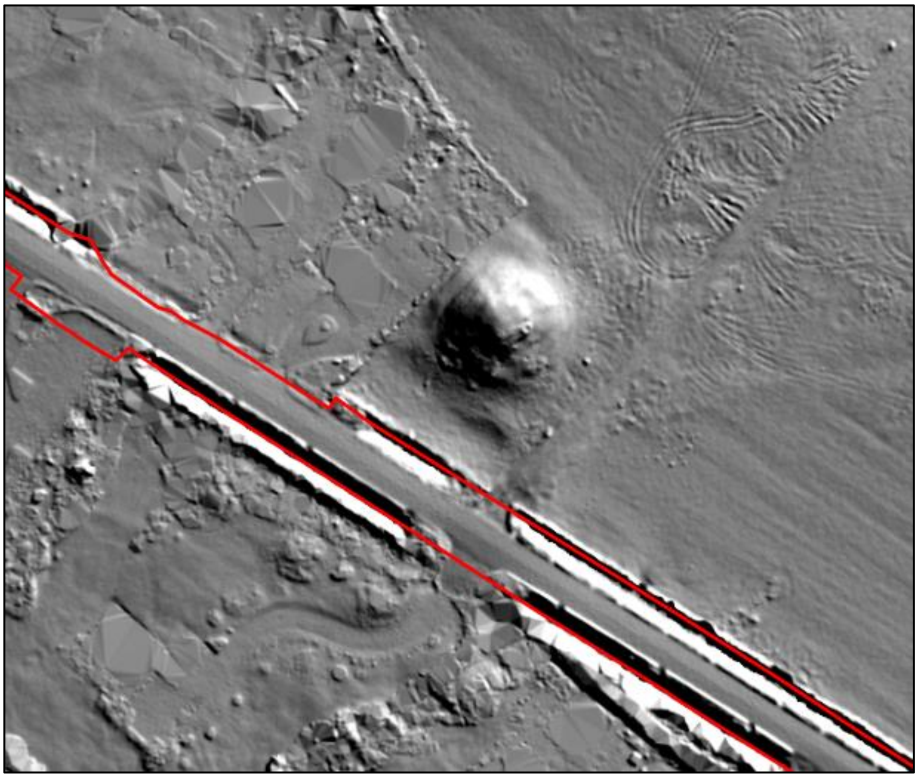
A poorly preserved rath (ringfort - AY_24) in Ballynagappagh is approximately 36 m to the south-east of the Planning Application Boundary. Raths are farmsteads of early medieval date enclosed by one or more banks and ditches, and AY_24 comprises a low, sub-circular earth mound (measuring approximately 37 m by 24 m) surrounded by a fragmentary earth bank, approximately 3.8 m in width, with a possible entrance to the north-west. This monument is depicted on historic mapping (Ordnance Survey 6", 1837–1842) as an oval earthwork. The rath is located within a private garden, to the east of a house, in an area of outcropping bedrock or subcrop[78]. It is covered in dense trees, with an established field boundary abutting the eastern edge, which limit views to and from the rath.

AY_26 (also a Protected Structure) is located 18 m to the north-east of the Planning Application Boundary in Firmount East, within the demesne lands of Moatfield House (DL_15). Depicted on historic mapping (Ordnance Survey 25", 1888–1913), AY_26 measures approximately 28 m in diameter and approximately 4 m in height, and comprises

[78] https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [accessed 01 February 2023]

a circular, round-topped, earthwork, located approximately 18 m to the north-east of the Planning Application Boundary. The site may be the remains of a motte or Anglo-Norman defended homestead dating to the 12th and 13th centuries (Department of the Environment, Heritage and Local Government, 2004; National Monuments Service, 2012). Topped with palisaded towers, these sites often had an associated enclosure (a bailey), which contained other buildings, attached. Cultivation patterns were visible on the mound from a review of LiDAR data acquired for the Proposed Development (Plate 13.5; Appendix 13.3) and is partially covered in mature trees. The site is visible from the L2002; however, views towards the site are filtered by an established private garden within which the mound is located. While there is the potential for associated features in the area surrounding the mound, for example associated field systems evidencing agricultural activities contemporary with the settlement, no features were identified from aerial imagery or LiDAR data (Appendix 13.3).

Plate 13.5: The mound in Firmount East (AY_26; Recorded Monument and Protected Structure) to the north-east of the L2002 (DTM) (approximately ch.34,250)



A small circular enclosure (AY_51) is located approximately 20 m to the east of the Planning Application Boundary. The enclosure, identified from an aerial photograph from the 1970s (GSI N 337-6; not available), forms part of a small group in Stephenstown South. The group is not depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) and more recent aerial imagery shows the southern portion of this field subject to extensive disturbance, so any associated archaeological remains in this location may have been removed. No above ground remains were visible during the walkover survey. The group of enclosures in Stephenstown South is near (within 1 km) of two further clusters of enclosures in Dunstown (see below), also identified from aerial imagery, and may comprise part of a larger area of possible prehistoric settlement or funerary activity.

A small rectangular enclosure (AY_58) also identified from an aerial photograph (GSI N 337-6; not available) forms part of a group of six roughly rectangular earthworks in Dunstown (AY_53 – 57; see below). The earthworks were arranged in two roughly parallel rows of three within a rectangular field bisected by a field drain (Deery, 2022). However, this area was developed in the mid-1980s for the Dunstown substation, and the group has been removed as a result.

Sites and Monuments Record

A total of 13 sites recorded on the SMR have been identified within the study area (see Figure 13.1) and details of these are provided in Table 13.2.

Four further sites within the study area were recorded on the SMR. These comprise the site of two small pits identified during archaeological monitoring (AY_07), the present location of an ex-situ medieval font (AY_27), the site of a midden (AY_41) identified at Jigginstown Castle complex, and the site of an enclosure that has since been developed (AY_50). While these provide an indication of archaeological activity within the study area, given these sites have been removed or are no longer in situ and, in the case of AY_07 and AY_50, the area developed, they have not been included in the baseline.

Table 13.2: Sites recorded on the SMR within the study area

Reference Number	SMR Reference	Description	Townland	Location (Easting / Northing)
AY_01	ME049-014001	A holy well (AY_01) depicted on historic mapping as 'Brides Well' (Ordnance Survey 6", 1837–1842) comprising a small natural spring at the centre of a low earth mound (AY_02; a Recorded Monument, see above). The well is described as one of the hot wells in Meath which sprung up when St Brigid rested in the location and is said to cure deafness.[79] The well has more recently been conserved and is now stone lined. The well is located within a small pasture field, identified as 'The Well Field', on a gentle east-facing slope. A modern post-and-rail fence surrounds the well and a footpath leads from the R125 to the well from the north-east corner of the field. The well is not visible from the road due to a high established hedgerow.	Calgath	689223 / 742511
AY_46	KD024-050004	A group of small rectangular cropmarks, interpreted as enclosures, identified from aerial photographs. These features are not depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) and no above ground remains are still extant. While it was not possible to obtain the original image, ASI records indicate AY_46 to AY_48 are located within a level pasture field east of the R412 and positioned parallel to a field boundary (since removed; CH_103; Deery, 2022). No above ground remains were identified, and it is likely any associated archaeological remains that may have been present within the boundary of the Dunstown access track may have removed or truncated during its construction in the 1980s (Plate 13.6).	Dunstown	687302 / 712740
AY_47	KD024-050005		Dunstown	687328 / 712725
AY_48	KD024-050006		Dunstown	687335 / 712719

[79] 'St. Brigid's Well', *Ireland's Holy Wells County-by-County*. Available online: https://ihwcbc.omeka.net/items/show/416 [Accessed 12.11.21].

<table>
<tr><th>Reference Number</th><th>SMR Reference</th><th>Description</th><th>Townland</th><th>Location (Easting / Northing)</th></tr>
<tr><td>AY_49</td><td>KD014-061</td><td>A cropmark identified from aerial imagery and interpreted as an enclosure, measuring approximately 20 m in diameter (Plate 13.7). These features are not depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) and no above ground remains are still extant. A second circular feature (AY_59) of similar size is visible as a cropmark on aerial imagery in a field approximately 160 m to the east. While established field boundaries limit the intervisibility between these sites, it is possible they were contemporary and could form part of a larger complex of activity uncovered during recent archaeological investigations in advance of construction of the Sallins Bypass approximately 130 m to the south of this constraint (Licence number: E004777).</td><td>Castlesize</td><td>688231 / 724261</td></tr>
<tr><td>AY_52</td><td>KD024-048003</td><td rowspan="2">A group of small circular cropmarks (AY_51; a Recorded Monument; see above, AY_52 and AY_60) identified from aerial imagery from the 1970s in a flat wedge-shaped field between the R448 and R412; however, the features are not visible on later imagery which shows the southern portion of this field subject to extensive disturbance. No visible above ground remains were identified. Located in a large pasture field, bounded by established hedgerows as well as modern concrete and post-and-wire fencing. Located to the north of an operational farmyard/construction site (substantial ground disturbance visible).</td><td>Stephenstown South</td><td>687262 / 713171</td></tr>
<tr><td>AY_60</td><td>KD024-048002</td><td>Stephenstown South</td><td>687252 / 713191</td></tr>
<tr><td>AY_53</td><td>KD024-052005</td><td rowspan="5">A cluster of small, roughly rectangular earthworks identified from aerial imagery and interpreted as enclosures. It is likely the group has been removed as a result of the construction of the Dunstown substation in the mid-1980s.</td><td>Dunstown</td><td>687688 / 712279</td></tr>
<tr><td>AY_54</td><td>KD024-052003</td><td>Dunstown</td><td>687744 / 712275</td></tr>
<tr><td>AY_55</td><td>KD024-052006</td><td>Dunstown</td><td>687688 / 712235</td></tr>
<tr><td>AY_56</td><td>KD024-052002</td><td>Dunstown</td><td>687740 / 712199</td></tr>
<tr><td>AY_57</td><td>KD024-052004</td><td>Dunstown</td><td>687682 / 712182</td></tr>
</table>

Reference Number	SMR Reference	Description	Townland	Location (Easting / Northing)
AY_59	KD014-062	A circular feature (approximately 30 m in diameter) identified from aerial imagery (Plate 13.7). It has been interpreted as a barrow, which are artificial mounds constructed over burials and typically date to the Bronze or Iron Ages (c. 2400 BC to AD 400). This constraint is located within arable land on the relatively flat, low-lying eastern floodplain of the River Liffey in Castlesize. A second circular feature (AY_49) of similar size is visible as a cropmark on aerial imagery in a field approximately 160 m to the west. While established field boundaries limit the intervisibility between these sites, it is possible they were contemporary and could form part of a larger complex of activity uncovered during recent archaeological investigations (Licence number: E004777) in advance of construction of the Sallins Bypass approximately 20 m to the south of this constraint.	Castlesize	688409 / 724218

Plate 13.6: Approximate former location of enclosures (AY_47 and AY_48), to the north of the Dunstown access track in an area of disturbance (approximately ch.52,500)

Plate 13.7: Aerial imagery showing possible barrow (AY_59) and enclosure to the west (AY_49) (BlueSky, 2022) (approximately ch.37,500)

Potential for the Presence of Unknown Archaeological Remains

The sources identified in Section 13.2.3 and in Section 13.8, provide a thorough understanding of the potential for the presence of unknown archaeological remains within the study area.

The off-road section south of Woodland substation (between ch.0 and ch.3,500) has been assessed to have a very high potential for unknown archaeological remains due to the presence of the cropmark remains of ring ditches, possibly funerary monuments (CH_60; see Plate 13.8, CH_61, CH_63 and CH_66), and field systems (LI_006, LI_013, LI_017, LI_021, and LI_026) identified from LiDAR and aerial imagery, which may date from the prehistoric period onwards.

The off-road section at Castlesize (between ch.36,800 and ch.37,800) has also been assessed to have a very high potential of unknown archaeological remains due to the presence of possible barrows (AY_49 and AY_59; both sites recorded on the SMR; see Plate 13.7) and recent archaeological investigations in advance of the construction of the M7 Osberstown Interchange and R407 Sallins Bypass (Licence Number: E004777)[80,81]. These excavations identified a multi-period complex of activity on the floodplain of the River Liffey, including early medieval settlement activity and post-medieval industrial activity in the 'Kiln Field'.

[80] http://excavations.ie/report/2017/Kildare/0026981/ [accessed 08 February 2023].
[81] https://www.archaeology.org/news/5862-170822-ireland-kildare-early-medieval-complex [accessed 08 February 2023].

Plate 13.8: Aerial imagery showing cropmarks interpreted as possible ring-ditches (CH_60) south of Woodland substation (BlueSky, 2022) (Approximate Chainage 250)

The potential for the presence of unknown archaeological remains has been reduced in the off-road sections that have been subject to disturbance:

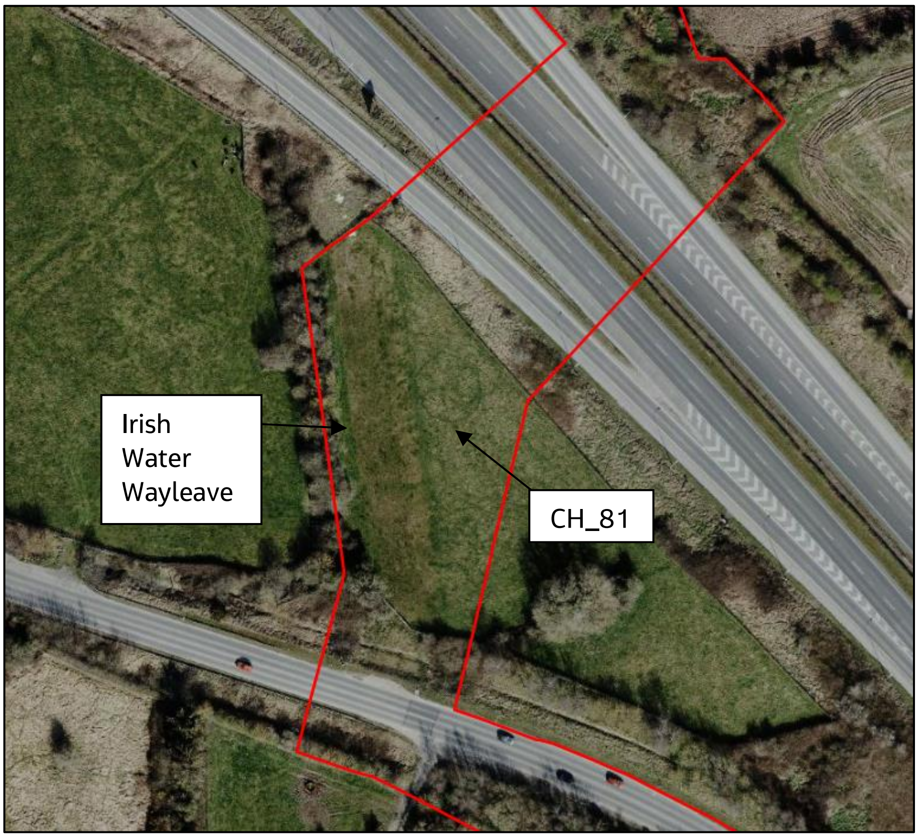
- in Kilcock between ch.16,250 and ch.16,800, where disturbance from the construction of the M4 motorway junction 8 (OSi Ortho 2005) and the wayleave of the Kilcock Ringmain PH 1 watermain (to the west of CH_81; Plate 13.9) is visible on aerial photographs (BlueSky, 2022).

- in Osberstown between ch.39,680 and ch.39,800, where disturbance from the construction of the Sallins Bypass (GoogleEarth, 2018–2020) is visible on aerial photographs.

- in Jigginstown between ch.44,500 and ch.44,900, where disturbance is visible on aerial photographs (GoogleEarth imagery; 4/2003, OSi Ortho 2000) from the construction of residential development, between the Grand Canal (Herbertstown Branch) and R445, and the installation of utilities (including a sewer and trunk water pipe) to the east of Jigginstown Castle (AY_39, a National Monument).

- in Stephenstown South between ch.51,900 and ch.52,200, where extensive ground disturbance is visible on aerial photographs (GoogleEarth imagery; 4/2003, OSi Ortho) associated with an agricultural complex.

Plate 13.9: Cropmark interpreted as a possible enclosure (CH_81) to the south the M4 motorway (Junction 8) with wayleave for the Kilcock Ringmain PH 1 watermain visible to the west (BlueSky, 2022) (approximately ch.16,750)



However, given the number of known archaeological constraints within the study area, the results of previous archaeological investigations (see Section 13.3.3), as well as extensive cropmarks identified from aerial photographs and sites identified from LiDAR (Appendix 13.3), the potential for the presence of unknown archaeological remains within the remaining off-road sections of the Proposed Development has been assessed to be high.

Ireland's extensive river network and post-glacial loughs are known to have been foci for human activity from the Mesolithic period onwards (FitzGerald, 2007; Mossop and Mossop, 2009; Aalen, Whelan and Stout, 2011; Woodman, 2015). In addition, votive offerings, objects deposited for religious reasons, were deposited in rivers, loughs and bogs, with a floruit in the Iron Age. Rivers were later used as a source of power, with evidence surviving from the early medieval period onwards. There is therefore potential for archaeological remains in and around watercourses.

The Proposed Development crosses 41 watercourses (some are cross multiple times) and details of these are provided in Table 13.3. As can be seen from Table 13.3:

- 15 are drainage ditches;
- 19 are streams (up to 3 m in width);
- four are rivers (over 3 m in width); and
- three are canals.

Table 13.3: Watercourses crossed by the Proposed Development

Reference	Watercourse Type	Notes	Chainage
WB01	Stream	Tributary of the River Tolka. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 800
WB02	Stream	Dunboyne Stream. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 1,900
WB03	Stream	Tributary of the Rye Water. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). A section of this stream has been straightened and is culverted under the Barstown Industrial Estate (south of the R156).	Ch. 3,615
WB04	Stream	Jenkinstown Stream, spanned by Jenkinstown Bridge (CH_04). Depicted as a stream on historic mapping (Ordnance Survey 6”, 1837–1842). However, later mapping (Ordnance Survey 25”, 1888–1913) shows the course of this stream was straightened to the south. This stream forms part of the Kilcock Drainage District of the Commissioners of Public Works which strongly suggests this stream may have been subject to modification, including deepening and widening.[82]	Ch. 6,000
WB05	Drainage Ditch	A straight roadside drainage ditch, which angles to the east at its southern end. Not depicted on the Ordnance Survey 6” map of 1837–1842; however, appears on later editions (Ordnance Survey 25”, 1888–1913).	Ch. 7,385
WB06	Stream	Jenkinstown Stream. Crossed by the R125. Depicted as a stream on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 8,080
WB07	Stream	Jenkinstown Stream, crossed by the R125 by a stone road bridge (CH_06). Depicted on historic mapping (Ordnance Survey 6”, 1837–1842); however, later mapping (Ordnance Survey 25”, 1888–1913) shows the course of this stream was straightened. The old alignment of the stream is visible on LiDAR. This stream forms part of the Kilcock Drainage District	Ch. 10,700

[82] https://www.floodinfo.ie/map/drainage_map/ [accessed 16 February 2023].

Reference	Watercourse Type	Notes	Chainage
		of the Commissioners of Public Works which strongly suggests this stream may have been subject to modification, including deepening and widening.[83]	
WB08	Stream	Jenkinstown Stream, crossed by the R125. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) as a stream; however, appears to have been straightened on modern mapping with the original course visible on aerial imagery (BlueSky, 2022).	Ch. 11,180
WB09	Stream	An unnamed stream, crossed by the R125 by a stone road bridge (CH_07). Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 11,400
WB10	Stream	Bride's Stream crossed by the R125. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913), crossed by 'Bride's Well Bridge' (no longer extant). Follows similar course; however, modern mapping shows the stream turning sharply to the west, to the west of the road.	Ch. 12,370
WB12	Stream	Tributary of the Rye Water, crossed by the R125. A watercourse is depicted on the Ordnance Survey 6” map of 1837–1842; however, later editions (Ordnance Survey 25”, 1888–1913) show this watercourse straightened and in a new location. The old alignment of the stream to the north of the R125 is visible on aerial imagery (BlueSky, 2022).	Ch. 14,400
WB13	River	Rye Water, crossed by the R158 over Balfeaghan Bridge (CH_12). Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course. A possible ford was noted to the west of the bridge (CH_108 during the walkover survey); however, no ford is depicted on historic mapping, and this could equally be a modern deposit. This river forms part of an Arterial Drainage Scheme of the Office of Public Works which strongly suggests this river may have been subject to modification.[84]	Ch. 15,050

[83] https://www.floodinfo.ie/map/drainage_map/ [accessed 16 February 2023].
[84] https://www.floodinfo.ie/map/drainage_map/ [accessed 16 February 2023].

Reference	Watercourse Type	Notes	Chainage
WB14	Canal	Section of the Royal Canal. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). Remains extant and operational.	Ch. 15,400
WB15	Stream	Lyreen_010 – crossed by passing bay	Ch. 19,920
WB17	Drainage Ditch	A ditch depicted on Ordnance Survey 25” map of 1888–1913. Not shown on earlier edition (Ordnance Survey 6”, 1837–1842).	Ch. 21,250
WB18	Drainage Ditch	A drainage ditch, not depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913).	Ch. 21,300
WB19	Drainage Ditch	Not depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913); however, Loughtown River shown further north (ch.21,550) (possibly course changed, or a later ditch). Crossed by the R407.	Ch. 21,650
WB20	Drainage Ditch	Ditch depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). Crossed by the R407.	Ch. 22,000
WB21	Drainage Ditch	A ditch depicted as a field boundary on Ordnance Survey 6” map of 1837–1842 and a ditch on later editions (Ordnance Survey 25”, 1888–1913). Crossed by the R407. This ditch forms part of the Baltracey Drainage District of the Commissioners of Public Works which strongly suggests this stream may have been subject to modification, including deepening and widening.[85]	Ch. 22,300
WB22	Stream	Clonshanbo River, crossed by the R407 via the Baltracey Bridge (CH_24). Depicted on historic mapping as ‘Baltracey River’ and ‘Belgard or Baltracey River’ (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 23,620

[85] https://www.floodinfo.ie/map/drainage_map/ [accessed 16 February 2023].

Reference	Watercourse Type	Notes	Chainage
WB24	Stream	An unnamed stream depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) crossed by the R407. This stream forms part of the Baltracey Drainage District of the Commissioners of Public Works which strongly suggests this stream may have been subject to modification, including deepening and widening.[86]	Ch. 25,800
WB25	Stream	Gollymochy River. Shown as a field boundary on Ordnance Survey 6" map of 1837–1842 with later editions depicting the stream as a named watercourse (Ordnance Survey 25", 1888–1913). Crossed by the R408.	Ch. 27,300
WB26	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). Crossed by the R408.	Ch. 27,600
WB27	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). Crossed by the R408.	Ch. 30,000
WB28	Stream	An unnamed stream depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). Could be associated with the drainage of Clane Bog.[87.]	Ch. 30,250
WB29	Stream	An unnamed stream depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). Could be associated with the drainage of Clane Bog.[88.]	Ch. 30,400
WB30	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 25", 1888–1913).	Ch.31,360
WB32	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 25", 1888–1913), possible extension of a stream orientated east-west.	Ch. 36,150

[86] https://www.floodinfo.ie/map/drainage_map/ [accessed 16 February 2023].
[87] https://www.bordnamonalivinghistory.ie/wp-content/themes/living-history/assets/maps/index.htm?start_scene=scene_Map_-_Kildare_-_Part_of_the_Bog_of_Allen [accessed 16 February 2023].
[88] https://www.bordnamonalivinghistory.ie/wp-content/themes/living-history/assets/maps/index.htm?start_scene=scene_Map_-_Kildare_-_Part_of_the_Bog_of_Allen [accessed 16 February 2023].

Reference	Watercourse Type	Notes	Chainage
WB33	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 25”, 1888–1913), possible extension of a stream orientated east–west.	Ch. 36,650
WB34	Drainage Ditch	No depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913).	Ch. 36,900
WB35	River	River Liffey. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 37,200
WB36	River	River Liffey. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 37,900
WB37	River	River Liffey. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course.	Ch. 39,000
WB38	Canal	Section of the Grand Canal. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). Remains extant and operational.	Ch. 39,400
WB39	Stream	A tributary of the River Liffey. Crossed by the Osberstown Millennium Parkway. Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course; however, modern mapping shows the stream running into a drainage pond south of the M7 motorway.	Ch. 41,510
WB40	Drainage Ditch	A ditch depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913), forming part of an extant field boundary.	Ch. 42,300
WB41	Drainage Ditch	A ditch depicted in historic mapping (Ordnance Survey 25”, 1888–1913). Crossed by the Osberstown Millennium Parkway.	Ch. 42,900

Reference	Watercourse Type	Notes	Chainage
WB42	Canal	Section of the Grand Canal (Herbertstown Branch). Depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). Remains extant and operational.	Ch. 44,600
WB43	Stream	A watercourse depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913). Identified on the latter as ‘canal supply’. Follows the same course (although residential development to the north). Crossed by the R448.	Ch. 45,330
WB44	Stream	An unnamed stream depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913) following the same course. Crossed by the R448.	Ch. 49,000
WB45	Drainage Ditch	No depicted on historic mapping (Ordnance Survey 6”, 1837–1842; Ordnance Survey 25”, 1888–1913).	Ch. 52,700

The potential for in situ archaeological remains within smaller watercourses and field drains, likely established in the 18th and 19th century as part of agricultural improvement (O'Sullivan and Downey, 2010), is considered to be lower than within unaltered streams and rivers, especially the large rivers. In addition, this potential is reduced where watercourses have been modified such as through canalisation or dredging. For example, recent assessment of dredged riverine deposits from the Rye Water in advance of road and flood mitigation works in Dolanstown did not identify any archaeologically significant remains (Licence Numbers: 11E239 and11R87)[89].

Where the evidence indicates that watercourses within the study area have been modified, this is presented in Table 13.3.

There is also the potential for the presence of unknown archaeological remains, including paleoenvironmental remains and preserved organics adjacent to watercourses. Ground investigation was undertaken for the Proposed Development, including next to the following watercourses:

- Rye Water;
- Baltracey River; and
- River Liffey.

At ch.15,070 to the south of the Rye Water, deposits of clay, gravel and boulders approximately 5.35 m deep were identified in BHC054, while at ch.23,700 south of the Baltracey River, clay and gravel deposits approximately 1.8 m thick were identified in BHA042. A similar sequence of deposits was identified at ch.39,000 on the north bank of the River Liffey where gravels approximately 6.7 m deep overlain by thin (0.4 m) topsoil were identified in BHC024. No organic deposits were identified. Given the type of deposits identified (boulders and gravels) and their depth, they are likely to be Pleistocene in date, and therefore geological rather than archaeological in origin, reducing the potential for the presence of unknown archaeological remains in these areas. In addition, while the River Liffey meanders within the study area, it does not appear to have deviated much from its current course. This also suggests that it is unlikely that gravels were deposited during the Holocene.

While not confirmed by the ground investigation, alluvium and lacustrine deposits were identified from the GSI online mapper[90] along watercourses and adjacent to former loughs in the townlands of in Culcommon, Cullendragh, Phepotstown, Millicent South and Dunstown, and these are considered to have a higher potential for the presence of palaeoenvironmental remains and preserved organic materials.

13.3.2 Architectural Heritage

Architectural heritage constraints within the study area comprise:

- six Protected Structures (AH_06, AH_11, AH_12, AH_15, AH_18 and AH_19; see Figure 13.2);
- two structures included on the NIAH (AH_01 and AH_20; see Figure 13.2), assessed by the NIAH to be of Regional importance; and
- ten GDLs (DL_02, DL_03, DL_04, DL_06, DL_07, DL_10, DL_14, DL_15, DL_17, and DL_20; see Figure 13.3).

No ACAs have been identified within the study area.

[89] http://excavations.ie/report/2011/Meath/0022718/ [accessed 07 February 2023].
[90] https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [accessed 31 January 2023]

Protected Structures

A total of six Protected Structures, comprising post-medieval houses and churches, have been identified within the study area (see Figure 13.2). Three additional Protected Structures are also a National Monument (AY_39), a site with a Preservation Order placed on it (AY_44) and a Recorded Monument (AY_26). These are described in Section 13.3.1.

'Millicent Estate Houses' (AH_15) is located within Millicent Demesne (DL_17; see below), approximately 3 m to the north-east of the Planning Application Boundary. The building comprises a square plan, two-storey house with a conservatory and outbuilding, both possibly of later date. While AH_15 is shown as a 'lodge' on historic mapping (Ordnance Survey 25", 1888–1913), the plan of the current building differs from that depicted on the historic mapping and the building therefore may have been altered at a later date. The principal elevation of the house is to the south-east, with views across a private access track towards an area of trees. Views in all directions are largely screened by trees and an established boundary hedge.

Vernacular architecture within the study area includes two thatched dwellings (AH_06 and AH_11) both dating to the 18th to 19th centuries and assessed by the NIAH to be of Regional importance. The house in Moortown (AY_06)[91] comprises an 'L'-shape plan building on Mooretown Drive, off the R407, on Painestown Crossroads. Formerly O'Neill's pub, this building has been substantially increased in size from the original single storey, three bay roadside dwelling, to include a two-storey building set perpendicular to the road and a modern (2002) single-storey thatched range (Kildare County Council, 2005). Not visible from the R407 due to established vegetation, mature trees and intervening buildings, views across Moortown Drive are limited by the hedgerow beyond. The building forms part of the local Sylvian streetscape character, and its location near a crossroads contributes to the understanding of the historic public function of the building. A five-bay, single-storey thatched house in Ballynagappagh (AH_11)[92] has also been extended and continues in use as a farmhouse forming part of the yard of an operational farm. The building is positioned perpendicular to the R408, behind a low roadside boundary wall which is approximately 0.6 km in length, with a large farmyard to the north. Views from the house are largely across the farmyard and an open area to the south, to the R408 and established fields and hedgerows beyond.

Bluebell Farm House (AH_18) is located approximately 6 m to the west of the Planning Application Boundary and comprises a roadside three bay, two-storey Victorian farmhouse. Historic mapping (Ordnance Survey 25", 1888–1913) depicts the house, and associated ranges forming a yard, enclosed by a boundary wall which surrounds the farm complex. Located on the former road alignment to the west of Kilcullen Road, the farm complex is screened from the road by the high stone boundary wall and established roadside hedges with views focused internally across the yard.

Millicent Church and Lych Gate (AH_12), is located within Millicent House Demesne (DL_17). Consecrated in 1883, the church comprises a Hiberno-Romanesque building, located on a rise towards the centre of the parish of Clane, with a square tower that is visible for some distance[93]. The lych gate comprises a covered gateway at the entrance of the graveyard where a coffin could be set down during a funeral until the celebrant arrived (Plate 13.10). The structure has a slate pitched roof with decorative ridge pieces[94] and is the only entrance leading directly from the L2002 into a quiet treelined graveyard. While partially screened by an established boundary of mature trees and hedges, the church is visible from the road and intermittent traffic noise is audible from the churchyard. A later example, St Patrick's Church (AH_19), comprises a Gothic-style, former Church of Ireland church that retains much of its original character despite a change in use. While now a residential property, the church is set back from the R148, within an enclosed former churchyard, east of the associated cemetery. Traffic noise and movement forms part of the setting of the church and views, while filtered by trees along the roadside boundary, are towards the road to the north.

[91] https://www.buildingsofireland.ie/buildings-search/building/11901001/moortown-celbridge-ed-kildare [accessed 06 February 2023].
[92] https://www.buildingsofireland.ie/buildings-search/building/11901401/ballynagappagh-clane-ed-kildare [accessed 06 February 2023].
[93] https://www.kildare.ie/ehistory/index.php/church-of-st-michael-and-all-angels-millicent-clane/ [accessed 06 February 2023].
[94] https://catalogue.nli.ie/Record/vtls000303403 [accessed 08 February 2023].

Plate 13.10: Millicent Church and Lych Gate (AH_12; Protected Structure) north-east of the L2002.

National Inventory of Architectural Heritage

Larch Hill House (AH_01; assessed by the NIAH to be of Regional importance) in Phepotstown comprises a detached 18th century country house and associated structures. While house itself (RPS MH049-107) is located outside the study area, the former gate lodge and rendered entrance piers with limestone wheel guards and cast-iron double gates are located within the study area to the west of the R125. Originally the home farm to the Phepotstown House estate (DL_03), Larch Hill was developed into an ornamental farm by Robert Prentice (Gatehouse, 2017). The farm became a separate property when the Prentice family's fortunes declined and while the farm continued to be developed in the latter half of the century by the Watson family, it fell into neglect until the 1990s (Gatehouse, 2017). The house is set back from the R125 to the more elevated north of the demesne, with ornamental farm buildings to the west. The boundaries of the demesne, which comprise belts of mature trees, limit views to and from the house, with views from the house focused across the designed landscape and the distant views of the surrounding countryside incorporated into the original design (Gatehouse, 2017).

AH_20 (assessed by the NIAH to be of Regional importance) comprises a single arch stone railway bridge, carrying the Great South and Western Railway across a local road. While the bridge has been subject to some later additions, the structure remains largely as built in c. 1870, including original rock-faced granite voussoirs and dressed stone copes. The bridge is shown on historic mapping (Ordnance Survey 25", 1888–1913), as the route of the railway crosses fields to the south of the Grand Canal. Despite some development to the west and east of the structure, including the Sallins Bypass and residential properties, it continues to be a prominent feature of the local streetscape and forms part of a group of similar bridges on this section of the railway.

Gardens and Designed Landscapes

A total of 10 GDLs have been identified within the study area. The GDLs were recorded by the Survey of Historic Gardens and Designed Landscapes or from historic mapping (Ordnance Survey 6", 1837–1842). Information on these GDLs is summarised in Table 13.4 and they are shown on Figure 13.3.

Table 13.4: GDLs identified within the study area

Reference Number	Name	Description	Townland	NIAH Reference
DL_02	Jenkinstown House	Demesne identified from historic mapping (Ordnance Survey 6", 1837–1842). The principal house remains extant (CH_02) and the footprint of the demesne remains legible as cropmarks and extant features including ancillary buildings and boundaries to the south-east. However, some of the boundaries, including the row of trees to the north-west depicted on historic mapping (Ordnance Survey 6", 1837–1842), have been removed. A modern barn has also been constructed to the north of the house. A curved roughcast boundary wall with alternate horizontal and vertical roughly squared copes, squared, rubble stone gate piers with tapered copes form the entrance with R156, and driveway leading to the house. Mature trees largely screen the house and form the roadside boundary along with an overgrown boundary along the R156.	Jenkinstown	N/A
DL_03	Phepotstown House	The GDL to Phepotstown House (CH_05), including principal house and ancillary buildings depicted on historic mapping (Ordnance Survey 6", 1837–1842). Retains elements of parkland and formal gardens, as well as original driveways and entrances with curved rendered entrance walls, gate piers and cast-iron gates. The boundary to the demesne is formed of an earth bank, hedgerows and mature trees, as well as high roughcast wall with buttressing (in poor condition).	Phepotstown	NIAH 5151
DL_04	Larch Hill House	The GDL to Larch Hill House (AH_01; see above) comprises an ornamental farm, which includes extant water features and woodland. While some features have been removed, for example the second lake to the south of the demesne (Gatehouse, 2017), these are legible as cropmarks. Established belt of trees with external roadside ditch and hedgerows bound the R125. A gated entrance with a single-storey lodge behind the boundary wall with a crenellated two-storey building behind. A low rubble stone wall runs from entrance to the carriageway, as well as rendered and painted entrance walls, with wheel guards. The southern boundary to the demesne comprises an established woodland belt.	Phepotstown	NIAH 5104
DL_06	Calgath House	The GDL to Calgath House. A significant number of modern agricultural buildings have been constructed within this site; however, the boundary remains perceptible. Mature trees, low hedges, roadside ditch and large roughly coursed rubblestone entrance wall and gate	Calgath	NIAH 5697

Reference Number	Name	Description	Townland	NIAH Reference
		piers are located along the R125. The entrance comprises splayed rubble stone entrance walls with square piers. A modern fence formed the roadside boundary further south.		
DL_07	Brides Stream House	The GDL to Bridestream House with legible features including areas of parkland and belts of trees. A lodge (CH_09) depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) remains extant to the south; however, the driveway appears to be overgrown and disused. The boundary along the R125 comprises a low stone wall and ditch, with a mature hedgerow and tree line. A low stone wall lining the roadside ditch was also identified, gradually increasing in height, leading to the entrance to the south.	Calgath	NIAH 4983
DL_10	Painestown House	The GDL to Painestown House. The principal building appears to be ruinous, and a large amount of woodland depicted on historic mapping (Ordnance Survey 6", 1837–1842) is no longer present. The R407 is bounded by established hedgerows and mature trees along an earth bank, with the entrances recessed from the carriageway. Sections of modern post-and-rail fences were identified, along with modern housing within boundary.	Painestown	NIAH 1884
DL_14	Firmount House	The GDL to Firmount House, includes the principal building and other estate features such as the walled garden, parkland and some estate trees. The walled garden bounds the L2002 with high rendered stone wall and includes a small pedestrian doorway directly onto the carriageway. Splayed entrance walls are located to the north of garden, and a second entrance comprises a rubble stone construction further south. Modern post-and-rail fence were identified further south, as well as entrances to later houses.	Firmount Demesne	NIAH 1882
DL_15	Moatfield House	The GDL to Moatfield House, includes principal building (RPS B14-18), agricultural range, and a wide tree-lined avenue. A ditch and established hedgerow bound the L2002; however, modern entrances and boundary features, including post-and-rail fencing, are also present. The entrance to the demesne is recessed with rubble stone walls and a set of simple square gate piers.	Firmount East	NIAH 1883
DL_17	Millicent House	The GDL to Millicent House. The extensive riverside demesne lands surrounding the principal house (RPS B14-26) include extant estate features such as lodges (including AH_15), a walled garden, drives, and areas of	Millicent Demesne	NIAH 1889

Reference Number	Name	Description	Townland	NIAH Reference
		woodland and parkland depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). Rubble stone walls and a set of grand entrance gates delimit the demesne to the south and line the road from the entrance to Millicent Bridge. A later farmstead has been built within the boundary of the demesne, and modern replacement boundaries was identified at various points, including later private gardens (hedges).		
DL_20	Killashee House	The GDL to Killashee House. Largely developed include Killashee National School, and the majority of demesne features have been removed. The R448 is located within the western boundary of the demesne. Extant boundary features include established hedgerows and a ditch, and modern post-and-rail fencing. A section of roughly coursed rubble stone wall is extant to the south of the demesne, along with a later recessed entrance.	Killashee	NIAH 1980

13.3.3 Cultural Heritage

A total of 304 cultural heritage constraints were identified within the study area (see Appendix 13.1 and Figures 13.4 – 13.6) comprising:

- 82 cultural heritage sites identified from historic mapping, aerial imagery, and during the walkover survey and site inspections;
- 135 features identified from LiDAR data acquired for the Proposed Development (Appendix 13.3); and
- 87 townland boundaries.

The cultural heritage constraints are characterised by domestic, industrial, and funerary activity dating from the prehistoric to the post-medieval periods. The locations of these constraints are shown on Figures 13.4 to 13.6 and further details are provided in Appendix 13.1.

A total of 22 cropmarks were identified. Fifteen of these were interpreted as evidence of activity dating from the prehistoric period onwards including ring-ditches (circular or near circular ditched features comprising the possible remains of barrows or round houses) in Woodland, Cullendragh Warrenstown, Jenkinstown, Phepotstown, Calgath and Boherhole (CH_60; Plate 13.4, CH_61, CH_63, CH_66, CH_69, CH_70, CH_77, CH_78 and CH_89), a possible barrow in Firmount East (CH_97), and enclosures in Portan, Culcommon, Jenkinstown, Kilcock, Duncreevan, Painestown, Betaghstown and Firmount West (CH_65, CH_71, CH_81; Plate 13.9, CH_82, CH_84, CH_91, CH_95 and CH_116). The remaining five cropmarks (CH_73, CH_75, CH_79, CH_86, and CH_96) have been interpreted as being of unknown date and function and could equally be non-archaeological in nature.

A further group of possible ring ditches (LI_033) was also identified in Warrenstown from LiDAR data acquired for the Proposed Development and features interpreted as groups of possible pits (CH_87 and LI_073) of unknown date were identified in Boherhole and Balfeaghan respectively. In addition, three enclosures (LI_058, LI_066, and LI_090) were identified from LiDAR data acquired for the Proposed Development in Phepotstown, Calgath and Ballybrack. LI_058 and LI_090 comprise negative linear features interpreted as ditches, which form part of larger square enclosures, and LI_066 comprises a sub-circular feature (approximately 58 m by 33 m across) interpreted as a possible enclosure of unknown date and function.

A total of seven mounds (LI_022, LI_027, LI_105, LI_107, LI_109, LI_146 and LI_147) were identified from LiDAR data acquired for the Proposed Development. These comprise positive earthen features including two (LI_146 and LI_147) associated with a group of prehistoric pit burials identified in Ploopluck (KD019-017; NS19-093; a Recorded Monument and Protected Structure) removed by gravel extraction in the 1930s (Mount, Buckley and Lynch, 1998). The remaining mounds have been interpreted as being of unknown date and function. Three negative circular features (LI_121, LI_127 and LI_129) between approximately 12 m and 28 m in diameter were also identified from LiDAR data acquired for the Proposed Development. These could be the sites of small circular enclosures or denuded mounds; however, they are equally likely to be the result of mineral extraction or non-archaeological in origin.

A total of 30 post-medieval structures were identified within the study area, comprising:

- five stone road bridges (CH_04, CH_06, CH_07, CH_12, and CH_24), which continue to form part of the road network, and a foot bridge within agricultural land (CH_104) depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913);
- seven extant farms (CH_10, CH_39, CH_56, and CH_105) and agricultural buildings (CH_17, CH_41, and CH_42) depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913). The farms remain operational and include more recent agricultural buildings;
- a roadside public house (CH_03) depicted on historic mapping (Ordnance Survey 25", 1888–1913) comprising a one and a half storey, roughcast building with ancillary structures, located on the R156. The

roadside position of the building, and connection to the historic road through Jenkinstown, contributes to its significance as a rural pub. Traffic noise and movement form a permanent feature with views across the road towards a modern petrol station forecourt;

- eight houses and cottages (CH_02, CH_15, CH_37, CH_43, CH_46, CH_55, CH_57, and CH_58) depicted on historic mapping (Ordnance Survey 6", 1837–1842), including 'the Vicarage' (CH_46) associated with Millicent Church and Lych Gate (AH_12), as well as a former thatched dwelling (CH_107; Plate 13.11) on the R148 within the cemetery boundary of St Patrick's Church (AH_19) depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913);

- four sections of the 19th century canal network comprising branches of the Royal and Grand canals through Kilcock, Sallins and Naas (CH_110, CH_111, CH_112 and CH_113);

- two estate buildings and structures comprising a single-storey roadside lodge (CH_16) depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) at the entrance to Courtown House and a set of rubble stone entrance walls with a pair of square stone gate piers and cast iron gates (CH_109) identified during the walkover survey and site inspection. The entrance, located to the north of the R125 at the former entrance to 'Balfeighan House', is depicted on historic mapping (Ordnance Survey 6" Last Edition, 1942) but is no longer in use; and

- a roadside boundary stone or roadside marker (CH_106; Plate 13.12) identified during the walkover survey and site inspection, comprising a square granite monolith approximately 1 m in height, with '1798' inscribed on the north-easternmost face. The stone could be related to the 19th century road network (Meath County Council and Heritage Council, 2010) and may be the guidepost ('G.P.') identified on historic mapping (Ordnance Survey 6" Last Edition, 1957); however, the inscription and floral tributes left at the roadside (various online mapping) indicate it may commemorate the 1798 Irish Rebellion.

Plate13.11: Former thatched dwelling (CH_107) within the cemetery located to the south of the R148

Plate 13.12: Roadside boundary stone or marker (CH_106) identified on the junction between a local road and the R156

Two previously unrecorded buildings were identified from historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) comprising the site of a roadside farm in Jenkinstown (CH_64) and the site of a small roofless building of unknown date and function depicted within an enclosed field in Cullendragh (CH_67). CH_64 is depicted as a linear range, with two small ancillary buildings, to the south-east of 'Jenkinstown Bridge' and later mapping shows additional buildings in fields to the north. This area is current under pasture and no above ground remains associated with the farm buildings were identified. A further 17 previously unrecorded buildings were identified from LiDAR data acquired for the Proposed Development (LI_015, LI_016, LI_030, LI_032, LI_042, LI_055, LI_061, LI_069, LI_082, LI_083, LI_084, LI_086, LI_087, LI_120, LI_130, LI_156 and LI_158). These are characterised by individual or small groups of rectangular features, often corresponding with buildings depicted on historic Ordnance Survey mapping. However, two of these buildings (LI_015 and LI_084) are not depicted on modern or historic mapping and therefore may pre-date these.

Sections of the alignment of a former road (LI_020), a roadside recess or bay (LI_045), and former tracks (LI_137, LI_139, and LI_161) were identified from LiDAR data acquired for the Proposed Development. LI_020 and LI_045 are both depicted on historic mapping, along with two trackways associated with brickworks on the flat plains of the River Liffey (LI_137 and LI_139) in Barretstown and Osberstown which were also identified. LI_161 comprises a track through plantation depicted on historic mapping (25" to 1 mile, 1888–1913). A possible ford (CH_108), comprising a shallow stony point in the Rye Water with gently sloping banks either side to the west of the road bridge (CH_12), was also identified during the walkover survey and site inspection; however, this could equally be material deposited during drainage works to river.

Located within the demesne lands associated with post-medieval country houses, four designed landscape features were identified from LiDAR data acquired for the Proposed Development (LI_048, LI_122, LI_134 and LI_151). These features comprise a ha-ha within Larch Hill demesne (DL_04), a rectangular feature within Firmount House demesne (DL_14), a drainage feature or pond within Millicent House demesne (DL_17), and a driveway along the eastern boundary of Jigginstown Castle (AY_39; a National Monument).

A total of 23 former field boundaries and field systems were also identified from aerial imagery (CH_68, CH_72, CH_74, CH_76, CH_80, CH_83, CH_85, CH_88, CH_90, CH_92, CH_93, CH_94, CH_98, CH_100, CH_101, CH_102, CH_103, CH_114, CH_115, CH_117, CH_119, CH_120, and CH_121) and 60 were identified from LiDAR data acquired for the Proposed Development (LI_002, LI_003, LI_005, LI_006, LI_007, LI_013, LI_017, LI_018, LI_021,

LI_026, LI_028, LI_029, LI_031, LI_036, LI_038, LI_040, LI_041, LI_043, LI_052, LI_062, LI_067, LI_072, LI_074, LI_076, LI_078, LI_079, LI_080, LI_085, LI_092, LI_094, LI_095, LI_096, LI_098, LI_100, LI_102, LI_104, LI_106, LI_108, LI_110, LI_113, LI_114, LI_117, LI_118, LI_119, LI_123, LI_125, LI_126, LI_128, LI_135, LI_138, LI_140, LI_142, LI_143, LI_144, LI_145, LI_149, LI_152, LI_154, LI_162 and LI_064). While some of these field systems correspond with the field pattern depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913) and are likely post-medieval in date, some (including CH_72, CH_76, and CH_98, and LI_017, LI_018, LI_021, LI_026, LI_029, LI_041, LI_052, LI_067, LI_079, LI_102, LI_119, LI_142, and LI_152) may be earlier examples given they do not match the pattern depicted on historic Ordnance Survey mapping. In addition, six areas of drainage within agricultural land (CH_122 and LI_037, LI_054, LI_056, LI_077 and LI_136) were identified from aerial imagery and LiDAR data acquired for the Proposed Development.

A further 20 linear features identified from LiDAR data acquired for the Proposed Development were interpreted as ditches (LI_001, LI_008, LI_009, LI_010, LI_011, LI_014, LI_025, LI_035, LI_044, LI_046, LI_047, LI_050, LI_057, LI_059, LI_081, LI_088, LI_112, LI_133, LI_148, and LI_155). While four of these (LI_046, LI_047, LI_050, and LI_57) are located within demesne lands and could be associated with these designed landscapes, there are no corresponding features depicted on historic mapping. The remaining ditches comprise individual linear features of unknown date.

A total of six former gravel pits and quarries (LI_024, LI_070, LI_075, LI_101, LI_111, and LI_159), the site of a post-medieval corn mill (LI_065), old mill race (CH_118), and smithy (LI_157) were identified from aerial imagery and LiDAR data acquired for the Proposed Development and comprise irregular areas of disturbance that correspond with sites depicted on historic mapping (Ordnance Survey 6", 1837–1842; Ordnance Survey 25", 1888–1913).

Previous Excavations

A review of Excavations Bulletin and TII's Archaeological Excavation Reports identified the following archaeological excavations within the study area: These are identified in Table 13.5.

Table 13.5: Previous excavations identified within the study area

Licence Number	Townland	Findings
02E0992	Boycetown	Excavation of an area of burning with an associated small pit and a series of stakeholes arranged in a rough arc (undated) (Coughlan, 2003).
10E0445	Portgloriam	Excavation during monitoring of the foundations and the internal layout of the dwelling, as well as an ash (post-medieval).[95]
05E1090	Maynooth	Excavation of a stone structure, possible outhouse or a coal-storage building, including the remnants of an interior mud wall, a brick-laid fireplace and a deposit of charcoal (post-medieval).[96]
99E0569	Curryhills	Excavation of a possible truncated fire-pit (undated).[97]
C000238; E3600	Jigginstown	Testing to the north-east of Jigginstown House recovered pieces of brick and mortar, and sherds from a roof tile (17^{th} to 18th century).[98]

[95] http://excavations.ie/report/2010/Kildare/0021615/ [accessed 21 January 2023].
[96] http://excavations.ie/report/2005/Kildare/0013775/ [accessed 21 January 2023].
[97] http://excavations.ie/report/1999/Kildare/0004267/ [accessed 21 January 2023].
[98] http://excavations.ie/report/2007/Kildare/0017795/ [accessed 21 January 2023].

Licence Number	Townland	Findings
16E0552	Jigginstown and Naas West	Testing prior to development identified two enclosures – a 'D'-shaped enclosure and a curvilinear ditch (medieval).[99]
04E0355 ext.	Killashee Demesne	Ditch complex, possibly a medieval monastic site (5th century).[100]

A further 20 archaeological excavations were also identified (under Licence numbers: 04E0764, 11E239, 11R87, 11E065, 02E0144, 02E0145, 02E0998, 02E0146, 02E0147, 02E0148, 11E0309, 99E0570, 07E0964, 09E0147, 15E0426, 13E0199, 02E0419, 05E1334, 05E1334 ext., 04E0355, and14E0452); however, these did not identify any archaeological remains or deposits.

Topographical Files

Information from the National Museum of Ireland' finds database identified a Bronze Pin (1969:75) found in Naas West, a Bronze Fibula and Bronze Mount (1984:5,6) and a Medieval Glazed Potsherd (1979:13) recovered in Jigginstown, burials and associated finds in Ploopluck and the Head of a Bronze Enameled Hand Pin (1990:136) recovered in Waterstown.

Townland Boundaries

Along with baronies and parishes, townlands comprise a geopolitical unit of land still in use today (Smith, 2003). They form the oldest and smallest territorial division in Ireland, and in rural areas are often characterised by historic hedgerows which follow more organic pre-18th century improvement boundaries (Aalen, Whelan and Stout, 2011). Many townland names are particularly old and provide invaluable information about the past at a local level, including information on natural features and past land use, local traditions and landmarks, and, in some cases, historic landownership.

Townland boundaries have been identified within the study area, which are detailed in Appendix 13.1 and shown on Figure 13.6. The townlands within the study area and information derived from their names from online sources and *Irish Place Names* (Flanagan and Flanagan, 2002) are presented in Table 13.6.

[99] http://excavations.ie/report/2017/Kildare/0026805/ [accessed 21 January 2023].
[100] http://excavations.ie/report/2006/Kildare/0015709/ [accessed 21 January 2023].

Table 13.6: Townlands within the study area

English Name	Irish Name	Possible Meaning
Balfeaghan	Baile Fhiacháin	*baile* townland / town [with family name]
Ballybrack	An Baile Breac	*Baile Breac* speckled homestead
Ballyloughan	Baile an Locháin	*baile* townland / town *Locháin* little lake
Ballynaboley	Baile na Buaile	*baile* townland / town *buaile* milking place
Ballynagappagh	Baile na gCeapach	*baile* townland / town *ceapach* plot of land, tillage plot
Baltracey	An Baile Trasna	*baile* townland / town
Barrettstown	Baile an Bhairéadaigh	*baile* townland / town [with family name]
Barstown		
Betaghstown	Baile na mBiatach	*baile* townland / town [with family name]
Bluebell	An Cloigín Gorm	Direct translation
Boherhole	Bóthar Chóil	bóthar road *coll* hazel
Boycetown	Baile an Bhúisigh	*baile* townland / town [with family name]
Broadfield	An Gort Leathan (translation)	Direct translation
Calgath		
Castlesize	Caisleán an tSaghasaigh	'fields or gardens' / 'path of light'[101]
Clane	Claonadh	*claonadh* slanted ford
Commons South	An Coimín Theas	*coimín* commonage, common land; little hollow, glen
Cott	An Bhoth	*bhoth* a cottage or a hut
Courtown Great	Baile na Cúirte Mór	*baile* townland / town *mór* great / big

[101] https://www.logainm.ie/en/25677 [accessed 21 December 2022].

English Name	Irish Name	Possible Meaning
		'the Courteton of Kilcok'[102]
Creemore		
Culcommon		
Cullendragh		
Curryhills	An Chorrchoill[311]	*coill* wood
Dolanstown		
Duncreevan	Dún Craobháin	'a very ancient personal name'103
Dunnstown	Baile Uí Dhuinn	*baile* townland / town [with family name]
Firmount Demesne	Diméin na Ceapóige	*ceapóige* plot of land
Firmount East	An Cheapóg Thoir	*ceapóige* plot of land
Firmount West	An Cheapóg Thiar	*ceapóige* plot of land
Gaulstown		Possibly from *Ballynagall* townland of the English (Joyce 1913, p 98)
Graiguepottle	Gráig Phoitéil	*gráig* settlement (hamlet) (introduced by the Anglo-Normans)
Harristown Common	Coimín Bhaile Hanraí	*coimín* common *baile* townland / town [with family name]
Hodgestown	Baile Hoiste	*baile* townland / town [with family name]
Hoganswood	Coill Úgáin311	*coill* wood [with family name]
Jenkinstown	Baile Sheinicín	*baile* townland / town [with family name]
Jigginstown	Baile Shigín	*baile* townland / town [with family name]
Kemmins Mill		
Kilclone	Coill Chluana	*cluain* meadow / pasture311 *coill* wood
Kilcock	Cill Choca	*cill* church 'Church of Coca' (Flanagan and Flanagan, 2002)
Killashee	Cill Uasaille	*cill* church

[102] https://www.logainm.ie/en/25386 [accessed 21 December 2022].
[103] https://www.logainm.ie/en/25388 [accessed 21 December 2022].

English Name	Irish Name	Possible Meaning
		'Church of St. Usaille' (Flanagan and Flanagan, 2002)[104]
Longtown North	Baile an Longaigh Thuaidh	*baile* townland / town [with family name]
Mainham	Maighneán	*Magh* plain
Martinstown		
Millicent Demesne	Diméin Millicent	
Millicent North	Millicent Thuaidh	
Millicent South	Millicent Theas	
Moortown	Baile na Móna	*baile* townland / town *móna* bog / peatbog
Mullagh	Mullach	*mullach* summit
Mylerstown	Baile Mhaoilir	*baile* townland / town [with family name]
Naas East	Nás; An Nás Thoir	*nás* assembly
Naas West	Nás; An Nás Thiar	*nás* assembly
Newland South	An Fearann Nua Theas	*fearann* land / unit of land *nua* new
Newland West	An Fearann Nua Thiar	*fearann* land / unit of land *nua* new
Oldtown	An Seanbhaile	*sean* old / ancient 'old homestead' (Flanagan and Flanagan, 2002)
Osberstown	Baile Osbeird	*baile* townland / town Osbert', 'Osborne', 'son of Osbert' - a common Anglo-Saxon personal name[105]
Painestown	Baile an Phaghanaigh	*baile* townland / town [with family name]
Phepotstown		
Pitchfordstown	Baile Phitsfeaird	*baile* townland / town [with family name]
Ploopluck	Ploopluck	Possible corruption of Cloyth-an-puka the tone or stone fortress of the pooka (Joyce 1913, pg. 191)
Portan		
Portgloriam	Port Gleoráin	*port* / bank / fort / platform

[104] https://www.logainm.ie/en/25905 [accessed 12 December 2022].
[105] https://www.logainm.ie/en/25979 [accessed 22 December 2022].

English Name	Irish Name	Possible Meaning
		'Bank of stinking gladon'[106]
Rathasker	Ráth Oscair	*rath* settlement unit 'Oscar's rath or fort'[107]
Stephenstown South	Baile Stiofáin Theas	*baile* townland / town [with family name]
Walterstown	Baile Bhaltair	*baile* townland / town [with family name]
Warrenstown		
Waterstown	Baile Uaitéir	*baile* townland / town [with family name]
Woodland	Fearann na Coille	*fearann* land / unit of land313 *coill* wood

13.4 Assessment of Potential Effects

13.4.1 Construction

Direct

Archaeology

The Proposed Development is located within the Zones of Notification of the following six Recorded Monuments:

- a mound (AY_02) in Calgath approximately 27 m to the west of the Planning Application Boundary;
- a linear earthwork (AY_13; also an RHM site) between Ballyloughan and Graiguepottle approximately 5 m to the east of the Planning Application Boundary;
- a rath (AY_24) in Ballynagappagh approximately 36 m to the south-east of the Planning Application Boundary;
- a mound (AY_26; also a Protected Structure) in Firmount East approximately 18 m to the north-east of the Planning Application Boundary;
- an enclosure (AY_51) in Stephenstown South approximately 16 m to the east of the Planning Application Boundary; and
- a small rectangular enclosure (AY_58) in Dunstown (located within Dunstown substation).

While the Proposed Development would not directly impact the Recorded Monuments themselves, excavation of the cable trench would have a direct impact on any archaeological remains that may survive within this zone. Where the Proposed Development is on-road, within Dunstown substation or areas of previous disturbance (AY_02, AY_24,

[106] https://www.logainm.ie/en/25395 [accessed 22 December 2022].
[107] https://www.logainm.ie/en/25973 [accessed 22 December 2022].

AY_26, AY_51 and AY_58), the potential for any archaeological remains is less than the off-road section (AY_13), as development in these areas may have already removed or truncated any archaeological remains that may have been present. The significance of effect of the direct impact on AY_13 has been assessed to be Moderate, and the significance of effect of the direct impacts on AY_02, AY_24, AY_26, AY_51 and AY_58 have been assessed to be Slight.

Construction of the Proposed Development, including excavation of the cable trench and joint bays, temporary passing bays, and the excavation of temporary launch and reception pits for HDD, may also result in a direct impact on any previously unknown archaeological remains that may be present within the land required for the Proposed Development. As identified in Section 13.3.1 (above), the potential for this impact is higher in undisturbed off-road sections than within the existing carriageways, the construction of which is likely to have removed or truncated any archaeological remains that may have been present.

There is potential for impacts on archaeological remains and artefacts that may survive in watercourses and in the land adjacent to them. Ten watercourses will be crossed using existing road structures (WB27, WB29, WB33, River Liffey (WB36 and WB37), WB38, WB39, WB40, WB41 and WB43), therefore avoiding watercourses themselves and the land immediately adjacent to them. No potential impacts on archaeological remains and artefacts that may survive have been assessed.

Five watercourse (including two canals) will be crossed using HDD (Rye Water WB13, Royal Canal WB14, Tributary of the River Lyreen WB20, River Liffey WB35, and Grand Canal WB42). There will therefore be no impact on these watercourses. In addition, ground disturbance at temporary launch and reception pits for HDD will also be reduced through the temporary installation of a level hardstanding area on a geotextile base for the drilling rig.

In-stream trenching will be required at 26 watercourses. Of these:

- Ten are drainage ditches (WB05, WB17, WB18, WB19, WB21, WB26, WB30, WB32, WB34 and WB45); and
- Sixteen are streams (WB01, WB02, WB03, WB04, WB06, WB07, WB08, WB09, WB10, WB12, WB15, WB22, WB24, WB25, WB28, and WB44).

As identified in Section 13.3.1, the potential for unknown archaeological remains to be present is considered lower in drainage ditches than within unmodified streams and rivers.

Of these streams, two have been dredged (WB04 and WB07) based on drainage scheme information from the Commissioners of Public Works in Ireland flood maps[108], and the potential for archaeological remains to be present within these watercourses is also considered to be lower than those that have not been dredged. In addition, four of these streams (WB03, WB08, WB10 and WB12) have been subject to modification, based on historic mapping, and therefore the potential for archaeological remains to be present within these watercourses is also considered to be lower.

The potential for structural damage to Jigginstown Castle (AY_39; National Monument) from vibration resulting from HDD was assessed. Using British Standard (BS) 5228-2, the castle was assessed to be a potentially vulnerable building, and the vibration threshold for structural damage during construction was identified to be 3 mm/s peak particle velocity (PPV). PPV is the instantaneous maximum velocity reached by the vibrating element as it oscillates about its rest position and is measured in millimetres per second (mm/s). The vibration assessment (see Chapter 9) assessed a PPV of 6 mm/s within 24 m of HDD locations and at least 3 mm/s between 24 m and 42 m from HDD locations during construction. Given the joint bay, including HDD launch pit, at Jigginstown will be located approximately 50 m to the south of Jigginstown Castle, the PPV would be less than 3 mm/s. Based on this, the vibration level has been assessed to be below the threshold for structural damage and therefore no impact from vibration was assessed.

[108] https://www.floodinfo.ie/map/drainage_map/ [accessed 17 February 2023].

Architectural Heritage

While the following three architectural heritage constraints would be retained, there is the potential for accidental damage to these structures during construction given their proximity to the Proposed Development:

- the entrance walls to Larch Hill House (AH_01; assessed to be of regional importance by the NIAH), which are partially located within the Planning Application Boundary;
- the boundary wall associated with the thatched dwelling in Ballynagappagh (AH_11; a Protected Structure), which is located approximately 2 m to the south-east of the Planning Application Boundary; and
- the lych gate to Millicent Church (AH_12; a Protected Structure), which is within the Planning Application Boundary.

The significance of effect of these direct impacts has been assessed to be Moderate.

In addition, three direct impacts of Slight significance have been identified for architectural heritage during construction of the Proposed Development. These are presented in Appendix 13.2.

Cultural Heritage

Construction of the Proposed Development would:

- wholly remove three and partially remove two ring-ditches that form part of a group of 14 ring ditches identified from aerial imagery (CH_60) in Woodland in the off-road section between ch.50 and ch.550;
- wholly remove a roadside post-medieval farmstead (CH_64) depicted on historic Ordnance Survey mapping in Jenkinstown as a result of the construction of Joint Bay 8, associated access track, and Watercourse Crossing WB04 between ch.5,920 and ch.6,000;
- wholly remove curvi-linear features forming part of a group of cropmarks identified from aerial imagery (CH_66) in Cullendragh in the off-road section between ch.2,875 and ch.3,030, including Joint Bay 4;
- wholly remove curvi-linear features forming part of a group of cropmarks identified from aerial imagery (CH_69) in Warrenstown in the off-road section between ch.4,450 and ch.4,580;
- wholly remove an enclosure (CH_81) identified from aerial imagery in Kilcock as a result of the excavation of the reception pit required for the HDD under the M4 motorway;
- remove a boundary/marker stone (CH_106) identified during the walkover survey and site section as a result of Watercourse Crossing WB04 (at ch.6,000);
- remove the footings of a small group of buildings (LI_015) in Cullendragh identified from a review of LiDAR data acquired for the Proposed Development in the off-road section between ch.2,375 and ch.2,425;
- remove a mound of unknown date and function (LI_027) in Warrenstown identified from a review of LiDAR data acquired for the Proposed Development as a result of the construction of Passing Bay 7 between ch.5,150 and ch.5,250; and
- remove the remains of a roadside building (LI_032) in Mullagh identified from a review of LiDAR data acquired for the Proposed Development as a result of the construction of Passing Bay 11 between ch.7,950 and ch.8,050.

The significance of effect of these direct impacts has been assessed to be Significant. However, after the application of mitigation (see Section 13.5), no significant effects are anticipated.

In addition, construction of the Proposed Development would also partially remove:

- former field boundaries and a possible rath (CH_121) in Curryhills as a result of the construction of the off-road section between ch.31,000 and ch.31,350;
- the site of a post-medieval corn mill (LI_065) in Calgath identified from a review of LiDAR data acquired for the Proposed Development as a result of the construction of Joint Bay 13 between ch.13,000 and ch.13,100; and
- the remains of two post-medieval buildings and associated boundaries (LI_042 and LI_158) in Barstown and Killashee identified from a review of LiDAR data acquired for the Proposed Development as a result of Watercourse Crossings WB38 (at ch. 39,400) and WB43 (at ch.49,000) respectively.

The significance of effect of these direct impacts has been assessed to be Moderate. However, after the application of mitigation (see Section 13.5), no significant effects are anticipated.

In addition, 35 direct impacts of Slight significance have been identified for the following cultural heritage sites during construction of the Proposed Development:

- seven post-medieval buildings and road bridges (CH_03, CH_04, CH_06, CH_07, CH_24, CH_109 and LI_156);
- 26 field boundaries, ditches, drainage and field systems (CH_68, CH_74, CH_76, CH_92, CH_94, CH_100, CH_117, CH_119, CH_120, CH_122, LI_001, LI_006, LI_009, LI_011, LI_017, LI_026, LI_038, LI_054, LI_056, LI_092, LI_096, LI_113, LI_119, LI_125, LI_143 and LI_145);
- one Old Mill Race (CH_118); and
- one post-medieval designed landscape feature (LI_134).

These impacts are presented in Appendix 13.2.

Construction of the Proposed Development would remove approximately 40 m of the Gaulstown – Woodland townland boundary (TB_01) at ch.800, and 30 m of the Gaulstown – Cullendragh townland boundary (TB_03) at ch.1,900. The significance of effect of these direct impacts has been assessed to be Moderate.

Small sections of townland boundaries (TB_08 to TB_10, TB_12, TB_13, TB_25 and TB_61) would be removed. The significance of effect of these direct impacts has been assessed to be Slight. More information on these effects is presented in Appendix 13.2.

No impact has been identified for the Balfeaghan – Boycetown townland boundary (TB_16) as the Proposed Development would cross under the townland boundary via HDD.

<u>Indirect</u>

Archaeology

No significant indirect impacts (i.e. of Moderate significance or above) on archaeology as a result of construction of the Proposed Development have been assessed. Indirect impacts of Slight (one) and Imperceptible (five) significance have been assessed, and these are presented in Appendix 13.2.

Architectural Heritage

No significant indirect impacts (i.e. of Moderate significance or above) have been assessed on architectural heritage constraints as a result of construction of the Proposed Development. A total of five indirect impacts of Slight significance and two indirect impacts of Imperceptible significance have been assessed. These impacts are presented in Appendix 13.2.

Cultural Heritage

No significant indirect impacts (i.e. of Moderate significance or above) were identified on cultural heritage constraints as a result of construction of the Proposed Development. A total of 14 indirect impacts have been assessed to be of Slight significance, and these are presented in Appendix 13.2.

13.4.2 Operation

<u>Direct</u>

No direct impacts were identified on archaeology, architectural heritage and cultural heritage constraints as a result of the operation of the Proposed Development. Given on-road sections would be reinstated post-installation, the Proposed Development would not be perceptible in these locations during operation. While the temporary passing bay and joint bays would require the removal of hedgerows, these would be reinstated with native species, and the off-road sections would be largely reinstated to agricultural land. Permanent private access tracks and off-road joint bays will be required for during the operational phase; however, no indirect impacts have been assessed as a result of these as they will be established during construction.

<u>Indirect</u>

Archaeology

No significant indirect impacts (i.e. of Moderate significance or above) were identified on archaeological constraints as a result of operation of the Proposed Development. During operation, the presence of new infrastructure in the form of the concrete cap and access track to the east of Jigginstown Castle (AY_39; National Monument) would introduce a new source of visual intrusion into its setting. The significance of effect of this direct impact has been assessed to be Imperceptible and is presented in Appendix 13.2.

Architectural Heritage

No indirect impacts were identified on architectural heritage constraints as a result of the operation of the Proposed Development.

Cultural Heritage

No indirect impacts were identified on cultural heritage constraints as a result of the operation of the Proposed Development.

13.5 Mitigation Measures

This section identifies measures to mitigate effects that result from construction of the Proposed Development on archaeological, architectural and cultural heritage constraints.

While the sources identified in Section 13.2, including the review of the LiDAR data acquired for the Proposed Development, provide a thorough understanding of known constraints and the potential for the presence of unknown archaeological remains, archaeological investigations will be implemented post-consent and pre-construction in all off-road sections required for construction, including land required for access tracks, passing bays and joint bays, and HDD and construction compounds to inform the design of mitigation. This will comprise archaeological geophysical survey, archaeological test excavation, palaeoenvironmental assessment, and underwater assessment to inform the design of archaeological excavation and further underwater surveys.

Mitigation measures for known archaeology, architectural heritage and cultural heritage that will be undertaken post-consent but in advance of construction comprise the following:

- Measured survey of upstanding cultural heritage constraints directly impacted by the Proposed Development (LI_015, LI_027, LI_032, LI_042, LI_065, LI_134, and LI_158);
- A photographic and written record of the elements of GDLs (DL_14, DL_15, and DL_17) impacted by the Proposed Development will be undertaken in advance of construction;
- Written and photographic survey will be undertaken for CH_106 prior to its removal. Following construction in this location, the boundary stone will be reinstated in the same location;
- Townland boundary surveys comprising detailed written and photographic survey, and test trenching through boundaries will be undertaken for townland boundaries that will be directly impacted by construction of the Proposed Development (TB_01, TB_03, TB_08, TB_09, TB_10, TB_12, TB_13, TB_25, and TB_61);
- Archaeological excavation informed by archaeological geophysical survey and archaeological test excavation will be undertaken for 42 constraints (AY_13, AY_51, CH_60, CH_64, CH_66, CH_68, CH_69, CH_74, CH_81, CH_92, CH_94, CH_100, CH_117, CH_118, CH_119, CH_120, CH_121, CH_122 LI_001, LI_006, LI_009, LI_011, LI_015, LI_017, LI_026, LI_027, LI_032, LI_038, LI_042, LI_056, LI_065, LI_092, LI_096, LI_101, LI_113, LI_119, LI_125, LI_134, LI_143, LI_145, LI_156 and LI_158);
- Archaeological wade survey or underwater assessments will be undertaken at the following unmodified watercourses which will be crossed via in-stream trenching:
    - WB01 (tributary of the River Tolka);
    - WB02 (Dunboyne Stream);
    - WB06 (Jenkinstown Stream);
    - WB09 (unnamed stream);
    - WB22 (Baltracey River);
    - WB25 (Gollymochy River).
- Archaeological metal detecting survey will be undertaken of the banks of the remaining watercourses (comprising modified stream and drainage ditches; see Table 13.3) where in-stream trenching is required (WB03, WB04, WB05, WB07, WB08, WB10, WB12, WB17, WB18, WB19, WB21, WB24, WB26, WB28, WB30, WB32, WB34, WB44 and WB45).

The Contractor will be contractually required to allow sufficient time in their programme to allow the mitigation required in advance of construction to be completed.

All mitigation will be carried out by a suitably qualified archaeologist under Licence (where required) granted by the Minister for Housing, Local Government and Heritage and in accordance with the provisions of the National Monuments Acts 1930–2004.

Written reports on the results of all mitigation undertaken will be prepared in accordance with the requirements of the Licence(s) granted by the National Monuments Service.

During construction, the following mitigation will be undertaken:

- archaeological monitoring of on-road work within the Zones of Notification of Recorded Monuments (AY_02, AY_24, AY_26, and AY_58); and
- roadside architectural heritage and cultural heritage features (AH_01, AH_11, AH_12, CH_03, CH_04, CH_06, CH_07, CH_24 and CH_109) and clearly demarcated with temporary fencing to avoid accidental damage and preserve in situ.

If archaeological remains are identified during the archaeological monitoring, and preservation in situ is not feasible, archaeological excavation will be undertaken under an excavation licence granted by the Minister for Housing, Local Government and Heritage and in accordance with the provisions of the National Monuments Acts 1930–2004.

Mitigation will be undertaken in line with the *Code of Practice between the Department of the Environment, Heritage and Local Government and EirGrid* (Department of the Environment, Heritage and Local Government and EirGrid, 2009).

13.6 Residual Effects

After the application of the mitigation measures identified in Section 13.6, no significant effects are anticipated for archaeology, architectural heritage and cultural heritage during construction.

No significant effects are anticipated for archaeology, architectural heritage and cultural heritage during operation. However, during operation, the continued presence of the concrete cap and access track to the east of Jigginstown Castle (AY_39; National Monument) would have an Imperceptible effect on this constraint.

13.7 Conclusion

This chapter presented the results of the assessment for archaeology, architectural heritage and cultural heritage arising from the Proposed Development. During construction, there is the potential for significant effects; however, following the application of the mitigation measures identified in Section 13.5, no significant effects are anticipated. One impact has been identified during operation on Jigginstown Castle (AY_39; National Monument); however, this has been assessed to be non-significant.

13.8 References

<u>Maps</u>

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Maps of the Newcastle Wicklow, Rathdrum and Jigginstown estate of the Right Hon. The Earl Fitzwilliam situated in the Counties of Wicklow and Kildare. Enlarged from the O.S. by Hodges and Smith, Dublin. 34 coloured maps in one volume, with accompanying lists of tenants and respective holdings. 34" x 22", also some topographical drawings. 1842. National Library of Ireland.

Ordnance Survey 6”, 1837 – 1842

Ordnance Survey 25”, 1888-1913

Ordnance Survey 6” Last Edition, Sheet KE005, published 1942

Ordnance Survey 6” Last Edition, Sheet MH049+049A, published 1957

Aerial Imagery

Cambridge Air Photographs: https://www.cambridgeairphotos.com/

CUCAP Number	Date	Type
BDU041	1970-07-19	Oblique
ASW017	1967-07-17	Oblique
ASW018	1967-07-17	Oblique

BlueSky Aerial (March 2022)

GoogleEarth (2003 - 2022)

Ortho imagery (1995, 2000, 2005): https://heritagemaps.ie/WebApps/HeritageMaps/index.html

OSi Ortho

DigitalGlobe aerial imagery

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14. Traffic and Transport

14.1 Introduction

This chapter covers the potential traffic impacts as a result of the Proposed Development. This includes a review of the existing traffic conditions and road environments near construction locations. For this purpose, the road network has been reviewed, and traffic counts have been undertaken. This information was analysed to estimate the impacts of the Proposed Development and how to minimise them, the results of which are presented in this chapter.

Consistent with advice set out in the TII Traffic and Transport Guidelines (May 2014), this chapter assesses the impacts of the construction phase of the Proposed Development and details the numbers of construction vehicles generated and their most likely routes to the respective construction locations. This chapter is supported by the Traffic Management Plan (TMP) included in Appendix 5.1. An assessment of the operational phase of the impacts is not considered necessary, as the level of traffic resulting from the operational phase will be negligible and limited to minor regular maintenance requirements which are more closely examined in Section 14.4.2.

Due to the relatively low number of construction phase workers, and the distribution of those workers to sites at several dispersed geographical locations, a Workplace Travel Plan is not considered necessary based on professional judgement.

The estimates within this chapter of construction duration and construction traffic are based on the current understanding of the project. There are a large number of factors that could result in these estimates increasing or decreasing. The estimates should be considered as indicative.

14.2 Methodology

14.2.1 Policy and Guidance

This following list outlines the relevant policies and guidance which have been applied in the assessment of the traffic and transport effects of the proposed development. They are referenced where they are applied throughout the report.

- Guidelines on the Information to be Contained in Environmental Assessment Reports (EPA, 2022);
- Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017);
- Traffic and Transport Assessment Guidelines (TII, 2014);
- Temporary Traffic Measures and Signs for Roadworks (TII);
- The UK Design Manual for Roads and Bridges (DMRB) (National Highways, 2023);
- The Institute of Environmental Management and Assessment Guidelines for the Environmental Assessment of Road Traffic (IEMA, 1993); and
- The National Transport Model (NTpM) Update, Travel Demand Forecasting Report (NTpM Volume 3) and the Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections (TII, 2016).

14.2.2 Study Area and Receiving Environment

The study area for traffic and transport is effectively the existing road network along the proposed underground cable route. The cable is traversed by a number of regional and local roads which are predominantly rural in nature. Two motorways, the M4 and M7, cross through the study area but will not be directly impacted by the Proposed

Development. There are some built up areas within the study area which, as satellites of Dublin, imply that an important role of the study area road network is to carry commuter traffic into the City. The largest of these satellite towns is Naas, which the cable route bypasses.

For the purpose of the traffic and transport assessment, the cable route is split into 31 Temporary Traffic Management (TTM) sections. For 19 of these, which comprise a length of 43.6 km, the cable will run in-road. These affected road sections, most of which are regional roads, are detailed in Table 14.1. The remaining 12 TTM sections, comprising 9.3 km of the cable route, are off-road and run predominantly through agricultural land.

Table 14.1: Road Sections along the Cable Route

TTM Sections	Length (m)	Road
2	3860	R156
4	3505	R125 North
5	3850	R125 South
6	200	R258
8	545	R148
10	460	R407 North
11	9370	R407
12	4145	R408
14	1170	R403
15	3190	L2002 North
17	300	L2002 South
19	2480	Sallins Bypass
21	100	Osberstown Road
23	2330	Millennium Parkway
24	1215	R409
26	1440	R447
27	5260	R448
28	400	R448 South
30	300	R412

In terms of public transport, these roads are used by 12 bus routes. Two railway lines – the Dublin-Sligo Railway Line and the Dublin-Cork/Limerick Railway Line – run through the study area. These services, and the likely impacts resulting from the construction of the Proposed Development, are outlined in more detail in Section 14.4.1.2.

14.2.3 Methodology and Approach

The assessment detailed in this chapter has been undertaken using a combination of a desktop study and current policy advice with best practice in line with statutory agencies. The expected construction vehicle trips were generated from the programme for the Proposed Development, a summary of which is shown in Chapter 5. These have been compared to baseline traffic flows to identify if there are likely to be periods where the increase in traffic exceeds standard thresholds. This additional traffic may cause effects, for example, on driver delay, road safety or community and these have been identified and their significance assessed.

The Guidelines on the Information to be Contained in Environmental Assessment Reports (EPA, 2022) do not provide specific guidance in relation to the threshold criteria for assessing vehicle impacts. However, IEMA Guidelines (IEMA, 1993) outline two rules which can be used to determine the scale and extent of the assessment of road traffic:

- Rule 1: Highway links where traffic flows (or the number of HGVs) are expected to increase by more than 30%
- Rule 2: Any other specifically sensitive areas where traffic flows would increase by 10% or more.

In addition, the TII Traffic and Transport Assessment Guidelines provide thresholds for assessment as follows:

- Traffic to and from the development exceeds 10% of the existing two-way traffic flow on the adjoining highway; and

- Traffic to and from the development exceeds 5% of the existing two-way traffic flow on the adjoining highway, where traffic congestion exists or will exist within the assessment period or in other sensitive locations.

In the context of both sets of guidance, and given that the impacts of any construction vehicles will be temporary in nature, it is considered that any changes in traffic volumes below 10% means no discernible environmental impact.

Where the predicted increase in traffic volumes falls short of this threshold, the significance of the impacts is termed as Not Significant. This means that further assessment is not warranted. Consequently, where the predicted traffic flow increase exceeds the 10% threshold, the impacts are considered to be potentially significant and, accordingly, are assessed in greater detail.

The EPA Guidelines (EPA, 2022) consider 'Major' and 'Moderate' impacts to be significant. An 'Impact Significance Matrix' has been developed to account for the potential of significant impacts. This is outlined in Table 14.2.

Table 14.2: Impact Significance Matrix

Significance of Impact	Percentage Increase in General Traffic
Major (Significant)	Greater than or equal to 60%
Moderate (Significant)	Greater than or equal to 10% and less than 60%
Minor (Not Significant)	Greater than or equal to 5% and less than 10%
None (Not Significant)	Less than 5%

The EPA Guidelines do not give specific thresholds to determine significance associated with driver delay, so professional judgement has been applied and a 'Driver Delay Impact Significance Matrix' developed as outlined in Table 14.3.

Table 14.3: Driver Delay Impact Significance Matrix

Significance of Impact	Increase in Journey Time
Major (Significant)	31–40 minutes
Moderate (Significant)	21–30 minutes
Minor (Not Significant)	11–20 minutes
None (Not Significant)	0–10 minutes

It should be noted that the likely duration of an effect is also a relevant consideration. The EPA Guidelines (EPA, 2022) categorise duration of effects. The following categories are relevant to the Proposed Development:

- Brief Effects – effects lasting less than a day;

- Temporary Effects – effects lasting less than a year; and

- Short Term Effects – effects lasting one to seven years.

The analysis conducted in this chapter is based on data sourced from the construction programme, the cable route, and traffic surveys conducted at a series of key locations within the study area. This data is presented in Table 14.5.

With regards to construction traffic volumes, the Proposed Development's construction programme, a summary of which is included in Chapter 5, specifies the number of heavy goods vehicles that access each of the TTM sections on each day during the overall construction period.

Negligible traffic volumes are anticipated during the operational phase of the Proposed Development, so the assessment primarily focuses on construction phase traffic and transport impacts.

14.2.3.1 Public Transport Impacts

Separately, the anticipated impact of the Proposed Development's construction on public transport routes has been estimated. The bus routes which run through the study area were identified along with the frequency of services and operator information, then any overlaps with the in-road portions of the cable route identified. Where there were overlaps, TTM measures along the relevant road section were identified. The effect of single lane closures and full lane closures are different, and their impact on bus routes depends on the number of days these TTM measures are active:

- Single lane closures could delay buses: a stop-and-go system will be implemented at the single lane closures, and queues may form at these locations if traffic levels are too high.
- Full road closures will require bus routes to be temporarily diverted, which may stop service to some bus stops and increase journey time. The diversion taken by the bus is assumed to be that identified in the TMP, which is also reproduced in Section 14.4.1.5 of this chapter.

The impact of full road closures will be determined in conjunction with the EPA Guidelines (EPA, 2022) on the duration of effects, as outlined above.

Train services were also reviewed by finding railway lines that traverse the cable route. The train services active on these were identified, and the impacts caused on them assessed on an individual basis. The construction methods used to create the cable crossing across the railway line determines how, if at all, train services will be affected.

14.2.3.2 Community Impacts

Potential community impacts were reviewed in an analysis of potential severance impacts. Severance impacts can result from increased traffic which exacerbates the severing effects that streets have on the surrounding environment. The IEMA Guidelines (IEMA, 1993) suggest a threshold of a 100% increase in traffic, above which severance increases are considered to be significant.

In addition to severance, this chapter examines locations where the construction of the Proposed Development would affect leisure routes, including hiking paths, cycle lanes, and greenways.

Chapter 7 of this PECR considers community impacts of the Proposed Development in a wider sense, while the community impacts examined here are exclusively those related to traffic effects.

14.2.3.3 Road Safety Impacts

The UK DMRB Volume 15, Section 1, Part 6, Chapter 4 states that, where traffic flow doubles, it can be expected that road traffic collisions will double (i.e. the increase in collisions is likely to be approximately proportional to the increase in traffic). It is acknowledged that the guidance source has been superseded, but based on professional judgement and experience the statement is considered to remain valid. As such, if the number of collisions were to increase proportionally with the increase in traffic, the impact of the construction traffic on road safety per route section can be forecast.

The revised DMRB GG 119 Road Safety Audit (Highways England, 2020) states, "*the analysis of road traffic collision data should include identification of changes in the collision trends in terms of number, rate (taking account of any traffic flow changes), types and other collision variables, and comparisons with control data*", suggesting that if traffic flow increases or decreases, causing collisions to increase or decrease, then the relative rate of collisions should remain constant.

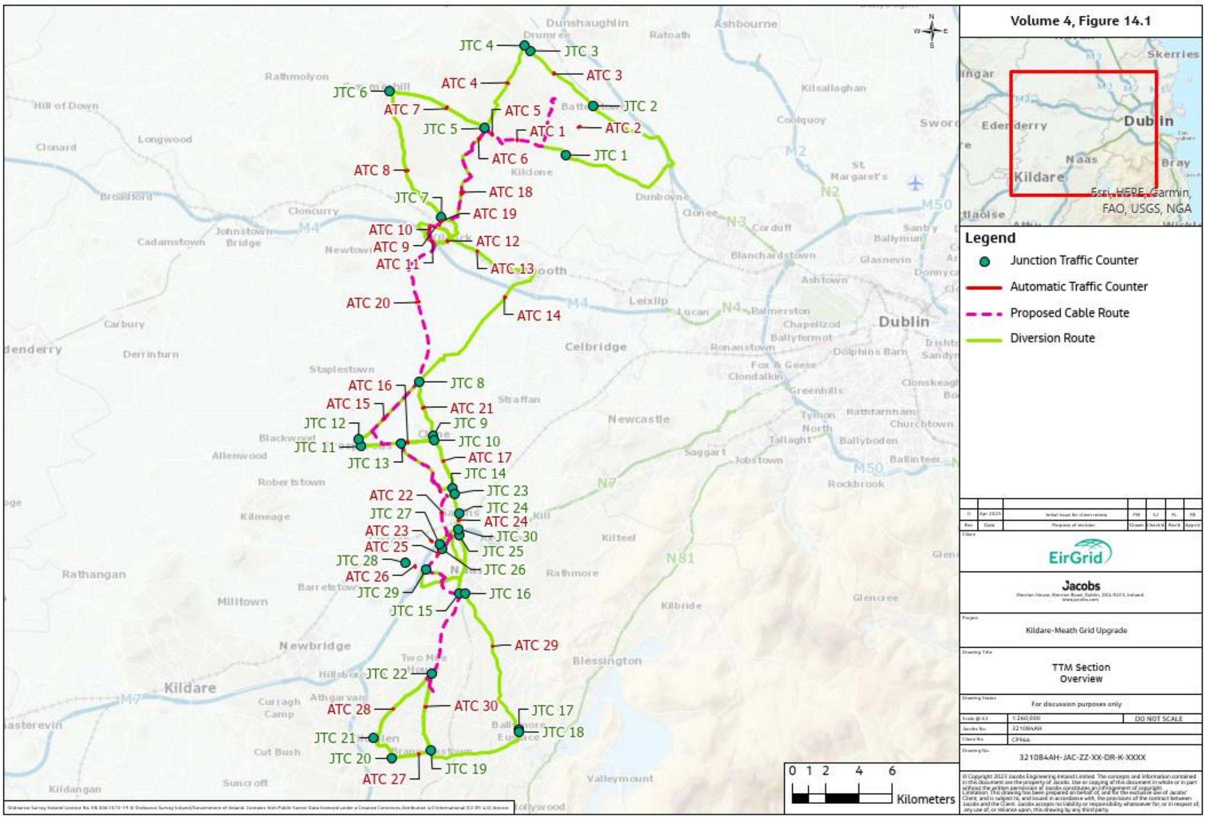
At present, the Road Safety Authority is in the process of "*reviewing* [their] *road traffic collision (RTC) data sharing policies and procedures*", and as a result, "*record-level RTC data can't be shared until this review is complete*" (www.rsa.ie, 2022).

The Road Safety Authority has removed all accident data from its website while it reviews its data privacy guidelines, so relevant collision data will be reviewed, and the corresponding potential increases in collisions due to the construction phase of the Proposed Development analysed, once available.

14.3 Baseline Conditions

Traffic surveys were commissioned to gain an understanding of baseline traffic conditions along the cable route and diversion routes. These were completed by Tracsis on behalf of Jacobs and cover a total of 30 Junction Turning Counts (JTCs) and 30 Automated Traffic counts (ATCs). The JTCs were collected on Tuesday 25th October 2022, while the ATCs were taken as weekday averages for the week from Monday 24th until Friday 28th October 2022. The traffic on these days is representative of normal traffic conditions since there were no public holidays, school holidays or special events in the area during this period. Plate 14.1 shows the location of the counters.

Plate 14.1: ATC and JTC locations



14.3.1 Traffic Volume Forecasting

The ATCs and JTCs were forecast using growth rates from Table 7.4 of the NTpM Volume 3 Travel Demand Forecasting Report. These growth rates were applied to the traffic at each link, because the network is sufficiently small and significant changes in flow distribution are not expected. This is in line with Section 5 of PAG Unit 5.3.

PAG Unit 5.3 requires the application of the Central Growth Scenario for project appraisal, which is therefore taken as the correct scenario for this assessment as well. This is in line with professional judgement of the nature of traffic growth in the study area: albeit rural, the roads considered here are close enough to Dublin that somewhat elevated – but not high – traffic growth is a reasonable expectation.

The construction period is expected to last from 2025 until 2028, which gives four possible forecast years. To maintain the overall approach in this chapter to analyse the worst-case scenario, 2025 is chosen as the forecast year. Baseline traffic is forecast to be lowest in 2025, so construction traffic would make up a greater proportion of the vehicles on the road and hence have a greater impact. The growth rates from the Travel Demand Forecasting Report, used in this chapter, are reproduced in Table 14.4.

Table 14.4: Traffic Growth Rates vs 2022

Year	Growth vs 2022
2022	0.0%
2023	1.5%
2024	3.0%
2025	4.5%

The recorded and forecast values for each location are given in Table 14.5, where the JTCs are the aggregate of all turning movements at that location and the ATCs are the sum of traffic passing on an average weekday in both directions.

Table 14.5: Recorded and Projected Traffic counts (Weekday 24hr Average)

Location	2022 Recorded	2025 Projected	Location	2022 Recorded	2025 Projected
ATC 1	4,146	4,333	JTC 1	4,670	4,881
ATC 2	1,484	1,551	JTC 2	6,020	6,292
ATC 3	6,084	6,359	JTC 3	9,491	9,920
ATC 4	1,537	1,607	JTC 4	8,277	8,651
ATC 5	4,777	4,993	JTC 5	4,560	4,766
ATC 6	917	9,58	JTC 6	9,167	9,582
ATC 7	3,831	4,004	JTC 7	7,728	8,077
ATC 8	7,399	7,734	JTC 8	10,005	10,457
ATC 9	13,479	14,088	JTC 9	15,249	15,939
ATC 10	10,489	10,963	JTC 10	14,260	14,905
ATC 11	11,550	12,072	JTC 11	11,902	12,440
ATC 12	9,630	10,065	JTC 12	5,940	6,209
ATC 13	7,089	7,410	JTC 13	8,861	9,262
ATC 14	4,302	4,497	JTC 14	17,360	18,145
ATC 15	4,242	4,434	JTC 15	21,935	22,927
ATC 16	7,210	7,536	JTC 16	12,785	13,363
ATC 17	16,684	17,438	JTC 17	4,442	4,643
ATC 18	1,343	1,404	JTC 18	3,103	3,243
ATC 19	8,515	8,900	JTC 19	2,359	2,466
ATC 20	7,680	8,027	JTC 20	3,364	3,516
ATC 21	8,618	9,008	JTC 21	12,577	13,146
ATC 22	12,207	12,759	JTC 22	4,651	4,861
ATC 23	1,338	1,399	JTC 23	14,092	14,729

Location	2022 Recorded	2025 Projected	Location	2022 Recorded	2025 Projected
ATC 24	14,349	14,998	JTC 24	11,307	11,818
ATC 25	16,156	16,887	JTC 25	22,893	23,928
ATC 26	7,839	8,193	JTC 26	13,274	13,874
ATC 27	1,884	1,969	JTC 27	14,304	14,951
ATC 28	5,901	6,168	JTC 28	7,157	7,481
ATC 29	3,284	3,432	JTC 29	14,035	14,670
ATC 30	1,613	1,686	JTC 30	13,600	14,215

14.4 Assessment of Potential Effects

14.4.1 Construction Phase

14.4.1.1 Road Safety Impacts

As mentioned in Section 14.2.3.3, all detailed road traffic collision data has been removed from public access, including historical road traffic collision data. Therefore, this data will be analysed once it is available again, in line with the methodology presented in Section 14.2.3.3.

As mentioned in the TMP, the contractor will carry out a Safety Audit of the Operational Traffic Management Plan prior to the commencement of works. This will ensure a high safety standard in relation to the traffic management measures implemented.

14.4.1.2 Public Transport Impacts

Several public transport routes have been identified near the proposed cable route through a desktop study. Many of the routes are local only, since the study area is predominantly rural. Table 14.6 outlines the public transport routes identified within or close to the study area.

The routes identified are mainly bus routes, but there are also two railway lines within or close to the construction works. The following services use these lines:

- Dublin–Sligo;
- Dublin–Maynooth;
- Dublin Heuston–Cork;
- Dublin Heuston–Galway;
- Dublin Heuston–Limerick and Ennis;
- Dublin Heuston–Waterford;
- Galway–Limerick; and
- Grand Canal Dock and Dublin Heuston–Portlaoise.

Just outside the Town of Kilcock, 1.2 km north-west of Kilcock Rail Station, the construction works will use HDD to cross beneath the tracks. These works are planned to take place during times when the trains are not in service, therefore causing no disruption to operational services.

At 1 km west of Sallins and Naas Rail Station, the construction works will use the rail bridge over the Sallins Bypass which has a redundant drainage tube. The cable will be inserted through the drainage tube, causing no disruption to railway services.

Table 14.6: Construction Impacts to Local Bus/Rail Routes

Service Number	Route Summary	Service Operator	Daily Services	TTM Section	Phase 1 & Phase 3 Impact	Phase 2 Impact
109	Busáras – Cavan Institute	Bus Éireann	Every 30-60 minutes	4; 5	Single lane closure – bus routing maintained, potential impact to journey times	Full road closure will require diversion of bus routing
109b	Busáras – Knightsbrook Hotel	Bus Éireann	Every 2 hours	4; 5	Single lane closure – bus routing maintained, potential impact to journey times	Full road closure will require diversion of bus routing
115	Mullingar-Enfield-Kilcock – Dublin	Bus Éireann	Every 30 minutes	6	Single lane closure – bus routing maintained, potential impact to journey times	Single lane closure – bus routing maintained, impact to journey times
115c	Mullingar – Killucan – Kilcock	Bus Éireann	Three times per day	6	Single lane closure – bus routing maintained, potential impact to journey times	Single lane closure – bus routing maintained, impact to journey times
(At Kilcock station)	Dublin – Sligo Rail Line	Irish Rail	Every 2 hours in AM and LT, every hour in SR and every 30 minutes in PM	7	No Impact	No Impact
(At Kilcock station)	Dublin – Maynooth Rail Line	Irish Rail	Every 2 hours in AM and LT, every hour in SR and every 30 minutes in PM	7	No Impact	No Impact
847a	Portumna-Maynooth	Kearns Coaches	One per day	8	Lane configuration maintained – service unaffected	Single lane closure – bus routing maintained, impact to

Service Number	Route Summary	Service Operator	Daily Services	TTM Section	Phase 1 & Phase 3 Impact	Phase 2 Impact
						journey times
847c	Portumna-Maynooth	Kearns Coaches	One per day	8	Lane configuration maintained – service unaffected	Single lane closure – bus routing maintained, impact to journey times
120/120x/ 120a/120e/ 120f	Dublin – Prosperous – Edenderry/ Newbridge	GoAhead	Every 30 minutes	14	Single lane closure – bus routing maintained, potential impact to journey times	Full road closure will require diversion of bus routing
125	University College Dublin - Newbridge	GoAhead	Two per day	26	No Impact	No Impact
126	Dublin-Rathangan	GoAhead	Every 30 minutes	26	No Impact	No Impact
130	Dublin-Athy	GoAhead	Peak hours only	27	Single lane closure – bus routing maintained, potential impact to journey times Section of R448 will have full closure and will require diversion of bus routing	Full road closure will require diversion of bus routing
(At Sallins Station)	Dublin Heuston-Cork	Irish Rail	Every 60 minutes	19	No Impact	No Impact
(At Sallins Station)	Dublin Heuston-Galway	Irish Rail	Peak hours only	19	No Impact	No Impact
(At Sallins Station)	Dublin Heuston-Limerick and Ennis	Irish Rail	One per day	19	No Impact	No Impact
(At Sallins Station)	Dublin Heuston - Waterford	Irish Rail	Peak hours only	19	No Impact	No Impact
(At Sallins Station)	Galway – Limerick	Irish Rail		19	No Impact	No Impact
(At Sallins Station)	Grand Canal Dock and Dublin	Irish Rail	Every 60 minutes	19	No Impact	No Impact

Service Number	Route Summary	Service Operator	Daily Services	TTM Section	Phase 1 & Phase 3 Impact	Phase 2 Impact
	Heuston-Portlaoise					

The majority of bus routes would be affected only by single lane closures. A stop-and-go system will be active at the single lane closures, which may cause delays depending on the traffic flows. Buses are expected to continue to serve the same stops, and single lane closures would only be temporary, so the impact of single lane closures on bus routes is deemed to be Not Significant.

Table 14.6 shows that four bus routes – the 109, 109b, 120, and the 130 – will be impacted by full road closures and will need to follow the diversions identified in Section 14.4.1.5. The diversions identified are deemed to be minor, with the following increases in journey time and closure durations:

- Bus routes 109 and 109b will be:
    - delayed for 12 minutes at the diversion for TTM Section 4, where a road closure will be active for an estimated 78 days[109], and
    - delayed for 11 minutes at the diversion for TTM Section 5, where a road closure will be active for an estimated 93 days;
- Bus route 120 will be delayed for 15 minutes at the diversion for TTM Section 14, where a road closure will be active for an estimated 36 days; and
- Bus route 130 will be delayed for 13 minutes at the diversion for TTM Section 27, where a road closure will be active for an estimated 110 days.

The closures in all cases will be temporary, and according to the EPA classification presented in Section 14.2.3, all are Temporary Effects since the duration would not exceed one year. In the case of bus routes 109 and 109b, which are affected by diversions on two different TTM sections, the road closures will not be active at the same time.

The diversion length is, according to the classification in Section 14.2.3, Minor in every case. Because of this, and the temporary nature of the effects, the impacts on bus routes where there are road closures are deemed to be Not Significant.

Train services would not be impacted by the construction of the Proposed Development, so impacts are deemed to be Not Significant here as well.

As outlined in the TMP (Appendix 5.1), the Contractor will liaise with public bus operators in relation to lane and road closures and create a communication plan for this purpose which would outline any independent decisions made by the bus operators. Impacts to a bus stop on the R403 in Firmount West (approximate chainage 33000) are addressed in Chapter 16 of this PECR.

14.4.1.3 Construction Traffic Impacts (Worker Movements)

Construction of the Proposed Development will require the movement of workers to and from various points along the cable route, throughout the entire construction period. Due to the rural nature of the study area, it is expected that all workers will use private vehicles to travel to and park at a construction compound. From here they will

[109] All construction durations in this chapter are an estimate and are subject to change at the detail design stage. The Contractor will seek to innovative and reduce the construction duration as far as possible. There could also be unexpected events that increase the duration. The durations are based on the current understanding of the Proposed Development and could increase or decrease in length.

consolidate to a smaller number of light goods vehicles to travel to specific construction locations. The contractor will also be required to ensure that their staff do not park on public roads (except within the work areas).

The required personnel have been estimated for the entire construction phase of the Proposed Development, and the most needed at any one time would not exceed 171 as shown in Table 14.7. The central compound would require the largest workforce, with an estimated peak of 63 workers.

Table 14.7: Workforce Numbers

Site Compound	2025			2026				2027				2028		
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
North	43	23	23	23	23	23	23	23	23	23	23	19	10	31
Central	63	33	33	33	33	33	33	33	46	52	52	52	39	50
South	38	18	18	18	18	18	18	18	31	37	37	37	24	25
Woodland Substation	0	0	0	0	0	0	20	20	20	20	20	20	20	20
Dunstown Substation	0	0	0	0	0	0	20	20	20	20	20	20	20	20
Total	144	74	74	74	74	74	114	114	153	171	171	167	132	146

The movement of workers and HGVs will not overlap, since the workers need to arrive at their respective locations before goods vehicles can be of any use at the construction sites. It follows that HGVs are considered separately and in isolation from the worker movement traffic.

Due to the very low number of vehicles expected to be required for the movement of construction workers, and the dispersed locations of the worksites, the traffic resulting from worker movements is not deemed to have a significant impact.

14.4.1.4 Construction Traffic Impacts (HGVs)

The construction of the Proposed Development will require the delivery and removal of various construction materials and equipment including excavated material, asphalt, engineered fill, concrete and facility equipment. The vehicles used for this purpose will be HGVs and ready mixed trucks, and their volumes estimated based on the construction programme requirements to deliver and remove these various materials from construction sites.

At this stage, the exact origins and destinations of the vehicles accessing each site has not yet been determined. For the purpose of this assessment, it is assumed that the distribution of HGVs will be the same as the baseline distribution of traffic.

In order to undertake as robust an assessment of the traffic impacts as possible, a number of different scenarios were assessed. These are as follows:

- Scenario 1 – The maximum impact of construction traffic in the immediate vicinity of each TTM section when it assumed to be actively under construction;
- Scenario 2 – The cumulative impact of construction traffic on the local road network as a result of adjacent TTM sections being actively under construction at the same time; and
- Scenario 3 – The impact of construction traffic on the wider network during the period of the construction programme which generates the greatest overall volume of construction vehicles.

Scenario 1

In order to ensure that localised impacts associated with any single TTM section are considered, the percentage impact of construction vehicles in the immediate vicinity of each TTM section was assessed. Since the number of vehicles accessing each TTM section varies significantly across the construction period, the day(s) with the highest construction traffic volume was selected for each TTM section. Table 14.8 shows this information along with the duration and timing of the peak at each location.

It should be noted that, while the first peak day for the various TTM sections ranges between 2025 and 2027, the percentage peak impact assessment has been based on forecast 2025 volumes so that the worst-case scenario has been considered, as explained in Section 14.3.1.

Table 14.8: Impact Assessment of Peak Construction Traffic at each TTM Section – Scenario 1

TTM Section	Max Construction Vehicle Trips/Day	Background 2025 Traffic	% Peak Impact on background traffic	Estimated Number of Peak Days
1 Woodland	86	4095	2.1%	7
2 R156	86	8894	1.0%	7
3 Mullagh	22	3526	0.6%	1
4 R125 North	52	958	5.4%	2
5 R125 South	52	2892	1.8%	3
6 R158	34	7526	0.5%	1
7 Balfeaghan	42	11494	0.4%	1
8 R148	52	10963	0.5%	1
9 M4	22	17724	0.1%	6
10 R407 North	30	12072	0.2%	4
11 R407	132	9115	1.4%	2
12 R408	80	3996	2.0%	12
13 Curryhills	24	5715	0.4%	1
14 R403	30	7892	0.4%	10
15 L2002 North	30	3824	0.8%	28
16 Millicent Demesne	18	3780	0.5%	3
17 L2002 South	30	3780	0.8%	3
18 Castlesize	38	10983	0.3%	2
19 Sallins Bypass	42	10469	0.4%	4
20 Mills	38	11319	0.3%	1
21 Osberstown Road	24	10491	0.2%	1
22 M7	22	10491	0.2%	1
23 Millennium Parkway	86	11388	0.8%	14

TTM Section	Max Construction Vehicle Trips/Day	Background 2025 Traffic	% Peak Impact on background traffic	Estimated Number of Peak Days
24 R409	28	7141	0.4%	5
25 Grand Canal	22	10290	0.2%	11
26 R447	30	13439	0.2%	10
27 R448	86	8806	1.0%	14
28 R448 South	30	9663	0.3%	3
29 Stephenstown	18	2575	0.7%	2
30 R412	24	1670	1.4%	3
31 Dunstown	140	1670	8.4%	1

It can be seen that the percentage increase in traffic flows resulting from additional construction traffic is below the 10% threshold value at all of the TTM sections. The maximum number of construction trips at a TTM section is 140 vehicles at TTM Section 31 Dunstown, and this is only expected to be for a single day. Therefore, for Scenario 1 the impacts of the construction traffic near each TTM section are considered **Not Significant** and of **Temporary Effect**.

Scenario 2

Where adjacent TTM sections attract HGV movements at the same time, this can lead to cumulative impacts on sections of the local road network which will need to accommodate HGVs to and from more than one TTM section at the same time. Based on the construction programme, there are five examples where adjacent TTM sections will be active at the same time. These are illustrated in Table 14.9.

Table 14.9: Traffic Peaks when Considering Cumulative Effects of Adjacent TTM Sections – Scenario 2

Cumulative Impact Location	TTM Sections	Max Construction Vehicle Trips/Day	Estimated Duration of Cumulative Impacts
1	Section 1-Woodland Section 2-R156	1-Woodland: 86 2-R156: 86	7 days
2	Section 14-R403 Section 15-L2002 North	14-R403: 30 15-L2002 North: 4	1 day
3	Section 25-Grand Canal Section 26-R447	25-Grand Canal: 22 26-R447: 22	1 day
4	Section 29-Stephenstown Section 30-R412	29-Stephenstown: 18 30-R412: 22	1 day
5	Section-30 R412 Section-31 Dunstown	30-R412: 8 31-Dunstown: 140	1 day

The cumulative impacts at locations 2 to 5 are each expected to last for a single day. In addition, the cumulative daily construction vehicle trips at locations 2, 3 and 4 are relatively low, so the impacts at these sites are considered to be **Not Significant** and of a **Brief Effect**.

The cumulative daily construction vehicle trips generated by adjacent TTM sections are greater at location 1 (172 trips) and location 5 (148 trips). These cases are taken forward for more detailed analysis where the construction is assigned onto road links in proximity of the relevant TTM sections to assess whether any impacts arise at road and junction level.

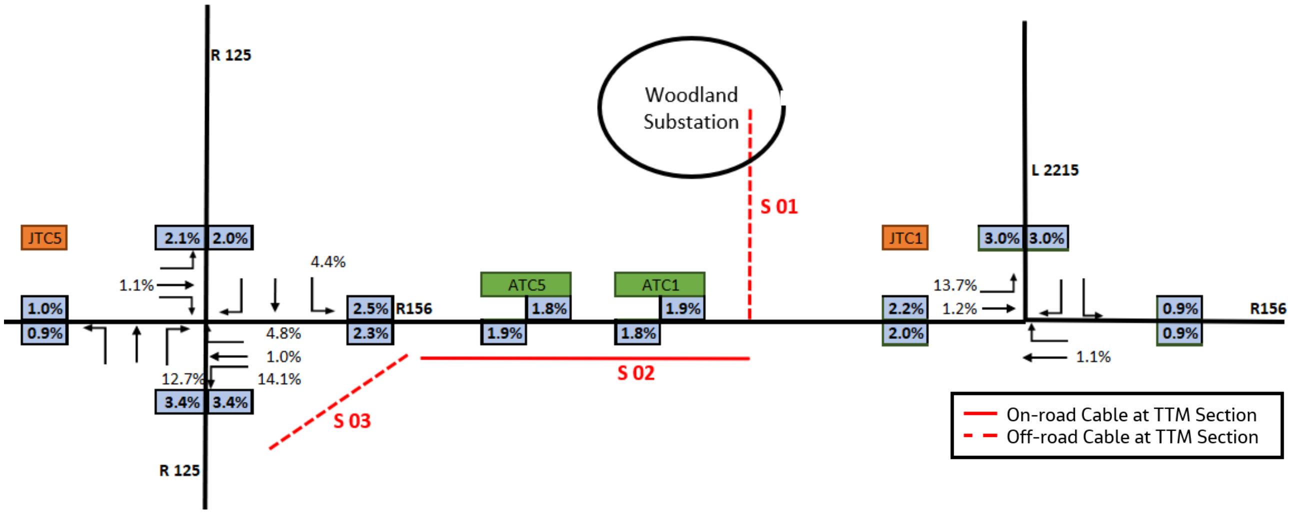
Location 1 (TTM Sections 1 and 2)

Plate 14.2 shows the peak construction traffic flows as a percentage of the baseline 2025 traffic on each link. The percentage impacts are below 10%, and so not significant, in all locations except for two: the left-turning movement from the R156 onto the R125 and the left-turning movement from the R156 onto the L2215, which carry 16 and 20 construction vehicle trips, respectively. From this information, it is clear that the impacts at these left turns are negligible and the percent impact is due to low background traffic levels.

The roads examined are located in a rural area and are not near any significant settlements. The R156 leads eastwards towards Dunboyne and goes near the M3 which is just over 7 km away.

When the peak flows shown in Plate 14.2 are expected, there will be nine passing bays along TTM Section 2. Since the construction traffic on this link is very low – it does not exceed 3% of baseline traffic – based on professional judgement, the combination of passing bays and additional construction traffic will not cause significant impacts. There will be no TTM measures active on nearby sections on this day.

Plate 14.2: Traffic Flow Diagram for TTM Sections 1 and 2



It is therefore concluded that the impacts at location 1 (TTM Sections 1 and 2) would be **Not Significant** and of a **Temporary Effect**.

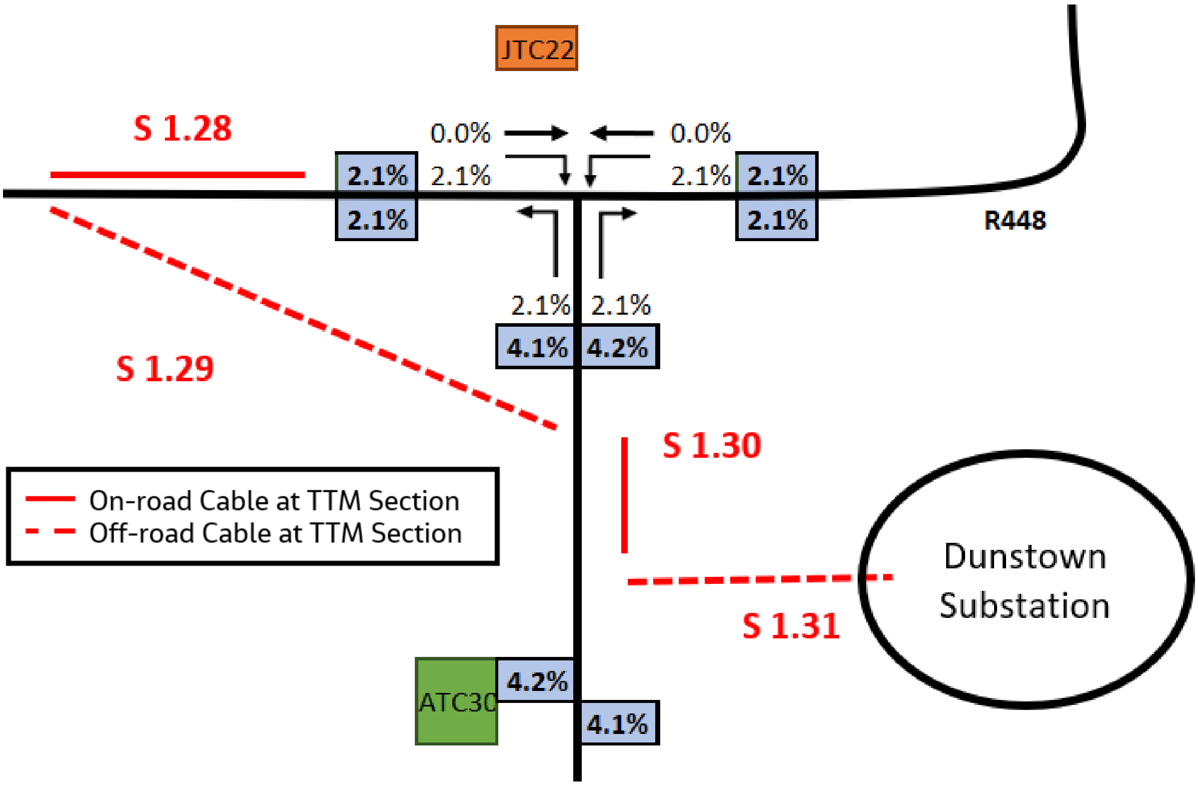
Location 5 (TTM Sections 30 & 31)

Plate 14.3 shows the peak construction traffic flows as a percentage of the baseline 2025 traffic on each link. The percentage impacts are all below 10%, and so not significant.

The roads examined are located in a predominantly rural area, the only settlement (Two Mile House) being located 900 m westwards of the junction marked as JTC 22 in Plate 14.3. Since there are no significant roads going through the settlement, and the regional roads that will be used to access TTM Sections 30 and 31 do not pass through it, no construction vehicles are expected to traverse Two Mile House.

When the peak flows shown in Plate 14.3 are expected, full road closures (with local access arrangements) will be active along TTM Section 30. Construction vehicles, which will be removing asphalt and excavated material and importing concrete to the site, are expected to access the site from either side of the road closure.

Plate 14.3: Traffic Flow Diagram for TTM Sections 30 and 31



Based on the assessment, it is concluded that the impacts at location 5 (TTM Sections 30 and 31) would be **Not Significant** and of a **Brief Effect**.

Scenario 3

During the peak period, it is forecast that a total of 430 construction vehicle trips will be made per day, and these will be associated with the following TTM sections:

- TTM Section 1 – Woodland;
- TTM Section 2 – R156;
- TTM Section 11 – R407;
- TTM Section 23 – Millennium Parkway; and
- TTM Section 27 – R448.

Construction vehicles associated with each of these sites have been collectively distributed across the study area network, and the percentage impact at each of the traffic survey locations in the study area is outlined in Table 14.10.

Table 14.10: Network Peak Construction Traffic at Counter Locations - Scenario 3

ATC	Construction HGV Trips per Day	2025 Background AADT	% Increase	JTC	Construction HGV Trips per Day	2025 Background AADT	% Increase
ATC 1	80	4,333	1.8%	JTC 1	80	4,881	1.6%
ATC 2	0	1,551	0%	JTC 2	0	6,292	0%
ATC 3	0	6,359	0%	JTC 3	0	9,920	0%
ATC 4	0	1,607	0%	JTC 4	0	8,651	0%
ATC 5	92	4,993	1.8%	JTC 5	92	4,766	1.9%

ATC	Construction HGV Trips per Day	2025 Background AADT	% Increase	JTC	Construction HGV Trips per Day	2025 Background AADT	% Increase
ATC 6	0	9,58	0%	JTC 6	0	9,582	0%
ATC 7	0	4,004	0%	JTC 7	0	8,077	0%
ATC 8	0	7,734	0%	JTC 8	39	10,457	0.4%
ATC 9	0	14,088	0%	JTC 9	0	15,939	0%
ATC 10	0	10,963	0%	JTC 10	0	14,905	0%
ATC 11	0	12,072	0%	JTC 11	0	12,440	0%
ATC 12	0	10,065	0%	JTC 12	0	6,209	0%
ATC 13	0	7,410	0%	JTC 13	0	9,262	0%
ATC 14	17	4,497	0.4%	JTC 14	0	18,145	0%
ATC 15	0	4,434	0%	JTC 15	64	22,927	0.3%
ATC 16	0	7,536	0%	JTC 16	0	13,363	0%
ATC 17	0	17,438	0%	JTC 17	0	4,643	0%
ATC 18	0	1,404	0%	JTC 18	0	3,243	0%
ATC 19	0	8,900	0%	JTC 19	0	2,466	0%
ATC 20	30	8,027	0.4%	JTC 20	0	3,516	0%
ATC 21	0	9,008	0%	JTC 21	0	13,146	0%
ATC 22	0	12,759	0%	JTC 22	23	4,861	0.5%
ATC 23	0	1,399	0%	JTC 23	0	14,729	0%
ATC 24	0	14,998	0%	JTC 24	0	11,818	0%
ATC 25	0	16,887	0%	JTC 25	0	23,928	0%
ATC 26	0	8,193	0%	JTC 26	43	13,874	0.3%
ATC 27	0	1,969	0%	JTC 27	0	14,951	0%
ATC 28	0	6,168	0%	JTC 28	0	7,481	0%
ATC 29	0	3,432	0%	JTC 29	34	14,670	0.2%
ATC 30	0	1,686	0%	JTC 30	0	14,215	0%

The percentage increase in traffic flows as a result of the additional construction traffic is below the 10% threshold value at all survey locations in the study area. It is acknowledged that there may be occasions when there are localised impacts during periods of construction which are linked to other TTM sections, and these have been assessed under Scenarios 1 and 2.

It should also be noted that the total number of construction vehicle trips made on the network during Scenario 3 (430 trips per day) is projected, under the construction programme, to only last for a period of two weeks. The total daily volume of construction vehicles on the network on any other day over the course of the construction programme is projected to be less than this volume. It is therefore considered that Scenario 3 represents a worst-case scenario in terms of the network-wide construction vehicle impacts. In addition, these impacts are considered to be **Not Significant** and of a **Temporary Effect**.

14.4.1.5 Diversion Routes

Around 44 km of the cable length will run in the road network. The TMP has identified a series of lane and full road closures during construction with the cable route split into a series of TTM sections. The closures planned for each TTM in-road section during the three construction phases are summarised in Table 14.11. Each lane closure and full road closure has an associated diversion route that is identified, along with illustrations, in the TMP. The expected journey time impacts and diversion route length are summarised in the following sections.

The diversion routes identified are in accordance with the Chapter 8 TII Guidelines "Temporary Traffic Measures and Signs for Roadworks", Section 8.2.4.6a of which states: "*Characteristics of the roads on the diversion route should be similar to the road to be closed. If this is not achievable, then it may be appropriate to consider the use of a single lane diversion for one direction of traffic only or two separate diversions for the traffic in each direction.*" In each case where a diversion is required, there are suitable alternative routes available.

Table 14.11: Summary of Lane and Road Closures Across the Construction Period

TTM Sections	Length (m)	Road	Joint Bay	Position	Road Width (m)	Phase 1&3 Traffic Measure	Phase 2	
							Traffic Measure	Diversion Route Length (km)
1.02	3860	R156	JB5	In-road	7.1	Passing Bay – single lane closure	Lane Closure with HGV diversion	27.4
			JB6	In-road	6.9	Passing Bay – single lane closure		
			JB7	In-road	6.7	Passing Bay – single lane closure		
			JB8	In-road	6.9	Passing Bay – single lane closure		
			JB9	In-road	7.0	Passing Bay – single lane closure		
1.04	3505	R125 North	JB11	In-road	6.6	Passing Bay – single lane closure	Full Road Closure	21.5
			JB12	In-verge	7.2	Temporary construction platform – single lane closure		
			JB13	In-road	4.9	Passing Bay – single lane closure		
			JB14	In-road	5.7	Passing Bay – single lane closure		
			JB15	In-verge	5.9	Temporary construction platform – single lane closure		
1.05	3850	R125 South	JB16	In-verge	5.8	Temporary construction platform – single lane closure	Full Road Closure	18.7
			JB17	In-verge	5.5	Temporary construction platform – single lane closure		
			JB18	In-road	5.8	Passing Bay – single lane closure		
			JB19	In-verge	5.5	Temporary construction platform – single lane closure		
			JB20	In-verge	14.4	Temporary construction platform		
1.06	200	R258	None	None	7.6	None	Lane Closure	3.6
1.08	545	R148	JB22	In-verge	8.5	Temporary construction platform	Lane Closure	5.0
1.10	460	R407 North	JB23	In-road	9.0	Passing Bay – single lane closure	Lane Closure	3.9

TTM Sections	Length (m)	Road	Joint Bay	Position	Road Width (m)	Phase 1&3 Traffic Measure	Phase 2	
							Traffic Measure	Diversion Route Length (km)
1.11	9370	R407	JB24	In-verge	5.0	Temporary construction platform – single lane closure	Lane Closure	17.1
			JB25	In-road	6.8	Passing Bay – single lane closure		
			JB26	In-road	9.8	Passing Bay – single lane closure		
			JB27	In-road	8.7	Passing Bay – single lane closure		
			JB28	In-road	8.9	Passing Bay – single lane closure		
			JB29	In-verge	7.9	Temporary construction platform		
			JB30	In-verge	6.9	Temporary construction platform – single lane closure		
			JB31	In-verge	5.0	Temporary construction platform – single lane closure		
			JB32	In-road	10.3	Passing Bay – single lane closure		
			JB33	In-road	7.3	Passing Bay – single lane closure		
			JB34	In-verge	6.1	Temporary construction platform		
			JB35	In-road	7.5	Passing Bay – single lane closure		
			JB36	In-verge	11.1	Temporary construction platform		
1.12	4145	R408	JB37	In-road	6.0	Passing Bay – single lane closure	Full Road Closure	9.6
			JB38	In-road	6.0	Passing Bay – single lane closure		
			JB39	In-road	6.0	Passing Bay – single lane closure		
			JB40	In-road	6.0	Passing Bay – single lane closure		
			JB41	In-road	6.0	Passing Bay – single lane closure		
1.14	1170	R403	JB43	In-road	6.5	Passing Bay – single lane closure	Full Road Closure	12.5
			JB44	In-road	6.5	Passing Bay – single lane closure		
1.15	3190		JB45	In-road	6.5	Passing Bay – single lane closure	Full Road Closure	6.7

TTM Sections	Length (m)	Road	Joint Bay	Position	Road Width (m)	Phase 1&3 Traffic Measure	Phase 2	
							Traffic Measure	Diversion Route Length (km)
		L2002 North	JB46	In-road	6.3	Passing Bay – single lane closure		
			JB47	In-road	5.7	Passing Bay – single lane closure		
			JB48	In-road	6.1	Passing Bay – single lane closure		
1.17	300	L2002 South	JB49	In-road	5.6	None	Full Road Closure	9.5
1.19	2480	Sallins Bypass	JB51	In-road	15.0	Single lane Closure	Lane Closure	5.6
			JB52	In-road	12.0	Single Carriageway closure – lane crossover		
			JB53	In-road	12.0	Single Carriageway closure – lane crossover		
1.21	100	Osberstown Road	None	In-road	5.2	None	Full Road Closure	4.8
1.23	2330	Millennium Parkway	JB55	In-road	9.0	Local road widening – single lane open	Lane Closure	5.7
			JB56	In-road	9.0	Local road widening – single lane open		
			JB57	In-road	9.0	Local road widening – single lane open		
1.24	1215	R409	JB58	In-verge	8.9	Temporary construction platform	Lane Closure	2.8
			JB59	In-verge	11.5	Temporary construction platform		
1.26	1440	R447	JB60	In-verge	13.2	Temporary construction platform	Lane Closure	2.0
			JB61	In-road	9.8	Local road widening – single lane closure		
			JB62	In-road	15.7	Lane Closure		
1.27	5260	R448	JB63	In-road	6.5	Road Closure	Full Road Closure	21.2

TTM Sections	Length (m)	Road	Joint Bay	Position	Road Width (m)	Phase 1&3 Traffic Measure	Phase 2	
							Traffic Measure	Diversion Route Length (km)
			JB64	In-road	8.0	Passing Bay – single lane closure		
			JB65	In-road	6.0	Passing Bay – single lane closure		
			JB66	In-road	6.0	Passing Bay – single lane closure		
			JB67	In-road	6.5	Passing Bay – single lane closure		
			JB68	In-road	6.0	Passing Bay – single lane closure		
			JB69	In-verge	6.0	Temporary construction platform – single lane closure		
1.28	400	R448 South	None	None	6.9	None	Full Road Closure	14.1
1.30	300	R412	None	None	5.3	None	Full Road Closure	14.2

Table 14.12: Summary of Lane and Road Closures Impacts Across the Construction Period

TTM Section	Cable Section Length	Location	Phase 1 and 3 Traffic Measures	Phase 2 Traffic Measures	Diversion distance	Diversion journey time increase	Driver delay significance
1.02	3.9 km	In-road	Single Lane Closure	Single Lane Closure with HGV Diversion	27.4 km	22 min	Moderate
1.04	3.5 km	In-road	Single Lane Closure	Full Road Closure (with local access arrangements)	21.5 km	12 min	Minor
1.05	3.9 km	In-road	Single Lane Closure	Full Road Closure (with local access arrangements)	18.7 km	11 min	Minor
1.06	0.2 km	In-road	None	Single Lane Closure	3.6 km	7 min	None
1.08	0.5 km	In-road	Temporary Construction Platform	Lane Closure	5.0 km	9 min	None
1.10	0.5 km	In-road	Passing Bay – Single Lane Closure	Lane Closure	3.9 km	9 min	None
1.11	9.4 km	In-road	Single Lane Closure	Single Lane Closure	17.1 km	15 min	Minor
1.12	4.2 km	In-road	Single Lane Closure	Full Road Closure	9.6 km	12 min	Minor
1.14	1.2 km	In-road	Single lane closure	Full road closure	12.5 km	15 min	Minor
1.15	3.2 km	In-road	Single lane closure	Full road closure	6.7 km	12 min	Minor
1.17	0.3 km	In-road	None	Full road closure	9.5 km	14 min	Minor
1.19	2.5 km	In-road	Single lane closure	Single lane closure	5.6 km	6 min	None
1.21	0.1 km	In-road	None	Full road closure	4.8 km	14 min	Minor
1.23	2.3 km	In-road	Lane closure	Lane closure	5.7 km	10 min	None
1.24	1.2 km	In-road	Lane closure	Lane closure	2.8 km	4 min	None
1.26	1.4 km	In-road	Lane closure	Lane closure	2.0 km	4 min	None
1.27	5.3 km	In-road	Single Lane Closure	Full Road Closure (with local access arrangements)	21.2 km	13 min	Minor
1.28	0.4 km	In-road	None	Full road closure	14.1 km	17 min	Minor
1.30	0.3 km	In-road	None	Full road closure	14.2 km	17 min	Minor

Diversion Impact Summary

The in-road TTM sections will impact drivers' route choices and cause some delays to diverted traffic.

To avoid the stop-and-go system at lane closures, and to circumvent the full road closures where they are implemented, drivers can follow the diversions outlined above. These are routed in accordance with TII Guidelines, so they follow roads of an appropriate standard. The driver delay impact is **Not Significant** (7 None and 11 Minor) in the vast majority of cases and all of these will be either **Brief** or **Temporary Effect**. Only in the case of TTM Section 2 is the impact categorised as **Significant** (Moderate). However, this impact is of **Temporary Effect**, and in reality, it is likely that a significant proportion of diverted traffic will dissipate throughout a number of alternative routes.

14.4.1.6 Community Impacts (Severance and Leisure Routes)

Increased traffic can impact communities, especially where urban streets become busier, and increase severance. There may also be impacts on cycle and pedestrian routes caused by construction and diversion routes.

To assess the impact on communities, pedestrian movements and cycle links, a desktop survey was carried out of such locations that are vulnerable to increases in heavy vehicle traffic. The potentially affected area is predominantly rural, with Naas being the most significant settlement near the cable route.

The IEMA Guidelines (IEMA, 1993) define severance as "*the perceived division that can occur within a community when it becomes separated by a major traffic artery*". Further, the IEMA Guidelines suggest "*a tentative threshold for judging the significance of changes in pedestrian amenity would be where traffic flows (or its lorry component) is halved or doubled*".

As shown in Table 14.8 and the detailed construction traffic analysis in Section 14.4.1.4, the levels of construction traffic are not expected to double the traffic flow anywhere in the study area. On this basis, and in relation to the IEMA Guidelines, the impact on severance is concluded to be **Not Significant** and of **Temporary Effect**.

Particular attention is given to Naas since it is the most significant settlement near the cable route. The underground cable in the Naas area passes through Kilcullen Road, South Ring Road, New Caragh Road and the R445 Millennium Park Road, all of which are ring roads. All of these roads provide pedestrian and segregated cycle facilities which may be affected by the construction works. Heavy vehicle traffic is not expected to impact the town itself, since access routes to the construction site will avoid the town area, and the total increase in traffic due to the construction is deemed to be not significant (Table 14.8).

Table 14.13 below highlights the main pedestrian crossings which will be impacted along the proposed route. The majority of crossings impacted are located in Naas; the final two in the table are located on the outskirts of Sallins.

Table 14.13: Pedestrian Crossings Affected

TTM Section	Location	Description
1.05 and 1.06	R158-L6228 Roundabout	Un-signalised pedestrian crossing at R158 Roundabout entrance and exit road. Cable will run through the crossing, and Joint Bay 20 is located at the roundabout.
1.11	R407-Duncreevan Rd junction	Un-signalised pedestrian crossings across the Duncreevan Rd. The cable route runs through the junction.
1.23	Millennium Rd Apple Green Roundabout	Un-signalised pedestrian crossing at roundabouts in front of Millennium Rd Apple Green Roundabout entrance and exit road. Cable will run through the crossing.
1.23	Millennium Rd Kerry Group Roundabout	Un-signalised pedestrian crossing at Millennium Rd Kerry Group Roundabout entrance and exit road. Cable will run through the crossing.
1.23	Millennium Rd Millennium Park Roundabout	Un-signalised pedestrian crossing at Millennium Rd Millennium Park Roundabout entrance and exit road. Cable will run through the crossing.
1.24	Radharc An Chaislean Roundabout	Un-signalised pedestrian crossing at Radharc An Chaislean Roundabout entrance and exit road. Cable will run through the crossing.
1.24	New Caragh Rd Roundabout	Un-signalised pedestrian crossing at Caragh Rd Roundabout entrance and exit road. Cable will run through the crossing.
1.25	Naas Historic Trail	Greenway will be affected by site works as the cable runs along a 400 m stretch of the trail between the R409 and R445.
1.26	Elsmore Glen Roundabout	Un-signalised pedestrian crossing at Elsmore Glen Roundabout entrance and exit road. Cable will run through the crossing.
1.26	R445 junction	Signalised pedestrian crossing at R445 junction. Cable will run through the crossing.
1.27	Pipers Hill Junction	Two signalised pedestrian crossings affected. (Pipers hill junction). Cable will run through the two crossings.
1.27	White Well Estate	Pedestrian crossing at entrance into White Well Estate. Cable will run parallel to crossing.
1.27	White Well Estate	Signalised pedestrian crossing outside White Well Estate. Cable will run through the crossing.
1.27	Killashee View Estate	Pedestrian crossing at entrance into Killashee View Estate. Cable will run parallel to crossing.
1.27	Broadfield Estate	Signalised pedestrian crossing outside Broadfield Estate. Cable will run through the crossing.
1.27	Broadfield Estate	Pedestrian crossing at entrance into Broadfield Estate. Cable will run parallel to crossing.
1.27	Esmondale Estate	Signalised pedestrian crossing outside Esmondale Estate entrance. Cable will run through the crossing.
1.27	Kilcullen Rd Roundabout	Un-signalised pedestrian crossing at Kilcullen Rd Roundabout entrance road. Cable will run through the crossing.
1.27	Kilcullen Rd Roundabout	Signalised pedestrian crossing on Kilcullen Rd Roundabout exit onto South Ring Road. Cable will run through the crossing.

Table 14.14: Cycle Facilities Affected

TTM Section No.	Location	Description
1.07	Royal Canal Greenway north of R148 Bridge	Cable route crosses the Greenway.
1.23	Millennium Rd	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.24	New Caragh Rd Roundabout	Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.25	Naas Historic Trail	Greenway will be affected by site works as the cable runs along a 400 m stretch of the trail between the R409 and R445.
1.26	South Ring Road	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.27	Killashee Primary School	Cycle lane begins at this location. Shared pedestrian/cycle facility. Cable layout runs parallel with facilities. Cycle facilities located on east side of road.
1.27	Pipers Hill Junction	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.27	White Well Estate	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.27	Killashee View Estate	Cycle facilities continue up to this point. Shared pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.27	Broadfield Estate	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.
1.27	Esmondale Estate	Cycle facilities continue up to this point. Segregated pedestrian/cycle facility. Cable layout runs parallel with facilities. At this point cycle facilities are located on both sides of the road.

Table 14.14 above highlights the current cycle facilities that may be temporarily affected by the installation of the cable. Along the Kilcullen Road and South Ring Road there is a combined cycle route length of 3.23 km. These facilities are a mixture of shared and segregated. Along the New Caragh Road and R445 Millennium Park Road there is a combined cycle route length of 3.63 km. These facilities are a mixture of shared and segregated.

In conclusion, while there are number of pedestrian and cycle routes which have been identified as being impacted along the route, due to the low construction volumes and the temporary nature of the impacts, the impact on severance is concluded to be **Not Significant** and of **Temporary Effect**. Notwithstanding, the TMP includes a commitment to provide advance warning of diversions and roadworks, as well as clear signage and physical barriers for walkers, cyclists and horse-riders, to reduce the risk of incursion within work zones or live traffic lanes.

14.4.1.7 Other Road Uses

The Drehid Landfill is located north-west of Prosperous and is served by heavy vehicles delivering waste to the facility. Some of the haulage routes designated for this purpose overlap with the cable or diversion routes:

- TTM Section 14 on the R403 between Clane and Prosperous;
- Diversion route for TTM Sections 15 and 17 on the R407 south of Clane, towards Naas;
- TTM Section 23 on the Sallins Road, northwest of Naas; and
- TTM Section 27 south of Naas on R448.

The abundance of haulage routes available to access the Drehid Landfill make it possible to circumvent the road closures that will be active along the road sections identified above. The disruption will be insignificant since the construction of the Proposed Development will result in only temporarily longer journey times for the landfill deliveries.

14.4.2 Operational Phase Considerations

The operational phase of the Proposed Development will not cause any discernible impacts on traffic since all roads will be restored to their original state after the construction is finished, and the presence of the Proposed Development along some portions of road in the study area will not affect traffic flows. Operational traffic and transport impacts will therefore be Negligible.

Where maintenance is needed along the cable, the traffic impacts will depend on the specific circumstances of the maintenance activity. The link box will require periodic inspection, for which localised, temporary traffic management will be devised by the contractor that carries out the inspection. Any maintenance-based traffic impacts would be temporary and therefore considered to be not significant.

14.5 Mitigation Measures

14.5.1 Traffic Management Plan (TMP)

The temporary impacts that the construction will have on traffic and movement through the area will be mitigated through the adoption of a regulated and approved TMP.

The TMP is provided in Appendix 5.1. It should be noted that both the TMP and CEMP are included in the application and have been considered for the purposes of assessment, but they be 'live' documents and subject to ongoing future refinement by the appointed contractor in collaboration and agreement with the Roads Authorities. However, all such refinement will occur in the context of the TMP (and CEMP) submitted as part of this application for approval, and therefore the subject of the assessment of the consenting authority.

The appointed contractor will agree temporary traffic measures, and will then adopt and monitor an appropriate way of working, in consultation with Kildare and Meath County Councils, TII and/or their agents, and An Garda Síochána as appropriate. Construction traffic will travel on predefined routes to and from the relevant sites to reduce the effects on local traffic.

The TMP will document measures to help efficiently transport components and materials to site, while reducing congestion and disruption which might impact negatively on local communities or general traffic and, in particular, emergency services.

Signed diversion routes, outlined in this chapter but with final agreement with the Roads Authorities, will be provided to mitigate journey disruption, and to minimise potential driver delay. Where practically achievable, diversion routes will not apply outside of the worksite hours of operation.

During the construction phase, signage will be installed to warn road and recreational route users to the presence of the works access and the associated likely presence of large or slow-moving construction traffic.

To minimise inconvenience to the local community in terms of obstructive parking, adequate car parking for permanent site personnel, visitors and deliveries will be provided within the site compounds. Car parking will not be permitted on any public road network adjacent to the site, to maintain sight lines and minimise the potential for obstruction and delay for other road users.

Furthermore, only vehicles needed for construction will be permitted to attend cable route worksites. Car sharing will be promoted to construction personnel by the contractor during the induction process.

The appointed contractor will nominate a person to be responsible for the coordination of all elements of traffic and transport during the construction process (liaison officer). This person will liaise with the local community, and be a direct point of contact within the contractor organisation for the community to contact for information or to discuss the traffic management.

14.5.2 Construction Access Arrangements

Transportation, including deliveries to and from the construction areas, will be via the existing public road network. Given the nature of the cable route's construction, there will be multiple worksites along the route throughout the construction programme. The proposed programme of worksite locations will be confirmed by the appointed contractor as an integral part of their adopted TMP. All construction vehicle drivers will be instructed to access their destination worksite via an approved route.

14.6 Residual Effects

There are no significant residual traffic and transport effects predicted during the construction and operational phases when taking into account the mitigation measures described above and contained within the TMP. It is acknowledged that inconveniencies will be caused in some areas due to the diversion routes and construction of the cable route. Each route will only be affected temporarily while construction passes through

14.7 Conclusions

Traffic surveys were completed in the study area in autumn 2022, and these were used to inform the assessment of the construction phase. A full assessment has been made of the roads affected by the Proposed Development and is presented in the TMP. This assessment has broken down the cable route into sections and identifies how the construction works will affect each section of road – whether it be a lane closure, diversions, and/or road closure with local access. The potential disruption to road users has been considered. Of the 31 TTM sections along the approximately 53 km cable route, one section (4 km in length) will have a Moderate effect. This section (labelled 1.02), along the R156 in County Meath, will have a significant effect as a result of the proposed single lane closure with HGV diversion. There will be a large diversion that will be signposted from the affected regional road to an alternative regional road. While the effect will be Moderate, the impacts will be limited to the construction of the cable trench, which will be a temporary impact – approximately 20–50 m of cable trench can be constructed in one day. The other sections of roads will experience no effects or effects assessed to be Minor. Other effects to public transport users or community severance have been assessed to be Not Significant.

15. Material Assets – Agriculture & Equine

15.1 Introduction

This chapter presents the assessment of potential impacts on Material Assets – Agriculture and Equine arising from the construction and operation of the Kildare – Meath Grid Upgrade project.

15.2 Methodology

This chapter is prepared in accordance with the standard guidelines for environmental assessment published by the EPA in May 2022. The assessment of agricultural and equine impacts involves:

1. Evaluation of the baseline environment, the types of farms and the sensitivity of farms and equine facilities along the Proposed Development;
2. Evaluation of the nature and magnitude of the impacts on farms along the entire route of the Proposed Development and the effects on agriculture within County Kildare and County Meath (i.e. regional effects); and
3. Having considered the sensitivity of the baseline agricultural and equine environment and the magnitude of effects, the effect significance is predicted for:

- Each affected land parcel affected along the route of the Proposed Development;
- Agriculture including Equine along the Proposed Development (i.e. locally); and
- Agriculture including Equine within County Kildare and County Meath (i.e. regionally).

These three elements of the methodology are described in Sections 15.2.2, 15.2.3 and 15.2.4. It is important to note that this agricultural and equine assessment considers the changes that would occur to the agricultural and equine environment.

15.2.1 Data Sources Used in the Assessment

The following data sources were relied upon;

- Census of Agriculture 2020 (CSO.ie). The average size and type of farms in County Kildare and County Meath was determined from the 2020 Census of Agriculture.
- Your Grid, Your Views, Your Tomorrow – Responding to Equine Concerns (EirGrid, 2014)110
- Land Registry mapping available on PRAI.ie was used to determine land ownership boundaries of farms along the Proposed Development;
- Baseline information gathered from roadside surveys in March 2021 and February 2023 was used to assess impacts on individual farms;
- Information from EirGrid Agricultural Liaison Officers based on their professional experience and engagement and consultation with affected land owners;

[110] https://www.eirgridgroup.com/site-files/library/EirGrid/EirGridEquineReview.pdf

- Aerial Photography and mapping was used as an aid in examining farm layout and land quality; and
- Baseline crops and grass yield data. Average crop yields 2008 – 2021 is available from the CSO, Crops and Livestock June Final Results (data accessed in December 2022). Baseline grass yields and trends were derived from Teagasc Ballyhaise Agricultural College 2008 – 2017 and UCD from 2016 – 2020 (data accessed in December 2022). This information is used to determine baseline trends as outlined in Section 15.2.3 when assessing magnitude of impact.
- the Meath County Development Plan 2021 – 2027 (Meath County Council, 2021), Kildare County Development Plan 2017 – 2023 (Kildare County Council, 2017) and Kildare County Development Plan 2023 – 2029 (Kildare County Council, 2023); and
- information from public consultation (Traverse, 2022).

15.2.2 Evaluation of the Baseline Environment

Background information was gathered on all farm types and sizes along the Proposed Development from the 2020 Agricultural Census data, consultation with EirGrid Agricultural Liaison Officers, roadside surveys conducted in March 2021 and February 2023 and examination of aerial photography.

15.2.3 Evaluation of the Magnitude of Impact

The magnitude of the potential effects is assessed by predicting the change on the affected land parcel or on agriculture along the route of the Proposed Development. For example, if the Proposed Development takes 10% of an affected agricultural land parcel, and provided the farm enterprise can continue during the operational phase of the Proposed Development, it is possible to predict that the yield from the land parcel will be affected by approximately 10%.

In order to quantify the magnitude of the effect, typical baseline trends[111] in the agricultural environment are examined and interpreted using professional judgement. Therefore, effects which result in a 2.5% to 5% variation in yield are considered to create a low magnitude effect on the farm and are similar to natural baseline trends in yield. Between 5% and 10%, the magnitude of yield loss is starting to exceed the natural baseline trends and is considered medium magnitude. Yield effects which exceed 10% are considered to be high magnitude. Other factors affect the magnitude of effects such as, severance or separation of land, the duration of effect, the quality of land affected and impact on farmyards and other farm facilities. Table 15.1 shows the criteria which are used to indicate the magnitude of effect – these criteria are based on analysis of baseline trends in crop yields and the author's professional judgment.

[111] According to CSO data (2008 – 2021) the yield of spring barley and winter wheat has varied by approximately 8.5% and 8.3% respectively from the average mean yield. Teagasc data for grass production at Ballyhaise Agricultural College (2008 – 2017) shows the natural trend is for grass production to vary on average by 7.7% from year to year. UCD data for grass production at Lyons Estate (2016 – 2020) shows the natural trend is for grass production to vary on average by 5.9% from year to year.

Table 15.1: Criteria for the Assessment of Magnitude of Effects

A high proportion of the land permanently taken (e.g. >10%) A high proportion of farm permanently separated (e.g. > 15%) Farm buildings or water sources may be affected permanently	High – Very High
A medium proportion of the farm permanently taken (e.g. 5% -10%) A medium proportion of farm permanently separated (e.g. 7% -15%) Farm buildings or water sources may be affected but can be replaced Temporary (construction) impacts which have long term effects	Medium
A small proportion of the farm permanently taken (e.g. 2.5% - 5%) A small proportion of farm separated or no separation (e.g. 2.5% - 7%) Farm buildings or water sources generally not affected but if affected can be replaced Temporary (construction) impacts which have short – medium term effects	Low
A very small proportion of the farm taken (e.g. <2.5%). A very small proportion of farm separated or no separation (e.g. <2.5% of the farm) Temporary (construction) impacts which do not have residual effects	Negligible – Very Low

Impacts that occur during the construction phase would generally result in low or very low magnitude because of the short duration (e.g. construction noise and vibration). Medium magnitude effects may arise during construction where for example there is a long-term effect on land drainage as a result of the construction activity; however, generally the effect magnitude is low after mitigation.

15.2.4 Evaluation of the Significance of Impact

Once the description of the effect, including magnitude, character, duration etc. has been identified, this can be cross-referenced with the sensitivity of the receptor to derive the overall significance of effect as per Section 3.7.3 of the May 2022 EPA guidelines. An effect which affects a farm with a low sensitivity will not be as significant as a similar magnitude of effect which affects a farm with a high sensitivity. In Table 15.2 the EPA guidelines for assessing significance have been adopted with minor adjustments that are appropriate for agricultural impact assessment. In general, the effects from the Proposed Development on agriculture are adverse in nature.

Table 15.2: Comparison of Significance of Effect Criteria Used in this Assessment with the EPA 2022 Guidance

Imperceptible An effect capable of measurement but without significant consequences	**Not Significant** An impact which may result in measurable effects and / or noticeable changes but the consequences are not significant.
Not Significant An effect which causes noticeable changes in the character of the environment without significant consequences	
Slight An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.	**Slight Adverse Effect** An effect which causes noticeable changes in the character and management of a farm in a minor way. The farm enterprise experiences inconvenience as a result of the proposed road development.
Moderate An effect that alters the character of the environment in a manner that is consistent with existing emerging trends.	**Moderate Adverse Effect** An effect which alters the character of a farm in a manner that requires moderate changes in the management and operation of the farm. The farm enterprise can be continued as before but with increased management or operational difficulties.
Significant	**Significant and Very Significant Adverse Effect**

An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.	An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the farm. The farm enterprise can be continued but will require major changes in management and operation of the farm. This would typically occur where the farm was split in two due to separation but where access between the separated portions and the farm buildings could still be achieved effectively. Assuming the enterprise can continue the degree of change in the management and operation of the farm will determine whether the effect is Significant or Very Significant.
Very Significant An effect which by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment.	
Profound An effect which obliterates sensitive characteristics.	**Profound Adverse** An effect which obliterates sensitive characteristics of the farm. The farm enterprise cannot be continued as a result of the Proposed Road Development. This would occur where land-take was of such a scale that the remaining land would not form a viable unit or where separation was of such a nature to make the holding unworkable or where important farm buildings and facilities were removed and could not be replaced. In some situations the farm enterprise may continue but will require dramatic changes in the future management and operation of the farm, such that the scale and operation of the enterprise is changed dramatically.

Source: Based on Table 3.4. EPA's 'Guidelines on the information to be contained in environmental impact assessment reports' (EPA, May 2022)

When assessing significance of effects, the basic principle which applies is as sensitivity increases so also does the significance of effect, at any one level of magnitude. This assessment is subject to variation due to professional judgement on a case-by-case basis.

15.3 Baseline Conditions

15.3.1 Land Quality and Soil Types

The soils along the Proposed Development consist of mainly Surface Water Gleys in the area north of Clane and a combination of Luvisols, Brown Earths and Alluvial soil types to the south of Clane. In general the land quality along the Proposed Development is good quality. The Surface Water Gleys are more suited to grass production while Luvisols and Brown Earths are more versatile and are also suited to tillage. However, in the east of the country Surface Water Gleys are often used for tillage due to the low rain fall. The land quality is suitable to support very high sensitive enterprises such as stud farms and high sensitive enterprises such as dairy enterprises. Farm Types and their sensitivity are described below Table 15.3 and Table 15.4.

15.3.2 Farm Types

Table 15.5: Comparison of Farm Types and Sensitivity

Enterprise Size & Type[112]	County Kildare	County Meath	Along Proposed Development[113]	National	Sensitivity
Average farm size (ha)	44.8	43.8	44[114]	33.4	-
Tillage / Beef / sheep / mixed / grass cropping (%)	92	88	85	85	Medium
Dairy (%)	6	11	1	11	High
Other (mainly equine) (%)	2	1	14	1	Medium – very high
[115]Number of horses / km^2	4.6	2.4	-	2.3	-

The average size of farms along the Proposed Development is likely to be reflective of the County averages and therefore is larger than the national average (approximately 44 ha versus 33.4 ha). The majority of the farm enterprises along the Proposed Development are medium sensitivity (i.e. beef / sheep / tillage / grass cropping). A comparison to the national statistics shows that within County Kildare the number of dairy farms is lower than the national average while the concentration of equines is significantly higher. Within County Meath (approximately 37% of the Proposed Development) the number of dairy farms and number of equines is similar to the national average.

Of the 68 land holdings where direct effects arise from the Proposed Development there are ten farms with horses (15%) and one high sensitivity dairy farm (1%). Of the ten equine enterprises, three are very high sensitivity stud farms, three are high sensitivity equine enterprises and four are medium sensitivity equine enterprises.

Table 15.6: Farm types and sensitivity along the Proposed Development

Enterprise Size & Type	Number along Proposed Development	Sensitivity
Beef / sheep / mixed / grass cropping	48 (71%)	Medium
Tillage	9 (13%)	Medium
Dairy	1 (1%)	High
Equine	3 (4.5%) 4 (6%)	High Medium
Stud Farms	3 (4.5%)	Very High

15.4 Assessment of Potential Effects

15.4.1 Potential Construction Effects

A detailed description of the proposed construction works is provided in Chapter 5.

15.4.1.1 Potential Construction Effects Where Construction Works are Entirely In-Road

The installation of an underground cable in-road may have potential effects on a particular farm adjoining these works for a period of two to three months; based on a rate of construction of 40-50 m per day. During the construction period the following effects may arise:

[112] 2020 Agri Census - https://www.cso.ie/en/releasesandpublications/ep/p-coa/censusofagriculture2020-preliminaryresults/farmstructure/

[113] These figures relate to the 68 land holdings where there are direct effects from the Proposed Development i.e. either temporary or permanent land-take or wayleaves

[114] The average size of directly affected land parcels is 27.4ha. However, it can be assumed that the average size of directly affected farms is similar to the county average, i.e. 44ha, when outlying lands remote from the Proposed Development are included.

[115] 2010 Agri Census; area based on Table 1, number of equines based on Table 8D; equine data only available from 2010 data at time of publication

- Construction dust, noise and movement:
    - The potential noise and dust effects will arise from the movement of construction machinery and excavation and handling of soil materials. Deliveries of materials and construction machinery noises and movements have the potential to startle livestock in adjoining agricultural land;
    - The likely effects resulting from dust from in-road construction sites will not have a significant effect on grazing livestock (including equines) and livestock (including equines) habituate to machinery and construction noises on farms without adverse effects. Therefore before mitigation the potential effect from construction dust, noise and movement is assessed as not significant;
- Disturbance to land access in relation to farm machinery and livestock movements.
    - The potential effect will result from disturbance and delays caused to local traffic during the construction phase. This has a potential effect on how farmers access their lands to carry out essential activities such as spreading of fertilisers and slurry and harvesting crops. It is a necessary requirement that bulk deliveries of farm inputs such as fertiliser and feed are unrestricted and that milk lorries have access to dairy farms to collect milk. Similarly access for tractors and HGVs to and from grain stores will be maintained subject to the proposed traffic management measures. It is essential that equine transport is not significantly disrupted. The movement of livestock along country roads in order to access outlying grazing land or housing is commonplace in Ireland and within the study area. It may arise more frequently on some dairy farms where a herd of cows may cross a public road to gain access to the milking parlour. Before mitigation this disturbance could have effects which are slight - moderate adverse because the disruption to land access could have severe effects but will only be short term. However, with mitigation this potential effect is assessed as not significant. While it is envisaged that there will be disturbance and inconvenience for several months due to traffic management on the public road network, the construction and traffic management plan commits to maintain effective access to agricultural land by farm machinery, transport lorries and livestock transport and movement;
- Disturbance to land drainage and water quality; and
    - The potential effect will result from construction activities interfering with surface water run-off from or to adjoining agricultural lands. There is the potential to cause flooding if drainage is impeded. Where there is sediment or construction material run-off from the construction site it has the potential to pollute water sources for livestock and potable water sources for farmyards and dwellings. Before mitigation this potential effect is assessed as not significant. The risk from construction effects on potable and livestock water sources is very low. Intersection of land drains from adjoining agricultural land is unlikely during in-road construction.

15.4.1.2 Potential Construction Effects Where Construction Works are Off-Road in Agricultural Land

The construction of an underground cable trench in agricultural land may typically take two to three months; based on a rate of construction of 40-50 m per day (additional time will be required for construction of access tracks, cable jointing and energ354354isation – see Chapter 5 for details). During this period direct effects are predicted to arise at 68 farms along the Proposed Development where works will be carried out in agricultural land. The particular elements of the proposed development which will be constructed on agricultural land include:

1. Where constructed within agricultural land there will be a 30 m wide construction working area. Within this area there will be a haul road along the cable trench. Where directional drilling is required (e.g. some water and road crossings) additional working areas will be required. Laydown areas will be required for the delivery of material to the construction site;
2. An underground trench approximately 1.5 m wide and 1.7 m deep containing the underground cables will be excavated and back-filled. There will be a permanent 5 m wide easement above this trench;

3. Joint bays, communication chambers and link boxes are located on average in 745 m intervals. These elements will be contained in a precast concrete box measuring approximately 10 m long x 2.5 m wide. Where located in agricultural land the surface of the concrete box will be visible at ground level and there will be a 3 m wide hard standing area around each joint bay. Permanent access tracks are required to access some joint bays;
4. Temporary construction compounds (No. 5 in agricultural holdings) are required for storage of machinery and materials; and
5. Passing bays located on agricultural land. These are areas adjoining the public road network where the local traffic can travel over when the local road is partially or wholly blocked due to the construction of joint bays These areas will be used for the construction period after which they will be reinstated and returned to agricultural use.

During the construction period the following effects may arise:

- Disturbance and damage to land
    - Temporary land-take will occur along the working area and at the sites of the construction compounds, stream and river crossings and traffic passing bays. The 30 m wide construction working area and passing bays will be fenced off for a period of approximately two to three years potentially affecting two cropping years and reducing land available for grazing, forage production and cropping. The construction compounds will be fenced off for a period of approximately 42 months potentially affecting five cropping years. The excavation of a 1.5 m wide trench, stripping of topsoil and movement of heavy machinery will disturb the soil structure and natural drainage. It is likely that the trench will intersect with land drains from adjoining agricultural land and this would interfere with land drainage. While the reinstatement works will adhere to best practice and in doing so will restore the land to its pre-works condition. this assessment assumes a worst-case scenario where the damage to land will have a medium-term effect (i.e. in exceptional cases this could take 7 to 15 years to recover but based on previous similar projects, this is likely to be much quicker. Where concerns are raised by affected landowners, additional reinstatement will be put into place to resolve the concerns).) on areas that are directly disturbed. These areas will show a gradual improvement in structure such that there is no difference in production levels between these disturbed areas and adjoining undisturbed areas after this time period has elapsed. Where the working areas cross agricultural land severance of services such as pasture water pipes and power cables (electric fencing) may necessarily occur. Such severance of services would be temporary and alternative fit for purpose water and fencing would be provided immediately.
    - There are thousands of kilometres of gas and water pipelines throughout Ireland which have similar effects on land. Due to the duration of impact and restoration of affected working areas and compounds the effects are slight – moderate adverse before mitigation and generally not significant to slight adverse with standard mitigation and best practice for reinstatement works.
- Construction dust, noise and movement
    - The potential noise and dust effects will arise from the movement of construction machinery and excavation and handling of soil materials. Deliveries of materials and construction machinery noises and movements have the potential to startle livestock in adjoining agricultural land.
    - The likely effects resulting from dust from off-road construction sites will not have a significant effect on grazing livestock (including equines) and livestock (including equines) habituate to machinery and construction noises on farms without adverse effects. Therefore, before mitigation the potential effect from construction dust, noise and movement is assessed as not significant.

- Disturbance to land access in relation to farm machinery and livestock movements
  - In addition to disturbance on the local road network the construction of the underground cable on agricultural land will interfere with access within farms. The working areas will be fenced off for a period of approximately two to three years. This will potentially affect how farmers access their lands to transport farm produce and inputs and to carry out essential activities such as spreading of fertilisers and slurry and harvesting crops.
  - Before mitigation this could have effects which are slight – significant adverse depending on the degree of severance. While it is envisaged that there will be disturbance and inconvenience for a two to three year period due to fencing off of the working areas, when temporary access points are provided across the working area this potential effect is assessed as not significant;
- Disturbance to land drainage and water quality
  - The potential effect will result from construction activities interfering with surface water run-off from or to adjoining agricultural lands and interference with land drainage. Severing land drains would impede drainage and possibly cause flooding in adjoining land. Where there is sediment or construction material run-off from the construction site it has the potential to pollute water sources for livestock and potable water sources for farmyards and dwellings. The presence of joint bays on agricultural land may potentially sever or block land drainage systems.
  - Before mitigation this potential effect is assessed as not significant – moderate adverse. Intersection of land drains from adjoining agricultural land is likely during off-road construction. The risk from construction effects on potable and livestock water sources is very low. With mitigation the potential effect is not significant.

15.4.2 Potential Operational Effects

The following effects could arise during the operation phase:

- Permanent land-take
  - Where the cables occur on agricultural land there will be a permanent 5 m wide easement. Permanent land-take of agricultural land will be required at the site of joint bays and the roads required to access these areas. The total permanent land-take area due to pipeline easement and joint bays on agricultural land for the Proposed Development is approximately 11 hectares;
- Permanent disturbance
  - There will be 1,000 mm of topsoil above the cables in agricultural land which will facilitate activities such as ploughing and there will be no significant restriction on normal agricultural activities. The areas of ground occupied by the joint bays, hard standing and the access tracks will not be available for agricultural use. While the proposed cable development does not cross existing commercial forestry, future land use such as commercial forestry and tree planting will be set back from the cable route. The set back distances will be agreed between EirGrid and ESB and affected landowners on a case by case basis depending on what tree species are planted. Please see Chapter 17 (Landscape) of this PECR for further details on tree and hedgerow planting. Building agricultural buildings in close proximity to the cable will also be subject to restrictions and agreement from ESB. The cable will require routine maintenance along the entire length of the cable route. Inspection vehicles and personnel will access joint bays, link boxes and communications chambers on an annual basis for inspection and for any necessary maintenance. This has the potential to cause damage to field

surfaces and disturbance to livestock. Before mitigation the effect from permanent disturbance is not significant;

- Electric and Magnetic Fields (EMF)
    - This assessment relies on information provided in Chapter 7 of this PECR which concludes that the electromagnetic fields produced by the Proposed Development will not significantly affect the health of farmers or their livestock. The food quality standards written by Bord Bia for Beef, Lamb, Milk and Cereals do not refer to electromagnetic fields and therefore there are no significant effects on food quality. Before mitigation the effect from EMF is not significant.

15.5 Mitigation Measures

15.5.1 Construction Phase Mitigation

The following mitigation measures will be implemented to address the impacts on agriculture (including equine):

- The appointed contractor will maintain close liaison with local community representatives and landowners to provide them with adequate progress information and advance notice of works. This will facilitate planning the maintenance of access to land to match the needs of the landowner. Scheduling of works will have to be agreed with each landowner to facilitate the operation of the farm and minimise disturbance. Where it is necessary to move livestock along public roads or across the working area this will be facilitated by the appointed contractor;

- Landowners with lands adjoining sites where rock breaking takes place will be notified in advance of these activities;

- Traffic management plans will ensure that farmers and agri-business have adequate access to farmyards and land so that the transport of farm inputs and produce is not significantly affected;

- Mitigation measures for the control of dust as set out in Chapter 8 (Air Quality) will be implemented by the appointed contractor;

- Mitigation measures for the control and monitoring of water quality and as set out in Chapter 12 (Hydrology) will be implemented by the appointed contractor;

- Mitigation measures for the control and monitoring of noise and vibration as set out in Chapter 9 (Noise and Vibration) will be implemented by the appointed contractor;

- The appointed contractor will comply with any regulations pertaining to the control of farm diseases as specified by Department of Agriculture Food and the Marine and will employ reasonable and best practice precautions against spreading any such farm disease. ESB and/or its appointed contractor will also take due notice and consideration of reasonable concerns expressed by landowners or occupiers prior to entry; and

- The appointed contractor will adhere to mitigation specified in this PECR and the Construction Environmental Management Plan (Appendix 5.4) in relation to issues such as; avoidance of staying livestock, maintenance of adequate pre-entry records, facilitating the provision of timber from the working area to landowners, provision of fit for purpose temporary fencing for the reasonable needs of landowners and the reinstatement of boundaries, farm roads or pathways, field drainage systems (if affected) and field surfaces (topsoil).

15.5.2 Operational Phase Mitigation

- The drainage reinstatement shall not impede the drainage of surrounding agricultural lands and where land drains have been intersected or blocked during construction these will be re connected or diverted to a suitable outflow;
- The loss of agricultural land due to the construction of the Proposed Development would be a permanent loss which cannot be mitigated except through compensation. Restriction of Common Agricultural Policy (CAP) payments, farmyard building, commercial forestry and commercial tree planting will be addressed by compensation where applicable; and
- Routine maintenance and inspection of cable infrastructure will be notified in advance to minimise disturbance to livestock and farm enterprises.

15.6 Residual Impacts

The construction and operation of the Proposed Development which is located entirely in-road i.e. within the public road network, will not significantly affect agriculture (including equine).

15.6.1 Residual Impacts on Individual Land Parcels

Table 15.7: Summary of Residual Impacts on Land Parcels along the Proposed Development

Impact Level	Number along Proposed Development	Number along Proposed Development with permanent easements or land-take
Not significant	60	35
Slight adverse	8	8
Moderate adverse	-	-
Significant adverse	-	-
Very significant adverse	-	-
Profound adverse	-	-
Total	**68**	**43**

The effects are confined to very small areas and typically at the edge of the land parcel. In the majority of affected land parcels the effects arise from passing bays or construction at watercourse crossing points. The construction works and traffic diversions at these sites is temporary (i.e. a low number of months) and the typical area of passing bays is less than 0.25 hectares. The construction area at the smaller watercourse crossing sites is typically less than 0.15 hectares. The construction area at directional drilling sites is typically less than 0.5 hectares. The agricultural land at these sites will be reinstated within two to three years. In the five land parcels where construction compounds are located the land will be unavailable for agricultural land use for the entire period of the Project construction i.e. 42 months. Of these five land parcels there will be two slight adverse residual impact. The area around joint bays and the access tracks to the joint bays will be permanently lost to agricultural production. The permanent easements will place an additional permanent disturbance effect on the affected land parcel because these easements will be inspected on a regular basis, for example, joint bays will be inspected once per annum. Of the 68 land parcels where there are direct effects on agricultural land the residual impact is assessed as not significant in sixty. Slight adverse residual impacts arise in eight land parcels. All the slight adverse residual impacts arise in land parcels where there is a permanent easement. None of the slight adverse residual impacts affect highly or very highly sensitive enterprises.

15.6.2 Residual Impacts on Agriculture Along the Proposed Development and on Agriculture within the Region (i.e. County Kildare and County Meath)

Sixty-eight farms are directly affected. These farms have a combined area of approximately 1,900ha[116]. The total area required for the construction of the Proposed Development represents approximately 2.5% of this area (approximately 41 ha of temporary land take and 11 ha of permanent easements and land-take). The majority of this directly affected area will be required on a temporary basis. Eighty-eight percent of the land parcel impacts are in the not significant impact category and twelve percent are in the slight adverse impact category. Therefore, the overall impact on agriculture (including equine) along the Proposed Development is not significant.

The agricultural land-take required for the entire development is approximately 41 ha. The total area (permanent and temporary) represents less than 0.02% of the entire agricultural area of County Kildare and County Meath[117]. Impacts on these small areas are not significant at a regional level.

Table 15.7 summarises the individual farm impacts and a more detailed assessment is provided in Appendix 15.1.

15.7 Conclusion

Significant impacts on agriculture and equine will not arise where the Proposed Development is constructed in-road. There are forty three land parcels where there will be permanent easements or land-take required for the underground cable, access roads and joint bays. Where the construction works are off-road there will be eight locations where slight adverse residual impacts arise due to the Proposed Development and the remaining sixty directly affected farms will have not significant residual impacts. None of the slight adverse residual impacts affect highly or very highly sensitive enterprises.

The overall residual impact on agriculture and equine along the entire Proposed Development is not significant due to 88% of all directly affected farms having a not significant residual impact and a slight adverse residual impact on 12% of these farms. The works will affect less than 2.5% of the area of these land parcels.

The Proposed Development will have direct effects on 0.02% of the area of County Kildare and County Meath. The residual impact on agriculture within this region is not significant because regional baseline trends in agricultural productivity continues to increase during the past 10 years despite widespread infrastructural developments.

[116] This area is based on land parcels owned adjoining or in close proximity is not the entire area of these farms

[117] According to map 5.1 of the preliminary 2020 Agri Census the agricultural areas of County Kildare and County Meath is 113,449 ha and 197,366ha respectively.

16. Material Assets – Non-Agriculture

16.1 Introduction

'Material assets' are defined by the EPA to mean 'built services and infrastructure' while 'land' relates to the potential issue of 'land-take' as per the EPA Guidelines (EPA 2022).

The assessment predicts the potential impacts on the surrounding environment arising from the construction and operational phase of the Proposed Development and, where appropriate, specifies mitigation measures based on the information presented in Chapter 5 Project Description of this PECR. Roads and traffic are discussed in Chapter 14 Traffic and Transport.

The Non-Agricultural material assets and land addressed in this chapter include the following:

- Utilities – electricity, telecommunications, gas, water supply and wastewater treatment infrastructure;
- Residential land and property;
- Commercial land and property;
- Community land and property – Public parks, open space or land that are used by the public for recreational amenity; and
- Development land – Land zoned for development (with or without planning permission) and sites with planning permission.

This chapter also considers resource and waste management. A Construction Resource and Waste Management Plan (CRWMP) is included in Appendix 5.5 of this PECR.

16.2 Methodology

16.2.1 Relevant Guidelines, Policy and Legislation

This Chapter has been prepared in accordance with the following guidance and policy documents:

- Guidelines on the Information to be contained in Environmental Impacts Assessment Reports (EPA 2022);
- Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017);
- Institute of Environmental Management and Assessment (IEMA) Guide to: Materials and Waste in Environmental Impact Assessment - Guidance for a Proportionate Approach (IEMA 2020);
- Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (EPA 2021a);
- Circular Economy Programme 2021-2027 (EPA 2021b);
- National Waste Action Plan (Government of Ireland 2021);
- Eastern – Midlands Waste Management Plan 2015-2021 (EMWR 2015);
- Construction & Demolition Waste, Soil and Stone Recovery / Disposal Capacity – Updated report 2020 (Regional Waste Management Offices 2020);

- EU Construction and Demolition Waste Protocol and Guidelines (European Commission 2018); and
- Transport Infrastructure Ireland (TII) The Management of Waste from National Road Construction Projects. Standard GE-ENV-01101 (TII 2017).

16.2.2 Data collection

16.2.2.1 Utilities

Identification of utility services has been based on publicly available datasets and mapping, consultation with utility providers and targeted investigations. It is possible that some utility services located in proximity to the works may not have been identified, however, the mitigation detailed and proposed as part of this PECR will be implemented when dealing with any such features.

All major infrastructure and utilities which may be impacted by the Proposed Development have been assessed including:

- Electricity;
- Water / Wastewater;
- Surface Water Drainage;
- Gas; and
- Telecommunications.

Existing utility information was requested from utility companies and service providers. The following service providers provided utility information for the study are of the Proposed Development:

- Kildare County Council (KCC);
- Meath County Council (MCC);
- Electricity Supply Board (ESB) Networks / EirGrid;
- Irish Water (for foul and water networks);
- Gas Networks Ireland (GNI);
- Telecommunication providers.

In addition, a Ground Penetrating Radar (GPR) survey was undertaken along the full cable route to identify potential utility crossings.

16.2.2.2 Land and Property

A review of all non-agricultural properties intersecting or immediately adjacent to the Planning Application Boundary were reviewed to identify where there will potentially be impacts associated with the construction and operation of the Proposed Development. This was done through the use of GIS and aerial imagery along the route of the Proposed Development.

16.2.2.3 Waste

A desk study has been undertaken of the existing waste management baseline locally, within the Eastern-Midlands Waste Region and across the country as appropriate. This desk study included:

- Review of the most recent waste management data and information available at the time of writing;
- Review of the existing waste and materials management options within the region; and
- Calculation of the estimated waste / surplus material generation for the Construction Phase of the Proposed Development.

16.2.3 Assessment of Effects

In line with the EPA EIA Guidelines, the following criteria are used in the assessment of effects within this chapter - see Table 7.1: Assessment Criteria

Table 16.1: Assessment Criteria

Significance of Effect	Description of Effect
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant Effects	An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment.
Profound Effects	An effect which obliterates sensitive characteristics.

16.3 Baseline Conditions

The following provides and overview of the existing conditions along the Proposed Development with respect to utilities, land and property, and waste management, utilising the information sources as outlined in Section 16.2.

16.3.1 Utilities

43.3 km of the 53 km 400 kV underground cable will be sited along existing roads, with the remainder to be located in private lands. The cable will be in a trench generally 1.3/1.7 m in depth, 1.5 m wide and will run the full length of the Proposed Development. There are a number of existing utility services of varying diameters and depths along and crossing the proposed cable route as described in Appendix 5.2. There are locations where the cable will need to cross existing utilities, and where existing utilities will need to be diverted as assessed in Section 16.4.1.

The following existing utilities are within the Planning Application Boundary for the Proposed Development:

- Overhead power lines;
- Underground power cables;
- Water distribution mains;
- Telecoms ducts;
- Gas mains; and
- Sewer pipes.

16.3.2 Land and Property

The land along the Proposed Development is a mixture of agricultural land (Chapter 15 Material Assets – Agriculture) and non-agricultural lands which consist of residential clusters, single dwellings, community, industrial and commercial properties. Refer to Chapter 7 (Population and Human Health) for an overview of the baseline community information and receptors.

The majority of the Proposed Development will follow existing roads or, where deviating from the roads, will run through agricultural lands. Some of the main non-residential properties located along the Proposed Development include:

- Residential property;
- Schools;
- Medical facilities;
- Retail, commercial and industrial property;
- Sports and recreational facilities; and
- Churches and graveyards.

16.3.3 Waste Management

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (referred to as the Waste Framework Directive) defines waste as '*any substance or object that the holder discards or intends to or is required to discard*'.

The Waste Hierarchy as shown in Image 16.1, prioritises prevention over re-use, recycling, recovery and disposal. It establishes the order of preference for the management of waste, with the most preferential management method be to prevent the creation of waste in the first place. The ultimate goal is to reduce, as far as is possible, the quantity of waste disposed of to a landfill, thus increasingly treating waste as a resource.

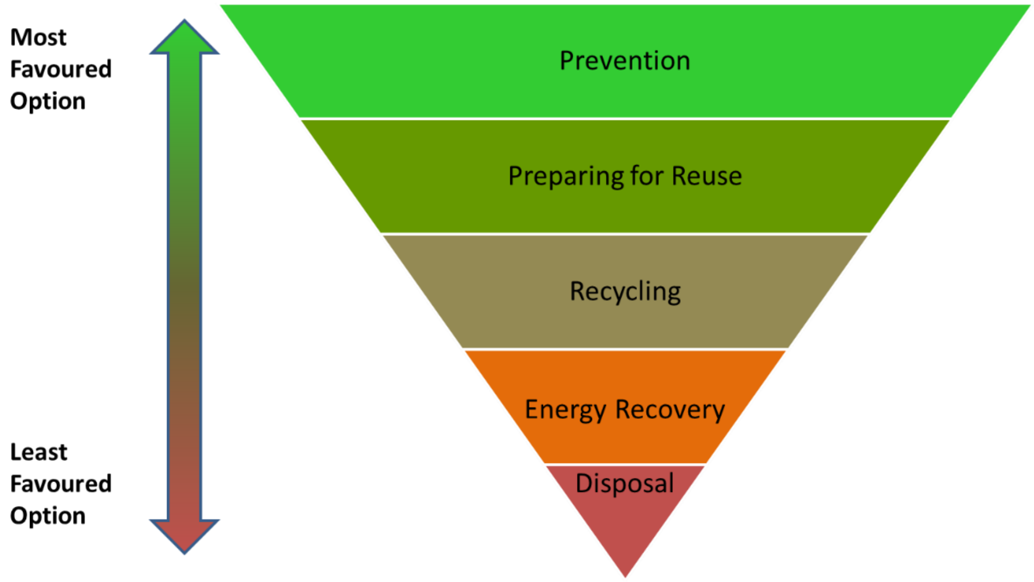


Image 16.1: Waste Hierarchy (as per Waste Framework Directive)

The majority of the waste which will arise as a result of the Proposed Development will be created during the Construction Phase. According to the most recently released EPA data on the Construction & Demolition Waste Statistics for Ireland (EPA 2022), the quantity of construction and demolition (C&D) waste generated in Ireland decreased from 8.8 million tonnes in 2019 to 8.2 million tonnes in 2020. The vast majority of this waste was composed of soil and stone (84.4%) while the rest comprised waste concrete, brick, tile and gypsum (6.4%); mixed C&D waste (4.6%); metal (2.4%); bituminous mixtures (1.6%); and segregated wood, glass and plastic (0.6%).

The vast majority (95%) of the C&D waste generated in 2020 underwent final treatment in Ireland. Approximately 5% was exported abroad for final treatment. Recovery through backfilling was the dominant final treatment of the C&D waste treated in Ireland (82%), with 10% being disposed of and 8% being recycled.

The Waste Framework Directive includes a target 70% of non-hazardous, non-soil and stone construction and demolition (C&D) waste to be recovered, reused, or recycled by 2020. According to the EPA statistics, Ireland achieved 78% material recovery of such waste in 2020, surpassing that target.

The Eastern and Midlands Region Waste Management Plan 2015-2021 provides a framework for the prevention and management of waste in a sustainable manner in County Kildare, Meath and other local authority areas.

There are a number of waste management facilities within counties Kildare and Meath and within the wider Eastern and Midlands Region which accept C&D waste. The most prominent C&D waste type likely to be generated by the construction of the Proposed Development will be uncontaminated soil and stone (List of Waste (LoW) Code 17 05 04). The potential waste management facilities available within Meath and Kildare which accept such C&D waste are summarised in Table 16.2.

Table 16.2: Summary of Waste Management Facilities within Meath and Kildare (February 2023)

Facility Type	Number of Facilities
County Meath	
EPA Licensed	10
Waste Facility Permit	21
Certificate of Registration	6
County Kildare	
EPA Licensed	5
Waste Facility Permit	15
Certificate of Registration	8

In addition to handling surplus excavated soil and stone as waste, there is the option to manage it as a by-product as defined in Article 27 of the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011). Surplus soil and stone which has been excavated as part of construction, and which cannot be reused within the project (e.g. as fill or for landscaping) may be managed as a by-product under Article 27 if it satisfies the following requirements:

> *'(a) further use of the substance or object is certain;*
>
> *(b) the substance or object can be used directly without further processing other than normal industrial practice;*
>
> *(c) the substance or object is produced as an integral part of a production process; and*
>
> *(d) further use is lawful in that the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.'*

If it is proposed to manage any material arising from the construction as a by-product instead of a waste, an Article 27 Notification will be made by the appointed contractor to the EPA. In 2020 the EPA received by-product notifications for 3,217,523 tonnes of soil and stone (EPA 2022), broken down as follows:

- Notifications for 155,200 tonnes were subsequently withdrawn;
- The EPA determined that 1,374,575 tonnes were by-products;
- The EPA determined that 73,000 tonnes were waste and could not be managed as by-products; and
- No determination was made for 1,614,748 tonnes.

16.4 Assessment of Potential Effects

The assessment of the potential impact of the Proposed Development on material assets has been undertaken having regard to EPA EIAR Guidelines (EPA 2022).

The following issues have been considered as part of the assessment of impacts:

- Potential for impacts on public utilities and the need to adequately protect them during the construction phase;
- Requirements for connections to public utilities by the Proposed Development during both the construction and operational phases;
- Use of imported material required for the construction of the Proposed Development;
- Land required; and
- Continued viability of the property or material asset in relation to any acquisition, demolition, land-take or physical impacts to access.

16.4.1 Utilities

The main potential for impacts on utilities associated with the construction phase of the Proposed Development will be as a result of:

- Utility usage by construction compounds and construction equipment (i.e. powering site offices and equipment, water and wastewater services for construction activities and welfare facilities, and telecommunications connections for site offices and equipment); and
- Any requirements to divert any of the existing infrastructure to allow for the works on the Proposed Development.

The utility demands during construction will be minimal and therefore no significant impacts on any existing utility capacity are anticipated.

There will be a number of utility diversions required as a result of the Proposed Development. In a worst-case scenario such diversion works may result in some temporary local disruptions to the services. These will be temporary and will need to be communicated to the affected areas in advance which will result in only slight impacts.

Once operational, the impact of the Proposed Development will be overall beneficial as it will result in an improvement of the electricity infrastructure in the region.

16.4.2 Land and Property

The following types of property were examined in this assessment:

- Residential property;
- Commercial property;
- Industrial property;
- Community property;
- Amenity / Recreational / sports areas / facilities;
- Lands zoned for residential, commercial or industrial development; and
- Planning permissions for any of the above which have been granted.

Potential impacts on non-agricultural property as a result of the Proposed Development will occur during the construction phase. These impacts include:

- Impact on the garden of a residential property on the R125 at approximate chainage 11200 to provide space for an off-road watercourse crossing. There is a gateway to the surrounding lands in the area affected, however, the main access point to the house will be maintained during construction;

- The proposed cable route runs through an area zoned for "New Residential" under the Kilcock Local Area Plan 2015-2021 (approximate chainage 16250), and which has a planning application for a housing development on it. The Proposed Development has been designed to avoid interaction with any of the proposed houses, with the cable to go through a proposed linear park and partly follow a proposed pedestrian and cycle path along the western edge of the Proposed Development;

- A bus stop located on the R403 in Firmount West (approximate chainage 33000) will need to be moved in order to accommodate a joint bay. A new temporary bus stop will be provided;

- The shared use footpath/cycleway along the Sallins Bypass will be temporarily unavailable during construction of the cable. The shared use footpath/cycleway extends from the northern start of the Sallins Bypass until approximately chainage 39600, approximately 100 m north of the railway bridge. At this point, the cycleway is diverted to the east to the Osberstown Road, and the footpath continues along the Sallins Bypass. The footpath is then diverted to the Osberstown Road approximately 115 m south of the railway bridge – chainage 39850. In all the Proposed Development will affect 1.8 km of the shared use footpath/cycleway and an additional 240 m of the footpath. The construction sequencing has not been confirmed for works along the Sallins Bypass; however, it is unlikely that the entire length of the shared use footpath/cycleway would be closed at one time. If the entire section were closed, users would be required to divert through the village of Sallins – which would be a diversion distance of 3.6 km from where the Proposed Development enters the Sallins Bypass to where the footpath departs the Sallins Bypass. This diversion is an additional 1.6 km of cycling or walking compared to using the Sallins Bypass;

- The Proposed Development will follow the access road to Naas Sports Centre and then turn south through the grounds adjacent to the car park, with an HDD compound to be located within the grounds of the campus on the north side of the Grand Canal. The Proposed Development will not directly impact on the adjacent car park or recreational facilities (skatepark and playground) but may impact the access paths to those recreational facilities. However, given that there are two access paths, one path will always be available to the public during the construction in that area. Access in general to the complex will also be maintained throughout construction;

- The HDD compound on the southern side of the Grand Canal will be located on scrub land adjacent to Jigginstown Castle, however, given that the area is currently unused, the impact of acquiring that land for construction will be minimal; and

- Properties which are not being directly impacted by land take, but which are lining the Proposed Development may experience impacts to their access while construction is being undertaken in front of the property.

16.4.3 Waste Management

16.4.3.1 Construction Phase

The main waste streams likely to arise during the Construction Phase of the Proposed Development are typical for this type of project and are listed in Table 16.3 with their List of Waste (LoW) code (EPA 2018).

Table 16.3: Main Waste Types Likely to be Generated during Construction

Waste Type	LoW Code
Concrete	17 01 01
Wood, glass and plastic	17 02 01 – 17 02 04*
Bituminous mixtures	17 03 02
Metals	17 04 01 – 17 04 11
Soil and Stones	17 05 04
Wastes of liquid fuels	13 07 01* – 13 07 03*
Absorbents, filter materials, wiping cloths and protective clothing	15 02 02* – 15 02 03
Batteries and accumulators	16 06 01* – 16 06 06*
Waste packaging	15 01 01 – 15 01 11*

The likely quantities of materials and waste which will require import and export during the Construction Phase have been estimated and are provided in Table 16.4. As shown, soils and fill material will make up the majority of the Construction Phase surplus material requiring management (either as a waste or as a by-product). This material will be managed in accordance with the mitigation measures outlined in Section 16.5.3.

Table 16.4: Materials Balance Estimate

			Import (m^3)	Export (m^3)		Transported Material Compacted (m^3)	Transported Material (t)
By Location	**Cable Route**						
	In-road	**Asphalt**	6545	6545		13089	30105
		Engineered Fill	*	-		52356	115183
		Subsoil	-	52356		52356	78534
		Concrete	37905	-		37905	-
	Off-road	**Topsoil**	-	-		-	-
		Subsoil	-	8691		8691	13036
		Concrete	8054	-		8054	-
	Permanent Access Tracks	**Topsoil**	-	4803		4803	6724
		Engineered Fill	7205	-		7205	15851
	Enabling Works						
	Passing Bays	**Topsoil**	-	-		-	-
		Asphalt	1421	1421		2843	6538
		Engineered Fill	5685	5685		11370	25014
		Subsoil	-	-		-	-
	Construction Platforms	**Topsoil**	-	-		-	-
		Engineered Fill	3314	3314		6629	14583
		Subsoil	-	-		-	-
	Compounds	**Topsoil**	-	-		-	-
		Engineered Fill	37540	37540		75080	165176
By material		**Asphalt**	7966	7966		15932	36642
		Topsoil	-	4803		4803	6724
		Subsoil	-	61047		61047	91570
		Engineered Fill	53744	46539		152639	335807
		Concrete	45958	-		45958	-
		Total	**108000**	**121000**		**281000**	**471000**

*All engineered road fill will be reused but will require movement around the project due to construction space constraints.

Given the relatively small potential quantity of surplus material to be generated, and that this quantity will be generated across the approximately 42 months construction phase, the potential impact of this quantity on the local and regional waste capacity will be not significant.

16.4.3.2 Operational Phase

The waste created during the Operational Phase will be minimal compared to the Construction Phase of the Proposed Development. The majority of operational waste would be associated with maintenance activities. This waste will be managed in accordance with all relevant waste management legislation and will not result in any significant environmental impacts.

16.5 Mitigation Measures

16.5.1 Major Infrastructure and Utilities

The Proposed Development has been designed to minimise the impact on major infrastructure. This includes the avoidance of interactions with major utility infrastructure as far as possible. Where there are interfaces with existing utility infrastructure, protection in place or diversion as necessary is proposed to prevent long-term interruption to the provision of the affected services.

All reasonable measures will be taken to avoid unplanned disruptions to any services during the construction phase. Prior to excavation works being commenced, localised confirmatory surveys will be undertaken by the Appointed Contractor to verify the results of pre-construction assessments undertaken. Where works are required in and around known utility infrastructure, precautions will be implemented by the Appointed Contractor to protect the infrastructure from damage, in accordance with the best practice methodologies and the requirements of the utility companies, where practicable.

Where diversions, or modifications, are required to utility infrastructure, service interruptions and disturbance to the surrounding residential, commercial and/or community property may be unavoidable. Where this is the case, it will be planned in advance by the Appointed Contractor. Prior notification of disruptions will be given to all impacted properties. This will include information on when disruptions are scheduled to occur and the duration of the disruption. Any required works will be carefully planned by the appointed contractor to ensure that the duration of interruptions is minimised as far as possible. Consultation with relevant neighbouring parties will be undertaken prior to any proposed disruptions.

16.5.2 Land and Property

Much of the mitigation against the impacts on land and property have been embedded within the design, by selecting a route which follows public roads for the most part, minimising the requirement for additional lands to be affected. Where private lands will be directly affected, either temporarily during construction or permanently, this will be managed by ESB and their contractor and supported by EirGrid’s Agricultural Liaison Officers.

Where there are potential access issues as a result of the Proposed Development, access arrangements to individual properties will be agreed with the affected property holders in advance to minimise the impact. Access arrangements in general along affected roadways and footpaths will be managed in accordance with applicable traffic management plans and measures outlined in Chapter 14 (Traffic and Transport) and in the CEMP.

Along the Sallins Bypass, early notification and signage to show diversions will be used by the Contractor. Local cycling/walking groups and community groups (as well as Cycling Ireland and Kildare County Council) will be directly contacted by the Contractor to inform them of the timing, extent, and duration of any closures and what signed diversion routes will be available. As far as possible the works along the Sallins Bypass will be phased so that the entire length of the cycleway and footpath will not be closed at any one time. The use of the Sallins Link Road at the roundabout on the Sallins Bypass will allow a shorter diversion.

During the construction works at the bus stop located on the R403 in Firmount West (approximate chainage 33000), a new temporary bus stop will be provided. Consultations with Kildare County Council, and Bus Éireann, will be undertaken prior to construction to ensure no disruption to bus services.

Impacts to the garden of a residential property on the R125 at approximate chainage 11200 will be mitigated by the use of screens during construction to allow the owner to use their garden. The affected area will be reinstated to its original condition post-construction. The owner will be consulted on the species for planting. Selected tree species will need to be agreed with ESB to ensure no impacts to the cable (See Chapter 17 Landscape for further details). At the detailed design stage the cable route will be re-examined to determine if the garden can be fully avoided.

Impacts to the "New Residential" area under the Kilcock Local Area Plan 2015-2021 (approximate chainage 16250) have been largely mitigated through routing. However, further consultation with the developer and Kildare County Council will be undertaken in so far as possible, to ensure there is no disruption during construction.

Similarly, impacts to the Naas Sports Centre the adjacent car park or recreational facilities (skatepark and playground) have been largely mitigated through routing. Further mitigation will be provided through consultation, early notification of proposed works, and ensuring safe access to the facilities at all times. Daily cleaning of road surfaces in this area and good site management (as described in the CEMP (Appendix 5.4 of this PECR)), will ensure that the construction activities do not cause unclean or muddy conditions. The affected areas will be reinstated to their current condition post-construction.

Access to properties which are not being directly impacted by land take will be maintained. Chapter 14 (Traffic and Transport) and Appendix 5.1 (Traffic Management Plan) have further details on the measures to minimise disruption to traffic and access in the area.

16.5.3 Waste Management

A Construction Resource Waste Management Plan (CRWMP – Appendix 5.5) is included for the Proposed Development. The appointed contractor will be responsible for reviewing and updating the CRWMP prior to commencement of construction and in periodically reviewing and updating as necessary throughout the Construction Phase.

All operations will be managed and programmed in such a manner as to prevent / minimise waste production. All waste material will be managed in accordance with the Waste Hierarchy, with an emphasis on reuse, recycling and recovery of material over disposal where feasible.

In order to minimise the creation of waste, opportunities for reuse of excavated material within the Proposed Development (e.g. as fill or in landscaping) will be sought. Where there is no reuse potential within the Proposed Development of such material, either due to the material being unsuitable or due to the quantity being in excess of requirements, the potential for reuse as a by-product in accordance with Article 27 will be investigated by the appointed contractor. Where this option is technically / economically feasible, the appointed contractor will be responsible for the EPA Article 27 notification and the associated requirements. Any material which is to be managed as a by-product will be appropriately stored on site and will be kept separate from any waste storage to avoid cross contamination.

Where waste is created it shall be managed on site in accordance with good practice and applicable waste legislation as follows:

- Waste excavated material will be appropriately stockpiled;
- Waste will be segregated at source to prevent cross contamination;
- Any hazardous wastes will be stored in segregated waste containers which are appropriately labelled;
- All waste will be collected by a suitable contractor in possession of a valid and appropriate Waste Collection Permit, and will only be transported to suitably licensed or permitted waste facilities;
- Regular site cleaning will be done in order to minimise the potential for litter in the surrounding area; and

- Waste records will be maintained throughout the Construction Phase of the Proposed Development.

The CRWMP will be available for inspection at all reasonable times by the Local Authority. All waste generated will be managed in accordance with the relevant provisions of the Waste Management Act 1996 and associated amendments and regulations, particularly with regard to the use of appropriately permitted waste contractors and destinations for waste materials.

16.6 Residual Effects

With the implementation of mitigation measures there will be no permanent significant Material Assets effects. There will be temporary disruption as a result of the construction works but consultation and mitigation measures will eliminate or minimise these effects.

16.6.1 Utilities

The impacts to utilities will be further resolved pre-construction. Established design standards will ensure no impacts to the existing utilities. Any disruption to services will be controlled through consultation with the utility owner and consumers would be fully informed. There will be a temporary effect on utilities, which is assessed to be not significant. Future utility work will need to be done in consultation with ESB to ensure that any future development does not impact the Proposed Development. There are minimum safety clearances and design standards to be maintained but it will be possible for future utilities to co-exist with the Proposed Development.

16.6.2 Land and Properties

There will be temporary significant effect to the property owner on the R125 at approximate chainage 11200. The disruption to the garden cannot be fully mitigated during construction but the impact will be removed post-construction. If the cable route can avoid the garden, there will be no impact.

Users of the bus stop located on the R403 in Firmount West (approximate chainage 33000), will be temporarily disrupted but will still be able to use the bus stop during construction. Therefore there will be no significant effect.

With mitigation measures there will be no significant effects on the “New Residential” area under the Kilcock Local Area Plan 2015-2021 (approximate chainage 16250).

There will be a temporary slight effect on users of the Naas Sports Centre and associated facilities during construction. While all the facilities will remain open for use, there will be an impact to the amenity of the area from noise, etc. from the proximity of the construction area. Following the completion of the construction works, there will be no impact.

Impacts to access and traffic are assessed in Chapter 14 (Traffic and Transport) of this PECR.

Users of the Sallins Bypass footpath and cycleway will experience a temporary significant effect from construction along the facility. Mitigation measures will be in place to minimise the disruption; however, the closure of the footpath and cycleway will result in diversions through the village of Sallins and the temporary loss of this amenity. The footpath and cycleway will be restored post-construction and there will be no permanent effects to users.

16.6.3 Waste Management

With the mitigation measures, given the relatively small potential quantity of surplus material to be generated, and that this quantity will be generated across the approximately 42 months construction phase, the effect of this quantity on the local and regional waste capacity will be not significant.

16.7 Conclusion

There is potential for impacts on material assets associated with the construction of the Proposed Development, however, with the implementation of the mitigation measures as outlined in this Chapter, the permanent impacts on material assets will not be significant. However, there will be a temporary significant effect to the property at approximate chainage 11200 because of impacts to the garden. Additionally, users of the Sallins Bypass footpath and cycleway will experience a temporary significant effect from construction along the facility. Further detailed design may avoid or minimise the effects, along with the listed mitigation measures that will be actioned. There will be no significant operational phase impacts, except for the beneficial impact that the new electricity infrastructure will have on the power grid in the region.

16.8 References

Environmental Protection Agency (EPA) (2018). Waste Classification List of Waste & Determining if Waste is Hazardous or Non-hazardous

Environmental Protection Agency (EPA) (2022). Construction & Demolition Waste Statistics for Ireland

Environmental Protection Agency (EPA) (2023). Waste Licence Search

European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011)

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

17. Landscape

17.1 Introduction

This Landscape and Visual Impact Assessment (LVIA) describes the landscape context of the Proposed Development and assesses the likely landscape and visual impacts of the Proposed Development on the receiving environment. Although closely linked, landscape and visual impacts are assessed separately.

Landscape Impact Assessment relates to assessing effects of the Proposed Development on the landscape as a resource in its own right and is concerned with how the Proposed Development will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

Visual Impact Assessment relates to assessing effects of a development on specific views and on the general visual amenity experienced by people. This deals with how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements. Visual impacts may occur from; visual obstruction (blocking of a view, be it full, partial or intermittent) or; visual intrusion (interruption of a view without blocking).

17.2 Methodology

Production of this LVIA involved:

- A desktop study to establish an appropriate study area, relevant landscape and visual designations in the County Development Plans as well as other sensitive visual receptors. This stage culminates in the selection of a set of potential viewpoints from which to study the effects of the Proposed Development;
- Fieldwork to establish the landscape character of the receiving environment and to confirm and refine the set of viewpoints to be used for the visual assessment stage;
- Assessment of the significance of the landscape impact of the Proposed Development as a function of landscape sensitivity weighed against the magnitude of the landscape impact;
- Assessment of the significance of the visual impact of the Proposed Development as a function of visual receptor sensitivity weighed against the magnitude of the visual impact; and
- If mitigation measures are proposed to reduce potential impacts, these will be incorporated into the assessment and estimation of residual impacts.

17.2.1 Relevant Guidelines, Policy and Legislation

The assessment was carried out in line with the Landscape Institute and the Institute of Environmental Management and Assessment (eds.) (2013) Guidelines for Landscape and Visual Impact Assessment. Routledge, Oxon. The assessment also had regard to the Environmental Protection Agency (EPA), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2022.

17.2.2 Data Collection

The desk study element of data collection involved review of project documents and Geographical Information System files for the Proposed Development. These documents were read against a backdrop of aerial photography and topographical information. Geographical Information System datasets included highly sensitive landscape areas scenic designations, and these were cross-checked against the relevant County Development Plans, in the interests of thoroughness.

Data to inform the assessment was extracted from the following data sources (accessed February 2023):

- Meath County Development Plan 2021-2027[118];
- Kildare County Development Plan 2023-2029[119];
- National Parks and Wildlife Service[120];
- The Heritage Council[121];
- Ordnance Survey maps;
- Coillte Recreation[122];
- Discover Ireland[123];
- The National Inventory of Architectural Heritage[124];
- Sport Ireland Trails; and
- Online Mapping.

17.2.3 Site Visit

Fieldwork was undertaken in January 2023 as part of the preparation of this assessment. This involved reviewing and recording aspects of landscape character along the route of the underground cable and at selected locations in relation to the visual baseline.

118 Meath County Development Plan 2021-2027. Available from: https://www.meath.ie/council/council-services/planning-and-building/development-plans/meath-county-development-plan
119 Kildare County Development Plan 2023-2029. Available from: https://kildarecoco.ie/AllServices/Planning/DevelopmentPlans/KildareCountyDevelopmentPlan2023-2029/index.html
120 National Parks and Wildlife Service. Available from: https://www.npws.ie/
121 Heritage Maps. Available from: https://www.HeritageMaps.ie
122 Coillte Recreation. Available from: https://www.coillte.ie/our-forests/recreation-map/
123 Discover Ireland. Available from: https://www.DiscoverIreland.ie
124 National Inventory of Architectural Heritage. Available from: https://www.buildingsofireland.ie/niah-data-download/

17.3 Baseline Conditions

17.3.1 Extent of Study Area

According to Guidelines for Landscape and Visual Impact Assessment (GLVIA), the first step in the process of LVIA is to determine a bespoke study area which is appropriate to the combination of the development type and the receiving landscape and visual context. From similar studies it is anticipated that the proposed works at Woodland and Dunstown substations are likely to be difficult to discern beyond approximately 500 m thus are not likely to give rise to significant landscape or visual impacts beyond this distance. However, in the interests of a comprehensive appraisal, a 1 km radius study area was selected for each substation. A 500 m radius study area was applied to the underground cable because significant landscape or visual effects are highly unlikely beyond this 1 km wide swathe due to the subterranean nature of the proposed infrastructure and the transient nature of the proposed construction works.

17.3.2 Receiving Environment

The landscape is the visible environment in its entirety, comprised of both natural and built elements including topography, water bodies, vegetation, wildlife habitats, open spaces, buildings and structures. Landscape and visual sensitivities considered include statutory and non-statutory landscape designations, natural features, landscape character areas, notable deciduous trees of woodland, amenities and historic landscapes.

Woodland substation is located within County Meath and Dunstown substation is located in County Kildare. Portions of the underground cable (Woodland to Dunstown) occur within both Counties – approximately 15 km in County Meath and 38 km in County Kildare. County Development Plans for Meath and Kildare were reviewed for this assessment. The review of the County Development Plans considered landscape character areas, landscape elements and scenic designations.

17.3.3 Landscape – policy context

The County Development Plans for Meath and Kildare have identified Landscape Character Areas across each respective County. A map showing those that occur within the Study Area is presented in Figure 17.1.

17.3.3.1 County Meath

The Landscape Character Assessment for County Meath is contained in Appendix 7 of the Meath County Development Plan. There are five Landscape Character Areas within the Study Area: South East Lowlands; Tara Skryne Hills; Rathmoylan Lowlands; Royal Canal and The Ward Lowlands. Each Landscape Character Area within County Meath is assigned a rating in relation to ‘value’, ‘importance’, ‘sensitivity’ and potential capacity to accommodate various forms of development. These are noted in Table 17.5.

17.3.3.2 County Kildare

The Kildare County Development Plan divides the County into various Landscape Character Areas. There are 12 Landscape Character Areas within the Kildare portion of the Study Area: Chair of Kildare, Northern Lowlands; North-western Lowlands; Western Boglands; Northern Hills; Allen Bog; Pollardstown Fen; The Curragh; Central Undulating Lands; Eastern Transition; River Liffey; and Eastern Uplands. In the County Development Plan, each Landscape Character Area is assigned a rating in relation to ‘sensitivity’. Furthermore, several of the Landscape Character Areas within the study Area are also designated as Areas of High Amenity: River Liffey; Pollardstown Fen; The Curragh; and Eastern Uplands. These classifications are noted in Table 17.5.

Included in Table 14.4 of Chapter 14 (and indicated on Map 14.2) of the Kildare County Development Plan is 12 ‘principal landscape sensitivity factors’: Major Rivers and Water bodies; Canals; Ridgelines; Green Urban Areas; Broad-Leaved Forestry; Mixed Forestry; Natural Grasslands; Moors and Heathlands; Agricultural Land with Natural Vegetation; Peat Bogs; Scenic View; and Scenic route.

17.3.4 Visual – policy context

The Landscape Appraisal of County Meath identifies 'scenic routes', 'protected views', 'venerable features' and 'slopes and ridgelines'. Map 10.2 of the Meath County Development Plan 2021-2027 identifies 'scenic routes' and 'scenic routes with designated views'. None of these designations are located close enough to the Woodland substation to be adversely impacted. In all instances where the underground cable is in close proximity to any of these features it will be within the road corridor and will not obstruct or materially alter views to or from these designations.

The Landscape Character Assessment in the Kildare County Development Plan 2017-2023 contains a map and a corresponding table, which identifies 'scenic routes' and 'scenic viewpoints' within the County. The scenic designations within Kildare are included as 'principal landscape sensitivity factors' and are accounted for as such. These are noted in Table 17.5 and a map showing those that occur within the Study Area is presented in Figure 17.1.

17.4 Assessment Methodology

17.4.1 Landscape Impact Assessment Criteria

When assessing the potential impacts on the landscape resulting from the Proposed Development, the following criteria were considered:

- Landscape character, value and sensitivity;
- Magnitude of likely impacts; and
- Significance of landscape effects.

The sensitivity of the landscape to change is the degree to which a particular landscape receptor (Landscape Character Area or landscape element) can accommodate changes or new elements without unacceptable detrimental effects to its essential characteristics. Landscape value and sensitivity are classified using the following criteria set out in Table 17.1.

Table 17.1: Landscape Value and Sensitivity

Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an international or national level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level (Area of Outstanding Natural Beauty), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes, which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use.
Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include, enhancement, repair and restoration.
Negligible	Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the Proposed Development. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the Proposed Development. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the Planning Application Boundary that may have an effect on the landscape character of the area (Table 17.2 refers).

Table 17.2: Magnitude of Landscape Impacts

Magnitude of Impact	Description
Very High	Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
High	Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
Medium	Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to changes in landscape character, and quality.
Low	Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements.
Negligible	Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable.

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the following matrix set out in Table 17.3.

Table 17.3: Impact significance matrix

	Sensitivity of Receptor				
Scale/Magnitude	**Very High**	**High**	**Medium**	**Low**	**Negligible**
Very High	Profound	Profound-substantial	Substantial	Moderate	Slight
High	Profound-substantial	Substantial	Substantial-moderate	Moderate-slight	Slight-imperceptible
Medium	Substantial	Substantial-moderate	Moderate	Slight	Imperceptible
Low	Moderate	Moderate-slight	Slight	Slight-imperceptible	Imperceptible
Negligible	Slight	Slight-imperceptible	Imperceptible	Imperceptible	Imperceptible
Note: For the purposes of this chapter, judgements deemed 'substantial' and above are considered to be equivalent to or greater than 'significant impacts'.					

17.4.2 Visual Impact Assessment Criteria

As with the landscape impact, the visual impact of the Proposed Development will be assessed as a function of sensitivity versus magnitude. In this instance the sensitivity of the visual receptor, weighed against the magnitude of the visual effect.

17.4.2.1 Sensitivity of Visual Receptors

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity they are engaged in and whether this heightens their awareness of the surrounding landscape. A list of the factors considered by the assessor in estimating the level of sensitivity for a particular visual receptor is outlined below and used in Table 17.7 below to establish visual receptor sensitivity at each VRP:

1. Susceptibility of Receptors - In accordance with the Institute of Environmental Management and Assessment ("IEMA") Guidelines for Landscape and Visual Assessment (3rd edition 2013) visual receptors most susceptible to changes in views and visual amenity are:

- "Residents at home;
- People, whether residents or visitors, who are engaged in outdoor recreation, including use of public rights of way, whose attention or interest is likely to be focussed on the landscape and on particular views;
- Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience;
- Communities where views contribute to the landscape setting enjoyed by residents in the area;

- People travelling on road, rail or other transport routes where such travel involves recognised scenic routes and awareness of views is likely to be heightened"; and
- Visual receptors that are less susceptible to changes in views and visual amenity include:
    - "People engaged in outdoor sport or recreation, which does not involve or depend upon appreciation of views of the landscape; and
    - People at their place of work whose attention may be focussed on their work or activity, not their surroundings and where the setting is not important to the quality of working life".

2. Recognised scenic value of the view (County Development Plan designations, guidebooks, touring maps, postcards etc). These represent a consensus in terms of which scenic views and routes within an area are strongly valued by the population because in the case of County Developments Plans, for example, a public consultation process is required;
3. Views from within highly sensitive landscape areas. Again, highly sensitive landscape designations are usually part of a county's Landscape Character Assessment, which is then incorporated within the County Development Plan and is therefore subject to the public consultation process. Viewers within such areas are likely to be highly attuned to the landscape around them;
4. Primary views from dwellings. A Proposed Development might be seen from anywhere within a particular residential property with varying degrees of sensitivity. Therefore, this category is reserved for those instances in which the design of dwellings or housing estates, has been influenced by the desire to take in a particular view. This might involve the use of a slope or the specific orientation of a house and/or its internal social rooms and exterior spaces;
5. Intensity of use, popularity. This relates to the number of viewers likely to experience a view on a regular basis and whether this is significant at county or regional scale;
6. Connection with the landscape. This considers whether or not receptors are likely to be highly attuned to views of the landscape i.e. commuters hurriedly driving on busy national route versus hill walkers directly engaged with the landscape enjoying changing sequential views over it;
7. Provision of elevated panoramic views. This relates to the extent of the view on offer and the tendency for receptors to become more attuned to the surrounding landscape at locations that afford broad vistas;
8. Sense of remoteness and/or tranquillity. Receptors taking in a remote and tranquil scene, which is likely to be fairly static, are likely to be more receptive to changes in the view than those taking in the view of a busy street scene, for example;
9. Degree of perceived naturalness. Where a view is valued for the sense of naturalness of the surrounding landscape it is likely to be highly sensitive to visual intrusion by distinctly manmade features;
10. Presence of striking or noteworthy features. A view might be strongly valued because it contains a distinctive and memorable landscape feature such as a promontory headland, lough or castle;
11. Historical, cultural and / or spiritual significance. Such attributes may be evident or sensed by receptors at certain viewing locations, which may attract visitors for the purposes of contemplation or reflection heightening the sense of their surroundings;
12. Rarity or uniqueness of the view. This might include the noteworthy representativeness of a certain landscape type and considers whether the receptor could take in similar views anywhere in the broader region or the country;
13. Integrity of the landscape character. This looks at the condition and intactness of the landscape in view and whether the landscape pattern is a regular one of few strongly related components or an irregular one containing a variety of disparate components;
14. Sense of place. This considers whether there is special sense of wholeness and harmony at the viewing location; and
15. Sense of awe. This considers whether the view inspires an overwhelming sense of scale or the power of nature.

Those locations which are deemed to satisfy many of the above criteria are likely to be of higher sensitivity. (No relative importance is inferred by the order of listing in Table 17.7). Overall sensitivity may be a result of a number of these factors or, alternatively, a strong association with one or two in particular.

17.4.2.2 Visual Impact Magnitude

The magnitude of visual effects is determined on the basis of two factors; the visual presence (relative visual dominance) of the Proposed Development and its effect on visual amenity. The magnitude of visual impacts is classified in Table 17.4.

Table 17.4: Magnitude of Visual Impact

Magnitude of Impact	Description
Very High	The Proposed Development obstructs or intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. An extensive degree of visual change will occur within the scene completely altering its character, composition and associated visual amenity
High	The Proposed Development obstructs or intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual change will occur within the scene substantially altering its character, composition and associated visual amenity
Medium	The Proposed Development represents a moderate intrusion into the available vista and is a readily noticeable element. A noticeable degree of visual change will occur within the scene perceptibly altering its character, composition and associated visual amenity
Low	The Proposed Development intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the Proposed Development would not have a marked effect on the visual amenity of the scene
Negligible	The Proposed Development would be barely discernible within the available vista and/or it would not influence the visual amenity of the scene

17.4.2.3 Visual Impact Significance

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the same significance matrix and applies the same EPA definitions of significance as used earlier in respect of landscape impacts (Table 17.3 refers).

17.4.3 Quality and Timescale of Effects

In addition to assessing the significance of landscape effects and visual effects, the EPA Guidelines (2022) requires that the quality of the effects is also determined. This could be negative/adverse, neutral, or positive/beneficial.

Landscape and Visual effects are also categorised according to their duration:

- Temporary – Lasting for one year or less;
- Short Term – Lasting one to seven years;
- Medium Term – Lasting seven to fifteen years;
- Long Term – Lasting fifteen years to sixty years; and
- Permanent – Lasting over sixty years.

17.5 Assessment of Potential Effects

17.5.1 Landscape character - sensitivity

With consideration of the nature and scale of the Proposed Development in respect of the Landscape Character Assessments for Meath and Kildare, sensitivity ratings[125] have been assigned to each Landscape Character Areas and are indicated in Table 17.5. These judgements refer to material contained within the relevant County Development Plan but are independent judgements specifically in relation to the scale and context of the Proposed Development.

In terms of sensitivity, road corridors themselves are not considered to be a particularly sensitive elements within the landscape as they are a highly modified transport routes and works can be readily reinstated. For this reason, for the vast majority of the underground cable is designed to be laid under existing road surfaces where the sensitivity of the immediate landscape is deemed to be low; however, there is a greater degree of landscape sensitivity where the underground cable is being laid off-road.

Off-road sections may result in the removal of vegetation which contributes to the hedgerow patterns and character of the receiving landscape. Additionally, although agricultural farm machinery is commonly present in these off-road sections the intensity of construction activities would be greater than typical agricultural activities. For these reasons, the sensitivity of each Landscape Character Area specifically in relation to a potential off-road portion of the Proposed Development that may occur within the extents each Landscape Character are indicated in Table 17.5.

[125] While influenced by the value and sensitivity judgements for particular Landscape Policy Areas Landscape Units and Landscape Character Areas in the County Landscape Character Assessments for Meath and Kildare, independent landscape sensitivity judgements are provided for this assessment based on the more universal criteria, which are derived from the GLVIA-2013 Guidelines (Landscape Institute and Institute of Environmental Management & Assessment 2013) and accounts for the susceptibility of the landscape to the proposed development. This approach is consistent with best practice and also accounts for the inconsistency that commonly occurs in assigning landscape sensitivity to similar or adjoining landscape units between Counties.

Table 17.5: Landscape Character Areas

Landscape Character Area	Summary of Landscape Character Assessment in the County Development Plan	Sensitivity
Meath: 12. Tara Skryne Hills	• *Landscape Character Type: Hills and Upland Areas* • *Value: Exceptional* • *Importance: National/International* • *Sensitivity: High* • *Potential capacity to accommodate development - underground services: Low* (The southern portion of this Landscape Character Area, where the Proposed Development is located, does not encompass Hill of Tara or Skryne Hill)	High-Medium
Meath: 11. South East Lowlands	• *Landscape Character Type: Lowland Landscape* • *Value: Very High* • *Importance: Regional* • *Sensitivity: Medium* • *Potential capacity to accommodate development - underground services: Medium*	Medium-Low
Meath: 14. Royal Canal	• *Landscape Character Type: River Corridor and Estuaries* • *Value: High* • *Importance: Regional* • *Sensitivity: Medium* • *Potential capacity to accommodate development - underground services: Medium*	Medium
Kildare: Northern Lowlands	• Class 1 – Low Sensitivity	Low
Kildare: River Liffey	• *Class 4 – Special Sensitivity* • *Areas of High Amenity*	High-Medium
Kildare: Eastern Transition	• *Class 2 – Medium Sensitivity*	Medium-Low

17.5.1.1 Landscape Character - Magnitude of Impacts

The following descriptions focus on those aspects of the Proposed Development that are most relevant to landscape effects and should be read in conjunction with Chapter 5 of this PECR. The greatest potential for significant effects on landscape character to occur in relation to the Proposed Development is during the construction stage, because there will only be very minor surface expression of the development during the operational stage (permanent joint bay, permanent access tracks and limited locations of permanent vegetation loss).

17.5.1.2 Construction phase - Underground Cable

The impacts on the physical terrain of the Proposed Development will be restricted mainly to the generally 1.5 m wide and 1.3 m / 1.7 m deep trench. Trenches for the underground cable will be dug so the conductors can be installed below the ground. There will be associated and ancillary development, including temporary construction compounds, permanent joint bays, temporary passing bays, temporary access tracks, permanent access tracks, site development, landscaping works, fencing and vegetation removal. There will also be joint bays and associated temporary passing bays positioned at intervals along the route of the underground cable. The physical impact of the trench on the landscape will be modest in scale and primarily contained within the already modified ground for the road network. There will be an increase in vehicle movements within the road network in the vicinity of the Proposed Development, which will be more noticeable along the smaller local roads within the study area.

Impacts on the land-cover for the off-road portions of the underground cable will be limited to the Planning Application Boundary, within which some grassland and hedgerow vegetation will need to be removed. The longest section of off-road track will be between Woodland substation and the public road to the south (ch. 0 to approx. ch. 3250), where there will be permanent vegetation removal to facilitate the 4 m wide access track. During the construction phase, there may be a small degree of impact at specific locations along the route of the underground cable. However, it would not be at a scale that would have any material impact on the overall landscape fabric or on the broader landscape character along the route. Although construction activity may alter the landscape character near where the cable is being installed, it will be transitory and temporary. Impacts will predominantly occur in the road network where vehicular movements are already part of the existing character.

Open-cut trenching and joint bay construction will involve localised vegetation removal, but, where possible, the felling of healthy mature trees will be avoided. However, there may be some instances where vegetation removal may open up views previously screened. At most locations, any removed vegetation will be replanted, but there will be occasions where this is not practical such as within the proposed 4 m wide permanent access track to joint bays or at the joint bays themselves, resulting in a permanent but very localised change. Planting above the cable easement is likely to be restricted to certain shallow rooting species. The species mix of the vegetation proposed within the 5 m permanent wayleave will be in accordance with the specification detailed in Chapter 10 (Biodiversity) of this PECR.

The cable trench on off-road sections will be backfilled with earth, then top soiled and re-vegetated, having regard for agricultural land use.

Construction phase works will be transient, reversible and, in terms of the overall duration, short term. Works at individual locations will be temporary – cable trench will be completed at approximately 40 m to 50 m per day so the construction area will pass receptors relatively quickly. Please see Chapter 5 of this PECR for further details on the construction programme. During the construction phase, the underground cable will result in a low magnitude of impact along the sections of the route that follow the existing road network. Still, the magnitude of effect will be medium-low along the off-road sections of the underground cable.

17.5.1.3 Construction Phase - Substations

Woodland and Dunstown substations will require additional infrastructure and equipment to accommodate connections with the underground cable, thus new lightning masts, lighting monopoles and electrical apparatus will be installed within the existing substation compounds. As a result, there will be an increase in construction-related activity within the substations sites and an increase in vehicular movements within the surrounding road network.

The footprint of the Woodland and Dunstown substations will remain unchanged. Neither will have a new permanent physical impact on the landscape. For these reasons, the magnitude of effect on the landscape due to the Woodland and Dunstown substations is deemed to be low-negligible.

17.5.1.4 Operational phase - Underground Cable

Once the construction phase is complete, the road surface / agricultural grassland will be reinstated along the underground cable route; thus, any material surface expression of the underground features will be minimal. Hedgerows removed for temporary works within the Planning Application Boundary will be replanted with a new species-rich hedgerow which is likely to be more ecologically diverse than what was removed. The species mix of the vegetation proposed above the 5 m permanent wayleave will be in accordance with the specification detailed in Chapter 10 (Biodiversity) of this PECR’. In addition, vegetation removed during the construction phase at passing bays will be reinstated along the original alignment and will also be replanted with species-rich hedgerows.

The main identifiable features will be the joint bays and permanent access tracks, both of which would have minimal impact on the landform. Operational stage impacts mainly relate to the maintenance works for the underground cable, which will be infrequent and will be brief in nature. Maintenance operations will be less intensive than the activity at the construction stage. For these reasons, the underground cable is deemed to have a negligible magnitude of effect on landscape character.

17.5.1.5 Operational phase - Substations

The proposed changes to the Woodland and Dunstown substations occur within the existing substation footprints and, consequently, are located where the landscape character is already influenced by electrical infrastructure; thus, there will be no material change to the landscape character. For these reasons, the magnitude of impact on the landscape due to the Woodland and Dunstown substations is deemed to be negligible.

17.5.2 Landscape Character - Significance Of Impacts

Based on the impact significance matrix (Table 17.3), the significance of landscape effects at each Landscape Character Area are outlined in the Table 17.3.

Table 17.6: Significance of landscape effect

Landscape Character Area	Landscape sensitivity	Magnitude of landscape effect - Construction	Significance of landscape effect - Construction	Magnitude of landscape effect - Operation	Significance of landscape effect - Operation
Meath: 12. Tara Skryne Hills	High- Medium	Medium-low	**Moderate-slight**	Negligible	**Imperceptible**
Meath: 11. South East Lowlands	Medium- Low	Medium-low	**Slight-imperceptible**	Negligible	**Imperceptible**
Meath: 14. Royal Canal	Medium	Medium-low	**Slight**	Negligible	**Imperceptible**
Kildare: Northern Lowlands	Low	Medium-low	**Slight-imperceptible**	Negligible	**Imperceptible**
Kildare: River Liffey	High- Medium	Medium-low	**Moderate-slight**	Negligible	**Imperceptible**
Kildare: Eastern Transition	Medium- Low	Medium-low	**Slight-imperceptible**	Negligible	**Imperceptible**
Woodland substation	High- Medium	Low-negligible	**Slight-imperceptible**	Negligible	**Imperceptible**
Dunstown Substation	Medium- Low	Low-negligible	**Slight-imperceptible**	Negligible	**Imperceptible**

17.5.3 Landscape Elements - Sensitivity

A total of ten Gardens and Designed Landscapes have been identified within the study area. Of these nine were recorded by the Survey of Historic Gardens and Designed Landscapes and two have been identified from historic mapping (Ordnance Survey 6", 1837 – 1842). Information on these Gardens and Designed Landscapes is summarised in Table 13.4, Chapter 13 of this PECR and are assessed within.

The underground cable runs adjacent to Larch Hill Demesne in the townland of Phepotstown but no direct impacts anticipated as the underground cable will be in road at this location. No specific landscape elements were identified in County Meath County Development Plan.

A number of landscape elements were identified in County Kildare County Development Plan. The Kildare County Development Plan, when describing the compatibility of different development types with the various 'principal landscape sensitivity factors', considers proximity within 300 m of the same as an area to also be considered. The proposed works at Dunstown substation are not within 300 m of any 'principal landscape sensitivity factor'. All 'principal landscape sensitivity factors' which occur within 300 m of the underground cable are listed in Table 17.7.

The sensitivity judgements in this assessment are based on a worst-case scenario where it is assumed that there is the potential for a direct impact on the 'principal landscape sensitivity factors'. Each of these 'principal landscape sensitivity factors' are locations with strong associations with naturalistic and/or recreational values and contribute to the character of the wider landscape; therefore, vegetation removal and construction activity have the potential to alter the intrinsic qualities of the 'principal landscape sensitivity factors' in their own right and also the wider landscape setting. Thus, the judgements regarding the sensitivity of the 'principal landscape sensitivity factors' to the proposed underground cable are noted in Table 17.7. (Note: Scenic View 'principal landscape sensitivity factors' will be assessed as visual receptors in Section 17.5.7 (Visual – Sensitivity) rather than landscape elements.)

Table 17.7: 'Principal landscape sensitivity factors' listed in Kildare County Development Plan within 300 m of the underground cable

Principal Landscape Sensitivity Factor	Landscape Sensitivity
Major Rivers and Water bodies - River Liffey (approx. ch. 37100 centreline)	High-medium
Canals - Royal Canal (approx. ch. 15350)	Medium
Canals - Grand Canal (approx. ch. 44500)	Medium
Mixed Forestry - Woodland near the R407 regional road (approx. ch. 17750)	High
Mixed Forestry - Woodland R412 regional road (approx. ch. 52250)	High
Scenic View - Allen Bridge RC11 (approx. ch. 15750)	See Section 17.5.7 (Visual – sensitivity)
Scenic View - Millicent Bridge RL6 (townland of Castlesize) (approx. ch. 37100)	See Section 17.5.7 (Visual – sensitivity)

17.5.4 Landscape Elements – Magnitude Of Impact

17.5.4.1 Construction Phase

It is assumed the construction of the cable route within roads with a width of 5 m or less would likely involve the consequent damage to the rooting system of roadside trees; thus, it was determined, based on a worst-case scenario, that this damage would be detrimental to one mature tree (greater than approximately 15 years of growth) within

Mixed Forestry - Woodland near the R407 regional road (approx. ch. 17750) and two mature trees within Mixed Forestry - Woodland R412 regional road (approx. ch. 52250) 'principal landscape sensitivity factors'. Although this tree loss represents a direct permanent physical impact, it will be a limited loss affecting a very restricted area in the context of the immediate woodland context and the wider landscape fabric.

All other construction activity in relation to these 'principal landscape sensitivity factors' is anticipated to be temporary effects. The underground cable will occur within 300 m of both plots of Mixed Forestry, but there will be no other direct impacts on either as the cable route, and other construction activity will occur within the road corridor. For these reasons, the magnitude of effect is deemed to be negligible.

An HDD technique will be undertaken so the underground cable can pass beneath the Canals and the River Liffey. HDD launch sites and the related facilities and activity will be new uncharacteristic features within 300 m of these watercourses but will be relatively discrete, involving a small number of workers.

The HDD launch sites for the canals will be located outside the canal corridors. Joint bays will be constructed within 300 m of the canals. At the Royal Canal, it will be in an agricultural field to the north, and at the Grand Canal, it will be in an existing road to the south, so in both instances, there will be no impact on any mature vegetation.

At the River Liffey, the HDD operation will not impact the riparian vegetation. The drilling area will be set back as far as possible from the riverbank to minimise impacts on tree roots. There will be one permanent joint bay (JB49) within 300 m of the River Liffey. It will be in an agricultural field and will be positioned as far from the riverbank as possible within the Planning Application Boundary to minimise impacts on tree roots but it is determined that a minimum of three trees at ch. 36805 are likely to be removed. The temporary construction area for the joint bay will occur within an area of 10 m x 2.5 m. The 3 m of permanent hardstanding associated with the joint bay will intentionally be positioned on the side of the bay furthest from the river. There will also be a section of permanent stoned access track within 300 m of the River Liffey. It will run parallel to an existing hedgerow but will be offset by a minimum of 3 m to minimise the potential for impacts on this hedgerow. At the western end of this permanent stoned track, the trench will have to pass through the adjacent hedgerow. A further four mature trees and four veteran trees (greater than approximately 80 years of growth) elsewhere along the cable route within the 'principal landscape sensitivity factors' are also anticipated to be removed during trenching works. All other construction activity concerning this 'principal landscape sensitivity factor' is anticipated to be temporary.

For the reasons outlined above, it is determined the magnitude of impact on these landscape elements during construction will be no greater than medium-low.

17.5.4.2 Operational Phase

Operational phase impacts will be lower than those anticipated to occur during the construction phase. All construction activity will have ceased, and there will be very little evidence of the Proposed Development. For the reasons outlined above, it is determined the magnitude of impact on these landscape elements during operations will be negligible in relation to the Mixed Forestry and the River Liffey; and no greater than low-negligible for the canals.

17.5.5 Landscape Elements - Significance Of Impacts

Based on the impact significance matrix (Table 17.3), the significance of landscape effects are outlined in the Table 17.8.

Table 17.8: Sensitivity Landscape Elements

Principal Landscape Sensitivity Factor	Sensitivity	Magnitude of effect - Construction	Significance of effect - Construction	Magnitude of effect - Operation	Significance of effect - Operation
Major Rivers and Water bodies - River Liffey	High-Medium	Medium-low	**Moderate-slight**	Negligible	**Slight-imperceptible**
Canals - Royal Canal	Medium	Medium-low	**Slight**	Low-negligible	**Imperceptible**
Canals - Grand Canal	Medium	Medium-low	**Slight**	Low-negligible	**Imperceptible**
Mixed Forestry - Woodland near the R407 regional road	High	Negligible	**Imperceptible**	Negligible	**Imperceptible**
Mixed Forestry - Woodland R412 regional road	High	Negligible	**Imperceptible**	Negligible	**Imperceptible**

17.5.6 Visual – Sensitivity

There are approximately 383 residential dwellings within 50 m of the cable route centreline, and approximately 41 of these will be located within 50 m of a Joint Bay. The greatest potential for negative adverse effects due to the Proposed Development will be during the construction phase. Visual impacts may occur, but they generally occur within the road corridor where there is already a baseline level of activity. Most effects would relate to construction-related activities, which would be transitory and localised. Trenching works in relation to individual properties will be short-term, although a small number of dwellings will be adjacent to other works, such as joint bays, construction compounds or HDD sites, where effects may be temporary. During the operation phase, any noticeable, permanent change to the views will be highly localised and limited in scale.

There will be nine new lattice tower lightning masts within the Dunstown substation. The lattice structure will be 40 m high with a 1 m high rod/conductor on top. These new masts will be the same height as the existing masts within the substation compound. Thus, the visual envelope of the substation, as viewed from the surrounding area, generally will remain unchanged, with only certain viewing angles where there will be a new mast identifiable protruding above the skyline. Still, the visual change will not be material in these limited instances. Dwellings in the vicinity of the substations at Woodland and Dunstown will be familiar with the presence of electrical infrastructure and related maintenance activity in the area; thus, the proposed changes within these substations are unlikely to result in any material visual impacts during construction or operation. Generally, the operational phase will see a return of conditions similar to the baseline for the residential dwellings located along the route of the underground cable, and at the substations; thus, the visual assessment focused on the proximity of the Proposed Development to specific key visual receptors such as scenic designations and public amenities.

In addition to the previously identified Scenic View 'principal landscape sensitivity factors' Allen Bridge RC11 and Millicent Bridge RL6 (townland of Castlesize), the following two additional visual receptors were identified for inclusion in visual impact assessment:

- Royal Canal National Waymarked Way (long-distance walking route); and
- Grand Canal National Waymarked Way (long-distance walking route).

Table 17.9 uses the criteria set out in Section 17.4.2 to determine sensitivity at each of the key visual receptors.

Table 17.9: Visual sensitivity

Scale of value for each criterion			
Strong association	Moderate association	Mild association	Negligible association

Visual Sensitivity at Key Visual Receptors				
Values associated with the view	Scenic View - Allen Bridge RC11	Scenic View - Millicent Bridge RL6	Royal Canal National Waymarked Way	Grand Canal National Waymarked Way
Susceptibility of viewers to changes in views				
Recognised scenic value of the view				
Views from within highly sensitive landscape areas				
Primary views from residences				
Intensity of use, popularity (number of viewers)				
Viewer connection with the landscape				
Provision of vast, elevated panoramic views				
Sense of remoteness / tranquillity at the viewing location				
Degree of perceived naturalness				
Presence of striking or noteworthy features				
Sense of historical, cultural and / or spiritual significance				
Rarity or uniqueness of the view				
Integrity of the landscape character within the view				
Sense of place at the viewing location				
Sense of awe				
Overall sensitivity assessment	**M**	**HM**	**M**	**M**
N = Negligible; L = low sensitivity; ML = medium-low sensitivity M = medium sensitivity; HM = High-medium sensitivity; H = high sensitivity; VH = very high sensitivity				

17.5.7 Visual – magnitude of impacts

Table 17.10: Magnitude of visual impacts

Key Visual Receptors	Construction Phase	Operation Phase
Scenic View - Allen Bridge RC11 (approx. ch. 15750)	The view is focused on the canal corridor from the busy R148 regional road. The underground cable will pass under the Royal Canal approximately 200 m to the northwest of this scenic view. Identifying construction works associated with the underground cable, a Joint Bay and the HDD launch site immediately to the north of the canal in the background may be possible. Intervening vegetation and terrain provide a good degree of screening of the Joint Bay and the HDD launch site. The magnitude of effect is deemed to be low.	Any changes to the view would be barely discernible; thus, the magnitude of the visual effect is deemed to be negligible.
Scenic View - Millicent Bridge RL6 (townland of Castlesize) (approx. ch. 37100)	The view from this location is a heavily enclosed view within the River Liffey corridor. The underground cable will pass under the River Liffey approximately 120 m to the southwest of this scenic view. It may be possible to identify construction works associated with the underground cable and the HDD sites on both banks of the river in the middle ground. Intervening vegetation is likely to provide a high degree of screening for the construction activities on the north side of the river, but on the south side, there will be a narrow-channelled view towards some of the works. Non-agricultural activities would be uncharacteristic in the view from this bridge, but they will be temporary in duration. Therefore, the magnitude of the visual effect is deemed to be low.	Any changes to the view would be barely discernible; thus, the magnitude of the visual effect is deemed to be negligible.
Royal Canal National Waymarked Way (long-distance walking route)	View from the canal is channelled along the canal corridor with vegetation on both sides, but it may be possible to glimpse the construction works. Still, these would be passed quickly in relation to the nature of the intermittent, sequential views afforded from the canal. Therefore the magnitude of the visual effect is deemed to be low.	Any changes to the view would be barely discernible; thus, the magnitude of the visual effect is deemed to be negligible.
Grand Canal National Waymarked Way (long-distance walking route)	The underground cable will be in-road as it spans the Grand Canal. Construction activity may be noticeable within a busy road corridor but will not be uncharacteristic at this location. Therefore the magnitude of the visual effect is deemed to be low-negligible.	Any changes to the view would be barely discernible; thus, the magnitude of the visual effect is deemed to be negligible.

17.5.8 Visual - Significance Of Impacts

Based on the impact significance matrix (Table 17.3), the significance of visual effects are outlined in the Table 17.11.

Table 17.11: Visual - significance of impacts

Key Visual Receptors	Sensitivity	Magnitude of visual effect - Construction	Significance of visual effect - Construction	Magnitude of Visual effect - Operation	Significance of Visual effect - Operation
Scenic View - Allen Bridge RC11	Medium	Low	**Slight**	Negligible	**Imperceptible**
Scenic View - Millicent Bridge RL6	High-medium-	Low	**Moderate-slight**	Negligible	**Imperceptible**
Royal Canal National Waymarked Way	Medium	Low	**Slight**	Negligible	**Imperceptible**
Grand Canal National Waymarked Way	Medium	Low-negligible	**Slight-imperceptible**	Negligible	**Imperceptible**

17.6 Mitigation Measures

The primary 'mitigation measure' employed in respect of landscape and visual impacts for the Proposed Development was avoidance of impacts. The key mitigation relevant to landscape and visual took place as part of the route selection process and/or is embedded in the final design.

Once the construction phase is complete, the road surface / agricultural grassland will be reinstated along the underground cable route; thus, any material surface expression of the underground features will be minimal. Hedgerows removed for temporary works within the Planning Application Boundary will be replanted with a new species-rich hedgerow which is likely to be more ecologically diverse than what was removed. The species mix of the vegetation proposed above the 5 m permanent wayleave will be in accordance with the specification detailed in Chapter 10 (Biodiversity) of this PECR. In addition, vegetation removed during the construction phase at passing bays will be reinstated along the original alignment and will also be replanted with species-rich hedgerows. It is impossible to replace mature and veteran trees removed as part of the Proposed Development on a like-for-like basis, but the replacement planting will, over time, repair and reinforce the broader landscape fabric.

Additional landscape and visual mitigation measures are not considered necessary in relation to the Proposed Development as there will be no significant effects during the operational phase. Likewise, additional specific landscape and visual mitigation measures are not considered necessary during the construction phase as all effects will be either temporary or short-term and not considered 'significant'.

17.7 Conclusion

Landscape effects and visual effects have been considered in respect of the Proposed Development. There will be adverse construction stage effects, but these will be temporary/short-term in duration, and there will be no material operational stage effects as the Proposed Development is predominantly below ground with the land cover above largely reinstated.

For the reasons outlined within this chapter, it is considered that the Proposed Development will not give rise to any significant landscape or visual effects, i.e. no judgements regarding potential landscape or visual effects are deemed equivalent or greater than a 'significant impact'.

17.8 References

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18. Cumulative Assessment & Interactions

18.1 Introduction

This Chapter considers and assesses the potential for cumulative impacts arising from the Proposed Development with existing and / or approved projects. It also considers projects which, at the time of assessment, were yet to be approved, but for which a decision on such project is reasonably foreseeable over the likely consenting and construction period anticipated for the Proposed Development.

In addition, the chapter addresses the potential for interactions between impacts on different environmental factors of the Proposed Development itself on the receiving environment.

This Chapter should be read in conjunction with Chapter 7 to Chapter 18 of this PECR, and their appendices, which present related impacts arising from the Proposed Development and proposed mitigation measures to ameliorate the predicted impacts.

This PECR is not an Environmental Impact Assessment Report (EIAR). However, reference has been made to EIA guidance (See 19.1.3) as they are relevant to this PECR, but not directly applicable.

18.1.1 Cumulative Impacts

The cumulative impacts of a development refer to the way in which an environmental resource may be subject to a particular type of impact from more than one Proposed Development. The impacts from multiple projects may overlap or act in combination at a particular location or upon a particular resource thereby leading to more significant environmental impacts than if the impacts were considered in isolation.

The European Commission (EC) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions provide the following definition of cumulative impacts:

> *'Impacts that result from the incremental changes caused by other past, present or reasonably foreseeable actions together with the project.'* (EC 1999)

Annex IV of the EIA Directive (2011/92/EU as amended by 2014/52/EU) requires that an EIAR provides a:

> *'description of the likely significant effects of the project on the environment resulting from…the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.'*

The EPA EIAR guidelines (EPA 2022) define cumulative effects as:

> '*The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.*'

Note that the EPA guidelines use the terms impacts and effects interchangeably. A relatively minor effect on a particular receptor cause by the Proposed Development could result in significant effects if it is added to by impacts from other nearby projects. This chapter identifies and provides an assessment of likely significant cumulative effects caused by the Proposed Development in combination with other planned projects. This includes consideration of the potential effects of any other Proposed Developments. Section 19.2 sets out the process for deciding which other planned projects were included in the assessment.

18.1.2 Environmental Interactions

Environmental interactions are the reactions between impacts, whether between impacts of just one project (i.e., the Proposed Development), or between the impacts of multiple projects. For each environmental topic there will be certain interactions or interdependencies with other environmental topics, whereby impacts may interact to create a greater effect or different type of effect. An assessment of these interactions has been undertaken as required by Article 3 of the EIA Directive, which states the following:

'The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

(a) Population and human health;
(b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
(c) Land, soil, water, air and climate;
(d) Material assets, cultural heritage and the landscape;
(e) The interaction between the factors referred to in points (a) to (d).'

Some of the topic assessments within this PECR already address environmental interactions. For example, Chapter 7 *Population and Human Health* provides an assessment of effects on community amenity, which relates to the interaction of impacts on air quality; visual amenity; traffic and transport; and noise and vibration and describes and assess how a combination of impacts on health determinants can interact and influence health outcomes.

Section 19.4.3 of this chapter sets out the main environmental interactions identified from the Proposed Development, sign posting chapters which already address environmental interactions and providing a description and assessment of environmental interactions which are not addressed elsewhere in this PECR.

18.1.3 Relevant guidelines, policy and legislation

The following guidelines and publications were adhered to in undertaking this assessment:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022);
- Environmental Impact Assessment of Projects. Guidance on the preparation of the Environmental Impact Assessment Report (European Union 2017); and
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999).

18.2 Methodology for Cumulative Impacts Assessment

18.2.1 Introduction

It is necessary to consider the scale, nature and likely impacts of other projects which could combine with the Proposed Development to cause cumulative effects. It was therefore necessary to identify which other projects should be included for analysis as part of the cumulative impacts assessment A staged approach to identify such other projects was applied as illustrated below, with each stage described in subsequent chapter sections.

18.2.2 Identification of Other Developments

The first stage of the cumulative assessment was to identify other projects deemed potentially relevant to be included in the long list. While the EIA Directive only requires the consideration of other existing and/or approved projects.

There is also potential for a number of other projects to receive approval and be progressed within that time period which may give rise to cumulative effects in combination with the Proposed Development. It was, therefore, considered appropriate to identify projects which, at the time of assessment, were yet to be approved, but for which a decision and potentially approval is reasonably foreseeable over the likely consenting and construction period anticipated for the Proposed Development.

18.2.2.1 Sources for the identification of other projects

This PECR goes further than these minimum requirements and, in addition to existing and / or approved projects, considers development plan land allocations in so far as possible. The Proposed Development and development plan land allocations that have been considered as part of this cumulative assessment have been identified through consultation with Local Authorities. A desk study involving general internet searches and scrutiny of local planning authority websites. The developments that have been considered are either registered in the planning system, are future major projects that the client and project team are aware of, or form part of land allocations within Development Plans.

Potentially relevant other projects include those from various sectors, such as residential and commercial projects, utilities, and other transport projects. The identification of projects for the long list considered the following sources:

- An Bord Pleanála website (http://www.pleanala.ie) – for details of Strategic Infrastructure Developments, Strategic Housing Developments and Large-scale Residential developments;
- Local authority websites and the development plans for Kildare and Meath – for details of allocations for housing, areas for regeneration and other zoning objectives;
- National Planning Application Database (https://data.gov.ie/dataset/national-planning-applications – for downloadable list of planning applications sent from Local Authorities;
- Projects being planned by the National Transport Authority (NTA) (the NTA website, https://www.nationaltransport.ie/planning-and-investment/transport-investment/projects/, provides detail) as part of other major transport projects and programmes in accordance with the Transport Strategy for the Greater Dublin Area 2016 – 2035 (hereafter referred to as the GDA Transport Strategy) (NTA 2016);
- Project Ireland 2040, which combines the National Development Plan (Government of Ireland 2021) and National Planning Framework (Government of Ireland 2019). (gov.ie - Project Ireland 2040 (www.gov.ie) and its interactive mapper

(https://geohive.maps.arcgis.com/apps/MapSeries/index.html?appid=f05a07c5a0324b1a887cd9d5d7103e22);

- Transport Infrastructure Ireland website (https://www.tii.ie/public-transport/projects-and-improvements/) – to identify major transport projects and programmes;

- The EIA Portal (https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal) maintained by the Department of Housing, Planning and Local Government – for applications for development consent accompanied by an EIAR;

- Irish Water's website, which includes a page on its projects (https://www.water.ie/projects/); and

- Other infrastructure and utility providers and developers

All planning application data provided by each local authority is fed into the National Data.Gov.ie database (https://data.gov.ie/dataset/national-planning-applications). This dataset was used to identify planning applications within a search area of the Proposed Development. The dataset included all planning applications lodged to the relevant local authorities within 500 m of the boundary of the Planning Application Boundary. The dataset contained planning applications which had been granted, granted and appealed, refused, refused and appealed, withdrawn or invalidated. The application list screened for potential cumulative impacts contained any application that was conditional or appealed and conditional. The exercise to identify relevant planning applications was initially undertaken in December 2022 with subsequent updates in January and February 2023. In addition to this process and to capture other potentially relevant foreseeable projects, major projects as part of transport and other infrastructure programmes were added to the preliminary long list.

The planning application lists were searched to identify and exclude very minor applications from the long list on the basis that, given their minor nature, these were not likely to have a cumulative effect noticeable over the effects of the Proposed Development in isolation. Examples of planning applications which were excluded from the preliminary long list were applications for one off houses and residential housing extensions. Granted and pending applications older than 10 years were also excluded from the preliminary long list on the basis that they would likely already have been built (and so would form part of the existing baseline) or are now unlikely to be progressed. Applications which have been refused or invalidated were discounted from the preliminary long list on the basis that they are unlikely to progress, unless through successful appeal.

In addition to this process and to capture other potentially relevant foreseeable projects, major projects as part of transport and other infrastructure programmes were added to the preliminary long list.

The types of projects that were identified for consideration on the long list have been classed as follows:

- Local Planning Applications – those projects for which planning permission is applied for through local planning authorities themselves and were identified from local authority planning applications lists;

- Strategic Housing Developments or Large-scale Residential Developments – housing developments of a certain type and scale (e.g., 100 or more houses or student accommodation units) for which applications are lodged directly with An Bord Pleanála;

- Strategic Infrastructure Developments - major developments by local authorities and others for which applications are lodged directly with An Bord Pleanála;

- Irish Water Projects – projects under the programmes of work listed on Irish Water's website; and

- Other Major Projects – projects which were at a pre-application stage at the time of identification, but which are anticipated to be developed over the time period for the Proposed Works. These include projects from various sectors including energy, utilities and transport.

18.2.2.2 Scale and Nature for Other Projects

In considering the scale and nature of the other projects, regard was had for the screening thresholds set out in Schedule 5 of S.I. No. 600/2001 - Planning and Development Regulations, 2001 (as amended). The use of EIA screening thresholds was only a guide however, and some projects which are below thresholds yet relatively close in proximity to the Proposed Development and still of a scale to be noticeable in the local context were shortlisted. Ultimately, the judgement as to whether a project should be shortlisted depended on whether the scale, location and/or nature could be sufficient to generate impacts which would be noticeable against typical baseline trends.

18.2.2.3 Shortlisting

The shortlisting was informed by input from the environmental topic specialists involved in the preparation of this PECR, which allowed for consideration as to whether a particular type of project could result in impacts to receptors of interest for the Proposed Development assessment.

18.2.2.4 Information Gathering

For the shortlisted developments, sufficiently detailed information was compiled to inform the assessment. This included:

- Proposed design and location;
- Proposed programme of construction, operation and decommissioning; and
- Environmental assessments set out baseline date and effects rising from the other development.

The relevant information was sourced from the websites of relevant local planning authorities and through general internet searches and project team knowledge. Some information was also gathered through consultations with developers (refer to Chapter 3 *Stakeholder Engagement*).

18.2.2.5 Assessment

The cumulative impacts of the Proposed Development with each of the other developments were assessed to a level of detail commensurate with the information that was available at the time of assessment. Where information regarding proposed other developments was limited, these gaps were acknowledged within the assessment and the associated uncertainty in these cases is documented.

There are no prescriptive techniques used in the evaluation of the significance of cumulative impacts. Professional judgment and consideration of standards, guidelines and environmental carrying capacities have been applied to determine whether in-combination impacts give rise to additional levels of significance. The EC and EPA guidelines referenced above were adhered to.

The significance criteria used to assess likely cumulative impacts considered the capacity of environmental resources and receptors to accommodate changes that are likely to occur. These include:

- The duration of the impact (i.e. would it be temporary or permanent);
- The extent of impact (e.g. its geographical area);
- The type of impact (e.g. whether additive (i.e. the loss of two pieces of woodland of one hectare (ha), resulting in 2 ha cumulative woodland loss)) or synergistic (i.e. two discharges combine to have an effect on a species not affected by discharges in isolation);
- The frequency of the impact;

- The 'value' and resilience of the receptor affected; and
- The likely success of mitigation.

18.3 Potential Cumulative Impacts

This section provides a topic-by-topic assessment of likely significant cumulative impacts pf the Proposed Development in combination with other developments.

Table X lists the projects and developments which have the potential to have cumulative impacts of the Proposed Development.

Table 19.1: Projects Considered for Cumulative Assessment

Project	Distance from Proposed Development	Status	Assessment
KCC (201143), 2/10/2020, conditional permission granted for a proposed extension to a Distribution Centre	Proposed Development passes through the development	Under construction – therefore the development has been considered as part of the baseline conditions. EirGrid has consulted extensively with the owner/developer and there will be no impacts to either project.	No cumulative effects
KCC (20840), 30/7/2020, conditional permission granted for the construction of a 5,627 m^2 Specialist Packaging Single Storey High Level Manufacturing Facility	Proposed Development passes the frontage of the development along the Millennium Parkway	This project is not yet under construction. The two projects will not directly impact each other. The nature of the manufacturing facility means that there will be significant interactions or cumulative effects between the two projects.	No cumulative effects
KCC (18303023), 16/11/2018, conditional permission granted for a strategic housing development (SHD) (ABP Decision) consisting of 125 no. new residential units	200 m to the west	The distance and nature of the proposed housing means that there will be significant interactions or cumulative effects between the two projects.	No cumulative effects
KCC (19305701), 16/10/2019, conditional permission granted for a strategic housing development (SHD)	10 m to the north	The two projects will not directly impact each other. The nature of the proposed housing means that there will be significant interactions or cumulative effects between the two projects.	No cumulative effects

Project	Distance from Proposed Development	Status	Assessment
Leinster Outer Orbital Route Potential new road around Dublin, connection to the M4 at Kilcock.	Potentially Adjacent to the Proposed Development	This project is at the feasibility stage and as such it cannot be assessed. The Proposed Development should not directly impact the M4 Junction at Kilcock.	No cumulative effects
M4 Maynooth to Leixlip (Improvements to M4 to the south and east of Maynooth.	Approximately 5 km west	Proposed project is at the option selection stage. There will be no direct interaction because of its distance from the Proposed Development. Future expansion (not currently proposed) of the M4 corridor can be accommodated as the M4 crossing will be set back from the motorway edge.	No cumulative effects
DART+ West - Maynooth and M3 Parkway to the City Centre (Improvements to railway line and new depot)	Approximately 4 km west	The DART+ West project has now sought statutory approval for its design, with the submission of a Railway Order application to An Bord Pleanála on 29th July 2022 and it is now closed, as of 28th October 2022. There will be no direct interaction because of its distance from the Proposed Development. Future expansion (not currently proposed) of the railway corridor can be accommodated as the Kilcock crossing will be set back from the railway edge.	No cumulative effects
EirGrid East Meath - North Dublin Grid Upgrade Project	Adjacent to the Proposed Development	The connection point into the Woodland substation is yet to be determined. This planning application is to be submitted in Q4 2023 and so, as the design is not finalised it is not possible to consider the project further	No cumulative effects

Project	Distance from Proposed Development	Status	Assessment
A new underground cable between Woodland, Clonee, Corduff, Finglas and Belcamp substations.			
GDA Energy 4 Ltd Battery Storage Park Planning permission has been consented to a third party for an energy park to the north of the existing Woodland substation.	Approximately 400 m northwest from the Proposed Development	An EIA screening report has been submitted as part of that application and has concluded that there are no likely significant effects for that application. Based on that conclusion and the nature of the extension works as part of the Proposed Development, it is concluded that there are no cumulative effects. There will be no direct interaction between this project and the Proposed Development.	No cumulative effects
Water Supply Project – Eastern and Midlands Region. Water pipeline from River Shannon to Dublin	Crosses under the Proposed Development	This planning application is unlikely to be submitted in the next few years and so, as the design is not finalised it is not possible to consider the project further. However, the Water Supply can pass under the Proposed Development without impact to the project.	No cumulative effects

Project	Distance from Proposed Development	Status	Assessment
CP1194 Woodland 400 kV Redevelopment Project An upgrade of the existing Woodland substation to accommodate proposed electricity transmission development that will help accommodate renewable generation expansion. Works are within the existing substation area.	Adjacent to the Proposed Development	A PECR has been submitted for this project and has been reviewed and it has determined there will be no significant effects from that project. The proposed extension to Woodland substation is in keeping with the existing use of the land. The Proposed Development does include a proposed bay within the substation which will connect the underground cable to the grid. These work will be immediately adjacent to the project. The nearest residential property from this point is approximately 800 m away and will be screened by intervening vegetation. It is considered that there will be no cumulative effects between the two projects.	No cumulative effects
Dunstown Substation – Series Compensation Extension. An extension to the western boundary of the existing Dunstown substation to allow connection of series compensation equipment to the Dunnstown-Moneypoint 400 kV circuit.	Adjacent to the Proposed Development	A PECR has been submitted for this project and has been reviewed and it has determined there will be no significant effects from that project. The proposed extension to Dunstown substation is in keeping with the existing use of the land. The Proposed Development does include a proposed bay within the substation which will connect the underground cable to the grid. This work will be adjacent to the project. The nearest residential property from this point is approximately 300 m away and will be screened by intervening vegetation. It is considered that there will be no cumulative effects between the two projects.	No cumulative effects

Project	Distance from Proposed Development	Status	Assessment
Sallins Amenity Lands Development of amenity and recreational facilities on 16.8 ha of land adjacent to the Sallins Bypass	Adjacent to the Proposed Development	An EIA screening report has been submitted as part of that application and has concluded that there are no likely significant effects for that application. Based on that conclusion and the nature of the extension works as part of the Proposed Development, it is concluded that there are no cumulative effects. There will be no direct interaction between this project and the Proposed Development.	No cumulative effects
North – South Interconnector 140 km overhead line stretching from Woodland substation to Turleenan, County Tyrone.	Approximately 100 m north of the Proposed Development	The North-South Interconnector has been consented by the planning authorities in Ireland and Northern Ireland. The terminal point of the overhead line into Woodland substation. Given the nature of the Proposed Development as an underground cable and a connection point into Woodland, it is assessed that there are no likely significant cumulative effects between the projects.	No cumulative effects
Louth – Woodland and Maynooth – Woodland Uprating of existing overhead lines.	Approximately 100 m northeast and east of the Proposed Development	These two projects involve the upgrading of the existing overhead lines into Woodland substation. As these are existing projects, there will be limited changes and therefore no cumulative effects.	No cumulative effects

Project	Distance from Proposed Development	Status	Assessment
Dunnstown Battery Energy Storage Project **Construction of enclosed battery energy storage system compound and all associated site works (proposed substation**	Approximately 230 m northeast of the Proposed Development	The project was refused planning by Kildare County Council, but An Bord Pleanála granted permission with conditions following an appeal. An EIA screening report has been submitted as part of that application and has concluded that there are no likely significant effects for that application. Based on that conclusion and the nature of the extension works as part of the Proposed Development, it is concluded that there are no cumulative effects. There will be no direct interaction between this project and the Proposed Development.	No cumulative effects

Through consultations Kildare County Council has flagged a number of potential future projects including junction improvements and greenways. EirGrid and ESB will continue to consult with Kildare County Council and Meath County Council so that future projects can be implemented without impacts to and from the Proposed Development.

18.4 Environmental Interactions

The interaction of impacts arises from the combined action of a number of different environmental topic-specific impacts upon a single receptor/resource. For example, the removal of trees can have landscape, visual and ecological effects, or an individual residential receptor can be affected by noise and visual impacts. Cumulative effects can also arise from different types of impact within a single topic on a receptor, such as the cumulative visual impact of vegetation removal and erection of an electricity tower on a single receptor.

The technical assessments in this PECR (Chapters 7 – 17) contain assessments of the likely significant cumulative effects arising from the Proposed Development singularly. During the assessment process, coordination took place between assessment specialists to ensure that interacting impacts arising from the Proposed Development singularly were identified, assessed and, where appropriate, mitigated. These impacts are reported in the individual chapters and are not repeated here. Table 19.1 outlines the likely interacting impacts and chapters where they are assessed.

Key interactive effects are:

- Biodiversity and Hydrology – interactive impacts could potentially occur to the surface water environment. They could include potential impacts on aquatic species, requiring mitigation measures;

- Biodiversity and Landscape & Visual – interactive impacts could potentially occur as a result of loss of habitats (hedgerows, trees, grassland, etc.);

- Archaeology, Architectural Heritage, and Cultural Heritage and Landscape & Visual – interactive impacts could potentially occur in relation to the landscape character and setting of cultural heritage assets;

- Archaeology, Architectural Heritage, and Cultural Heritage and Soils, Geology and Hydrogeology – interactive impacts arising from dewatering could potentially impact on cultural heritage sites, such as historical wells; and,

- Material Assets (Non-Agricultural), Agriculture, Air Quality, Noise and Vibration, Traffic and Transport, and Population and Human Health –interactions in the human environment are typically complex as there is the potential for receptors to be impacted in a number of ways.

The likely significance of these combined and interrelated impacts has been assessed within the individual assessment chapters. For instance the Landscape and Visual chapter includes an assessment of the relevant interactive ecological impacts. The converse is found in the Biodiversity chapter.

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Table 19.2: Matrix Summarising Key Interactions

Environmental Topic	Population and Human Health	Air Quality and Climate	Noise and Vibration	Biodiversity	Soils, Geology and Hydrogeology	Hydrology	Archaeology, Architectural and Cultural Heritage	Traffic and Transport	Material Assets – Agriculture and Equine	Material Assets (Non-Agricultural)	Landscape
Population and Human Health		X	X					X		X	
Air Quality and Climate	X			X	X	X			X	X	
Noise and Vibration	X			X							X
Biodiversity	X	X			X	X			X	X	
Soils, Geology and Hydrogeology	X					X			X	X	X
Hydrology	X			X	X				X	X	
Archaeology, Architectural and Cultural Heritage	X		X		X					X	
Traffic and Transport	X	X	X	X	X	X			X	X	
Material Assets – Agriculture and Equine	X			X	X						
Material Assets – Non-Agricultural	X					X					X
Landscape	X		X	X							

19. Summary of Mitigation and Monitoring Measures

The following mitigation measures will be implemented as part of the Proposed Development. These measures have been set out in the preceding chapters of this PECR.

19.1 Population and Human Health

19.1.1 Construction Phase

The design of the Proposed Development has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable.

Construction activities have the potential to create a nuisance and cause disruption. All work will be carried out in compliance with national legislation, and in accordance with best practice guidance, as detailed in the topic-specific chapters of this PECR. The assessment has been informed by the residual impacts reported in Chapter 8 *Air Quality and Climate*, Chapter 9 *Noise and Vibration*, Chapter 14 *Traffic and Transport*, and Chapter 17 *Landscape and Visual*. The reported residual impacts in these chapters take into account any topic-specific mitigation identified within the respective chapters. No further mitigation is proposed over and above that set out in individual chapters.

A CEMP is included in Appendix 5.4 of this PECR. The CEMP will be developed by the contractor in consultation and agreement with Kildare County Council and Meath County Council. It will be implemented during the construction phase to safeguard the environment, site personnel, and nearby sensitive receptors, i.e. occupiers of residential and commercial properties, from site activities which may cause harm or nuisance.

The appointed contractor will be required to liaise closely with local community representatives, landowners and statutory consultees throughout the construction period. This is likely to include circulating information about ongoing activities, particularly those that could cause disturbance, including due to traffic. The appointed Contractor will also implement the Traffic Management Plan included as Appendix 5.1 of this PECR, which will be finally agreed following detailed design with Kildare County Council and Meath County Council to mitigate construction traffic on the public road network. All construction activities, including construction traffic, will be managed through the site CEMP. Specific measures to mitigate effects on human health during the construction phase (i.e. noise and vibration, air quality and climate, hydrology, landscape and visual, and traffic and transport) are dealt with separately in the relevant chapters of this PECR.

Because of the potential for traffic disruption, the construction of the cable trench (Phase 2 – see Chapter 5 for further details) between Chainage 7395 and 14750 may be subject to traffic management measures set out in Chapter 14 which will be agreed with the owners of the Larchill Arcadian Gardens in advance of the construction phase. Phases 1 and 3 of the construction sequence are not affected by this restriction.

Because of the potential for traffic disruption, the construction of the cable trench (Phase 2 – see Chapter 5 (Project Description) for further details) between Chainage 46190 and 51450 may be subject to bespoke traffic management measures during school term times for those schools along the R448. These measures will be agreed with school management in advance of the construction phase. Phases 1 and 3 of the construction sequence are not affected by this restriction.

19.2 Air Quality and Climate

19.2.1 Construction Phase

19.2.1.1 Dust Emissions

The good practice dust mitigation measures to manage the generation of dust at source will be undertaken, as per the IAQM construction dust guidance (IAQM, 2016). These mitigation measures, which are based on the overall low risk for potential dust soiling, human health and ecological impacts, include the following:

- Communication**:**
  - Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager;
  - The head or regional office contact information will be displayed.
- Site management:
  - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
  - Make the complaints log available to the local authority when asked;
  - Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.
- Monitoring:
  - Carry out regular site inspections to monitor compliance with the CEMP, record inspection results, and make an inspection log available to the local authority when asked;
  - Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. Regular site inspections to monitor compliance with the CEMP will be carried out inspection and results will be recorded.
- Preparing and maintaining the site:
  - Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
  - Avoid site run-off of water or mud.
- Operating vehicles/machinery and sustainable travel:
  - Ensure all vehicles switch off engines when stationary – no idling vehicles;
  - Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Operations:
  - Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;

- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. Cutting, grinding or sawing equipment will only be used where fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction.

19.3 Noise and Vibration

The construction works shall comply with the recommendations of BS 5228-1, and the mitigation measures that will be implemented include the following:

- Noise barriers will be installed around the HDD compounds:
  - HDD4 Ch. 22000 – Crossing of the Lyreen tributary of the River Liffey along the R407. The closest sensitive receptor is located around 18 m away. Noise barriers will be placed on the perimeter of both the launch and reception HDD compounds to screen the receptors identified in Plate 9.3;
  - HDD5 Ch. 37100 – Crossing of the River Liffey north of Sallins. The closest sensitive receptor is located around 68 m away. Noise barriers will be placed on the northern perimeter of the HDD compound on the western bank of the River Liffey to screen the receptors identified in Plate 9.4;
  - HDD6 Ch. 44600 – Crossing of the Grand Canal in Naas. The closest sensitive receptor is located around 32 m away. Noise barriers will be placed on the northern perimeter of the southern HDD compound to screen the receptors identified in Plate 9.5;
  - The noise barriers will be within the Planning Application Boundary. The exact location, height and type of noise barriers to be installed will be confirmed pre-construction;
- BS 5228-1 states that a noise barrier which blocks the line of sight between the source and the receptor would result in an approximate attenuation of 10 dB, which would reduce the effects to be not significant;
- The Contractor will be obliged to comply with Local Authority controls on noise and vibration during construction. This will include (but will not be limited to) setting limits to control noise and vibration from construction activities, implementing the necessary mitigation measures while adopting best practicable means, and carrying out any noise or vibration monitoring where significant adverse effects need to be monitored. The location of the noise barrier will be set out and agreed in advance of the works designed to keep noise levels within the limits;
- The routing, depth, locations, and drilling types of the proposed HDD works have been carefully selected to avoid effects. Structural surveys will be completed pre-construction at all structures that will be crossed or that are within 50 m of the HDD locations. These locations will be monitored during the HDD works, and the surveys will be repeated post-construction. In the extremely unlikely event of repairs being required, these will be immediately undertaken in agreement with the structure owner;
- During the HDD works, constant monitoring by the specialist drilling team will be carried out. The volume of cuttings produced will also be monitored to ensure that no over-cutting takes place and that hole cleaning is maintained. The nature of the cuttings will also be monitored to understand the ground conditions as the drilling progresses. Technical mitigation measures will be applied to the drilling equipment to reduce any vibrational issues. The CEMP will be updated pre-construction with further information about HDD monitoring

when the Contractor is appointed and will be agreed with stakeholders including the Local Authorities, TII, Waterways Ireland, and Irish Rail;

- The Contractor will develop and implement a stakeholder communications plan prior to the commencement of construction which will facilitate community engagement;
- Selection of plant and equipment, construction methods and programming. Only plant conforming with or exceeding relevant national or international standards, directives or recommendations on noise or vibration emissions would be used. Construction plant will be maintained in good condition with regards to minimising noise and vibration emission;
- Plant will be operated and maintained appropriately, with due regard for manufacturer recommendations. All vehicles, plant and equipment will be switched off when not in use;
- Careful selection of routes and programming for the transport of construction materials, spoil and personnel to reduce the risk of increased noise and vibration impacts during construction;
- Vehicle and mechanical plant/equipment used for the works will be fitted with effective exhaust silencers, to be maintained in good working order and operated in a way that minimises noise emissions;
- Construction plant and activities will be positioned to minimise noise at sensitive locations;
- Equipment that breaks concrete by pulverising or similar, rather than by percussion, will be used where practicable;
- Mufflers shall be used on pneumatic tools;
- Works will be programmed to minimise the need for working outside normal working hours;
- Unnecessary revving of engines will be avoided and equipment will be switched off when not required;
- Plant and vehicles will be started-up sequentially rather than all together;
- Drop height of materials will be minimised;
- Rubber linings will be used in, for example, chutes and dumpers to reduce impact noise;
- Any plant, such as generators, which are required to operate before 07:00 or after 19:00 will be surrounded by an acoustic enclosure or portable screen;
- Low vibratory or non-vibratory plant will be used when working close to a vibration sensitive receptor; and
- Vibratory equipment will be started up and turned off as far away from sensitive receptors as is possible.

19.4 Biodiversity

19.4.1 Pre-construction Surveys and Reporting

19.4.1.1 Ecological Clerk of Works

An on-site Ecological Clerk of Works (ECoW) will be appointed by the Contractor to carry out pre-construction surveys (see below) to ensure that the baseline is current and, where required, will implement appropriate mitigation measures as needed. The ECoW will be on site for any works deemed sensitive, i.e. within or near protected European sites or watercourses linked to such sites. Where sensitive habitats or species could be impacted, the ECoW will be on site to implement all mitigation measures as described below. The ECoW will have demonstrate experience and will be a member of a professional body such as CIEEM or similar.

19.4.1.2 Pre-construction Surveys

In advance of enabling works, the Contractor's ECoW will complete pre-construction confirmatory surveys of selected ecological features whose distribution is dynamic over time, and which are known to have potential to occur within the ZoI of the PAB. Any of the small number of areas that could not be surveyed during baseline data collection will also be surveyed at this time. These surveys will update the findings of the surveys completed between October 2021 and October 2022 (survey dates as detailed in Table 10.1), and include the following:

- Bat trees previously identified as having roosting potential and within the ZoI;
- Otter breeding/resting sites within the ZoI of the PAB (minimum 50 m, up to150 m at HDD sites, where access allows; noting that guidance recommends 20 m for non-breeding sites);
- Badger setts within the ZoI of the PAB (minimum 50 m, up to 150 m at HDD locations where access allows);
- Squirrel (grey and red), where dreys are identified within trees to be felled within the PAB;
- Amphibians and reptiles: a pre-construction survey will be undertaken by the ECoW of previously identified area suitable to host these species: reptile habitat (dry calcareous grassland, dry meadows and grassy verges and recolonising bare ground) and of amphibian habitat (drainage ditches, wet grassland and reed and sedge swamps) within the PAB. A suitable safe receptor site will be pre-identified, and if amphibians or reptiles are found the ECoW will translocate animals if necessary to the suitable receptor habitat; and
- Invasive species within the PAB.

Bat surveys will be carried out in accordance with guidance from Marnell *et al*. (2022) and NRA (2006a). Surveys may comprise inspection of roost features at height using a mobile elevating work platform and will be carried out by a licensed bat worker where appropriate.

All surveys will be undertaken by suitably qualified ecologists with demonstrable experience in the survey and assessment of the feature.

19.4.1.3 Reporting

The results of pre-construction confirmatory surveys will inform the refinement of mitigation measures (if required) in the Contractor's method statements, and all results will be incorporated into the Contractor's constraint mapping.

Survey reporting and mapping will be provided to the Developer's Ecologist (ESB), EirGrid's Planning and Environmental Unit (PEU) within the Chief Infrastructure Office, and to any prescribed bodies as additionally required by any planning conditions.

19.4.2 Construction Phase

19.4.2.1 Site-Wide Mitigation Measures

A number of site-wide mitigation measures will be applied across the Proposed Development to avoid the impacts associated with pollution of watercourses and impacts to small mammal species, amphibians and breeding bird species. In addition to this, there are mitigation measures specific to the various Proposed Development elements.

The contractor's ECoW will give toolbox talks to all site personnel to highlight any environmental sensitivities and the boundaries of sensitive habitats. Toolbox talks will include findings of pre-construction surveys on baseline changes and any adaptive mitigation measures required. During sensitive works, e.g. in-stream works, the contractor's ECoW will supervise the works and propose adaptive mitigation measures in response to, for instance, extreme weather events (amber and red Met Eireann weather warnings) or new mitigation requirements arising from pre-construction surveys. Method statements in relation to trenched crossings will be agreed with IFI prior to the start of works. No sensitive works will be permitted without the prior approval of the ECoW.

Pollution Control

The measures set out below will be implemented to ensure that there will be no pollution of surface water during the construction phase of the Proposed Development. The measures will be incorporated into the contractor's CEMP and developed in accordance with the following guidance documents and legislation:

- CIRIA C532 Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams *et al.*, 2001);
- CIRIA C648 Control of Water Pollution from Linear Construction Projects: Technical Guide (Murnane *et al.*, 2006a);
- CIRIA C649 Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane *et al.*, 2006b);
- CIRIA C692 Environmental Good Practice on Site (Audus *et al.*, 2010);
- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA, 2005).

Mitigation measures with respect to accidental pollution are focused on prevention, safeguarding the approach to the storage and handling of materials, and managing vehicles during the temporary construction phase.

Control of Silt-Laden Runoff

Specific measures to control silt will be implemented at each of the Proposed Development infrastructure sites. Surface water run-off at the construction sites will be managed to prevent silt-laden surface water flowing into surface water receptors:

- The contractor will ensure no deleterious discharges are released from construction sites to the nearby waterbodies during construction. If a discharge to a watercourse is necessary, the water will pass through a swale or silt buster prior to discharge. Levels of suspended solids in any discharge will be no greater than 25 mg/l as per IFI guidance (2016), and flows will be controlled to levels appropriate to the receiving water. It is possible that such a discharge may require a licence under the Water Pollution Acts 1977 & 1990, as amended, and the Arterial Drainage Act 1945 & 1995, as amended. The Contractor will liaise with the regulatory authorities at an early stage to determine the need for licences and include the appropriate application time required in any construction programme;
- Silt fences will be erected along the boundary of water bodies to prevent any silt-laden run-off from impermeable surfaces, temporary or permanent, as well as spoil heaps within the construction working width;
    - double silt fencing will also be applied to areas where concrete pouring is to be undertaken and where there is a risk to European designated sites;

- silt fences will be installed downgradient of the potential source of the silt/sediment;
- the silt curtain will contain the area where silted waters are being generated and will terminate on high ground;
- they will be constructed using permeable filter fabric (Hy-Tex Terrastop silt fence or similar) rather than a mesh material;
- its base will be embedded at least 15 cm into the ground and staked at 2 m intervals;
- the vegetated turves will be peeled back and not detached from the ground, the materials inserted and the turves replaced to hold the base in place;
- the silt fence will be inspected regularly by the ECoW and contractor, and in particular following heavy rainfall;
- silt fences will remain in situ until the vegetation on the disturbed ground is re-established;
- the fence will not be pulled from the ground, but cut at ground level and the stakes/posts removed;
- should water build up behind the fences, the sediment will settle to the bottom. Water can be released, but sediments will remain;
- two lines of silt fencing will be installed in sensitive areas, based on the ECoW's professional judgement;
- a record of its installation, inspection and removal will be maintained by the ECoW; and
- Reinstatement of any banks affected by silt-laden run off during construction will be reinstated back to pre-development conditions.

Stock piling of Materials

The following measures will be implemented for the stockpiling of materials. During construction, mobilisation sites will either be cleared in stages to prevent bare earth being exposed for prolonged periods, or the bare earth would be immediately covered in a gravel/plastic covering to reduce the likelihood of sediment-laden run-off following rainfall events. Stripped soil will be stockpiled more than 10 m away from the surface interceptor drain. Stockpiles will be in a dry zone that is not subject to flooding (i.e. outside 1:100 flood extent (1% Annual Exceedance Probability)). The following measures will be put in place by the Contractor for stockpiling of material:

- Temporary stockpiles will be located away from drains and watercourses. Stockpiles will not be located within 10 m of a watercourse;
- For watercourse crossings, stockpiles will not be located anywhere within the crossing working area;
- Stockpiles will be managed to prevent siltation of watercourse systems through run-off during rainstorms with the final measures to be determined by the Contractor. These will include the following measures or equivalent measures:
    - Allowing vegetation to establish on the exposed soil;
    - Providing silt fences or straw barriers at the toe of the stockpile to mitigate run-off during rain events;

- Surrounding stockpiles with cut-off ditches to contain run-off;
- Directing any run-off to the site drainage system or filter drains along the construction working width and to the settlement pond (or other) treatment systems; and
- Providing bunds or another form of diversion to keep run-off from entering the stockpile area.

Storage of materials

The following measures will be implemented for storage of materials:

- All oil and diesel storage facilities will be at least 30 m from any watercourse, including surface water drains, and outside the 1:100 flood extent (1% Annual Exceedance Probability);
- Spill kits and drip trays will be provided for all equipment and at locations where any liquids are stored and dispensed;
- Storage areas for solid materials, including waste soils, will be designed and managed to prevent deterioration of the materials and their escape (via surface run-off or wind blow);
- Storage areas will be kept secure to prevent acts of vandalism that could result in leaks or spills; and
- All containers of any size will be correctly labelled, indicating their contents and any hazard warning signs.

Spills

The following measures will be implemented across the site to prevent spills:

- fuel tanks, drums and mobile bowsers (and any other equipment that contains oil and other fuels) will have a secondary containment, for example double-skinned tanks;
- all tanks, drums and mobile bowsers will be located in a sealed impervious bund with sufficient capacity to contain at least 25% of the total volume of the containers or 110% of the largest container, whichever is the greatest;
- storage areas will be covered, wherever possible, to prevent rainwater filling the bunded areas;
- fuel fill pipes will not extend beyond the bund wall and will have a lockable cap secured with a chain;
- where fuel is delivered through a pipe permanently attached to a tank or bowser:
  - the pipe will be fitted with a manually operated pump or a valve at the delivery end which closes automatically when not in use;
  - the pump or valve will be fitted with a lock;
  - the pipe will be fitted with a lockable valve at the end where it leaves the tank or bowser;
  - the pipework will pass over and not through bund walls;
  - tanks and bunds will be protected from vehicle impact damage;
  - tanks will be labelled with contents, capacity information and hazard warnings; and

  - all valves, pumps and trigger guns will be turned off and locked when not in use. All caps on fill pipes will be locked when not in use.

- suitable precautions will be taken to prevent spillages from equipment containing small quantities of hazardous substances (for example, chainsaws and jerry cans) including:

  - each container or piece of equipment will be stored in its own drip tray made of a material suitable for the substance being handled; and

  - containers and equipment will be stored on a firm, level surface.

- For deliveries and dispensing activities, the Contractor will ensure that:

  - site-specific procedures are in place for bulk deliveries; and

  - delivery points and vehicle routes are clearly marked.

- emergency procedures will be displayed, and suitably sized spill kits will be available at all delivery points, and staff will be trained in these procedures and the use of spill kits.

Fuel and oil leaks from vehicles and plant

The use of vehicles and plant poses similar risks to those posed by storage of liquids. Fuel and oil may leak from such equipment which may enter drains and/or watercourses, as well as contaminating the ground itself. The following measures will be implemented to reduce this risk:

- vehicles and plant provided for use on the site will be in good working order to ensure optimum fuel efficiency, and will be regularly inspected to ensure they are free from leaks;

- sufficient spill kits will be carried on all vehicles;

- vehicles and plant will be regularly maintained to ensure that they are working at optimum efficiency and are promptly repaired when not in good working order;

- vehicles and plant will not park near or over drains; and

- refuelling of vehicles and plant will be carried out on hard standing, using drip trays to ensure no fuel can contaminate the ground outside of the bunded areas.

Concrete

If concrete is required on site, the following measures will be implemented to reduce risks associated with concrete pouring:

- when working in or near the surface water and the use of introduced materials, e.g. oil, cannot be avoided, alternative materials such as biodegradable oils shall be used;

- placing of concrete in or near watercourses will be carried out only under the supervision of the ECoW;

- there will be no hosing of concrete, cement, grout or similar material spills into surface water drains. Such spills shall be contained immediately, and run-off prevented from entering the watercourse;

- concrete waste and wash-down water will be contained and managed on-site to prevent pollution of all surface watercourses; and
- washout from concrete lorries will not be permitted on-site and will only take place at the batching plant (or other appropriate facility designated by the manufacturer).

Nesting birds

Unless suitable mitigation is adopted (see next paragraph), hedgerows, trees and scrub will not be removed within the bird breeding season, generally taken to be between 1 March and 31 August, to avoid impacts on nesting birds.

Where this seasonal restriction cannot be adhered to, habitats that need to be removed will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. The ecologist will demarcate a suitable buffer around an active nest and clearance within this area will be postponed until the chicks have fledged. A suitable exclusion zone will be established by the ECoW. Bird deterrents (e.g. flicker tape/compact discs will be tied to habitat confirmed without nests and the habitat will be cleared within three days of the inspection; otherwise, repeat inspections will be required to confirm the continued absence of nesting birds. If vegetation is to be cleared in the breeding season (under supervision of an ecologist), it will be chipped, removed or covered (ideally) on the same day to prevent birds from nesting. Planting of woodland, hedgerow and grassland habitats within the PAB as detailed in the landscape drawings will provide suitable compensatory habitat for the breeding bird species recorded within the study area. Once established, this will provide nesting habitat for breeding birds displaced as a result of the Proposed Development

Squirrels

Squirrels breed in winter (young born February to April) when trees are generally proposed to be felled (i.e. outside the bird nesting season). Even if adults vacate their dreys, if present, young could be killed. Dreys are often distinguishable from bird nests as dreys are constructed in the main upper tree trunk (not upper thinner terminal branches). Dreys are not usually in isolated trees, and typically have leaves attached to twigs. Grey squirrels are a scheduled invasive species widespread in the environs of the Proposed Development site. Red squirrels are a nationally protected species with a patchy distribution in the environs of the Proposed Development site.

Where pre-construction surveys identify potential dreys at risk from felling, vantage point watches (for individual trees) or transects (for hedgerows/groups of trees) will be conducted to visualise squirrels and identify if the squirrel is grey (invasive) or red (protected). Surveys are best conducted in the early morning, during the summer months. Where visualisations are inconclusive, hair tube surveys may be required, following the method in NRA (2009). As grey squirrels are a scheduled invasive species, confirmed grey squirrel dreys can be felled without mitigation. In the event that confirmed or suspected red squirrel dreys require felling, felling will only be carried out from October to January, in consultation with the NPWS, who may require a licence, subject to survey findings.

Roosting bats

Although no bat roosts were known to be present, to avoid the risk of killing and injuring bats during construction, all trees to be removed will be subject to pre-construction surveys. Any roosts recorded would be felled under a derogation licence, which would require mitigation measures, such as the provision of an alternative roost (bat box) in a suitable, undisturbed location, away from the construction works, either within the Planning Application Boundary where works have been carried out or on third-party lands, and with the agreement of landowners. The loss of trees with high potential for roosting bats will be mitigated for on a 3-to-1 ratio with bat boxes, and moderate potential trees will be mitigated on a 2-to-1 ratio with bat boxes. A range of models will be used, suited to the species recorded within the study area, and for different seasons. The boxes will be erected in a suitable location. It may be necessary for temporary lighting to be provided at construction compounds for security purposes. Temporary lighting would need to be controlled and directed in order to mitigate any potential impacts to bats as advised by the appointed ECoW.

Mammals (otter)

Following the pre-construction survey methods, the following general mitigation measures for otter will be implemented:

- any excavations will be covered at night to prevent otter from falling in or becoming trapped;
- should any otter be observed within the PAB or should any evidence of otter activity be found during the works, works must cease immediately and the ECoW contacted for advice;
- should a non-breeding otter holt or rest site be identified, a buffer zone of 30 m will be implemented around the feature. Where a resting place is confirmed to be a natal site this would increase to 150 m; and
- TII's Guidelines for the Treatment of Otters will be followed at all times as necessary.

Further surveys, mitigation and licensing may be required to lawfully proceed if impacts to otter cannot be avoided.

Mammals (badger)

Following the pre-construction survey methods, the following general mitigation measures for badger will be implemented:

- any excavations will be covered at night to prevent badger from falling in or becoming trapped;
- if badgers are found to be present, any works within 30 m of a sett will be supervised on-site and full-time by a suitably qualified ecologist (extended to 50 m during the breeding season for a main sett where there is breeding activity);
- breeding setts will not be interfered with or disturbed during the badger breeding season (December to June inclusive);
- only the use of hand tools will be permitted within 20 m of an active sett;
- no heavy machinery will be used within 30 m of a sett except under licence;
- during the breeding season, none of the above works will be undertaken within 50 m of active setts nor blasting (if required) within 150 m of active setts. Should this not be possible, an experienced ecologist will be contacted for advice on how best to proceed;
- night-time working will be restricted as far as possible within 100 m of a sett;
- the use of noisy plant and machinery near badger setts will cease before sunset; and
- any spoil heaps will be sited at a minimum distance of 30 m from setts.

Small mammals

Removal and clearance of vegetation may affect small mammal species if present in these habitats. The following measures will be adhered to in order to minimise impacts to small mammal species:

- any excavations will be covered at night to prevent small mammals from falling in or becoming trapped;

- working at night will be prohibited where specific tasks such as vegetation removal and clearance are to be carried out and will be information by the ECoW;
- any lights will be turned off after working hours;
- noise levels will not exceed permissible levels for construction works (70 dB(A)) based on Guidelines for the Treatment of Noise and Vibration in National Road Schemes (NRA, 2004); and
- post construction, the site will be re-vegetated.

Amphibians and reptiles

Removal and clearance of vegetation may affect amphibians or reptiles if present in these habitats. The following measures will be adhered to, to minimise impacts on amphibians or reptiles:

- a toolbox talk will be carried out to ensure all site personnel are aware of these protected species and their mitigation requirements;
- vegetation will be cleared in two stages, during the reptile and amphibian active season, following the completion of the toolbox talk:
    3) A hand-search by a licensed ECoW for any animals present within vegetation to be cleared, followed by a first cut of vegetation down to 210 mm above ground-level using hand tools;
    4) A second hand-search of vegetation by an ECoW for any animals present, followed by the second cut of vegetation to ground-level (or as close as practicable).
- if any reptiles are found during pre-construction surveys or during works, they will be captured and translocated by a suitably qualified and experienced ecologist under licence to a previously identified receptor site.
- where practicable in the context of construction, water levels will be maintained in any watercourses potentially used by amphibians; and
- habitat reinstatement will re-create, except in areas of permanent hardstanding, the former habitats within the PAB.

Invasive Plant Species

The mitigation measures described below follow the recommendations set out in the *Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads* (TII, 2010):

- all staff will be informed of the presence of Himalayan balsam and any other invasive species through toolbox talks;
- exclusion zones will be established where necessary to prevent the spread of invasive species;
- no machinery will be allowed within exclusion zones other than where necessary to undertake treatment measures;
- any plant material and soil-containing plant material must be disposed of in accordance with the TII (2010) guidelines; and

- care will be taken near watercourses to ensure that material that contains flower heads, seeds or cuttings of any invasive species will be disposed of correctly and not enter watercourses.

19.4.3 Specific mitigation measures

19.4.3.1 European designated sites

The NIS for the Proposed Development (Jacobs 2023b) found that, in the absence of mitigation, likely significant effects on the Rye Water Valley/Carton SAC could not be excluded, because this SAC is hydrologically connected to the PAB by the following waterbodies: WB03 (Cullendragh); WB04 (Jenkinstown Stream); WB09 (un-named ditch, flows into Rye Water); WB10 (Bride Stream); WB12 (un-named ditch, flows into Rye Water); WB13 (Rye Water); WB26(un-named ditch, flows into River Lyreen); WB16 (River Lyreen); WB20 (un-named ditch, flows into River Lyreen); WB22 (Baltracey River, flows into River Lyreen).

Mitigation measures to protect the Rye Water Valley/Carton SAC from water pollution are described in the NIS (Jacobs 2023b) and in the site-wide mitigation measures.

19.4.3.2 Nationally designated sites

In addition to the site-wide waterbody mitigation measures, the following mitigation relating to HDD will be put in place where it crosses the Grand Canal pNHA and the Royal Canal pNHA to prevent bentonite drilling fluid release entering these canals:

- when using HDD, the drilled cuttings will be flushed back by the drill fluid flowing via nozzles in the drill bit, to the surface, where they will be separated from the fluid fraction for disposal. A comprehensive closed-loop drilling fluid mixing and circulation system with recycling capability will be used to minimise the volume of fluids required on site;

- the shaft and borehole will be kept at least 50 m away from any watercourse where possible. However, given that the shaft will be kept as short as possible to reduce the risk of the drilling machine becoming stuck, it may not be possible to keep 50 m from a watercourse. In this case, a bunded area will be created around the temporary working space to prevent slurry washing into the SAC in the case of accidental release;

- use will be constantly monitored by the contractor through materials balance calculations, pressure monitoring in the lines and above ground visual assessment of the works. The pressure will be lowered, if necessary, to prevent a breakout. Bentonite pumping will stop immediately if any sudden drop in pressure is detected which could indicate a bentonite breakout;

- biodegradable drilling mud formulation and management for the conditions and best practice drilling practices will be adhered to by the contractor at all times; and

- the contractor will prepare an emergency action plan as part of the CEMP which will include containment, control and clean-up measures in the event of drilling fluid release into the environment. Containment measures include installing interception devices (e.g., silt fence, staked straw bales, sediment curtains, collection sumps).

19.4.3.3 Otter

The mitigation measures described below follow the recommendations set out in the *Guidelines for the Treatment of Otters during the Construction of National Road Schemes* (NRA, 2008)

One potential otter holt was identified within the PAB during the field surveys (see Figure 6, Appendix 10.7). The hole showed no signs of otter use, but due to its location near to the river there was high potential for use.

Prior to the works, the potential holt may become active. To confirm the holt status, the holt will be monitored under licence for a minimum of five days using remote cameras. Should the holt be determined to be inactive, works can proceed under the supervision of an ECoW. Should the holt be determined to be active, a buffer zone will need to be established as agreed with the ECoW.

19.4.3.4 Badger

The mitigation measures described below follow the recommendations set out in the *NRA Guidelines for the Treatment of Badgers during the Construction of National Road Schemes* (NRA, 2006).

During the baseline surveys, it was identified that seven badger setts/potential badger setts could be impacted by the Proposed Development, including five within 50 m of the PAB and two between 61 and 150 m (see Table 10.20 and on Figure 7, Appendix 10.8).

Of the seven setts, there are three active setts: one at 32 m, one at 40 m and one at 150 m from the PAB, and four are inactive (all within 61 m of the PAB).

To determine whether a sett is active or inactive, camera traps will be set up to monitor the entrance to the holes for a minimum of five days. If, after five days, there is no evidence that badgers are using the sett, it is presumed inactive and no further actions are required. However, this would only apply if the monitoring was carried out directly prior to the start of works, meaning there was no change to the baseline. The use of the sett may change over time, so if there is a delay of more than 12 months prior to the commencement of the works from the date of the final camera monitoring, then a further badger survey will be undertaken to determine the status of the hole.

No heavy machinery will be used within 30 m of badger setts (unless carried out under licence); lighter machinery (generally wheeled vehicles) will not be used within 20 m of a sett entrance; light work, such as digging by hand or scrub clearance will not take place within 10 m of sett entrances. During the breeding season (December to June inclusive), none of the above works will be undertaken within 50 m of active setts nor blasting or pile driving within 150 m of active setts.

Where a sett needs to be closed, the measures presented in the NRA guidance (2006) will followed in full.

19.4.3.5 Wintering Birds

Wintering birds recorded at Osberstown Pond could be disturbed if present during works from September to March inclusive, as the pond is within the 300 m distance for noise and visual disturbance as suggested by Cutts *et al*. (2013). The following measures will mitigate disturbance to wintering birds;

- Hoarding/non-transparent visual screening will be erected to hide the construction works. The barrier material will have a mass per unit area exceeding 7 kg/m^2 in accordance with the recommendations of BS 5228 Part 1:2009+A1:2014 Part B.4. Screening will be installed in early September. Erection of fencing later than this could potentially cause further disturbance to the birds. The fencing will be of adequate height to screen the PAB (2–3 m) or as advised by an experienced ecologist and will remain in place for the duration of the works. The ECoW will supervise the erection of the screening (where natural screening cannot be retained) and provide guidance through a toolbox talk ensuring these measures are effective. The ECoW will make regular checks of the screening throughout the works to ensure it is maintained in good condition and working order.

- Habitat disturbance will be limited by controlling the movement of vehicles and personnel. Construction vehicles and personnel will not encroach onto habitats beyond the Proposed Development footprint. To reduce the level of disturbance to wintering birds, construction activities will be restricted to between 07:30 and 19:30 Monday to Friday and between 08:00 and 18:00 on Saturdays.

- All plant used during the construction phase will be the quietest of its type practical for achieving the works. All plant will be operated and maintained in accordance with the manufacturer's recommendations including the use and maintenance of any specific noise reduction measures. At a minimum, the following will be incorporated to reduce the impact further:
    - The use of mufflers on pneumatic tools;
    - Effective exhaust silencers;
    - Sound-reducing enclosures;
    - Pumps and static mechanical plant will be enclosed by acoustic sheds or screens;
    - Machines in intermittent use will be shut down during periods where they are not required.

19.4.3.6 Fish and white-clawed crayfish

The following control measures will be implemented during construction in or adjacent to a watercourse:

- works within and adjacent to watercourses will be conducted during forecast low-flow periods where possible;
- in-stream works will not be carried out in watercourses frequented by salmon or trout during the Annual Close Season. The duration of the season varies regionally within the period from the beginning of October to the end of February, inclusive (IFI, 2016). River and brook lamprey spawn during March to April/May. Translocation (fish rescue) and in-stream works will be undertaken outside of the spawning season for salmonids (salmon and trout) and lamprey (river and brook), generally taken to be summer to early autumn, which would also protect white-clawed crayfish. The timing of works will be considered on a site-specific basis and in agreement with the IFI;
- operation of machinery in-stream will be kept to an absolute minimum. All construction machinery operating in-stream will be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery will be cleaned and checked prior to commencement of in-stream works;
- the design of temporary settlement ponds, the outfalls from these temporary ponds and the construction method statements for their installation will be agreed with IFI prior to construction;
- the area of disturbance of the watercourse bed and bank will be the absolute minimum required for the installation of outfalls/culverts;
- any dewatering flows will be directed to the construction drainage system and to the settlement pond (or other) treatment system;
- sediment mats/silt traps or similar will be located immediately downstream of the works within and adjacent to the watercourses. These will be inspected daily, maintained and cleaned regularly by the ECoW during the course of site works. Diversion of water to and from a temporary diversion channel will only take place during the period March to September (IFI, 2016) or as agreed with the IFI;
- small check dams will be constructed in the cut-off watercourse to trap any sediment, and a sediment trap will be provided immediately downstream of the diversion to the existing watercourse; and

- where in-stream bed material is to be removed, coarse aggregates, if present, will be stockpiled at least 10 m away from the watercourse for replacement following reinstatement of a watercourse channel.

Watercourse banks affected during construction in/near a watercourse will be reinstated back to pre-development conditions.

Where open trenching is proposed, site restoration works will be carried out following completion of the crossing, in agreement with IFI. These works may include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation. Open cut trenching works will not be carried out during extreme rainfall or high flow events. Met Éireann provides a five-day weather forecast via its website (www.met.ie), and works will not take place during orange and red weather warnings unless agreed with the ECoW. Unless otherwise agreed with IFI (for fish) and/or the NPWS (for white-clawed crayfish), any element of the works requiring in-stream works will be restricted to the fisheries open season (i.e. restricted to July to September inclusive). Where white-clawed crayfish were confirmed as present (WB46 and WB32), works will be carried out under licence.

Additional measures that will be undertaken to protect fish species and white-clawed crayfish are as follows:

- where in-stream trenching is to be carried out, the area will be dewatered to provide a dry working area;
- netting, sandbags and/or dumpy-bags filled with rock will be installed upstream to prevent fish travelling downstream into the working area;
- fish will be removed from the working area through electrofishing and moved upstream of the dammed area;
- hand searches, under licence, will be conducted at WB46 and WB32 where crayfish were confirmed to be present, and any crayfish found will be removed and moved upstream of the dammed area;
- water will then be over-pumped continually to ensure a dry working area. This must be pumped through a silt buster to avoid sediment from becoming suspended within the watercourse; and
- once construction is completed, the watercourse will be re-wetted under the direction of the ECoW. Water will be released slowly, and silt mats, sediment traps and haybales will be used to avoid a sudden influx of sediment to the system. A silt buster will be used where required.

19.4.3.7 Invasive species

Himalayan balsam was present along the route of the Proposed Development between ch 37000 and 37250 at N 87990 24456, approximately 40 m from the HDD launch platform on the west bank of the River Liffey, and at the same location but approximately 70 m south of the PAB at N 87999 24353. These areas will be fenced off and toolbox talks given to raise awareness. Where this is not possible, biosecurity measures must be carried out as presented in the site-wide mitigation measures.

19.4.4 Reinstatement

19.4.4.1 General requirements (all hedgerows)

All planting will be native (only), taking account of the vegetation that has been removed and typical species of the Kildare/Meath landscape.

Unless otherwise agreed with the Developer (ESB) and the local authority, the Contractor will reinstate hedgerows and treelines to a species-rich condition (i.e., five woody species per 30 m), comprising only native species. All other sites will be returned as close as possible to their pre-existing condition, using the same woody species removed, under the supervision and direction of the Contractor's ECoW.

Hedging/hedgerow plants will be planted as a staggered double row, six plants per metre with 330 mm between rows. Suitable individual protection from browsing animals will be provided by tube, spiral or similar held in place with a short cane. Group protection of new planting may be provided by suitable fencing, but individual plant protection of spirals will be provided to protect against browsing animals. Mulch mats or similar weed suppression materials (restricted to a biodegradable specification) will be used to promote successful establishment.

The Contractor will make orders by the scientific name to ensure native plants are delivered and not a cultivated variety.

Nurseries prefer to grow trees to order, so the Contractor will make the order as soon as possible (up to a year in advance) to ensure the required species and stock specification can be secured.

Consideration will be given to the procurement of planting so that there are suitable lead-in times to ensure that plants are of the right age/height required for when they are planted.

The Contractor will manage the establishment phase of planting (1–2 years) in accordance with online Teagasc guidance (Teagasc, 2020), to include watering in, weed suppression (using biodegradable mulches), and (where required) protection from browsing animals.

Thereafter, the Developer (ESB) will manage plantings from years 3-5 in agreement with the landowner.

19.4.4.2 Specific requirements (hedgerows within the cable easement)

At the time of writing, the latest specification (EirGrid, 2021) stated:

"*The easement area shall be cleared, and kept clear, of trees and other vegetation with deep root systems as these may damage the cable*".

All planting from the edges of the easement to the edges of the PAB will be replanted.

EirGrid has not confirmed known precedence for safely planting trees or shrubs over High Voltage Underground cables.

A Draft Planting Strategy is under development for restricted low shrub planting within the cable easement, including the potential use of a high performing Root Barrier Membrane.

This Draft Planting Strategy is undergoing Risk Assessment, in conjunction with a review of international best practice.

If approved, by EirGrid and ESB, the Planting Strategy would complement the commitment to Offsite Compensatory Planting for permanent hedgerow loses within the footprint of permanent surfaced areas.

The risk assessment may conclude that easement planting cannot be delivered while guaranteeing cable performance and security.

Therefore, applying a precautionary principle, in this assessment offsite compensatory planting is assumed for all permanent losses within the easement.

19.4.4.3 Specific requirements (semi-natural grasslands)

The Contractor's ECoW will develop site-specific reinstatement plans for all semi-natural habitats (including dry calcareous grassland, dry meadows and grassy verges, and reed and large sedge swamps). These plans will be provided to the Developer's Ecologist (ESB), and the Planning and Environmental Unit in EirGrid's Chief Infrastructure Office. In accordance with the All-Ireland Pollinator Plan, commercial seed mixes will not be sown with the objective of restoring biodiversity. Seeds of certain plant species, such as wildflowers and certain species included in multi-species mixtures, are not subject to the seed certification schemes as implemented by the EU Member States and OECD-designated authorities in respect of third countries (DAFM, 20218). Furthermore, even where harmful weed species are not present, seeds of non-local origin — even if the species are native — introduce new genetic strains which may displace or compromise the local, naturally-occurring flora (Dublin Naturalists Field Club, 2021).

As such, in the site-specific habitat reinstatement plans for semi-natural habitats, the Contractor's ECoW will adopt the following approach, subject to consultation with the NPWS:

4. where it is deemed appropriate to allow habitats to re-vegetate naturally (e.g. roadside verges, where similar habitat is contiguous either side of the construction area), there will be no active seeding of reinstated topsoil;

5. in all other areas, the preferred approach to reinstatement shall be use of locally collected seed from similar habitats;

6. use of commercial seed in semi-natural habitats will only be permitted where local seed is not available, or where local seed establishment has failed, AND if both:

    a. Certified native by the Department of Agriculture, Food, and the Marine; and,

    b. With the written agreement of the NPWS.

19.4.4.4 General requirements (roadside verges and agricultural areas)

Measures for use of seed in grassland reinstatement are as follows:

- commercial seed mixes can be used on road verges but not on semi-natural grassland habitats.

- all seed mixes will be certified native by the Department of Agriculture, Food, and the Marine.

- in agricultural areas, the rate of seeding, time and method of sowing, including the application of fertiliser, will be agreed with an experienced agronomist and will follow the guidance on reseeding (Teagasc, 2014).

19.4.4.5 Compensation (Unrelated to European sites)

An off-site hedgerow compensation strategy has been developed, in light of the urgent biodiversity action required at European and national level, and the hedgerow/tree policy objectives of Kildare County Council (particularly Policy Objectives BI 026, BI 027, BI 028) and Meath County Council (particularly HER POL 37, HER POL 38, HER POL 40).

The strategy will comprise off-site compensatory planting, outside the PAB, to deliver an overall net gain of habitat area. A minimum of 130% compensatory off-site planting will be delivered by the Developer (ESB), in consultation with EirGrid.

The surplus will mitigate the risk of failures and contribute to the reduction of residual effects on mature and veteran trees, which cannot be replaced. Subject to consent, the planting will commence in advance of, or in parallel with, construction works. EirGrid has identified candidate sites in Co. Meath in consultation with a charity partner, who provides compensatory planting options on third-party lands. Whether these candidate sites or other sites are used for compensatory planting, there will be no planting in semi-natural habitats of significant ecological value, which will be verified by the Developer's Ecologist.

While the strategy cannot fully mitigate the loss of mature and veteran trees, the proposed surplus of off-site compensation will reduce the significance of residual effects.

19.4.4.6 Monitoring

To ensure that the proposed mitigation measures remain effective, particularly in regard to reinstatement and compensation, the Contractor and ESB will collectively deliver a five-year monitoring landscape aftercare regime.

Sediment mats/silt traps or similar will be located immediately downstream of the works within and adjacent to the watercourses. These will be inspected daily, maintained and cleaned regularly by the independent EnCoW during the course of site works. Diversion of water to and from a temporary diversion channel will only take place during the period March to September (IFI, 2016) or as agreed with the IFI.

19.4.4.7 Reporting

All reinstated or indirectly impacted semi-natural vegetation will be inspected at the completion of construction, at which time the Contractor's ECoW will provide written reports on habitat condition to the Developer's Ecologist (ESB), and EirGrid Planning and Environmental Unit. At that time, the Developer's Ecologist (ESB) will determine what additional steps are required. Additional steps could include replacement tree planting, additional hedge mulch or protection from browsing animals, or sowing of locally harvested seed (using a green hay approach) for semi-natural grasslands).

19.5 Soils, Geology and Hydrogeology

No significant impacts to land cover or geology are predicted from the Proposed Development. Measures set out in the CEMP will also reduce any risks to the land use and geology.

For hydrogeology there is the potential for some temporary and long term localised significant impacts. The following mitigation measures will be implemented prior to the commencement and throughout the duration of the works to limit these impacts:

- Protection of private water supplies:
    - The potential presence of private water supply abstractions will be confirmed through pre-construction surveys. Source and supply assets will be monitored if unforeseen private abstractions are present near the Proposed Development.
    - Replacement water supplies will be provided if necessary.
- Protection of potential GWDTE sites:
    - While impacts on groundwater levels and flows are predicted to be generally small, in order to prevent potential impacts to GWDTE the potential GWDTE sites identified will be monitored by the ECoW during construction. The ECoW will be on site for any works deemed sensitive, i.e. within or near protected European sites or watercourses linked to such sites. There is the possibility of groundwater ingress from excavations at potential GWDTEs, and where deeper excavations are proposed (HDD sites and any stream crossings deeper than 1.7m). In this case, the Contractor will remove water to

facilitate suitable working conditions. The Contractor will overpump intercepted water and treat it via a filter bag (or similar) before discharging it within a suitable vegetated area locally to infiltrate to ground and recharge groundwater.

- Groundwater monitoring:
  - Groundwater conditions will be monitored during construction where deeper excavations are proposed (HDD sites and any stream crossings deeper than 1.7 m) in order to confirm no significant impacts to the groundwater regime at critical points along the cable route.
- Adhere to measures set out in the CEMP.

19.6 Hydrology

19.6.1 Construction Phase

19.6.1.1 General

The following mitigation measures will be implemented prior to commencement and throughout the duration of the proposed works:

- Implementation of the CEMP (Appendix 5.4 of this PECR) and the Construction Resource Waste Management Plan (Appendix 5.5) which sets out measures to control and manage activities at the surface to prevent issues such as accidental spillage;
- A full-time on-site Environmental Clerk of Works (EnCoW) will be appointed prior to commencement of works;
- Works will be carried out in accordance with the guidelines set out by Inland Fisheries Ireland in Guidelines on Protecting Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016);
- The Inland Fisheries Ireland Biosecurity Protocol for Field Survey Works will be complied with;
- Works method statements will be agreed with Inland Fisheries Ireland for all watercourse crossings. The works method statement will include details on silt fencing, pH monitoring requirements for in-stream concrete pouring works, and handheld turbidity monitoring for in-stream and HDD works; and
- An adverse weather stop work plan will be developed to ensure that activities with the potential to cause pollution are stopped under certain weather conditions. Certain activities (such as open cut trenching, HDD works) will not be carried out during extreme rainfall or high flow events. Met Eireann (Red, Amber, Yellow) warnings and flood warnings will be monitored daily by the EnCoW.

19.6.1.2 Surface Water Quality Protection Measures

The following surface water quality mitigation measures will be implemented prior to commencement and throughout the duration of the works:

- Activities will be planned in advance and machinery will be managed to ensure that the number of trips is limited to the minimum required at each location. This is because the more times a piece of ground is tracked, the more likely it is that vegetative cover will be removed and ruts will be created that will act as miniature rivers where dirty water will flow;

- Tracking beside streams and tracks will be avoided to avoid damage to the bankside;
- Geotextile or timber matting will be used on soft ground, and in all protected areas;
- A buffer zone of 20 m will be maintained between storage/working areas and sensitive watercourses, such as the River Liffey, taking account of the minimum working area required to facilitate the works;
- Oil or fuel stored in or adjacent to the construction site will be kept in a bunded area (providing 110% capacity of the largest storage unit), 100 m from any watercourse which appears on a 6" OS map of the site. Vehicle maintenance will not occur within 100 m of any watercourse and all machinery will be in good working order, free from any leakage of fuel, oil or hydraulic fluid;
- Reinstatement method statements will be subject to approval by the EnCoW;
- Concrete will be brought to site by covered truck. Wet concrete operations adjacent to watercourses will be minimised, with a minimum separation distance of 10 m. Where unavoidable, these operations will be carried out under supervision of the EnCoW and with suitable mitigation measures in place, such as controlling the leakage of any cement;
- The Contractor will ensure that all concrete truck rinsings/cleaning is undertaken within construction compounds and at least 10 m away from watercourses;
- In order to reduce the risk of contamination arising as a result of spills or leakages, measures including, but not limited to, the following will be employed:
    - All collected waste will be managed in accordance with the Waste Management Act 1996, and associated Regulations;
    - Fuels, chemicals, liquid and solid waste will be stored on impermeable surfaces;
    - Refuelling of plant, equipment and vehicles will be carried out on impermeable surfaces;
    - All tanks and drums will be bunded; and
    - Spill kits will be provided at all compound locations and carried by all crews during underground cable installation works.
- Silt fences (to Hy-Tex Premium specification or similar) and silt traps will be installed prior to commencement of works and will be inspected daily so that they can be adjusted as necessary. The EnCoW will consider the locations for these measures based on the potential for sediment-laden run-off to reach a receiving watercourse.
- Site restoration post works will be carried out, in agreement with Inland Fisheries Ireland. These works may include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation;
- The Emergency Incident Response Plan and environmental control and mitigation measures described in the CEMP will be agreed prior to construction with Inland Fisheries Ireland; and
- Water pumped from dry works areas and any dewatering will be treated using settlement tanks to remove sediment prior to discharge onto grass and allowed to filter back to the watercourse.

19.6.1.3 Silt Control Measures

The following silt control mitigation measures will be implemented prior to commencement and throughout the duration of the works:

- Silt control measures will be used to control silt generated from activities on site and prevent it gaining access to surface drainage which could convey silt to larger streams and watercourses;
- Silt control measures will include silt traps which can be located in small drains where flow is small and silt fences where run-off from large areas needs to be controlled;
- Silt fences will be installed in the working areas and not at the watercourse;
- Access routes will be delineated such that an appropriate set back distance from watercourses is maintained. Where works are to be undertaken adjacent to watercourses the setback distance will be delineated by the EnCoW on site;
- Where distances between the works and watercourse allow, a minimum setback distance of 20 m from the watercourse will be maintained; and
- Where the site is constrained, the best available set back distance will be employed taking account of the minimum working area required to facilitate the works.

Silt Fences

- Silt fences will be installed downslope of the area where silt is being generated on disturbed ground;
- To be effective, the silt fence will contain the area where silt is generated and will terminate on high ground (i.e. an elevated area not in the watercourse);
- Silt fences will be constructed using a permeable filter fabric (e.g. Hy Tex Terrastop Premium silt fence or similar) and not a mesh;
- The base of the silt fence will be bedded at least 15–30 cm into the ground at 2 m intervals. The manufacturer's installation instructions should be consulted prior to installation to ensure the silt fence is appropriately installed to avoid a reduction on performance efficacy,
- Once installed the silt fence will be inspected regularly by the EnCoW, daily during the proposed works, weekly on completion of the works for at least one month, but particularly after heavy rains;
- The integrity of the silt fencing will be checked daily by the EnCoW and after poor weather conditions (rain or wind) and any failures rectified immediately;
- Two lines of silt curtain/fence will be installed, where considered necessary, by the EnCoW;
- Any build-up of sediment along the fence boundary will be removed daily;
- Silt fences will be maintained until vegetation on the disturbed ground has re-established;
- The silt fencing will be left in place until the works are completed (which includes removal of any temporary ground treatment);
- Silt fences will not be removed during heavy rainfall;
- The silt fence will not be pulled from the ground but cutaway at ground level and posts removed; and

- A record of when it was installed, inspected and removed will be maintained by the EnCoW.

Silt Traps

The purpose of the trap is to reduce the level of solids in the slowly flowing water. The silt trap works by allowing a build-up of water behind it, slowing flow and allowing solids to settle out. The following requirements will apply:

- Silt traps will only be placed in drains downstream of working areas where the volume of water flow is expected to be low;
- Silt traps will be made of Terram or similar material, not mesh;
- The trap will be staked into the banks of the drain/watercourse such that no water can flow around the sides;
- The material will be bedded into the drain bed/watercourse to prevent water flowing beneath it;
- The height of the trap will be lower than the bank heights. The upper edge will be fixed to a timber cross piece. This will allow water to overtop the silt trap and not burst through or around it;
- Inspections will be carried out daily during the proposed works, weekly on completion of the works for at least one month, and after heavy rains, and monthly thereafter until bare areas have developed new growth;
- Any build-up of solids will be carefully removed without removing any vegetation growing on the bottom;
- The silt trap will not be pulled from the ground but cutaway at ground level and posts removed; and
- A record of when it was installed, inspected and removed will be maintained by the EnCoW.

19.6.2 Construction Compounds/Laydown areas

All temporary construction compounds will be secured with hoarding/fencing around the compound perimeters as appropriate. Where temporary construction areas are required and existing hardstanding is not available, engineering stone fill will be laid and compacted and maintained as required for the duration of the works. Once the works are completed, the engineered stone fill will be removed, and the land will be reinstated to its original condition or for specific locations with biodiversity value in line with reinstatement measures outlined in Chapter 10: Biodiversity of this PECR.

Temporary facilities will be provided at the construction compounds including construction phase car parking and welfare facilities and temporary material storage areas as necessary.

Any discharges from temporary welfare facilities will be connected to a sealed holding tank to be emptied and disposed of off-site by a licensed contractor to an approved licensed facility.

Storage of fuel and refuelling will be undertaken within bunded hardstanding areas. Water will be brought to site via tankers as required.

19.6.3 Service Diversions/Interactions

All reasonable measures will be taken to avoid unplanned disruptions to any services during the proposed works. This will include thorough investigations to identify and reconfirm the location of all utility infrastructure within the works areas and implementing procedures to be agreed with utility providers when undertaking works around known infrastructure services.

Service disruptions impacting the surrounding residential, social and commercial properties will be kept to a minimum, only occurring where unavoidable. Prior notification of disruptions will be given to all impacted properties.

This will include information on when disruptions are scheduled to occur and the duration of the disruption. Relevant neighbouring parties will be consulted prior to any proposed disruptions.

19.6.4 Open Trench Water Crossings

As with all construction works proposed, no works on watercourses will be allowed to commence until the relevant Risk Assessment Method Statements (RAMS) and pertinent Health and Safety documents are received from the specialist Contractor and are reviewed and agreed by the Client's representative. These Contractor documents will include method statements, open trenching risk assessments and environmental management plans specific to the area where the trenching is to take place. These plans will be submitted by the Contractor to the Employer's Representative on site for review and comment prior to commencing open trench operations. All documentation relating to the proposed works will also be provided to Inland Fisheries Ireland for approval.

All open trench watercourse crossings in salmonid watercourses will take place during the May to September period in order to avoid the period of salmon and trout spawning.

The ground preparation works (such as soil stripping, hardstand formation) adjacent to the watercourse crossing will be carried out in the same manner as that for other works activities. All clean coarse surface material (gravel, cobbles and boulders) on the riverbed or stream will be removed to a depth of 20cm. A thinner layer will be removed if deeper material is mainly clay or sand. These excavated materials will be set back from the watercourse and placed on a geotextile base for use in the reinstatement process following the cable installation.

Where damming and pumping methods are to be used for open trenching, sandbags will be used with an impermeable barrier. Should sites be flumed, the diameter chosen for the flume pipe will accommodate flows at the time with spare capacity to cover that predicted over the period that the works would be expected to last. A clay material will be used around the flume pipe to create a seal.

Material excavated from the trench (and an upstream pump sump if required) will be placed on terram on level ground as far back from the watercourse edge as is practicable and surrounded on its downslope side by a silt fence to prevent material re-entering the watercourse. This material, if deemed suitable, can be used to partially backfill the trench. However, a significant amount will be in excess and will be removed from site under licence. Dewatering of the excavation will be treated on site using settlement tanks before the settled water is returned to the watercourse. A second tank in series with the first will be used if the first isn't sufficient to remove enough solids. Pumped over water will be directed to a splash plate to prevent erosion of the riverbed at the downstream side.

The surface coarse substrate which was set aside will be used to reinstate the stream bed after the ducts have been installed and the flume pipe has been removed as well as all the damming materials. All surfaces will be reinstated to the satisfaction of the landowner and re-seeded to assist soil stabilisation. A silt fence will be placed along the riverbank where the works were undertaken in order to prevent solids washed off the works area during heavy rainfall from entering the stream while the surface adequately re-vegetates. This measure will be particularly important at sites which slope to the edge of the watercourse.

Site restoration works will be carried out following completion of any water crossings, in agreement with Inland Fisheries Ireland. These works may include riverbank stabilisation, gravel replacements, etc. In all cases, the site will be restored post-installation. Significant adverse effects in terms of water depth, velocities and sediment erosion/deposition are therefore not anticipated.

19.6.5 HDD Water Crossings

As with all construction works proposed, no drilling works will be allowed to commence until the relevant RAMS and pertinent Health and Safety documents are received from the specialist Contractor and are reviewed and agreed by the Client's representative. These Contractor documents will include method statements, drilling risk assessments and environmental management plans specific to the area where the drilling is to take place. These plans will be submitted by the Contractor to the Employer's Representative on site for review and comment prior to commencing drilling operations.

The specialist drilling team will constantly monitor fluid volume pressure, pH, weight and viscosity during the proposed works. The volume of cuttings produced will also be monitored to ensure that no over cutting takes place and that hole cleaning is maintained. The mud returns will be pumped to the circulation system trailer by a bunded centrifugal pump. The nature of the cuttings will also be monitored to understand the ground conditions as the drilling progresses.

After the initial pilot hole is completed, it will be reused in a number of passes to reach the required bore size to enable the duct lining to be pulled. To ensure that the prevailing geological conditions have suitable cohesion that can maintain the bore during the drilling and reaming process, the specialist drilling team will pay close attention to modelled drag forces during pullback and constantly monitor load stress to ensure that modelled tensile stress, collapse pressures, hoop stress and buckling stress are not exceeded. In addition to the above measures, the rate of drilling progress will be monitored to help identify any voids or changes in strata.

In addition, the Contractor will monitor river/stream flows upstream and downstream of any HDD watercourse crossings. The flow monitoring will be undertaken on a daily basis for five working days prior to the HDD, during the HDD and for five working days following completion of the HDD. If a measurable increase in losses from the watercourse to ground is observed in the reach where the HDD took place, bed lining will be undertaken if required by Inland Fisheries Ireland.

19.6.6 Operational Phase

There are no recommended mitigation and monitoring measures during operation of the Proposed Development to reduce the potential impact with respect to hydrology.

19.6.7 Monitoring

The appointed Contractor will ensure that all personnel and visitors to site are encouraged to report visual indications of changes in water quality in any watercourses on site. Ongoing monitoring will be carried out throughout the construction phase of the Proposed Development to ensure that the mitigation measures deployed remain effective,

The Contractor will undertake regular visual inspection of the watercourses on site. The monitoring records will include the following minimum information:

- Antecedent and current weather conditions;
- Current construction activities near and in particular up-stream or up-gradient of the observation point;
- Visual assessment of water colour, turbidity and flow rate;
- Details on any communication, corrective action and/or mitigation undertaken as a result of water quality issues observed.

Certain construction activities (including HDD, open trench crossings, or wet concrete near watercourses) will require constant supervision by the EnCoW. Visual monitoring supported by turbidity monitoring of receiving waters will be conducted by the Contractor's EnCoW for the duration of works.

19.7 Archaeology, Architectural and Cultural Heritage

Archaeological investigations will be implemented post-consent and pre-construction in all off-road sections required for construction, including land required for access tracks, passing bays and joint bays, and HDD and construction compounds to inform the design of mitigation. This will comprise archaeological geophysical survey, archaeological test excavation, palaeoenvironmental assessment, and underwater assessment to inform the design of archaeological excavation and further underwater surveys.

Mitigation measures for known archaeology, architectural heritage and cultural heritage that will be undertaken post-consent but in advance of construction comprise the following:

- Measured survey of upstanding cultural heritage constraints directly impacted by the Proposed Development (LI_015, LI_027, LI_032, LI_042, LI_065, LI_134, and LI_158);

- A photographic and written record of the elements of GDLs (DL_14, DL_15, and DL_17) impacted by the Proposed Development will be undertaken in advance of construction;

- Written and photographic survey will be undertaken for CH_106 prior to its removal. Following construction in this location, the boundary stone will be reinstated in the same location;

- Townland boundary surveys comprising detailed written and photographic survey, and test trenching through boundaries will be undertaken for townland boundaries that will be directly impacted by construction of the Proposed Development (TB_01, TB_03, TB_08, TB_09, TB_10, TB_12, TB_13, TB_25, and TB_61);

- Archaeological excavation informed by archaeological geophysical survey and archaeological test excavation will be undertaken for 42 constraints (AY_13, AY_51, CH_60, CH_64, CH_66, CH_68, CH_69, CH_74, CH_81, CH_92, CH_94, CH_100, CH_117, CH_118, CH_119, CH_120, CH_121, CH_122 LI_001, LI_006, LI_009, LI_011, LI_015, LI_017, LI_026, LI_027, LI_032, LI_038, LI_042, LI_056, LI_065, LI_092, LI_096, LI_101, LI_113, LI_119, LI_125, LI_134, LI_143, LI_145, LI_156 and LI_158);

- Archaeological wade survey or underwater assessments will be undertaken at the following unmodified watercourses which will be crossed via in-stream trenching:

    - WB01 (tributary of the River Tolka);

    - WB02 (Dunboyne Stream);

    - WB06 (Jenkinstown Stream);

    - WB09 (unnamed stream);

    - WB22 (Baltracey River);

    - WB25 (Gollymochy River).

- Archaeological metal detecting survey will be undertaken of the banks of the remaining watercourses (comprising modified stream and drainage ditches; see Table 13.3) where in-stream trenching is required (WB03, WB04, WB05, WB07, WB08, WB10, WB12, WB17, WB18, WB19, WB21, WB24, WB26, WB28, WB30, WB32, WB34, WB44 and WB45).

The Contractor will be contractually required to allow sufficient time in their programme to allow the mitigation required in advance of construction to be completed.

All mitigation will be carried out by a suitably qualified archaeologist under Licence (where required) granted by the Minister for Housing, Local Government and Heritage and in accordance with the provisions of the National Monuments Acts 1930–2004.

Written reports on the results of all mitigation undertaken will be prepared in accordance with the requirements of the Licence(s) granted by the National Monuments Service.

During construction, the following mitigation will be undertaken:

- archaeological monitoring of on-road work within the Zones of Notification of Recorded Monuments (AY_02, AY_24, AY_26, and AY_58); and

- roadside architectural heritage and cultural heritage features (AH_01, AH_11, AH_12, CH_03, CH_04, CH_06, CH_07, CH_24 and CH_109) and clearly demarcated with temporary fencing to avoid accidental damage and preserve in situ.

If archaeological remains are identified during the archaeological monitoring, and preservation in situ is not feasible, archaeological excavation will be undertaken under an excavation licence granted by the Minister for Housing, Local Government and Heritage and in accordance with the provisions of the National Monuments Acts 1930–2004.

Mitigation will be undertaken in line with the *Code of Practice between the Department of the Environment, Heritage and Local Government and EirGrid* (Department of the Environment, Heritage and Local Government and EirGrid, 2009).

19.8 Traffic and Transport

19.8.1 Traffic Management Plan (TMP)

The temporary impacts that the construction will have on traffic and movement through the area will be mitigated through the adoption of a regulated and approved TMP.

The TMP is provided in Appendix 5.1. It should be noted that both the TMP and CEMP are included in the application and have been considered for the purposes of assessment, but they be 'live' documents and subject to ongoing future refinement by the appointed contractor in collaboration and agreement with the Roads Authorities. However, all such refinement will occur in the context of the TMP (and CEMP) submitted as part of this application for approval, and therefore the subject of the assessment of the consenting authority.

The appointed contractor will agree temporary traffic measures, and will then adopt and monitor an appropriate way of working, in consultation with Kildare and Meath County Councils, TII and/or their agents, and An Garda Síochána as appropriate. Construction traffic will travel on predefined routes to and from the relevant sites to reduce the effects on local traffic.

The TMP will document measures to help efficiently transport components and materials to site, while reducing congestion and disruption which might impact negatively on local communities or general traffic and, in particular, emergency services.

Signed diversion routes, outlined in this chapter but with final agreement with the Roads Authorities, will be provided to mitigate journey disruption, and to minimise potential driver delay. Where practically achievable, diversion routes will not apply outside of the worksite hours of operation.

During the construction phase, signage will be installed to warn road and recreational route users to the presence of the works access and the associated likely presence of large or slow-moving construction traffic.

To minimise inconvenience to the local community in terms of obstructive parking, adequate car parking for permanent site personnel, visitors and deliveries will be provided within the site compounds. Car parking will not be permitted on any public road network adjacent to the site, to maintain sight lines and minimise the potential for obstruction and delay for other road users.

Furthermore, only vehicles needed for construction will be permitted to attend cable route worksites. Car sharing will be promoted to construction personnel by the contractor during the induction process.

The appointed contractor will nominate a person to be responsible for the coordination of all elements of traffic and transport during the construction process (liaison officer). This person will liaise with the local community, and be a direct point of contact within the contractor organisation for the community to contact for information or to discuss the traffic management.

19.8.2 Construction Access Arrangements

Transportation, including deliveries to and from the construction areas, will be via the existing public road network. Given the nature of the cable route's construction, there will be multiple worksites along the route throughout the construction programme. The proposed programme of worksite locations will be confirmed by the appointed contractor as an integral part of their adopted TMP. All construction vehicle drivers will be instructed to access their destination worksite via an approved route.

19.9 Material Assets – Agriculture and Equine

19.9.1 Construction Phase Mitigation

The following mitigation measures will be implemented to address the impacts on agriculture (including equine):

- The appointed contractor will maintain close liaison with local community representatives and landowners to provide them with adequate progress information and advance notice of works. This will facilitate planning the maintenance of access to land to match the needs of the landowner. Scheduling of works will have to be agreed with each landowner to facilitate the operation of the farm and minimise disturbance. Where it is necessary to move livestock along public roads or across the working area this will be facilitated by the appointed contractor;

- Landowners with lands adjoining sites where rock breaking takes place will be notified in advance of these activities;

- Traffic management plans will ensure that farmers and agri-business have adequate access to farmyards and land so that the transport of farm inputs and produce is not significantly affected;

- Mitigation measures for the control of dust as set out in Chapter 8 (Air Quality) will be implemented by the appointed contractor;

- Mitigation measures for the control and monitoring of water quality and as set out in Chapter 12 (Hydrology) will be implemented by the appointed contractor;

- Mitigation measures for the control and monitoring of noise and vibration as set out in Chapter 9 (Noise and Vibration) will be implemented by the appointed contractor;

- The appointed contractor will comply with any regulations pertaining to the control of farm diseases as specified by Department of Agriculture Food and the Marine and will employ reasonable and best practice precautions against spreading any such farm disease. ESB and/or its appointed contractor will also take due notice and consideration of reasonable concerns expressed by landowners or occupiers prior to entry; and

- The appointed contractor will adhere to mitigation specified in this PECR and the Construction Environmental Management Plan (Appendix 5.4) in relation to issues such as; avoidance of staying livestock, maintenance of adequate pre-entry records, facilitating the provision of timber from the working area to landowners, provision of fit for purpose temporary fencing for the reasonable needs of landowners and the reinstatement of boundaries, farm roads or pathways, field drainage systems (if affected) and field surfaces (topsoil).

19.9.2 Operational Phase Mitigation

- The drainage reinstatement shall not impede the drainage of surrounding agricultural lands and where land drains have been intersected or blocked during construction these will be re connected or diverted to a suitable outflow;
- The loss of agricultural land due to the construction of the Proposed Development would be a permanent loss which cannot be mitigated except through compensation. Restriction of Common Agricultural Policy (CAP) payments, farmyard building, commercial forestry and commercial tree planting will be addressed by compensation where applicable; and
- Routine maintenance and inspection of cable infrastructure will be notified in advance to minimises disturbance to livestock and farm enterprises.

19.10 Material Assets – Non-Agricultural

19.10.1 Major Infrastructure and Utilities

The Proposed Development has been designed to minimise the impact on major infrastructure. This includes the avoidance of interactions with major utility infrastructure as far as possible. Where there are interfaces with existing utility infrastructure, protection in place or diversion as necessary is proposed to prevent long-term interruption to the provision of the affected services.

All reasonable measures will be taken to avoid unplanned disruptions to any services during the construction phase. Prior to excavation works being commenced, localised confirmatory surveys will be undertaken by the Appointed Contractor to verify the results of pre-construction assessments undertaken. Where works are required in and around known utility infrastructure, precautions will be implemented by the Appointed Contractor to protect the infrastructure from damage, in accordance with the best practice methodologies and the requirements of the utility companies, where practicable.

Where diversions, or modifications, are required to utility infrastructure, service interruptions and disturbance to the surrounding residential, commercial and/or community property may be unavoidable. Where this is the case, it will be planned in advance by the Appointed Contractor. Prior notification of disruptions will be given to all impacted properties. This will include information on when disruptions are scheduled to occur and the duration of the disruption. Any required works will be carefully planned by the appointed contractor to ensure that the duration of interruptions is minimised as far as possible. Consultation with relevant neighbouring parties will be undertaken prior to any proposed disruptions.

19.10.2 Land and Property

Much of the mitigation against the impacts on land and property have been embedded within the design, by selecting a route which follows public roads for the most part, minimising the requirement for additional lands to be affected. Where private lands will be directly affected, either temporarily during construction or permanently, this will be managed by ESB and their contractor and supported by EirGrid’s Agricultural Liaison Officers.

Where there are potential access issues as a result of the Proposed Development, access arrangements to individual properties will be agreed with the affected property holders in advance to minimise the impact. Access arrangements in general along affected roadways and footpaths will be managed in accordance with applicable traffic management plans and measures outlined in Chapter 14 (Traffic and Transport) and in the CEMP.

Along the Sallins Bypass, early notification and signage to show diversions will be used by the Contractor. Local cycling/walking groups and community groups (as well as Cycling Ireland and Kildare County Council) will be directly contacted by the Contractor to inform them of the timing, extent, and duration of any closures and what signed diversion routes will be available. As far as possible the works along the Sallins Bypass will be phased so that the entire length of the cycleway and footpath will not be closed at any one time. The use of the Sallins Link Road at the roundabout on the Sallins Bypass will allow a shorter diversion.

During the construction works at the bus stop located on the R403 in Firmount West (approximate chainage 33000), a new temporary bus stop will be provided. Consultations with Kildare County Council, and Bus Éireann, will be undertaken prior to construction to ensure no disruption to bus services.

Impacts to the garden of a residential property on the R125 at approximate chainage 11200 will be mitigated by the use of screens during construction to allow the owner to use their garden. The affected area will be reinstated to its original condition post-construction. The owner will be consulted on the species for planting. Selected tree species will need to be agreed with ESB to ensure no impacts to the cable (See Chapter 17 Landscape for further details). At the detailed design stage the cable route will be re-examined to determine if the garden can be fully avoided.

Impacts to the "New Residential" area under the Kilcock Local Area Plan 2015-2021 (approximate chainage 16250) have been largely mitigated through routing. However, further consultation with the developer and Kildare County Council will be undertaken in so far as possible, to ensure there is no disruption during construction.

Similarly, impacts to the Naas Sports Centre the adjacent car park or recreational facilities (skatepark and playground) have been largely mitigated through routing. Further mitigation will be provided through consultation, early notification of proposed works, and ensuring safe access to the facilities at all times. Daily cleaning of road surfaces in this area and good site management (as described in the CEMP (Appendix 5.4 of this PECR)), will ensure that the construction activities do not cause unclean or muddy conditions. The affected areas will be reinstated to their current condition post-construction.

Access to properties which are not being directly impacted by land take will be maintained. Chapter 14 (Traffic and Transport) and Appendix 5.1 (Traffic Management Plan) have further details on the measures to minimise disruption to traffic and access in the area.

19.10.3 Waste Management

A Construction Resource Waste Management Plan (CRWMP – Appendix 5.5) is included for the Proposed Development. The appointed contractor will be responsible for reviewing and updating the CRWMP prior to commencement of construction and in periodically reviewing and updating as necessary throughout the Construction Phase.

All operations will be managed and programmed in such a manner as to prevent / minimise waste production. All waste material will be managed in accordance with the Waste Hierarchy, with an emphasis on reuse, recycling and recovery of material over disposal where feasible.

In order to minimise the creation of waste, opportunities for reuse of excavated material within the Proposed Development (e.g. as fill or in landscaping) will be sought. Where there is no reuse potential within the Proposed Development of such material, either due to the material being unsuitable or due to the quantity being in excess of requirements, the potential for reuse as a by-product in accordance with Article 27 will be investigated by the appointed contractor. Where this option is technically / economically feasible, the appointed contractor will be responsible for the EPA Article 27 notification and the associated requirements. Any material which is to be managed as a by-product will be appropriately stored on site and will be kept separate from any waste storage to avoid cross contamination.

Where waste is created it shall be managed on site in accordance with good practice and applicable waste legislation as follows:

- Waste excavated material will be appropriately stockpiled;
- Waste will be segregated at source to prevent cross contamination;
- Any hazardous wastes will be stored in segregated waste containers which are appropriately labelled;
- All waste will be collected by a suitable contractor in possession of a valid and appropriate Waste Collection Permit, and will only be transported to suitably licensed or permitted waste facilities;
- Regular site cleaning will be done in order to minimise the potential for litter in the surrounding area; and
- Waste records will be maintained throughout the Construction Phase of the Proposed Development.

The CRWMP will be available for inspection at all reasonable times by the Local Authority. All waste generated will be managed in accordance with the relevant provisions of the Waste Management Act 1996 and associated amendments and regulations, particularly with regard to the use of appropriately permitted waste contractors and destinations for waste materials.

19.11 Landscape

The primary 'mitigation measure' employed in respect of landscape and visual impacts for the Proposed Development was avoidance of impacts. The key mitigation relevant to landscape and visual took place as part of the route selection process and/or is embedded in the final design.

Once the construction phase is complete, the road surface / agricultural grassland will be reinstated along the underground cable route; thus, any material surface expression of the underground features will be minimal. Hedgerows removed for temporary works within the Planning Application Boundary will be replanted with a new species-rich hedgerow which is likely to be more ecologically diverse than what was removed. The species mix of the vegetation proposed above the 5 m permanent wayleave will be in accordance with the specification detailed in Chapter 10 (Biodiversity) of this PECR . In addition, vegetation removed during the construction phase at passing bays will be reinstated along the original alignment and will also be replanted with species-rich hedgerows. It is impossible to replace mature and veteran trees removed as part of the Proposed Development on a like-for-like basis, but the replacement planting will, over time, repair and reinforce the broader landscape fabric.

Additional landscape and visual mitigation measures are not considered necessary in relation to the Proposed Development as there will be no significant effects during the operational phase. Likewise, additional specific landscape and visual mitigation measures are not considered necessary during the construction phase as all effects will be either temporary or short-term and not considered 'significant'.

20. Conclusions

Volume 1 of this PECR provides a non-technical summary of the findings of the PECR and the assessment chapters of this PECR contain conclusion section.

The need for the Kildare-Meath Grid Upgrade Project was established first at Step 1 in 2017 by EirGrid and it has been reconfirmed at each step of the project. The Kildare-Meath Grid Upgrade Project is required because:

1. Increased demand on East coast – An increase in electricity demand as part of natural growth is expected. In addition, there is a demand increase in the order of 1200 MW due to the planned connection of high energy users. This is based on executed and offered connection agreements mostly in the counties Kildare, Meath and Dublin. Part of this demand is expected to start to connect to the system in 2017 and is ramping up to the total demand figure in 2030. The interest is high and it is expected that this trend will continue with further requests for connection.

2. Integration of generation from the South and South West regions – Significant levels of new renewable generation have connected or are in the process of connecting to the transmission and distribution system in the south and south west of Ireland. This is also where the newer and more cost effective existing conventional generation units are located. This results in a scenario whereby a significant portion of the generation sources are located in the south and south west of Ireland away from the main demand centres within the Dublin and Greater Dublin Area, and East region in general. The power produced will hence have to be transported to get to where it is needed (known as demand centres).

EirGrid has identified that the Proposed Development will have the following benefits:

- Community – Deliver community benefit in the areas that facilitate the project infrastructure;
- Competition – Apply downward pressure on the cost of electricity;
- Sustainability – Help facilitate Ireland's transition to a low carbon energy future;
- Security of Supply – Improve electricity supply for Ireland's electricity consumers; and
- Economic – Contribute to the regional economy and support foreign direct investment.

The Proposed Development will create a new circuit in the electricity transmission network and will enhance the network in the area and provide capacity to connect new demand for electricity to support economic growth in the area and to connect new renewable generation to help with meeting national Climate Action Plan targets.

The Proposed Development facilitates the delivery of national energy policy outlined in the National Planning Framework; sustainability, security of supply, and competitiveness, and aids in moving Ireland towards a low carbon, climate resilient society. It also delivers on the National Development Plan through the delivery of an expanded and strengthened electricity network. In terms of the Climate Action and Low Carbon Development (Amendment) Act 2021 and Climate Action Plan 2023, the Proposed Development helps climate action via strengthening of the electricity grid and allowing the supply of more renewable energy.

The Proposed Development meets with the polices within the Meath and Kildare County Development Plans and Local Area Plans. Both County Development Plans identify the clear need for improved energy grid infrastructure alongside new development, and outline policies that facilitate grid infrastructure improvements. The Kildare County Development Plan specifically supports the Proposed Development.

The Proposed Development is considered to be entirely in compliance with national, regional and local planning policy, and with the principles of proper planning and sustainable development for the areas.

The selection of Proposed Development as an underground cable and the routing of the cable route has been informed by ongoing discussions with the affected landowners, months of public consultations, and multiple meetings with Meath and Kildare County Councils, TII, Irish Rail, Waterways Ireland, and other stakeholders. The location of the Proposed Development has been informed by the Routing Principles, set out at Step 4 of the project, however, the Project Team has accommodated feedback into the routing the cable route and other aspects of the project, as far as possible.

With mitigation measures, the majority of potential of environmental impacts will be avoided or will be not significant. Traffic disruption on one 4 km section (out of a total cable length of 53 km) of the R156 in County Meath has assessed to be significant because of the larger diversion that will be required for HGV traffic. However, this diversion will be required on a temporary basis and will be lifted as the cable trench is completed on that section of road. The loss of mature trees will be significant because of the time it will take for these trees to be replaced. Additionally, because of the nature of some of the works, replacement planting will not be possible at all areas directly affected. For instance, on permanent access tracks or joint bays and their associated hardstanding areas. EirGrid has committed to planting more trees than are cut down for the Proposed Development. The loss of these trees as these carbon sinks will be more than outweighed by the amount of renewable energy the Kildare-Meath Grid Upgrade project will connect to the electric grid, as a key part of the nation's Climate Action Plan.