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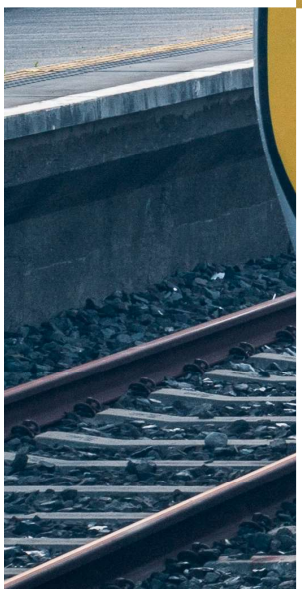

Cork Area Commuter Rail Glounthaune - Midleton Twin Track

Environmental Impact Assessment Report Volume 2 EIAR

November 2022

Rialtas na hÉireann Government of Ireland | Tionscadal Éireann Project Ireland 2040

NTA Údarás Náisiúnta Iompair National Transport Authority

Maoinithe ag an Aontas Eorpach Funded by the European Union NextGenerationEU

Iarnród Éireann Irish Rail

CIE

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Abbreviations

AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
AAP	Area of Archaeological Potential
ABP	An Bord Pleanála
ACA	Architectural Conservation Area
AEP	Annual Exceedance Probability
AIRO	All-Island Research Observatory
AOD	Above Ordnance Datum
AQS	Air Quality Standards
BCT	British Conservation Trust
bgl	Below Ground Level
BoCCI	Birds of Conservation Concern Ireland
BS	British Standard
BSI	British Standard Institute
C&D	Construction and Demolition
CACR	Cork Area Commuter Rail
CARO	Climate Action Regional Offices
CBAM	Carbon Border Adjustment Mechanism
CBD	Convention on Biological Diversity
CCDDP	Cork County Draft Development Plan
CCTV	Close Circuit Television
CDP	County Development Plan
CEMP	Construction Environmental Management Plan
CFRAM	Catchment-based Flood Risk Assessment and Management
Ch	Chainage
CIÉ	Córas Iompair Éireann
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CMATS	Cork Metropolitan Area Transport Strategy
CPO	Compulsory Purchase Orders
CRN	Calculation of Railway Noise
CRR	Commission for Railway Regulation
CRU	Commission for Regulation of Utilities
CRWMP	Construction Resource Waste Management Plan
CS	Core Strategy
CSO	Central Statistics Office
CTMP	Construction Traffic Management Plan
CYR	Cork and Youghal Railway
D&B	Design and Build
DAFM	Department of Agriculture, Food and the Marine

DAHGI	Department of Arts, Heritage, Gaeltacht and the Islands
dBA	Decibels
DECC	Department of Communications, Climate Action & Environment
DETE	Department of the Enterprise, Trade and Employment
DHLGH	Department of Housing, Local Government and Heritage
DHPLG	Department of Housing, Planning, and Local Government
DMRB	Design Manual for Roads and Bridges
DRCD	Department of Rural and Community Development
DTTAS	Department of Transport, Tourism and Sport (now Department of Transport)
EC	European Commission
EcIA	Ecological Impact Assessment
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EnCoW	Environmental Clerk of Works
ENR	Environmental Noise Regulations
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
ETS	Emissions Trading Scheme
EU	European Union
EURRF	European Union Recovery and Resilience Facility
EV	Electric Vehicle
eVDV	Estimated Vibration Dose Value
EWC	European Waste Code
FAQ	Frequently Asked Questions
FLTIF	Future Land Transport Investment Framework
FRA	Flood Risk Assessment
GHG	Greenhouse Gas
GI	Ground Investigation
GMTT	Glounthaune - Midleton Twin Track Project
GPS	Global Positioning System
GSI	Geological Survey Ireland
GWDTE	Groundwater Dependent Terrestrial Ecosystems
H++EFS	High++ End Future Scenario
H+EFS	High+ End Future Scenario
HDV	Heavy Duty Vehicles
HEFS	High End Future Scenario
HGV	Heavy Good Vehicles
HSA	Health and Safety Authority
HSE	Health Service Executive
IAA	Irish Aviation Authority
IAQM	Institute of Air Quality Management

ICE	Internal Combustion Engine
IDA	Industrial Development Agency
IE	Iarnród Éireann
IEMA	Institute of Environmental Management and Assessment
IFI	Inland Fisheries Ireland
IGBC	Irish Green Building Council
IGI	Institute of Geologists Ireland
ISO	International Organization for Standardization
KER	Key Ecological Receptors
LAP	Local Area Plan
LCA	Landscape Character Area
LCT	Landscape Character Types
LDV	Light Duty Vehicles
LEV	Low Emission Vehicle
LIA	Landscape Impact Assessment
MASP	Metropolitan Area Strategic Plan
MD	Municipal District
MMI	Mott MacDonald Ireland Limited
MRFS	Mid-Range Future Scenario
NDP	National Development Plan
NHA	Natural Heritage Area
NIAH	National Inventory of Architectural Heritage
NIFM	National Indicative Fluvial Mapping
NIFTI	National Investment Framework for Transport in Ireland
NIS	Natura Impact Statement
NMVOC	Non-Methane Volatile Organic Compounds
NPF	National Planning Framework
NPWS	National Parks & Wildlife Service
NRA	National Roads Authority (now TII)
NRRP	National Recovery and Resilience Plan
NSL	Noise Sensitive Locations
NSO	National Strategic Outcomes
NTA	National Transport Authority
OD	Ordnance Datum
OPW	Office of Public Works
OSI	Ordnance Survey Ireland
OSM	Open Street Mapping
PAS	Publicly Available Specification
PIC	Personal Injury Collisions
pNHA	Proposed Natural Heritage Area
PPV	peak particle velocity
PSCS	Project Supervisor for the Construction Stage

PSDP	Project Supervisor Design Process
PUP	Pandemic Unemployment Payment
QI	Qualifying Interest
RBSP	River Basin Specific Pollutants
RDO	Cork National Roads Office
RMP	Record of Monuments and Places
RO	Railway Order
RPO	Regional Policy Objectives
RSA	Road Safety Authority
RSES	Regional Spatial and Economic Strategy
SAC	Special Areas of Conservation
SAR	Strategic Assessment Report
SCI	Site of Community Importance
SDG	Sustainable Development Goals
SHD	Strategic Housing Development
SMR	Sites and Monuments Record
SPA	Special Protection Areas
Tii	Transport Infrastructure Ireland
TTA	Traffic and Transport Assessment
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
VIA	Visual Impact Assessment
VOC	Volatile Organic Compounds
VP	View Point
VPH	Vehicles Per Hour
VRPs	Viewshed Reference Points
WFD	Water Framework Directive
WHO	World Health Organization
WSA	Waste Storage Area
ZoI	Zone of Influence

Chapter 1 Introduction

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1 Introduction

1.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála ('the Board' or 'ABP'). The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by further amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

An examination, analysis and evaluation is carried out by the Board in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

In carrying out an EIA in respect of an application made under section 37 of the 2001 Act, the Board is required, where appropriate, to co-ordinate the assessment with any assessment under the Habitats Directive or the Birds Directive.

The 2001 Act as amended (including by Statutory Instrument No. 743/2021) at section 37 requires, inter alia, that the application be made in writing and be accompanied by:

- A draft of the proposed Railway Order;
- A plan of the proposed railway works;
- A book of reference to a plan describing the works which indicates the identity of the owners and of the occupiers of the lands described in the Plan; and
- A report on the likely effects on the environment of the proposed railway works.

A report of the likely effects on the environment of the proposed railway works is addressed by the preparation of this Environmental Impact Assessment Report (EIAR) (previously referred to as an Environmental Impact Statement in section 39 of the 2001 Act prior to the amendments effected by S.I. No. 743/2021). As mentioned, this EIAR is based on a coordinated approach in order to facilitate An Bord Pleanála carrying out a coordinated assessment with any assessment under the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992) or the Birds Directive (Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009).

In accordance inter alia with section 39 of the 2001 Act and the provisions of the EIA Directive, CIÉ, as the applicant for this Railway Order, has ensured that this EIAR is prepared by competent experts; contains a description of the proposed railway works comprising information on the site, design, size and other relevant features of the proposed works; contains a description of the likely significant effects of the proposed railway works on the environment; contains the data required to identify and assess the main effects which the proposed railway works are likely to have on the environment; contains a description of any features of the proposed railway works, and of any measures envisaged, to avoid, prevent or reduce and, if

possible, offset likely significant adverse effects on the environment; contains a description of the reasonable alternatives studied by the applicant – here CIÉ – which are relevant to the proposed railway works and their specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the railway works on the environment; contains a summary in non-technical language of the above information; takes into account the available results of other relevant assessments under European Union or national legislation with a view to avoiding duplication of assessments; in addition to and by way of explanation or amplification of the specified information referred above, the EIAR contains such additional information specified in Annex IV to the EIA Directive relevant to the specific characteristics of the particular railway works, or type of railway works, proposed and to the environmental features likely to be affected and in this regard Annex IV sets out the information which is referred to in Article 5(1) of the EIA Directive. Further the EIAR includes the information that may reasonably be required for reaching a reasoned conclusion in accordance with section 42B of the 2001 Act on the significant effects of the proposed railway works on the environment, taking into account current knowledge and methods of assessment. This assessment has been undertaken in accordance with the above legislative and regulatory regime.

Córas Iompair Éireann, hereafter referred to as CIÉ or "the Applicant", is applying to An Bord Pleanála ("the Board") for a Railway Order ("RO") for the Glounthaune to Midleton Twin Track Project (hereafter referred to as the "proposed development") under the Transport (Railway Infrastructure) Act 2001 (as amended and substituted) ('the 2001 Act"). The RO application is made pursuant to the provisions of Section 37 of the 2001 Act.

While the application is being made by CIÉ, Iarnród Éireann (IÉ), a wholly owned subsidiary of CIÉ, have developed the proposed development from concept to application stage.

Mott MacDonald Ireland Limited (MMI) have been appointed by IÉ to prepare this Environmental Impact Assessment Report (EIAR). This EIAR will support a Railway Order (RO) application for statutory approval to An Bord Pleanála (ABP). The proposed development will enable enhancements to the existing Glounthaune to Midleton rail line to facilitate future increases in service frequency and passenger capacity. All Railway Orders must be accompanied by an Environmental Impact Assessment Report (EIAR) pursuant to Section 37(e) of Transport (Railway Infrastructure) Act 2001 (as amended).

This EIAR has been prepared in accordance with the provisions of the Environmental Impact Assessment Directive 2011/92/EU as amended by Directive 2014/52/EU (together, the "EIA Directive"). The objective of the EIAR is to identify and predict the likely significant effects which the proposed development, if carried out, would have on the environment. The EIAR consists of a systematic analysis and assessment of the potential effects of a proposed project on the receiving environment. As part of IÉ public engagement procedures and in line with the Aarhus Convention, public consultation on the proposed development was held between 26th July and 16th August 2022 for members of the public, interested stakeholders, landowners and prescribed bodies to submit observations prior to the lodgement of the RO application. In addition, Public Information events were undertaken in Midleton and Glounthaune on the 3rd and 4th August 2022 respectively.

1.2 The Applicant

The application is being made by Córas Iompair Éireann (CIÉ), Ireland's national public transport provider. Under Section 37(1) of the 2001 Act CIÉ may apply to An Bord Pleanála for a Railway Order. As the leading provider of public transport services in the State, the CIÉ Group is committed to provision of accessible services for all of its customers.

The goal of the CIÉ Group ("the Group") is to deliver attractive sustainable public transport services, which supports the continued growth of the Irish economy and social cohesion. The Group has the unique capacity to manage a cost-effective delivery of high-quality public transport solutions across Ireland. The Group works in collaboration with its shareholder, the Minister of Transport, and with the regulator, the National Transport Authority (NTA).

Iarnród Éireann (IÉ) is a wholly owned subsidiary of CIÉ and has developed the proposed development from concept to application stage. IÉ is responsible for the operation of InterCity and Commuter rail passenger services throughout Ireland and more specifically for the Glounthaune and Midleton commuter rail line.

1.3 Project Overview

The Glounthaune to Midleton Twin Track proposed development will provide twin tracking of the existing single track rail line between Glounthaune and Midleton train station, County Cork.

In addition to the provision of twin tracking it will comprise the demolition of one un-used bridge and the widening of the existing Owenacurra River bridge to accommodate a second track between Glounthaune and Midleton railway station. The proposed development will also provide for a sidings/turn back facility at Midleton. The geographical location of the proposed development is provided in Figure 1.1.

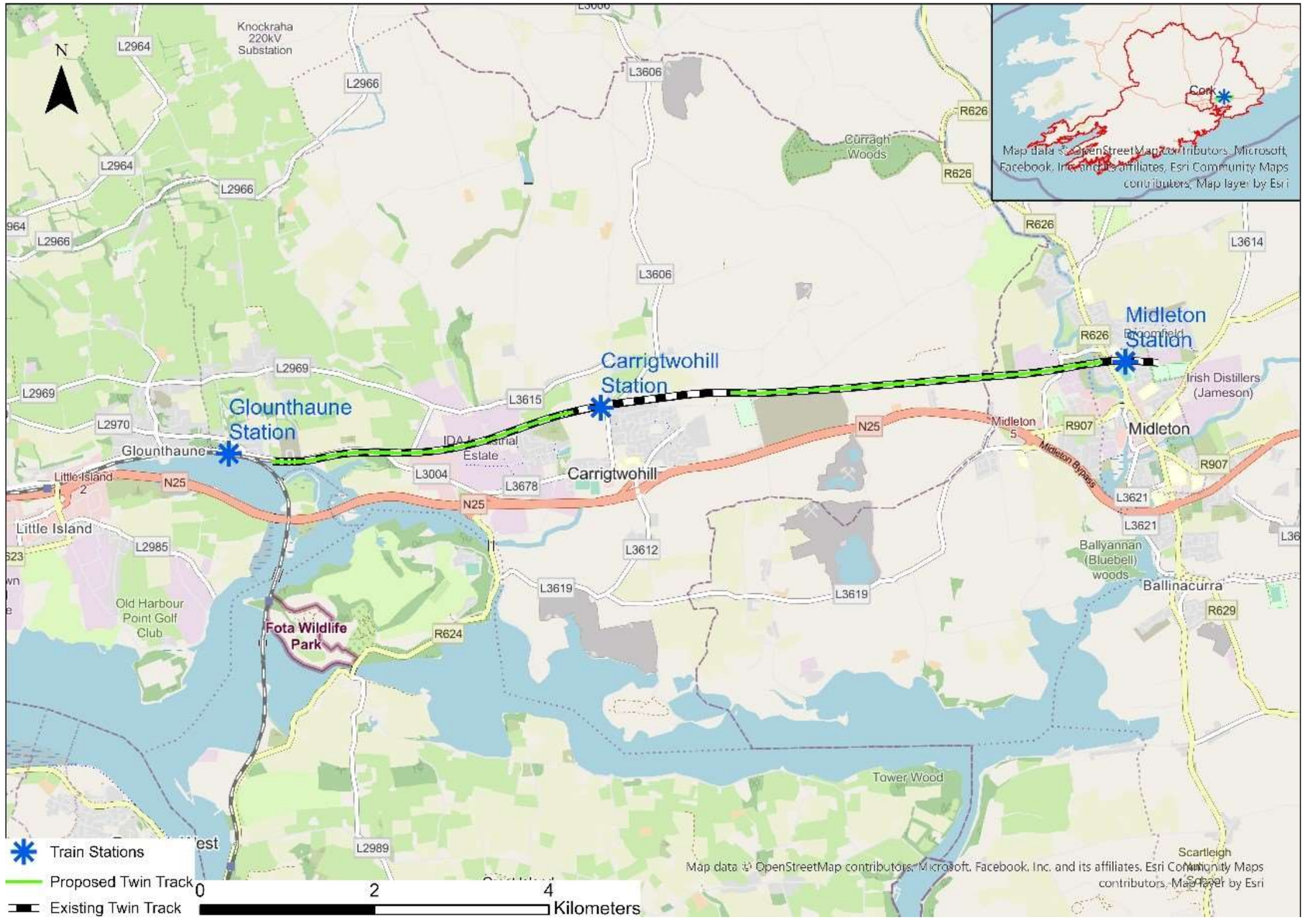
As part of the European and national climate change targets, the Cork to Midleton rail line will in time rely on alternative forms of energy and will reduce greenhouse gas emissions for passenger journeys along this route. CMATS supports the electrification or alternative fuel sources for the suburban rail network which would result in higher performance, lower maintenance costs, lower energy costs and reduced emissions.

The description of the proposed development as per the statutory notices is:

The proposed development will involve the upgrade and enhancement of the Glounthaune to Midleton railway line to a twin track configuration over a total distance of approximately 10km. The proposed development will comprise the following principal elements:

- Twin tracking of the single-track sections between Glounthaune and Midleton totalling a distance of approximately 10km;
- Reconfiguration of the operational track layouts;
- Removal of bridge (OBY08, Ballyadam House overbridge) and widening of bridge deck (UBY11, crossing the Ownenacurra River);
- Extinguishment of one level crossing (Ford CCTV XY010) and widening of one level crossing (Water-Rock CCTV XY009);
- Provision of sidings/turn back facility at Midleton Station;
- Provision of new cable containment routes from Glounthaune to Midleton to facilitate signalling upgrades and alterations;
- Associated signalling upgrades and alterations; and
- All associated works (e.g. temporary construction compounds; drainage, retaining walls, boundary treatments).

Figure 1.1: Proposed Development Location



Source: Mott MacDonald

1.4 Structure of EIAR

This EIAR is accompanied by a stand-alone Non-Technical Summary produced in accordance with the requirements of the EIA Directive. This EIAR has been prepared in accordance with EIA Directive and the Environmental Protection Agency's "Guidelines on the information to be contained in Environmental Impact Assessment Reports" (2022) and has regard to the following guidance:

- Department of Housing, Planning and Local Government (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;
- European Commission Environmental Impact Assessment of Projects, Guidance on the preparation of the Environmental Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU), 2017;
- Environmental Protection Agency (EPA) Advice Notes for Preparing Environmental Impact Statements (Draft 2015); and
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission (EC) 1999).

The structure of the EIAR documentation is as follows:

- Volume 1 – Non-Technical Summary
- Volume 2 – Environmental Impact Assessment Report
- Volume 3 - Appendices
- Volume 4 – Photomontages

The principal document is the EIAR and its structure is set out in Table 1.1.

Table 1.1: Structure of EIAR

Chapter	Title
1	Introduction
2	Methodology
3	Policy and Need for the Proposed Development
4	Alternatives Considered
5	Consultation
6	Description of the Proposed Development
7	Population and Human Health
8	Air Quality
9	Climate
10	Land, Soils and Hydrogeology
11	Surface Water and Flood risk
12	Biodiversity
13	Landscape and Visual
14	Archaeology, Architectural and Cultural Heritage
15	Roads and Traffic
16	Noise and Vibration
17	Material Assets
18	Major Accidents and/ or Disasters
19	Cumulative Effects
20	Interactions of the Foregoing

Chapter	Title
21	Summary of Mitigation and Monitoring Measures

1.5 Competency of EIAR Production Team

Mott MacDonald is a multidisciplinary consultancy with over 20 years' experience of undertaking complex and challenging environmental impact assessments and of writing environmental impact assessment reports for a wide range of projects. These include some of the Ireland's largest infrastructure, engineering and development projects. Mott MacDonald maintains high professional standards amongst staff both individually and across technical areas of practice.

Mott MacDonald is a corporate member of the Institute of Environmental Management and Assessment and holds its EIA Quality Mark. The Quality Mark Scheme allows organisations that lead the co-ordination of statutory EIAs to make a commitment to excellence in their EIA activities and have this commitment independently reviewed. This Quality Mark Scheme is a clear indication that that Mott MacDonald can fully demonstrate the requirements for a 'competent expect' as outlined in the EPA's 'Guidelines on the Information to be contained in Environmental Impact Assessment Report' (2022).

Individually Mott MacDonald's technical staff are subject to annual performance reviews which evaluate their Continued Professional Development. As a business Mott MacDonald maintains technical "Practices" which are internal professional networks that span organisational and geographical boundaries. These help to maintain high professional standards across technical disciples as well as facilitating contribution to the wider development of the Environmental Consulting industry. Specialist consultants have also been commissioned to provide support in the preparation of the EIAR. The credentials and competencies of all respective EIAR contributors is provided in Appendix 1.1.

1.6 Difficulties Encountered

No exceptional difficulties or limitations were experienced in compiling the required information for this EIAR. Where any specific difficulties were encountered these are outlined in the relevant chapter of the EIAR.

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2 EIAR Methodology

2.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann to An Bord Pleanála.

By virtue of section 38 of the Transport (Railway Infrastructure) Act 2001 (as amended) and the development the subject matter of a Railway Order is deemed to be exempted development and the provisions of Part IV of the Planning and Development Act 2000 (as amended) (which addresses protected structures) are disapplied where the works involved are authorised by a Railway Order.

2.2 The 2001 Act and the EIA Directive

The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act'). An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

In carrying out an EIA in respect of an application made under section 37 of the 2001 Act, An Bord Pleanála is required, where appropriate, to co-ordinate the assessment with any assessment under the Habitats Directive or the Birds Directive. Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as "The Habitats Directive", and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds, better known as "The Birds Directive", provides legal protection for habitats and species of European importance. Ireland has given effect to the Habitats and Birds Directives through Part XAB of the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) as amended.

In accordance with Section 39 of the 2001 Act the Environmental Impact Assessment Report for this Railway Order Application inter alia contains:- (i) a description of the proposed railway works comprising information on the site, design, size and other relevant features of the proposed works;(ii) a description of the likely significant effects of the proposed railway works on the environment;(iii) the data required to identify and assess the main effects which the proposed railway works are likely to have on the environment;(iv) a description of any features of the proposed railway works, and of any measures envisaged to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;(v) a description of the reasonable alternatives studied by CIÉ which are relevant to the proposed railway works and their specific characteristics and an indication of the main reasons for the option chosen, taking into account the effects of the railway works on the environment; and (vi) a summary in non-tactical language of the above information.

The EIAR takes into account the available results of other relevant assessments under European Union or national legislation with a view to avoiding duplication of assessments. The assessments contained in the EIAR have also been co-ordinated with the assessment under Council Directive 92/43/EEC of 21 May 1997 (The Habitats Directive) and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 (Birds Directive) as transposed in the Planning and Development Act 2000 (as amended) and the NIS which has been prepared for this Railway Order application.

The EIAR, in addition to addressing the matters set out in section 39(1) of the Transport (Railway Infrastructure) Act 2001 (as amended), contains information specified in Annex IV to the EIA Directive relevant to the specific characteristics of a particular railway works and type of railway works proposed and to the environmental features likely to be effected (this is addressed further below).

Section 42B of the 2001 Act includes provisions in relation a “reasoned conclusion.” Accordingly, whenever an application is made under section 37, before deciding whether or not to grant a Railway Order An Bord Pleanála must take into account *inter alia* the following matters:

- The Environmental Impact Assessment Report submitted under S.37 and any revised Environmental Impact Assessment Report submitted under S.47 D;
- Any additional information furnished to the Board under S.41 and where applicable any information submitted on foot of a notice under S.47 D (4);
- Any submissions or observations made in relation to the likely significant effects on the environment of the activity to which the application relates duly made to it under: section 40(3) or 41(4) and not withdrawn; by an authority referred to in S.40(1)(c) or (e); on foot of a request under S.47 D(1) or a notice under S.47 D(6);
- consider any other evidence it has obtained under this Part in relation to the likely significant effects on the environment of the activity to which the application relates, and
- taking into account the results of the examination of matters referred to above aand reach a reasonable conclusion on the significant effects on the environment of the activity to which the application relates.”

Prior to the Board making its decision it takes into account its “reasoned conclusion” under S.42B and concludes that it is up to date and remains up to date. The Board can, if it is of the opinion that the application should be granted, make an order authorising Córas Iompair Éireann to construct, maintain, improve and operate the railway works specified in the Railway Order in such manner and subject to such conditions (including environmental conditions and conditions regarding monitoring measures, parameters to be monitored and the duration of monitoring, modifications, restrictions and requirements) and such other terms as the Board thinks proper and specifies in the Railway Order. Accordingly, section 43 of the 2001 Act has been amended to reflect the changes brought about by Statutory Instrument Number 743 of 2021.

Environmental Impact Assessment is defined in the 2001 Act (as amended by S.I. No. 743/2021) as meaning a process –

(a) consisting of -

(i) the preparation of an environmental impact assessment report by the applicant in accordance with section 39,

(ii) the carrying out of consultation required by or under this Part,

(iii) the examination by the Board of -

(I) the information presented in the environmental impact assessment report,

(II) any further information provided by the applicant under section 41 and, where applicable, section 47D, and

(III) any relevant information received through consultation under section 40, section 41 and, where applicable, section 47D,

(iv) the reaching of a reasoned conclusion by the Board in accordance with section 42B on the significant effects of the proposed railway works on the environment, taking into account the results of the examination referred to in subparagraph (iii) and, where appropriate, its own supplementary examination, and

(v) the integration by the Board of its reasoned conclusion into its decision under section 43,

and

(b) including an examination, analysis and evaluation by the Board under sections 42B and 43 in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on -

(i) population and human health,

(ii) biodiversity, with particular attention to species and habitats protected under Council Directive 92/43/EEC of 21 May 19925 and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 20096 ,

(iii) land, soil, water, air and climate,

(iv) material assets, cultural heritage and the landscape, and

(v) the interaction between the factors mentioned in subparagraphs (i) to (iv);

The Environmental Impact Assessment Directive 2011/92/EU on the assessment of the effects of certain public and private projects as amended by Directive 2014/52/EU (together, 'EIA Directive') defines EIA as a process consisting of:

1. The preparation of an Environmental Impact Assessment Report (EIAR) by the developer;
2. The carrying out of consultations;
3. The examination by the competent authority of the EIAR, any supplementary information provided by the developer (where necessary) and relevant information received through consultations with the public, prescribed bodies and any affected Member States;
4. The reasoned conclusion of the competent authority on the significant effects of the project on the environment; and,
5. The integration of the competent authority's reasoned conclusion into any development consent decision.

This definition provides for a clear distinction between the process of EIA to be carried out by the competent authority and the preparation by the developer of an EIAR.

The Guidelines on the information to be contained in Environmental Impact Assessment Reports [Environmental Protection Agency (EPA), 2022], hereafter referred to as the EPA Guidelines 2022 describe the EIAR as follows:

"The EIAR represents the results of a systematic analysis and assessment of the significant effects of a proposed project on the receiving environment. …The EIAR should be prepared at a stage in the design process where changes can still be made to avoid significant adverse effects. This often results in the modification of the project to avoid or reduce effects through redesign".

This chapter sets out the approach to this EIAR. For each assessment, a precautionary approach[1] has been applied whereby maximum design parameters based on realistic worst-case dimensions, orientations and components have been assessed. This approach ensures that the assessment will consider the greatest environmental impact (i.e. largest footprint, longest exposure, or highest dimensions depending on the topic). This approach is a resilient method where it may not be possible to identify the exact design parameters at this stage within the final design, thereby accommodating flexibility in design and construction whilst ensuring maximum extents and ranges are assessed in this EIAR.

The technical chapters of this EIAR provide further topic specific details of the methodologies applied in the preparation of this EIAR.

As set out above, the European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the amended EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

The amended EIA Directive requires that the EIAR provides:

"A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge".

Article 3(1) states that the EIA shall:

"Identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of the project on the following factors:

A. Population and human health (Chapter 7);
B. Biodiversity, with particular attention to species and habitats protected under Directive92/43/EEC and Directive 2009/147/EC (Chapter 12);
C. Land, soil, water and climate (Chapter 9, Chapter 10, Chapter 11);
D. Material assets (Chapter 17), cultural heritage (Chapter 14)and landscape (Chapter 13); and
E. The interaction between the factors referred to in points (a) to (d) (Chapter 19)".

Article 5 states that an EIAR shall include at least:

1. "A description of the project comprising information of the site, design, size and other relevant features of the project.
2. A description of the likely significant effects of the project on the environment;

[1] Principle adopted by the UN Conference on the Environment and Development (1992) states that in order to protect the environment, a precautionary approach should be widely applied, meaning that where there are threats of serious or irreversible damage to the environment, lack of full scientific certainty should not be used as a reason for posting cost-effective measures to prevent environmental degradation (Definition from the European Commission (europa.eu))

3. A description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce, and if possible, offset likely significant adverse effects on the environment;
4. A description of the reasonable alternatives studied by the developer which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment;
5. A non-technical summary of the information referred to in (a) to (d); and
6. Any additional information specified in annex iv relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected".

Annex IV requires;

"The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short term, medium term and long term permanent and temporary, positive and negative effects of the project. The description should take into account the environmental protection objectives established at Union or member State level which are relevant to the project".

In addition, Annex IV requires:

"A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved".

This proposed development is being progressed through an application to be submitted by Coras Iompair Éireann (CIÉ) to An Bord Pleanála under Section 37 of the 2001 Act (as amended by S.I. 743 of 2021) for a Railway Order (RO) which requires an EIAR to be submitted as part of the application for an RO.

The 2001 Act as amended (including by Statutory Instrument No. 743/2021) at section 37 requires, for example, that the application be made in writing and be accompanied by:

- A draft of the proposed Railway Order;
- A plan of the proposed railway works;
- A book of reference to a plan describing the works which indicates the identity of the owners and of the occupiers of the lands described in the Plan; and
- A report on the likely effects on the environment of the proposed railway works.

As stated above, a report of the likely effects on the environment of the proposed railway works is addressed by the preparation of this Environmental Impact Assessment Report (EIAR) (previously referred to as an Environmental Impact Statement in section 39 of the 2001 Act prior to the amendments effected by S.I. No. 743/2021). As mentioned, this EIAR is based on a coordinated approach in order to facilitate An Bord Pleanála carrying out a coordinated assessment with any assessment under the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992) or the Birds Directive (Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009).

2.3 EIAR Methodology

2.3.1 Regulations and Guidelines

This EIAR has been prepared in line with the Planning and Development Act, 2000 S.I. No. 30/2000, as amended, and associated Regulations and Guidelines on the information to be

contained in Environmental Impact Assessment Reports, Environmental Protection Agency (EPA), 2022 and has regard to the followingguidelines.

- Environmental Protection Agency (EPA) Advice Notes for Preparing Environmental Impact Statements (Draft 2015);
- Department of Housing, Planning and Local Government (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment; and
- European Commission Environmental Impact Assessment of Projects, Guidance on the preparation of the Environmental Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU), 2017.

Further specific reference documents are cited in the technical chapters of this EIAR, as appropriate.

2.3.2 Receiving Environment

The receiving environment describes the current state of environmental characteristics, detailing the condition, sensitivity and significance of relevant environmental factors which are likely to be significantly affected by the proposals.

The amended EIA Directive also requires consideration of the likely future receiving environment in the absence of the project, refer to Section 2.5.9 *Do-Nothing Effects*:

"A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge".

2.3.3 Temporal and Spatial Scope

The duration of effects will be described for each technical chapter of this EIAR.

Spatial (or geographical) scope refers to the area over which the EIAR considers effects. The environmental sensitivity of the surrounding geographical areas and the establishment of source-pathway-receptor linkages (i.e. the zones of influence) will determine the extent of the area to be assessed as part of the EIAR. This is defined in each of the technical chapters of the EIAR.

2.3.4 Identification of Potential Receptors

A receptor is defined as "*any element in the environmentwhich is subject to impacts*".

The environmental effect will depend on the spatial relationship between the source and the receptor with some receptors being more sensitive than others to environmental effects. Topic specific receptors will be identified in each technical chapter.

2.3.5 Identification of Likely Significant Impacts

Where appropriate and unless otherwise stated, the evaluation of impacts on the environment has been evaluated according to the criteria outlined in Table 2.1 *Description of Effects* and as referenced in the EPA Guidelines 2022.

Table 2.1: Description of Effects

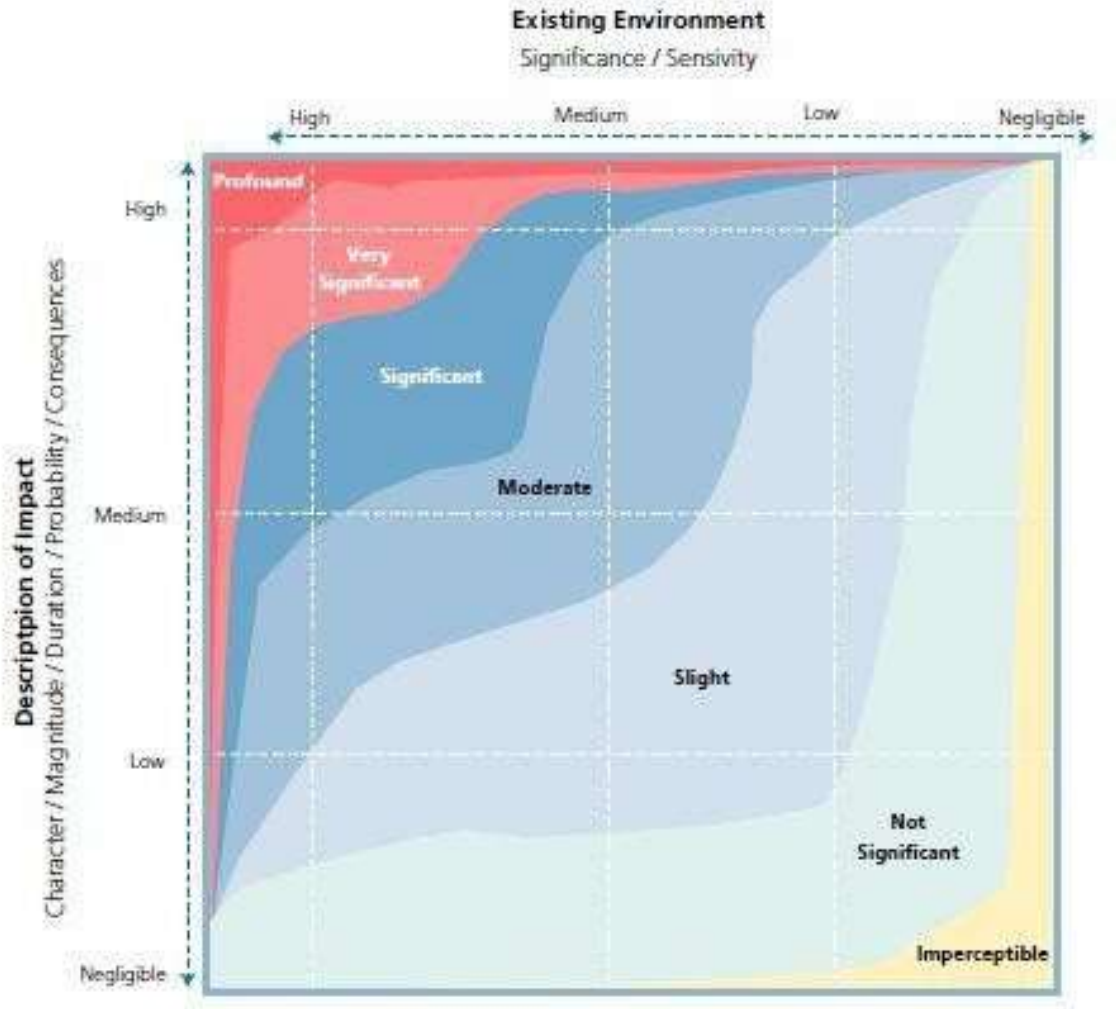
Category	Description of Effects
Quality of Effects It is important to inform the non-specialist reader whether an effect is positive, negative or neutral	**Positive Effects** A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative/adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).
Describing the Significance of Effects 'Significance' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful (also see Determining Significance below.).	**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
Describing the Extent and Context of Effects Context can affect the perception of significance. It is important to establish if the effect is unique or, perhaps, commonly or increasingly experienced.	**Extent** Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Context Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Describing the Probability of Effects Descriptions of effects should establish how likely it is that the predicted effects will occur – so that the CA can take a view of the balance of risk over advantage when making a decision.	**Likely Effects** The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented. **Unlikely Effects** The effects that can be reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Describing the Duration and Frequency of Effects 'Duration' is a concept that can have different topics – in the absence of specific	**Momentary Effects** Effects lasting from seconds to minutes
	Brief Effects Effects lasting less than a day

Category	Description of Effects
definitions for different topics the following definitions may be useful	**Temporary Effects** Effects lasting less than a year
	Short-term Effects Effects lasting one to seven years.
	Medium-term Effects Effects lasting seven to fifteen years
	Long-term Effects Effects lasting fifteen to sixty years
	Permanent Effects Effects lasting over sixty years
	Reversible Effects Effects that can be undone, for example through remediation or restoration
	Frequency of Effects Describe how often the effect will occur. (Once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
Describing the Types of Effects	**Indirect Effects (a.k.a. Secondary Effects)** Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects
	'Do-Nothing Effects' The environment as it would be in the future should the subject project not be carried out
	`Worst case' Effects The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects When the full consequences of a change in the environment cannot be described.
	Residual Effects The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).

Source: EPA, 2022

The significance of a potential impact is defined by the sensitivity of the receiving environment and the character of the predicted impact as shown in Figure 2.1. In some cases, magnitude or significance cannot be quantified with certainty, and in these cases professional judgement remains the most effective way to identify the significance of an impact. Where significant adverse effects are likely, mitigation to offset those impacts is required.

Figure 2.1: Impact Assessment Methodology



Source: Guidelines on the information to be contained in Environmental Impact Assessment Reports [Environmental Protection Agency (EPA), 2022

2.3.6 Mitigation and Monitoring

There are four established strategies for the mitigation of effects; avoidance, prevention, reduction and offsetting.

Mitigation measures and monitoring that have been proposed / implemented for each environmental topic are set out in the technical chapters in this EIAR.

Mitigation by design / avoidance is incorporated into the design of the proposals, as described in Chapter 4 Alternatives Considered and Chapter 6 Description of the Proposed Development. Additional mitigation measures and monitoring that have been proposed / implemented for each environmental topic are set out in the technical chapters in this EIAR.

2.3.7 Residual Impacts

Residual impacts that remain from the predicted impacts of the proposals once additional mitigation has been implemented are set out in the technical chapters in this EIAR.

2.3.8 Decommissioning

The operational life of the equipment and apparatus of the proposed development is a minimum of 60 years, dependent on the type of infrastructure. It is assumed that the equipment will be decommissioned and replaced with new equipment.

The activities associated with the decommissioning phase will be similar to those associated with the construction phase. Decommissioning impacts are however assessed for each technical chapter of this EIAR.

2.3.9 Do-Nothing Effects

As outlined in the Guidelines on the information to be contained in Environmental Impact Assessment Reports [Environmental Protection Agency (EPA), 2022 the description of Do-Nothing effects relates to *'the environment as it would be in the future should the subject project not be carried out'*.

In the context of this proposed development, the existing railway track would remain in place and operations would continue as at present. The do nothing scenario would mean that the benefits of the proposed development would not be realised in so far as the potential increase in train journeys would not occur, thus not facilitating the local communities.

The Do-nothing scenario is considered for each technical chapter of this EIAR.

2.3.10 Cumulative Effects

Cumulative effects take account of the addition of many minor or significant effects to create larger, more significant effects.

As outlined in the Guidelines on the information to be contained in Environmental Impact Assessment Reports [Environmental Protection Agency (EPA), 2022, while a single activity may itself result in a minor impact, it may, when combined with other impacts (minor or significant), result in a cumulative impact that is collectively significant. A single effect which may, on its own, have a significant effect, may also have a reduced and insignificant impact when combined with other effects.

For each technical topic, the nature and scale of the other development has been evaluated and the potential for temporal overlap within the topic-specific zone of influence (ZoI) has been assessed, having regard to the potential for significant cumulative effects. A planning search was conducted on 8th July 2022 and large scale projects in the vicinity of the proposed development are detailed in Table 2.2. The search criteria omitted one-off housing, small housing developments, small commercial developments, farm sheds, extensions and similar, as these projects would not have the potential for significant environmental effects.

Subject to consents being granted, it is anticipated that the construction phase of the Midleton Twin Track development will commence in Q4 of 2023, with construction complete in 2026.

Iarnrod Eireann also has future plans for two new train stations along the railway line, at Carrigtwohill West and Water Rock. These developments are not currently in the planning system and sufficient information is not known at the time of writing and therefore these projects are not included in the cumulative assessment.

Iarnród Éireann will continue to engage with the proponents of the other developments in the area throughout the construction the proposed development to ensure a co-ordinated approach to the minimisation of environmental impacts.

2.3.11 Transboundary Effects

Certain environmental effects of a proposed development have the potential to cross state boundaries and have a 'transboundary effect'.

The need to consider transboundary impacts has been enshrined in the United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context, adopted in 1991 (the Espoo Convention). The Espoo Convention has been ratified by the European Union, Ireland and the United Kingdom of Great Britain and Northern Ireland. Under the amended EIA Directive, the likely significant transboundary effects of a proposed Project must be described.

All activities associated with the construction, operation and decommissioning of the proposed development are wholly within Ireland and there is no potential for transboundary effects and as such are not considered further in this EIAR.

2.3.12 Interactions between Environmental Factors

Interactions between effects may arise from the reaction between effects of the proposed development on different aspects of the environment which may exacerbate the magnitude of those effects. These are presented in Chapter 20.

Table 2.2: Other Developments

Development	Reference (planning or other)	Location	Summary of Details
Local Authority Development – Part 8 (Cork County Council)			
Burys Bridge, Kilcoolishal to Carrigtwohill via Glounthaune Pedestrian and Cycle scheme.	ABP confirmed associated CPO (Ref. CH04.310856) on 04/08/2021	Burys Bridge, Kilcoolishal to Carrigtwohill	From the approved drawings, it is noted that a new bridge is proposed at eastern edge of Carrigtwohill. The Scheme involves the construction of a dedicated pedestrian and cycle route on the northern side of the L3004 (the former N25) road and includes the following: · A general cross section of 3m wide shared pedestrian and cycle path with a 1m landscaped separation between the path and the public road where possible; · Formalised parking and controlled (i.e. traffic signals) pedestrian crossings; • New footpaths, ducting and LED public lighting Approved Part 8: 2020
Carrigtwohill to Midleton Inter-Urban Cycleway -	-	Carrigtwohill to Midleton	The construction of a dedicated pedestrian and cycle route from the western side of the L3616-0 west of Carrigtwohill to the south of L3617-0 the east of Carrigtwohill. Dedicated pedestrian and cycle links will be provided from this route to the Carrigtwohill Train Station, the planned Carrigtwohill School's Campus (planning reference 19/5707) and along the L3617-0. The proposed development includes the following: · A general cross section of 4m wide shared pedestrian and cycle path with public lighting and landscaping on both sides; · 2 no. pedestrian/ cyclist bridges including one over the Cork to Midleton railway line; · 1 no. railway underpass (at existing underpass structure) · 1 no. road underpass of the L3617-0; · At grade pedestrian/ cyclist crossings of existing roads (L3616-0, L3603-0, L3606-37, L7641-0 and L3617-0) The scope of the scheme includes a new cycle and footbridge over the existing rail line Traffic calming measures on existing roads (L3616-0, L3603-0, L3606-37, L7641-0 and L3617-0). Approved March 2022
Ballinacurra to Midleton pedestrian and cycle route		Ballinacurra to Midleton Train Station	The construction of a dedicated pedestrian and cycle route from Ballinacurra to Midleton Train Station and includes the following: · A mixture of segregated cycle facilities, shared use pedestrian and cycle paths and greenway. • A one-way system for traffic from the south of the Bailick Road to Charlestown Wharf. · A traffic light shuttle system at the N25 underbridge on the Bailick Road. • Works are proposed to Protected Structure Ref number 00517 on Bailick Road. • An underbridge under the existing Irish Rail railway line. • New footpaths, Controlled Crossings, Bus Stop Upgrades and LED public lighting. Approved Part 8: 2020
Water Rock Urban Expansion Area Infrastructure Works	Local Authority Own Development – Part 8 Approved with Modifications	Water-Rock (townland), west of Midleton	Various infrastructural works and services – • Traffic Management Measures for Water Rock Road (L3618) – Erection of bollards within the existing Water Rock public road (L3618) each side of the railway line to close the level crossing to vehicular traffic. Railway level crossing to remain operational and access across the level crossing will be maintained for pedestrians and cyclists; • Bridge over Railway and Extension to Services Corridor Link Road – New bridge over the Cork to Midleton railway line connecting the Services Corridor Link Road to lands to the south of the railway line and new serviced road corridor with footpaths and cycle tracks to access the proposed railway stop and bridge and ancillary works • Railway Stop – New railway stop along the Cork to Midleton railway line consisting of a platform and shelter, drop-off area, cycle parking, disabled parking and access, ticket machines and ancillary works Approved Part 8: March 2019
Youghal to Midleton Greenway	Local Authority Own Development – Part 8 Approved	Youghal - Mildteton	Cork County Council is constructing a Greenway on the disused railway corridor between Midleton and Youghal. The 23km long Greenway will be an off-road walking and cycling route through the heart of East Cork which will connect the towns and villages of Midleton, Mogeely, Killeagh and Youghal.

Development	Reference (planning or other)	Location	Summary of Details
Carrigtwohill Public Realm Improvements	Local Authority Own Development – Part 8 Approved on 27th June 2022		Carrigtwohill Urban Regeneration and Development Fund (URDF) Initiative – Public Realm Infrastructure Bundle, comprising works at the following locations: – Main Street from the junction at Castlelake Avenue (Castle Square) to the junction with Carrigane Road; – Station Road from the junction with Main Street to the junction at Carrigtwohill Train Station; – Carrigane Road from the junction with Main Street to the junction with Castleview; – Cluain Cairn, An Fána, Castle Close, Castle Avenue; – Wises Road/Main Street junction; – Wises Road/Oakbrook Link Road (Access Road to Castlelake)/IDA Industrial Estate Access Road junction; – N25 Junction 3 and lands adjoining this junction.
PCI & Strategic Infrastructure Development and Strategic Housing Development Applications: Application made directly to ABP			
Dunkettle Interchange Improvement Motorway Scheme	ABP - MA0011 and HA0039	Cork City	A series of direct road links between the N8, the N25 and the N40 and links to the R623 Regional Road in Little Island and Burys Bridge in Dunkettle; • 1 grade separated junction arrangement at the existing N25 to the east of the existing Dunkettle Interchange; • 4 roundabouts – 2 at the grade separated junction and 2 at tie ins with the existing road network; • 43 major structures of various forms; • Several culverts where the scheme crosses watercourses or intertidal areas; and • Pedestrian and cyclist facilities
Celtic Interconnector	ABP Case Ref: VA04.310798	Townlands of Ballynanelagh, Ballyadam and other various townlands, County Cork	EirGrid - Proposed development of that portion of an electricity transmission interconnector (Celtic Interconnector) to be constructed onshore in Ireland to the mean high-water mark, including a connection to the Irish National Grid, an electricity converter station and all associated and ancillary works. Approved with conditions 19/05/22
Proposed new 110kV substation at Ballyadam, Carrigtwohill, Co. Cork	ABP Case ref: VC04.309585	Ballyadam (IDA site)	The Electricity Supply Board (ESB) proposes to construct a new 110 kV substation within the IDA owned Ballyadam site.
Harpers Creek	ABP-301197	Harpers Creek	174 No residential units (201 No houses and 88No. apartments); 35 place creche & doctor's surgery. Granted - 29/05/2018
Ballynaroon Housing development	ABP-312658	Ballynaroon, Glounthaune, Co. Cork.	Demolition of an existing buildings, construction of 112 no. residential units (72 no. houses, 40 no. apartments). Granted – 03/06/2022
A new vehicular access and pedestrian entrance onto Ballynaroon Road	ABP-309195		The provision of landscaping, community recreation space, and amenity areas to include a multi-use games area (MUGA), levelled grass amenity area, local play areas, local open green space/landscaped areas, and amenity woodland and trail including glade. The provision of new footpaths and upgrading of existing footpaths to provide a shared pedestrian/cycle path and new and upgraded public lighting extending from the application site to Glounthaune crossroads junction via the residential estate (The Highlands) to the south. This will comprise works along public roads L-2970-6, L-7086-1, L-7086-0 and L-2968-0 and the footpath within The Highlands estate connecting the L-2970-6 and L-7086-1. Proposed decommissioning of overhead 230V ESB line and associated poles traversing the north-eastern section of the site. Lodged with ABP: 07/02/2022 - Decision Due: 30/05/2022
BAM Property Limited - housing development	ABP-311855 SHD Pre-App Consultation (Consultation closed)	Castlelake, Terry's land and Carrigtohill (townlands).	BAM Property Limited - 706No residential units (239No houses, 467 No apartments, creche and associated site works.
Section 34 Planning Applications lodged with Cork County Council			
Bluescape Development	17/5699	Bluescape Development	Bluescape Ltd, 31 No 2-storey houses - 21/05/2018 - Granted on appeal by ABP (Ref. ABP-300128-17)
Castle Rock Homes (Midleton) Ltd - Bloomfield Village	166818	Broomfield Village, Broomfield East and Broomfield West, Midleton, Co. Cork	Construction of 100 no. dwellings, a crèche and all ancillary site development works. The proposed development will consist of 31 no. detached dwellings, 46 no. semi-detached dwellings, 2 no. 3 storey blocks consisting of 8 no. apartments and 15 no. ter. Granted - 11/11/2016

Development	Reference (planning or other)	Location	Summary of Details
Church Road Development, Murnane & O'Shea Ltd	174498	Church Road, Carrigtohill, Co. Cork	Residential development of 25 no. residential units and all ancillary site development works. The proposed development consists of 20 no. 3 bed semi-detached dwellings, 4 no. 2 bed semi-detached dwellings and 1 no. 3 bedroom detached dwelling. Granted 03/03/2017
Bluescape Ltd.	175315	Cluain Cairn, Station Road, Carrigtohill, Co. Cork	Construction of 19 no. 2 storey dwelling houses and all ancillary site development works. The proposed development consists of 7 no. 2 bed townhouses, 10 no. 3 bed townhouses, and 2 no 3 bed semi-detached dwellings. Ancillary site development work. Granted 26/05/2017
Cork Co-operative Marts Ltd	175516	Market Green, Knockgriffin, Midleton	Construction of a residential development of 42 no. residential units and a community room. The proposed development consists of the demolition of the existing Educate Together School and ancillary structures located on the eastern portion of the site, extinguishing the existing vehicular access to the north. New vehicular & pedestrian access to the west of the site onto Knockgriffin Rd; Granted 27/10/2017
Stryker Ireland Ltd	185546	Stryker Ireland Ltd, (Springhill), IDA Business Park, Anngrove, Carrigtwohill	Extension to Manufacturing facility: 6,235m2, Will be carried out on a phased basis – Phase 1 has been implemented, Phase 2 remains to be implemented. Granted 08/08/2018
Castle Rock Homes (Midleton) Ltd	186553	Midleton	Construction of 26 no. dwelling houses consisting of 8 no. 5 bedroom detached dwelling houses and 18 no. 3 bedroom semi –detached dwelling houses and all ancillary site works. The proposed development is a change of plan from that permitted under An Bo. Currently being implemented – part of overall development which includes Pl. Ref 18/7321. Granted 18/01/2019
Park Hill View Estates Ltd,	187236	Broomfield West, Midleton. NE of existing Carrigtwohill station	Demolition of existing sheds and construction of 41 no. residential units. The proposed development includes the demolition of existing sheds (2 no. agricultural sheds) and the construction of 2 and 3 storey detached and semi-detached houses and the provision of landscaping, car parking and all assoc. infrastructural abd site development works, incl widening of L-7630 Broomfield Road and provision of pedestrian footpath. Granted - 20/08/2019
Castle Rock Homes (Midleton) Ltd	187321	Midleton	The construction of 13 no. dwelling houses consisting of 12 no. 3 bedroom semi-detached dwelling houses and 1 no. 3 bedroom detached dormer dwelling house and all ancillary site works. The proposed development is a change of house type from that. Granted 12/02/2019
Murnane & O'Shea Ltd	194124	Carrigane Road, Carrigtohill	The construction of 94 no. dwelling houses and all ancillary site works. The proposed residential development represents a change of house type from that permitted under Cork County Council planning reference 06/10171 [as amended under planning ref. 14/4654]. Granted 13/01/2020
Ancelstierre Investments Ltd,	194216	Avoncore Mill Rd, Broomfield West, Midleton	Construction of 40 no. dwelling houses consisting of 2 no. 2 bedroom townhouses, 28 no. 3 bedroom townhouses, 8 no. 3 bedroom semi-detached dwelling houses and 2 no. 4 bedroom semi detached dwelling houses and all ancillary site works. Granted 02/08/2019
Smithkline Beecham (Cork) Ltd	204090	IDA Business & Technology Park, Killacloyne, Carrogtohill	The development will consist of (1) a single storey laboratory building to include plant and equipment area, office area, meeting rooms, canteen and kitchen, staff toilets, laboratories, IT room, electrical switch rooms and store rooms. The main laboratory bdg is 6.1m high, 44.5m long and 21.5m wide; incl. 19No new car pkg spaces. Granted 23/04/2020
The Cork Education and Training Board - Post Primary School accommodation:	204810	Fota Retail & Business Park, Killacloyne, Carrigtwohill.	8No prefabs – temporary permission for a period of no longer than 5 yrs. Granted 03/07/2020
Midleton Association Football Club Ltd	214154	Immediate south of Midleton Station	The construction of a full size all weather playing surface on pitch number two, floodlighting, surrounding fencing, ball catching nets and all associated site development works on the club grounds. Granted 22/03/2021
Murnane & O'Shea Ltd	214267	Carrigane Rd. Carrigtohill (townland), Carrigtwohill	The construction of 10 no. 4 bed semi-detached dwelling houses and all ancillary site development works. The proposed development is a change of plan from that previously permitted under Cork County Council planning application reference 19/4124. Granted 01/04/2021
Barlow Properties Ltd	215072	Ashbourne House, Johnstown, Glounthaune	94no. residential units (comprising 5no. 4-bed detached dwelling houses, 3no. 3-bed detached dwelling houses, 9no. 3-bed apartments, 4no. 3-bed duplex apartments, 65no. 2-bed apartments and 8no. 1-bed apartments in 8no blocks ranging in height from 2-4storey. Currently on FI (requested 16 June 2021) – FI submitted 04/02/2022
Murnane & O'Shea Ltd	215150	Carrigtohill (townland), Carrigtwohill	The construction of 67 no. dwelling houses and all ancillary site works. The proposed development consists of the construction of 34 no. 4 bedroom dwellings, 30 no. 3 bedroom dwellings and 3no. 2 bedroom dwellings. Access to the proposed development via estate entrance (2nd phase of 'Elmbury' development); Granted 08/12/2021

Development	Reference (planning or other)	Location	Summary of Details
Park Hill View Estates Ltd,	215664	at Broomfield West, Midleton, Co. Cork	A temporary waste water treatment system to serve the permitted housing consent 18/7236 (a consent for 41 houses), including ancillary links, connections to the public foul system, local servicing and access off the. Granted 16/09/2021
Compass Homes Ltd	216240	Station Road, Carrigtwohill, Carrigtwohill (townland), Co. Cork	Construction of 38 houses and a café; ABP decision due: 20/06/2022
Vella Homes Ltd	216874	Junction of Mill Rd & Northern Relief Rd, Broomfield West, Midleton.	The construction of a mixed-use residential development with café/community space and all ancillary site works. The proposed development provides for the construction of 57 no. residential units comprising 4 no. 3 bedroom two storey townhouses and 53 no apartment/ duplex units. CEMP indicates a potential construction start of April 2023 (site set up) and August 2023 (construction of units). Granted: 14/06/2022
Connaught Trust Limited	217130 ABP Case Ref: PL04.313907 (Grated 01/06/2022 3rd party appeal – decision due 27/10/2022)	Ballyadam and Carrigtohill (townland), Carrigtwohill.	63No Residential units (47No houses and 16No duplex apartment units); vehicular entrance from upgraded site entrance from the Bog Road; On Further Information – immediate south and alongside railway line – diag opposite proposed newly aligned entrance to IDA site (see Pl. ref 217374); Docs include an Ecological Assessment. FI request refers to the access road being within a flood zone; request for FRA; EclA to provide an assessment of the predicted implications of the proposed dev on habitats; use of natural drainage solutions on site where possible to enhance the biodiversity value. See also IDA road alignment: Pl. Ref 217374. F
EMR Projects Ltd	217264	Knockgriffin and Water Rock, Midleton	284No Residential units on 6.7Ha site; 7,525sqm is non-residential (childcare facility; retail unit; café unit; medical clinic; office units and associated ancillary accommodation). FI requested 07/02/2022
IDA Ireland	217374	Carrigane Road, lBallyadam, Hedgy Boreen Carrigtohill, Carrigtwohill	New site access, local road improvement works and site development works comprising; new vehicular site entrance from L-7642 (Hedgy Boreen) including approx. 34m of internal stub road; road improvement works to approx. 140m of the northern end of the L-7642 to widen approx. 80m of carriageway and provide a grass verge and new setback boundary to the north and south of proposed entrance; improvement of sightlines along L-3617. Granted 18/02/2022
Cruachan Investment Limited Partnership	217424	Titan Container Storage Facility, Fotapoint Enterprise Park, Killacloyne, Carrigtwohill, Co Cork	Construction of 13 no. warehouse/light industrial units in 3 no. buildings with ancillary two storey offices internally and associated site works (part of previous permitted development under planning reg no. 06/6741 and extension of permission Reg No. 1
Irish Water pumping station	225032	Lands to the west of the Mill Road and part of, Mill Road, The Owenacurra River,and the Northern, Relief Road, townlands Townparks, Broomfield West, & Knockgriffin	The Midleton North wastewater pumping station and network, which will consist of: 1) a new wastewater pumping station with below ground wet well and chambers, 2 no. above ground kiosks, vent stack (c.6.2m in height), telemetry pole (c. 6m in height), boundary fencing, retaining wall, and modifications to an existing entrance from Mill Road, including new gates, to facilitate vehicular and pedestrian access; (2) the construction of a below ground pipeline (c. 650m long) connecting the proposed wastewater pumping station to the previously approved Water-Rock pumping station (consented as per section 179 of the planning and development act, 2000, as amended(Water-Rock UEA Infrastructure Works)
New access road and temporary carpark	225378	Fota Retail and Business Park, Killacloyne, Carrigtwohill	Permission for the construction of an access road, a temporary unsurfaced carpark, temporary security hut, temporary bus shelter building, temporary portaloo toilets, temporary lighting, temporary fencing and ancillary works.
Single storey pre-fabricated office and general lab building	224567	Stryker Innovation Centre, IDA Business Park, Tullagreen, Anngrove, Carrigtwohill	To apply for a temporary permission for the provision of single storey pre-fabricated office and general lab building. The development also includes the provision of a temporary covered walkway connecting the proposed temporary office accommodation to the existing innovation centre, car parking, cycle parking and all ancillary site development works. Access to the proposed development will be from the existing entrance to the IDA Business Park.
South Midleton Wastewater Network Diversion Project	Future Irish Water application to Cork County Council	Townparks	This project seeks to transfer further loads to Carrigtohill WWTP via a wastewater pumping station located east of Ballick Road within the southern half of Midltown, via a rising main to Midleton North Pumping Station to cater for loads for future developments in Midleton town centre and wider area.
Compulsory Purchase Orders			
Irish Water Compulsory Purchase (Midleton LIHAF Wastewater Project) Order, 2021	ABP Case Ref: CH04.311549 Related to Irish Water planning application for North Midleton Wastewater pumping station (225032)	Various	Connecting wastewater pipeline connection from North Midleton Pumping Station to wastewater treatment plant in Carrigtwohill, requirement for pipeline to cross beneath the rail line

Chapter 3 Policy and Need for the Proposed Development

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3 Policy and Need for the Proposed Development

3.1 Introduction

The purpose of this chapter of the EIAR is to detail the policy context and the need for the Glounthaune to Midleton Twin Track Project (hereafter referred to as the "proposed development") and the project objectives. The strategic alignment of the project objectives with planning policy context for the proposed development is set herein and details compliance with EU, national, regional, local and sectoral plans. In this regard among the matters which An Bord Pleanála ('ABP') is required consider when an application is made for a Railway Order, are the matters referred to in section 143 of the Planning and Development Act 2000 (as amended) by virtue of section 43(1)(h) of the Transport (Railway Infrastructure) Act 2001 (as amended and substituted).

Accordingly, the Board, in the performance of its functions is required to have regard to (a) the policies and objectives for the time being of the Government, a State authority, the Minister, planning authorities and any other body which is a public authority whose functions have, or may have, a bearing on the proper planning and sustainable development of cities, towns or other areas, whether urban or rural; (b) the national interest and any effect the performance of the Board's functions may have on issues of strategic economic or social importance to the State, and (c) the National Planning Framework and any regional spatial and economic strategy for the time being in force.

3.2 Strategic Alignment with Policy

The proposed development has been identified within the Cork Metropolitan Area Transport Strategy (CMATS) and within the Cork Area Commuter Rail (CACR) programme, which includes the principles of the heavy rail vision in CMATS, CMATS has been developed by the National Transport Authority in collaboration with Transport Infrastructure Ireland, Cork City Council and Cork County Council. The concept for CACR has been in existence for nearly 20 years. The need to improve the Cork rail network is well established having formed part of numerous local plans and recently having been included within Project Ireland 2040 - National Planning Framework and now forms part of the CMATS. There is a robust policy context at all levels which support the improvement of the heavy rail system to enable the Cork Metropolitan Area to develop in a sustainable manner.

There is a strong strategic fit between CACR and European, national, regional and local policy objectives relating to sustainable mobility, decarbonisation, compact land use development and consolidation of population and employment growth along high-frequency transport corridors. The policy which supports and is supported by the proposed development is detailed below.

3.2.1 European Policy

3.2.1.1 EU White Paper on Transport: Roadmap to a single European Transport Area – Towards a competitive and resource efficient transport system

The general objective and overall role of the White Paper is as a strategy document for the EU's transport policy - the main purpose of which is to develop a transport system that meets the needs and aspirations of people while minimising undesirable impacts. The vision of the White Paper identified four broad areas:

- Growing transport and supporting mobility while reaching a 60% emission reduction target
- Delivering an efficient core network for multimodal intercity travel and transport
- Ensuring a global level-playing field for long-distance travel and intercontinental freight
- Promoting clean urban transport and commuting.

The White Paper focussed on the reduction of emissions from transport, with a series of target actions established for Member States, including supporting increasing demand for mobility whilst meeting a 60% emission reduction target.

3.2.1.2 European Sustainability and Smart Mobility Strategy – putting European transport on track for the future (COM/2020/789 final)

In December 2020, the European Commission presented its 'Sustainable and Smart Mobility Strategy'. The Strategy is part of the EU Green Deal[1] and lays the foundation for how the EU transport system can achieve its green and digital transformation and become more resilient to future crises. It includes an action plan interlinking three objectives, 10 flagships, 14 milestones and 82 initiatives.

Given the ambitions of the European Green Deal, the result should be a 90 % cut in emissions by 2050, delivered by a smart, competitive, safe, accessible and affordable transport system. The Strategy highlights the need for cities and regions to adapt their existing systems and invest to make transport more sustainable, whilst also allowing citizens to better combine the available mobility options, enabling them to reduce their daily travel needs while ensuring connectivity and service accessibility.

As rail is one of the most environmentally positive choices with regards to public transport, the Strategy targets transport and mobility under three key objectives, including sustainable mobility, smart mobility and resilient mobility. As regards achieving sustainable mobility, three key perspectives will be evident in EU policies enacted to achieve sustainable mobility, with two of these comprising:

- The reduction of fossil fuel dependence; and
- Making alternative choices.

3.2.1.3 The European Green Deal

The European Green Deal (EGD) sets out the EU's increased ambition on climate action. It presents a roadmap of key policies and measures needed to achieve the ambition of becoming the first climate-neutral bloc in the world by 2050. This requires a transformation of the EU's economy, with sectors such as transport, buildings, agriculture, and energy production all having key roles to play.

As well as setting out the policy and legislative programme for all key economic sectors to deliver on the EU's climate ambition, the EGD also addresses the EU's overall ambition on climate targets. It proposes increasing the EU's emissions reduction targets for 2030 from 40% to at least 50% and towards 55% compared with 1990 levels. In December 2020, EU leaders agreed to reduce GHG emissions by at least 55% by 2030 compared to 1990 levels

In identifying that surface transport is one of the second most CO_2 emitting sectors in the EU, the European Green Deal recognises the role of rail as one of the key sectors in greening European transport and for reaching both the EU targets and the Paris Agreement objectives. Rail is identified as the only mode of transport that is able to achieve economic growth whilst reducing its emission levels.

[1] EU Green Deal (2019) Action Plan: *Accelerating the shift to sustainable and smart mobility*

The Green Deal is composed of various elements going from "*a zero-pollution ambition for a toxic-free environment*" to "*mobilizing industry for a clean and circular economy*". The strategic element in the railway sector is named "*accelerating the shift to sustainable and smart mobility*".

3.2.2 National Policy

3.2.2.1 National Planning Framework – Project Ireland 2040

The National Planning Framework – Project Ireland 2040 (hereafter referred to as the NPF), sets out the strategic planning and development context for Ireland up to 2040. As such, it sets a high-level framework for the co-ordination of a range of national, regional and local authority policies and activities, aligned with planning and investment - both public and private.

The NPF is structured around a set of shared goals which are expressed as National Strategic Outcomes (NSOs). The following NSOs relate directly to the proposed development, namely:

- **NSO 1 Compact Growth**

NSO 1 seeks to build on existing assets and "improve accessibility to and between centres of mass and scale and better integration with their surrounding area". The proposed development will help the achievement of compact growth at local level. The proposed development will "enhance the attractiveness, viability and vibrancy of smaller towns" by ensuring that rail services will result in viable alternative options when deciding on locations to live in the Cork Metropolitan Area.

- **NSO 2 Enhanced Regional Accessibility**

Under "Enhanced Regional Accessibility" the NPF details the sought outcome for NSO 2; it seeks to build on a "more compact approach to urban development requirements, enhancing connectivity between centres of population of scale". In relation to public transport, NSO 2 seeks to "strengthen public transport connectivity between cities and large growth towns…with improved services and reliable journey times".

- **NSO 4 Sustainable Mobility**

The importance of a well-functioning and integrated public transport system is acknowledged with NSO 4 which seeks to provide "attractive public transport alternatives to car transport to reduce congestion and emissions and enable the transport sector to cater for the demands associated with longer term population and employment growth in a sustainable manner" and also "provide public transport infrastructure and services to meet the needs of smaller towns, villages and rural areas".

- **NSO 5 A Strong Economy Supported by Enterprise, Innovation and Skills**

The proposed development will indirectly support NSO 5 by ensuring that the employment base required to provide a "competitive, innovative and resilient regional enterprise base" is retained and attracted to the area as an improved level of rail service provision is provided to the Cork Metropolitan Area and wider region.

- **NSO 7 Enhanced Amenities and Heritage**

The NPF seeks to ensure placemaking results in attractive and appealing places for citizens which are easily accessible to all, provide a diversity of uses and are supported by integrated transport systems. NSO 7 also seeks the implementation of planning and transport strategies for the five cities and other urban areas; the publishing of the Cork Metropolitan Area Transport Strategy 2040 fulfils an element of this objective. The proposed development, also comprising an element of the overall CMAT strategy, is thus also compliant with the objective of NSO7 which seeks to implement the CMATS.

- **NSO 8 Transition to a Low Carbon and Climate Resilient Society**

There is a strategic aim to increase renewable deployment in line with EU targets and national policies to 2030 and beyond. The proposed development will assist the country's transition to a low carbon future by providing a viable and attractive alternative to private car use. The proposed development will facilitate the future electrification of this rail line. It will thus further the aims and objectives relating to a reduction of carbon emissions post 2030 as electrification is rolled out nationally across the rail network.

In addition to the above, within Section 3.4 - Cork City & Metropolitan Area of the NPFP, Cork is identified as an emerging medium-sized European centre of growth and innovation. To build on this potential the provision of transport system which is created in line with best European practice is stated as one of the requirements to achieving significant growth. Other requirements for growth fall under the NSO's for compact growth (NSO 1), strong economy (NSO 5) and enhanced regional accessibility (NSO 3), through the diversification of Cork's employment base, addressing the long-term decline of the city's urban population and providing, in tandem, improved regional connectivity (NSO 2). It is stated that journey times per km from Cork are up to 30-40% slower per km travelled than from Dublin to the other regional cities. An identified 'key future growth enabler' for Cork city and metropolitan area is specifically identified as *"improved rail journey times to Dublin and consideration of improved onward direct network connections."*

3.2.2.2 National Development Plan 2021-2030

The revised National Development Plan (NDP) was published on 4th October 2021. The NDP is a detailed investment strategy setting out the ten-year capital ceilings to 2030 which will support economic, social, environmental and cultural development across all parts of the country under Project Ireland 2040, in parallel with the NPF.

The NDP provides for significant investment in terms of expanding sustainable mobility options in the country's cities, towns and villages, supporting the ambition for compact growth under Project Ireland 2040. The NDP highlights that improved and expanded sustainable mobility services and infrastructure can act as an enabler of the NPF's commitment toward compact growth of our cities, towns and villages within their existing urban footprint. The NDP confirms that Commuter Rail is an investment priority and will be delivered under NSO 4 - Sustainable Mobility. Cork Commuter Rail is specifically identified as one of the Major Regional Investments planned for the Southern Region.

3.2.2.3 National Investment Framework for Transport in Ireland

The Department of Transport has prepared and finalised the National Investment Framework for Transport in Ireland (NIFTI). NIFTI is the Department of Transport's high-level strategic framework to support the consideration and prioritisation of future investment in land transport. It represents the Department's contribution to Project Ireland 2040, Government's long-term, overarching strategy to make Ireland a better country for all and to build a more sustainable future. NIFTI has been developed to ensure sectoral investment is aligned with the National Planning Framework (NPF) and supports the delivery of the ten National Strategic Outcomes (NSOs).

The NIFTI notes that the National Development Plan identities a range of transport projects, including a host of smaller projects, that will enhance regional connectivity and improve the transport offering in rural Ireland. The NIFTI establishes an 'Intervention Hierarchy' (Maintain, Optimise, Improve, New), with interventions being made according to four Investment Priorities: Decarbonisation, Protection and Renewal, Mobility of People and Goods in Urban Areas, and Enhanced Regional and Rural Connectivity. Future transport projects must align with these priorities to be considered for funding. Moreover, as the National Strategic Outcomes are

embedded in NIFTI, future investment made in accordance with the priorities will support the delivery of the National Planning Framework over the coming decades.

3.2.2.4 National Sustainable Mobility Policy

The National Sustainable Mobility Policy, published in April 2022, sets out a strategic framework to 2030 for active travel (walking and cycling) and public transport journeys to help Ireland meet its climate obligations. It is accompanied by an action plan to 2025 which contains actions to improve and expand sustainable mobility options across the country by providing safe, green, accessible and efficient alternatives to car journeys.

The Policy forms part of Ireland's climate action agenda with a number of complementary actions in the Climate Action Plan 2021, including actions focused on decarbonising the public transport fleet and enhancements across active travel and public transport. This Policy is primarily focused on measures to promote and facilitate active travel and public transport for all and, in doing so, encourage less private car usage nationally and particularly to, from, and within our towns and cities.

The policy aims to deliver at least 500,000 additional daily active travel and public transport journeys by 2030 and a 10% reduction in the number of kilometres driven by fossil fuelled cars. It will make it easier for people to choose walking, cycling and use public transport daily, instead of having to use a petrol or diesel car.

3.2.2.5 Department of Transport: Statement of Strategy 2021-2023

The Statement of Strategy set out the departmental priorities and action plans for the coming years. It does not refer to specific projects, however, there are a number of objectives outlined in the Strategic Approach that are relevant to the Glounthaune to Midleton Twin Track project:

"Aligned with the National Planning Framework and the National Economic Plan we will maintain and develop high quality sustainable road, public transport and active travel networks to enable economic activity, essential services and social connections between and within our cities, regions and communities.

We will encourage and support transport networks and services that are environmentally, economically and socially sustainable, in line with the UN Sustainable Development Goals.

We will prioritise the decarbonisation of transport and low carbon technology in line with the EU Green Deal and ambitious government policies.

We will continue to invest in active travel and in our public transport networks, greenways and alternative technologies."

3.2.2.6 Climate Action Plan 2021

The Climate Action Plan 2021 provides a detailed plan to achieve 51% reduction in overall greenhouse gas emission by 2030. This is part of the net-zero carbon emission target to be reached by 2050 to which the Government have committed in the Programme for Government and as set out in the Climate Act 2021.

An action identified to reduce emissions in the transport sector is: "*The proposed pathway in transport is focused on accelerating the electrification of road transport, the use of biofuels, and a modal shift to transport modes with lower energy consumption (e.g. public and active transport)*."

The abatement ambition targets for the transport sector in 2030 are predicted to result in a reduction of greenhouse gas (GHG) emissions of between 40-50% when compared against 2018 GHG emissions. This reduction rate is based on the implementation of core measures or a

combination of core and future measures from the Climate Action Plan 2021. The abatement ambition is set to be achieved by the transport sector via several core measures and a total of 72no. actions with associated timelines and responsible organisations detailed. The core measures are detailed in Table 3.1.

Table 3.1: Core Measures of the Climate Action Plan 2021

Climate Action Plan 2021 – Core Measures	Technology/Actions
T1 electrification of road transport	845,000 passenger electric vehicle (EVs) with a focus on battery EVs 95,000 vans 3,500 heavy goods vehicles
T2 increase biodiesel blend rates	Bioethanol blend increases; petrol-E10 and diesel-B20
T3 transition to zero emission mass transportation	1,500 EV buses Expanding electrified rail services
T4 Sustainable Transport Journeys and Demand Management Measures	500,000 (14%) additional public transport and active travel journeys per day Reduce kilometres travelled by internal combustion engine (ICE) cars by c.10%

3.2.3 Regional Policy

3.2.3.1 Regional Spatial and Economic Strategy for the Southern Region

The Regional Spatial and Economic Strategy for the Southern Region (hereafter referred to as the RSES), came into effect on 31 January 2020. The RSES sets out a 12 year strategic regional development framework for the Southern Region for the three main cities and metropolitan areas of Cork, Limerick-Shannon and Waterford. The primary aim of the RSES is to support and implement the NPF and NDP.

The RSES supports investment, strengthening and enhancement of the rail network for the Region and seeks to ensure that rail services meet passenger demand and future growth while providing reliable services to encourage use of sustainable transport. The Regional Transport Strategy for the RSES sets out 'A Transport Vision for the Southern Region' which states that investment in the Region aims to meet a number of objectives, including the following objectives which are considered relevant to the proposed development:

- To reduce environmental impact of travel on the Region.
- To provide for the integrated development of sustainable transport infrastructure, including walking, cycling (including emerging e-modes) and public transport to accommodate the necessary switch to private car, for the travel needs of all individuals in the Region, in line with the stated government transport policy.
- Supporting improved strategic and local connectivity.
- To expand attractive public transport and other alternatives to car transport.

The Transport Vision within the RSES is based on a set of principles which inform the integration of land use and transport planning in the Region. In regard to rail infrastructure it sets out that "*The management, maintenance and improvement of the regions transport infrastructure is a key consideration to ensure that the safety, capacity and efficiency of the networks are maintained and factored into the capital funding process*", whilst also highlighting the need for *"Strengthening intra-regional connectivity between the metropolitan areas and large towns, and between large towns to improve public transport services and reliable journey times."*

The proposed development is considered to be supported by and in turn supports, the following Regional Policy Objectives (RPOs);

- **RPO 155 Managing the Region's Transport Assets** It is an objective that the capacity and safety of the Region's strategic land transport networks will be managed and enhanced including through the management of travel demand to ensure their optimal use. Enhancement to existing land transport to existing land transport networks shall be subject to robust feasibility, route selection, environmental assessment and planning processes that reduce impacts on the environment
- **RPO 160 Smart and Sustainable Mobility** It is an objective to deliver NSO: Sustainable Mobility subject to the required appraisal, planning and environmental assessment processes. This includes the following sustainable mobility investment actions:
  - Recognise the importance of public transport networks and multi-modal interchange
  - Continued investment in bus and rail fleets
  - Support Steady State Investment to maintain and upgrade the existing road, rail and bus networks to provide a quality service to transport users
  - Reduction in the use of fossil fuels for public transport and increasing the use of technology and green energy sources to pursue low emission public transport fleets
- **RPO 163 Sustainable Mobility Targets** It is an objective that[2]

  Through effective integration of land-use and transport planning, implementation of RPOs in the RSES and MASPs and actions driven though Development Plan, Local Area Plan, Metropolitan Area Transport strategies and Local Transport Plans, significant progress is sought for the Southern Region to reduce the modal share of travel by walking, cycling, public transport and car sharing

  Support the function of Metropolitan Area Transport Strategies and Local Transport Plans to achieve higher rates of modal shift to sustainable transport.

- **RPO 164 Metropolitan Area Transport Strategies** This objective has been realised through the publication of the Cork Metropolitan Area Transport Strategy 2040 and is discussed further below, in this context, under Section 6.4.2.
- **RPO 170 Rail** It is an objective to seek to strengthen investment in the maintenance, improvement and strengthening of the rail network in the Region subject to appropriate environmental assessment and outcome of the planning process. This will provide for (listed below are those objectives specific to the proposed development):
  - Future proofed infrastructure for rail in our transition to smart transport networks and low carbon society
  - Improved journey times, services and passenger facilities to encourage greater use of rail between cities, towns and villages on the rail network across the Region
  - Take immediate actions to transition transport fleets to non-fossil fuel and renewable/low emission energy sources
  - Optimisation of the existing rail network assets and the protection of these assets for our region's transition to greater levels of sustainable mobility, use of rail and achievement of lower carbon emissions
  - Achieve improved and consistent journey times and frequencies

[2] only project specific paragraphs included for RPO 163

3.2.3.2 Cork Metropolitan Area Strategic Plan

The Cork Metropolitan Area Plan (CMASP), which forms part of the RSES for the Southern Region, seeks to make Cork a primary driver of economic population growth in the Region, as aligned with the objectives of the NPF. Each MASP is based on seven universally applied goals. Goal 1-Sustainable Place Framework comprises a number of objectives, including, the delivery of a *"network of compact metropolitan settlements and employment areas offering quality residential and working choices, interconnected with sustainable public transport, pedestrian and cycling networks".* These principles are translated into Policy Objective 1-Cork Metropolitan Area.

Goal 2 - Excellent Connectivity and Sustainable Mobility seeks to deliver, inter alia.

- well-connected metropolitan areas through efficient rail, road, bus networks and services
- encourage the development of sustainable modes of transport; and
- ensuring the provision of high-capacity public transport corridors and achieve sustainable higher densities and appropriate uses at nodes serviced by public transport networks.

The CMASP acknowledges that the distribution of population and employment growth in the metropolitan area must align with public transport investment and that the delivery of an integrated multi modal transport network is a key requirement.

Policy Objective 8-Key Transport Objectives is subject to the finalisation of the Cork Metropolitan Area Transportation Strategy, which has subsequently been published and is discussed in Section 5.5.2. Under Policy Objective 8 (e) Rail Network the dual tracking of the rail line to Midleton is stated as a specific suburban rail project, along with the improvement of journey times and electrification of the rail fleet. The proposed development is therefore aligned with Policy Objective 8. The proposed development also supports other policy objectives which are reliant on sustainable transport to be a catalyst for the delivery of compact residential and employment growth and improve the quality of living for citizens, specifically:

- Policy Objective 1: Cork Metropolitan Area
- Policy Objective 2: Cork City
- Policy Objective 4: Cork Metropolitan Regional Interactions
- Policy Objective 5: Investment to Deliver Vision
- Policy Objective 6: National Enablers
- Policy Objective 7: Integrated Landuse and Transport Planning
- Policy Objective 12: Infrastructure for Strategic Employment Locations
- Policy Objective 15: Cork MASP Tourism
- Policy Objective 16: Retail

3.2.3.3 Cork Metropolitan Area Transport Strategy 2040

As stated in Section 3 of this report the Cork Metropolitan Area Transport Strategy (CMATS) provides a land use and transport strategy for the managed delivery of an efficient transport network in the CMA. The CMATS is directly informed by the NPF policy objectives. The proposed development is one of a number of projects identified in the CMATS heavy rail strategy which will ensure the provision of the following, as appropriate:

- **Attractive and reliable rail services**: Ensure that sustainable modes of transport, such as rail, are provided as an attractive alternative to private car use
- **Increased rail infrastructure capacity**: Address inadequate levels of rail service to meet current and future need

- **Facilitate compact development**: Ensure that planned new residential development is support with sustainable modes of transport
- **Facilitate economy development**: Ensure that sustainable transport is provided to attract investment
- **Address transport carbon emissions**: Electrification will reduce carbon emissions and help achieve the Government's transport carbon targets under the Climate Acton Plan 2019
- **Protect residential amenity**: Electrification of the rail network will reduce noise and air emissions to protect proposed new residential amenity along rail corridors

3.2.4 Iarnród Éireann Strategic Plans

3.2.4.1 Iarnród Éireann Strategy 2027

Iarnród Éireann as the national rail provider has prepared a strategy detailing how service provision will be transformed over the lifetime of the NDP through strategic investment interventions and programmes. The Strategy states that the "*rail network is an invaluable national asset, providing the backbone for an integrated public transport system".* The Strategy aims to strengthen Ireland's rail system to *"create a modern, fit-for purpose and sustainable transport asset that will deliver for customers and support Ireland's growing population and economy for decades to come".*

The Strategy supports the delivery of the ten National Strategic Outcomes (NSO's) of the NPF, either 'directly addressing' and/or 'supporting' the ten NSO's, as illustrated in Figure 3.1. Additionally, it also contributes towards Ireland's meeting of several UN Sustainable Development Goals.

Figure 3.1: Iarnród Éireann Strategy 2027 contribution to NSO delivery

Project Ireland 2040 National Strategic Outcomes		Directly Addressed	Supported	Strategy outcome
1	Compact Growth	✓	✓	Improved integration and access to Rail Safeguarding the rail network Capacity to meet transport demand Customer satisfaction Future proofing our business *Meet United Nation Sustainable Goals 8, 9 and 11*
4	Sustainable Mobility	✓		
10	Access to Quality Childcare, Education & Health	✓	✓	
5	A Strong Economy Supported by Enterprise, Innovation & Skills	✓	✓	
2	Enhanced Regional Accessibility	✓		Improved Regional Connectivity by Rail *Meet United Nation Sustainable Goal 11*
3	Strengthened Rural Economies & Communities		✓	
6	High Quality International Connectivity	✓		Delivery of connectivity through Rosslare Europort Hourly Enterprise services between Dublin and Belfast Opportunities for additional rail freight access to ports Support public transport connectivity to Dublin Airport through interchange with MetroLink *Meet United Nation Sustainable Goal 9*
7	Enhanced Amenity & Heritage		✓	Safeguarding the rail network
8	Transition to a Low Carbon and Climate Resilient Society	✓		Taking action against climate change *Meet United Nation Sustainable Goal 13*

Source: Iarnród Éireann Strategy 2027 p.44

The Strategy identifies several challenges which will result from increasing demand pressures on the rail network, these include:

- Growing congestion on road networks
- Inadequate levels of infrastructure and service to meet the needs of the growing population and economy
- Lost potential to develop rail as a high-capacity transport solution in support of compact development along key corridors
- Impacts on the delivery of sustainable transport and negative implications for climate change
- Deteriorating infrastructure and increasing maintenance backlog
- Increasing safety requirements resulting in slower services or reduction in activity

The Strategy uses demand modelling to forecast the anticipated growth scenarios for the rail network based on three population growth scenarios - low, central and high. From the baseline, taken as 2018 passenger numbers, by 2027 the total growth in annual journeys for the low-growth scenario is 21%, compared to 51% in the central scenario and 81% for the high-growth scenario. The high-growth scenario broadly reflects Iarnród Éireann's '75 by 25' vision with just under 75 million passengers expected by 2025 in this scenario. Combined annual growth rates up to 2027 are 2.1% for the low scenario, 4.6% for the central scenario and 6.7% for the high scenario.

To meet the forecasted demand and deliver the increase in rail network capacity, the Strategy references three programmes of investment to achieve continued and sustainable economic growth. One of these programmes is the 'Heavy Rail Enhancement Programme which is a programme of investment consisting of numerous signalling, civils and on-board fleet renewal projects, including investment to upgrade certain stations, improve accessibility, track renewal, city centre re-signalling and other network development projects. This includes the Cork City Centre re-signalling project. Also specifically referenced, is Cork Commuter Services, with service enhancement proposals that are aligned to CMATS, which includes the proposed development.

3.2.4.2 Iarnród Éireann Cork Area Commuter Rail Programme Strategic Assessment Report (November 2021)

This strategic assessment report (SAR) examines the investment rationale for the Cork Area Commuter Rail (CACR), its strategic fit and alignment with Government policy and assesses programme objectives, consideration of options and identification of risks. The report represents the first deliverable in the lifecycle and Decision Gate appraisal process as set out in Department of Public Expenditure and Reform Public Spending.

Programme delivery is aligned to project funding allocation from the European Union Recovery and Resilience Facility (EURRF), with a commitment to achieve project completion by 2026 for all three elements of the programme – these include:

- Through-running platform at Kent Station
- Double tracking of the line between Glounthaune and Midleton
- Cork area re-signalling

3.2.5 Local Policy

3.2.5.1 Cork County Development Plan 2022-2028

The proposed development is located within the administrative planning boundary of Cork County Council. The Cork County Development Plan 2022-2028 (hereafter referred to as the CDP), is the key local policy document in the context of the proposed development. The Cork County Development Plan was adopted on 25th April 2022 and came into effect on 6th June 2022.

The CDP Vision is stated below and is supported by ten aims:

"The Vision is to provide for the development of County Cork as an attractive, competitive and sustainable place to love, visit and do business, where the quality of its economy, natural and built environment, culture and the strength and viability of its rural and urban communities are the to the highest standards".

The CDP Core Strategy considers all aspects needed to deliver sustainable communities and support the vision for the CDP. Emerging spatial trends arising from the Cork Metropolitan Area Transport Strategy are integral to the development of the CDP and the identification of zoning objectives.

The proposed development is directly supported in the Core Strategy under the following paragraphs of Objective CS 2-3:

CS 2-3 County Metropolitan Cork Strategic Planning Area[3]

- Recognise the importance of the role to be played by the Cork Metropolitan Area in the development of the Cork 'MASP' as identified in the RSES for the Southern Region, in tandem with the development of Cork City, to promote its development as an integrated planning unit to function as a single market area for homes and jobs where there is equality of access for all, through an integrated transport system, to the educational and cultural facilities worthy of a modern and vibrant European City
- Provide an enhanced public transport network linking the City, its environs, the Metropolitan Towns and the major centres of employment in line with the Cork Metropolitan Area Transport Strategy (2020)
- Support the existing Strategic Employment Locations as important economic assets, particularly in terms of public transport provision and linkages to local residential populations.

Transport and Mobility

The aim of the transport chapter (Chapter 12 of the CDP) is to support the delivery of an efficient transport system in order to deliver economic, social, health wellbeing, environmental and climate action benefits. Specific transport and mobility objectives provided in the CDP, and considered to be directly relevant to the proposed development (only relevant sections of objectives have been reproduced below), include the following:

TM 12.1 Integration of Land Use and Transport

Support and facilitate the integration of land use with transportation infrastructure, through the development of diverse, sustainable, compact settlements, to achieve sustainable transport outcomes, with the pattern, location and design of new development in the County to support existing and planned well-functioning, integrated public transport, walking and cycling transport modes.

[3] Note: Only those objective paragraphs specifically relevant to the proposed development, are noted here

a) The Council will support delivery of transport programmes and policies that have been committed to in Project 2040 and the Cork Metropolitan Area Strategic Plan as they apply to County Cork.

TM12.2.1 Active Travel

Deliver a high level of priority and permeability for walking and cycling to promote accessible, attractive, liveable, vibrant and safe settlements to work, live, shop and engage in community life, within a ten-minute walk of one's home. Prioritise development in our settlements that is well located and designed to facilitate walking, cycling and public transport trips.

TM12.3 Rail Transport

Support and prioritise the following key Rail Transport initiatives:

a) Encourage the enhancement of service provision in tandem with planned population and employment growth

b) Secure the delivery of new stations to support planned population growth in: Carrigtwohill (Carrigtwohill West), Midleton (Water Rock), Cobh (Ballynoe), and Monard

c) Secure the delivery of a Park & Ride facilities where and as appropriate including at Carrigtwohill and Dunkettle/North Esk.

d) Support other agencies in delivering an appropriate integrated land-use and transportation framework to maximise rail use and facilitate connectivity with other transport modes

e) Provision of enhanced rail station access and multi modal facilities to include secure, sheltered bicycle parking, public bicycle sharing facilities, bicycle maintenance stations, EV charging, park and pool facilities, car sharing facilities, where appropriate.

TM12:6 Local Link

Support investment in sustainable transport infrastructure that strengthens the connections between rural and urban areas.

TM12.7 CMATS

Support the implementation of the Cork Metropolitan Area Transport Strategy.

Climate Change

The importance of addressing climate change has been transposed into Irish planning legislation under the Planning and Development Act 2001 (as amended by the Planning and Development (Amendment) Act 2010 S.I. No. 447 of 2010), as well as under the Climate Action and Low Carbon Development Acts 2015 to 2021 (and through the Climate Action Plan 2021). A main objective for Iarnród Éireann under their Strategy 2017, is to continue to electrify the rail network, electrification will be undertaken as part of the proposed development. A core strategy objective of direct relevance to the proposed development is CS 2-8 Climate Change which reads as follows:

CS 2-8 Climate Change

Promote sustainable settlement and transportation strategies in urban and rural areas, including the promotion of measures to:

a) Reduce energy demand in response to the likelihood of increases in energy and other costs due to long term decline in non-renewable resources,

b) Reduce anthropogenic greenhouse gas emissions, and address the necessity for adaption to climate change, in particular, having regard to location, layout and design of new development.

c) Address climate change with particular emphasis on transport provision, by implementing the policies and objectives of this CDP.

Chapter 17 Climate Action of the CDP contains the mandatory objectives addressing measures to reduce energy demand, reduce GHG emissions and address Climate Adaption. Those objectives which are appliable to the proposed development are set out below.

CA 17-1: Support national and local climate change objectives set out in the following:

- National Planning Framework
- Southern Region Spatial and Economic Strategy
- Climate Action Plan
- National Climate Change Adaptation Framework (2018 or any successor framework)
- National Mitigation Plan (2017 or any successor plan)
- Cork County Council Climate Change Adaptation Strategy

CA 17-2: In order to achieve a reduction in greenhouse gas emissions, an increase in renewable energy production, an increase in energy efficiency and enhanced biodiversity, support the transition to a low carbon, competitive, climate resilient and environmentally sustainable economy by 2050 through implementation of the polices of this plan that seek to deliver the following:

- compact growth;
- integrated land use and transport;
- sustainable transport choices;
- liveable settlements;
- renewable energy production and reduced energy consumption;
- enhanced ecological biodiversity; and
- climate adaptation measures such as through flood risk management, sustainable urban drainage systems and high quality placemaking and design.

3.3 Project Need

The railway network in Cork is a vitally important component of the local and regional transport infrastructure network providing essential commuter and InterCity services. Prior to COVID-19, the commuter and InterCity rail services to and from Cork were experiencing strong growth, particularly in recent years.

The rail service offering in Cork has undergone considerable improvements since the early 2000s with a new hourly Cork-Dublin InterCity service in 2007, the re-opening of the Midleton line in 2009 to commuter services and major upgrades to the concourse and booking hall at Kent Station. More recently, a new station entrance facing on to Horgan's Quay opened up the station to a new transport interchange and developments in the City Docklands.

In early 2020, the National Transport Authority (NTA), in partnership with both Cork City and County Councils and Transport Infrastructure Ireland (TII), finalised the Cork Metropolitan Area Transport Strategy (CMATS) 2040[4]. The rail network is a central component of the CMATS strategic vision. The CMATS recognises the imperative need to upgrade the public transport

[4] Cork Metropolitan Area Transport Strategy 2040

system in the Cork region; heavy rail must change and improve to play its role within an integrated local and regional transport network for the future of Cork city and its surrounds.

The projected population increase for Cork city region is estimated by the National Planning Framework to be 50-60% by the year 2040 and will result in an increased demand for public transport. CMATS will support compact urban growth in a more sustainable way, facilitating a modal shift from the private car to public transport. A more efficient, sustainable, low carbon and climate resilient heavy rail network will help to reduce road congestion and support Ireland's transition to a low emissions transport system and assisting in achieving emission reduction targets. The CMATS is aligned with the Climate Action Plan 2019 and its subsequent 2021 update to ensure that a shift to sustainable and active modes of travel can be facilitated and delivered.

The proposed development has been identified within CMATS and within the Cork Area Commuter Rail (CACR) programme, which includes the principles of the heavy rail vision in CMATS, as such its need has been identified as part of the development of these strategies and its delivery is anticipated to be implemented before the lifetime of these strategies.

The concept for CACR has been in existence for nearly 20 years. The need to improve the Cork rail network is well established having formed part of numerous local plans and recently having been included within Project Ireland 2040 - National Planning Framework and now forms part of CMATS. There is a robust policy context at all levels which support the improvement of the heavy rail system to enable the CMA to develop in a sustainable manner.

The key drivers for the CACR and therefore the proposed development include the following:

3.3.1 European

Transport accounts for a quarter of the Union's greenhouse gas emissions and these continue to grow. To achieve climate neutrality, a 90% reduction in transport emissions is needed by 2050. Public transport, more specifically rail, is one of the most sustainable and safest modes of transport, and thus will play a major role in the Green Deal's vision to make Europe climate neutral.

3.3.2 National Level

Project Ireland 2040, where CACR is aligned with multiple National Strategic Objectives (NSOs) for compact growth, enhanced regional accessibility, a strong economy and a transition to a low carbon and climate resilient society.

The Future Land Transport Investment Framework (FLTIF) (2021), which outlines an intervention hierarchy that emphasises maintaining, optimising and improving existing transport assets.

The Climate Action and Low Carbon Development (Amendment) Bill 2021, which provides statutory recognition of a national climate objective and a requirement for sector-relevant carbon budgets, which will place further emphasis on the need to decarbonise the transport sector.

3.3.3 Regional Level

The Southern Regional Assembly's Regional Spatial and Economic Strategy (RSES) outlines 11 core 'Statements of the Strategy' to build a strong, resilient and sustainable region. CACR aligns with six of these; compact growth; enhanced regional accessibility; sustainable mobility; a strong economy; a low carbon, climate resilient and sustainable society; and sustainable, planned and infrastructure-led development

3.3.4 Local Level

Locally, CACR is aligned with the Cork Metropolitan Area Transport Strategy (CMATS) as it will deliver the suburban rail elements of the Strategy. Both the Cork City and Cork County Development Plans recognise and aim to enable the proposals in CMATS.

The CACR programme includes a series of projects that will create a fully integrated metropolitan area rail network for Cork. The CACR programme involves development and enhancements to the rail network over c.62 km from Mallow through Cork to Cobh and Midleton. This will include future electrification and re-signalling across the three main routes primarily over existing alignments which can be summarised as follows:

- Mallow Line - c.30km from Kent Station to Mallow
- Cobh Line - c.20km from Kent Station to Cobh
- Glounthaune to Midleton Line - c.10km from Cobh Junction to Midleton

The overall CACR programme consists of a number of separate but interrelated projects including:

- Kent Station Through Platform
- Signalling and Communications Upgrade
- **Glounthaune to Midleton Twin Track – the proposed development**
- Per-way, Civils & Structures
- Depot
- Electrification
- Rolling Stock

The Glounthaune and Midleton Twin Track Project along with the completion of the new Kent Station Through Platform and the proposed Signalling and Communications upgrades will facilitate a future tripling of service frequency along the line, while also ensuring a more reliable service for commuters and other rail users to and from the city.

The Strategic Assessment Report (SAR) for the CACR programme critically examined the rationale for the programme proposed and ensure the strategic fit of it with Government policy, particularly the Project Ireland National Development Plan (NDP) and National Planning Framework (NPF). The SAR concluded that there was a “good strategic fit” between CACR and the national, regional and local policy objectives, particularly in relation to sustainable mobility, emissions reductions, compact land use development, and consolidation of population and employment growth along high-frequency transport corridors.

The investment rationale within the SAR is based upon the requirement to modernise the rail network within the CMA to address the drivers for change, which include the following:

- Contribute to emissions targets
- Facilitate the anticipated growth in passenger demand
- Support economic and population growth
- Enable the compact growth within the Cork Region
- Engaging and Enabling Modal Shift

The National Recovery and Resilience Plan (NRRP) 2021, seeks to provide significant funding to projects which assist in the green transition, reducing overall greenhouse gas emissions and achieving carbon neutrality by 2050. Under Priority 1 - *Enhancing the Green Transition*, the NRRP has prioritised seven investments, including the initial three CACR projects (namely, Kent

Station Through Platform, Signalling and Communication Upgrade and Glounthaune to Midleton Twin Tracking) for immediate progress via the EU Recovery and Resilience Facility.

3.4 Project Objectives

The proposed development has several objectives which are aligned to those of the CMATS and key drivers for change within the CACR, these include:

- Continue to promote rail travel as an attractive alternative to private transport
- Support the compact growth of Cork city region, particularly the future intensification and consolidation of development at Water Rock, Carrigtwohill and Midleton
- Support decarbonisation and climate change targets for sustainable transport journeys
- Provide better connectivity and enhanced reliability on the suburban rail network
- Facilitation of the future operation of a higher frequency service
- Facilitate increased capacity and more passenger journeys to help achieve the passenger and journey targets within the CMATS

The proposed development along with the other projects identified within the CACR programme listed above will collectively contribute to the targets of the CACR and CMATS.

3.5 Conclusion

The Glounthaune to Midleton Twin Track Project is a key development as identified within the national and regional strategy for rail development included within the Cork Metropolitan Area Transport Strategy (CMATS) 2040. The proposed development will deliver improved links to and from Cork city and provide a more efficient, sustainable, low carbon and climate resilient rail network, reducing road congestion. The proposed development helps to support Ireland's transition to a low emissions transport system helping achieve emission reduction targets.

The policy review confirms that the proposed Glounthaune to Midleton Twin Track project is consistent with EU, National, Regional and local policy provisions and will support existing and projected population centres and their sustainable economic growth. It will also facilitate future improved sustainable mobility options, supporting reductions in emissions from the transport sector and making rail travel a more viable alternative to private car use.

Chapter 4 Alternatives Considered

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4 Alternatives Considered

4.1 Introduction

In accordance inter alia with section 39 of the 2001 Act and the provisions of the EIA Directive, CIÉ, as the applicant for this Railway Order, has ensured that this EIAR is prepared by competent experts; contains a description of the proposed railway works comprising information on the site, design, size and other relevant features of the proposed works; contains a description of the likely significant effects of the proposed railway works on the environment; contains the data required to identify and assess the main effects which the proposed railway works are likely to have on the environment; contains a description of any features of the proposed railway works, and of any measures envisaged, to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment; contains a description of the reasonable alternatives studied by the applicant – here CIÉ – which are relevant to the proposed railway works and their specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the railway works on the environment; contains a summary in non-technical language of the above information; takes into account the available results of other relevant assessments under European Union or national legislation with a view to avoiding duplication of assessments; in addition to and by way of explanation or amplification of the specified information referred above, the EIAR contains such additional information specified in Annex IV to the EIA Directive relevant to the specific characteristics of the particular railway works, or type of railway works, proposed and to the environmental features likely to be affected and in this regard Annex IV sets out the information which is referred to in Article 5(1) of the EIA Directive. Further the EIAR includes the information that may reasonably be required for reaching a reasoned conclusion in accordance with section 42B of the 2001 Act on the significant effects of the proposed railway works on the environment, taking into account current knowledge and methods of assessment. This assessment has been undertaken in accordance with the above legislative and regulatory regime.

The consideration of alternatives is a mandatory part of the EIA process and as mentioned above is provided for in section 39 of the 2001 and the EIA Directive. Article 5(1)(d) of the Directive, for example, provides that the information to be provided by the developer shall include: *"A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment;"*

Specifically, in terms of railway works, this requirement has been transposed through Section 39 (1) of the Transport (Railway Infrastructure) as inserted by section 49 (b) of the Planning and Development (Strategic Infrastructure) Act 2006 and as amended and substituted by the European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No. 743/2021), which requires inter alia that the EIAR contain the following: *"(v) a description of the reasonable alternatives studied by the applicant which are relevant to the proposed railway works and their specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the railway works on the environment."*

The Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022) states the following in respect of alternatives: *"The objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with 'an indication of the main reasons for selecting the chosen option'. It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into*

account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required".

4.2 Project Objectives

The delivery of Glounthaune to Midleton Twin Track project along with the completion of the new the proposed signalling and communications upgrades and the delivery of a new fleet should facilitate the following project objectives outlined in Table 4.1:

Table 4.1: Key Project Objectives

• Operation of a higher frequency service up to a 10-minute service from the current 30-minute service
• Increased capacity of the suburban rail network
• Enhanced reliability of service
• Provide better connectivity
• Improve passenger experience.
• Integrate with CMATS and CACR
• Integration

4.3 Alternatives Considered in the Options Selection Report

As this project relates to facilitating an increase in train frequency on an existing railway line, alternative locations for the railway line were not considered.

Four principal alternatives were considered for the Options Selection Report (Appendix 4.1):

- 'Do Nothing' alternative – Option 1;
- 'Do Minimum' – Option 2;
- Full Twin Track - Optimised Alignment – Option 3; and
- Full IRL1 Gauge and standard Cross Section – Option 4.

Mott MacDonald completed the review of options 1 to 4 under the Common Appraisal Framework for Transport Projects and Programmes published by the Department of Transport, Tourism and Sport (DTTAS), March 2016. A description of the options assessed in the Options Selection Report is provided below.

4.3.1 Option 1

With the 'do nothing' alternative, there would be no changes to the existing railway line between Glounthaune and Midleton.

4.3.2 Option 2

Option 2 'Do-Minimum' explores whether inclusion of additional passing loops to the existing network will provide the required 10-minute service interval. In theory the provision of new single-track passing loop along the existing single-track section of line will allow trains to run between Glounthaune to Middleton at 10-minute intervals, this option was found to be impractical. New passing loops would present operational challenges, any slight delays in running time would restrict movement of other trains in the intervening periods, causing significant delays to train services' reliability. The introduction of additional passing loops would also increase operational safety risks as the likelihood of a Signal Passed at Danger (SPAD) along these sections which ultimately would increase safety risks and service reliability.

4.3.3 Option 3

Option 3 considers the twin tracking of the single-track sections between Glounthaune and Midleton, with minimum intervention to reconfigure the operational track layouts. This option looks at re-using the existing infrastructure where possible whilst providing an enhanced service interval of 10 minutes.

4.3.4 Option 4

Option 4 – 'Full IRL1 Gauge with standard cross section' I-PWY-1101 (IRL1 gauge) was analysed which consisted of providing the full IRL1 gauge with standard cross sections along the route. New bridges would be required at four locations which do not achieve IRL1 gauge and three of these bridges are listed on the National Inventory of Architectural Heritage (NIAH).

4.4 Assessment of Options 3 and 4

Option 4 meets the project objectives by providing twin tracking to provide for the increased frequency of trains between Glounthaune and Midleton. The design is technically feasible and deliverable. In terms of the environment, there would be significant permanent effects on the NIAH bridges along the railway line. Due to the larger amount of works required in demolishing and reconstructing bridges, there would be more potential for environmental effects, eg. water quality effects.

The project team met with the Heritage Section in Cork County Council and discussed Option 4 and the removal of the NIAH bridges to allow for pedestrian access along the line. The feedback from Cork County Council was that this would be a significant effect and should be avoided if possible. Subsequent to this meeting, Option 3 was developed, which would require a derogation from standards, but was feasible.

For Option 3, all the NIAH bridges along the railway line would be retained. The retention of the NIAH bridges is beneficial from a heritage perspective but also from biodiversity/air/noise/hydrology perspectives. The retainment of these bridges will mean that nuisance effects from dust and noise will be avoided at these locations as there will be no demolition or construction and so noise and dust effects on the surrounding lands will be avoided and there will be no potential for water quality effects or effects on flora or fauna.

Option 3 requires the widening of the Owenacurra River bridge would be required, however, as the existing piers can be used, environmental effects would be greatly reduced. This option proposes to remove OBY 8 (an un-used bridge) due to the potential for future safety concerns as a result of degradation. With regard to environmental effects, the loss of OBY 8 will have an effect, while not a NIAH bridge, the bridge does have local heritage value

With regard to social perspectives, this development, along with other projects related to the Cork Area Commuter Rail Programme, will facilitate enhanced train services. The local population will benefit from these enhanced train service between Cork and Midleton, providing a reduction in carbon travel for commuters such as students, tourists and the local population. During the construction phase an increased in local spend is expected, benefiting the local economy. Option 3 was the preferred option, and this option was taken forward as the proposed development for assessment in the EIAR.

4.5 Design Iterations

At the outset of the design and through the design process, environmental constraints were identified and avoided where possible, as detailed above in relation to the NIAH bridges. At the western end of the scheme, the existing railway line borders Great Island Channel SAC and Cork Harbour SPA. The design of the alignment was such that areas of land required for the

proposed development were identified to the north of the existing line where possible. The design was refined such that there would be no direct effects on the designated sites to the south of the railway line. Where space was restricted and where environmental constraints were present, piled retaining walls are proposed to avoid the land requirement for embankments.

The design also sought to minimise effects on 3rd party lands by maximising works within the existing railway corridor.

For example, in terms of the temporary construction compounds, an iterative process was undertaken to identify suitable locations for these compounds. In relation to the most easterly compounds, originally a single compound was identified to the west of the Owenacurra River at the bridge location. However, to minimise effects on the floodplain, a reduced access corridor and compound area were designed. Access to the abutments will be required for construction, so completely avoiding this area was not possible, however the tailored design will minimise effects and there will be no storage of materials or portacabins located at this compound. A second compound is located to the east of the Owenacurra River. For the westerly compound, there will be no changes to existing ground levels, no changes to the watercourse, no buildings in the compound and an early flood warning system will be required to allow for the removal of plant and materials from the compound in the event of a flood warning. Both compounds will be setback a minimum of 15m from the riverbank.

4.6 Conclusion

Throughout the design of the proposed development, the options selection assessment and the integration of the design and environmental team resulted in avoidance of environmental effects where possible. The iterative design, assessment and review process enabled a design which minimises effects on the environment.

Chapter 5 Consultation

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5 Consultation

5.1 The 2001 Act and EIAR Requirements

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act'). An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

The EIAR requirements for consultation are defined in the EIA Directive (85/337/EEC) as amended in 2011 Directive 2011/92/EU and 2014 Directive 2014/52/EU under Article 6.

Article 6(1) provides that "*Member States shall take the measures necessary to ensure that the authorities likely to be concerned by the project by reason of their specific environmental responsibilities or local and regional competences are given the opportunity to express their opinion on the information supplied by the developer and on request for development consent.*"

In addition, before an application is made for a Railway Order, section 40 of the 2001 Act provides for the publication of notice in relation to an application for a Railway Order.

5.2 Consultation

Extensive consultation has been carried out in preparation for this EIAR to inform consultees of the proposed development and provide them with the opportunity to offer feedback. The EIAR project team could account for issues raised and consider them in the design process and in compiling this EIAR. Members of the public, including residents, business owners, landowners, individuals, organisations, community groups and statutory bodies, were involved in this process. A summary of the main findings is presented below.

5.2.1 Consultation Method

5.2.1.1 Stakeholder Consultation (pre-application)

As part of the EIAR process, an informal EIAR consultation exercise was carried out. A letter was issued via email to consultees, informing them of the proposed Railway Order, Glounthaune to Midleton Twin Track Project.

Stakeholder consultation was carried out with prescribed bodies and stakeholders prior to the finalisation of the EIAR and lodgement of the Draft Railway Order. The purpose of this consultation exercise was to address potential concerns, and comments on the content of the EIAR, or to incorporate recommendations on the proposed project. Information on the proposed project and an outline of the proposed EIAR was provided to consultees requesting comments / input on the final scope and content of the EIAR. All stakeholders were informed that the current

consultation does not preclude them from commenting during public consultation post submission of the application to An Bord Pleanala.

On 28 February 2022, Mott MacDonald, on behalf of Córas Iompair Éireann (CIÉ), issued consultation letters to the bodies detailed in Table 5.1.

In response to the consultation letter, submissions were received from eight consultees in addition to several acknowledgements where no submission was received. The issues raised are addressed in the relevant chapters of this EIAR. Feedback from consultation is included in Table 5.1.

5.2.2 Public Consultation

The public consultation process began on 26 July 2022 and finished on 16 August 2022. A public consultation report was produced and is included in Appendix 5.1.

A webpage on Iarnród Éireann's website was made available for the public consultation. The webpage contains information on the following:

- Benefits of the project for rail users
- Detail of the works to be carried out
- Information on the two information sessions (Midleton on 03 August 2022 and Glounthaune on 04 August 2022)
- Information leaflet
- Project brochure
- Option selection report
- Project description
- Location plans
- Preferred option drawings
- FAQs

5.2.2.1 Public Consultation Feedback

In total, this consultation received engagement from 66 people interested in the project. Submissions received were recorded in a database for analysis and categorised into feedback types (letter, email, phone call). Observations and comments received during public consultation were categorised under the following themes:

- Community
- Design
- Environment
- General

5.3 EIAR Stakeholder Consultation Feedback

An informal consultation exercise was carried out between February and March 2022 as part of the EIAR process. Information on the Draft Railway Order – Glounthaune to Midleton Twin Track Project and on the outline of the proposed EIAR was provided to stakeholders, requesting input/comments on the scope of the EIAR. Stakeholders were notified by email which included an attachment outlining the relevant information. Eight responses were received. The feedback received and how this was addressed in the EIAR is presented in Table 5.1.

Table 5.1: Feedback from Stakeholder Consultation (February – March 2022)

Consultee	Feedback/Comments	Addressed in EIAR
An Comhairle Ealaion (The Arts Council)	None	
An Taisce - The National Trust for Ireland	None	
Bord Iascaigh Mhara	None	
Birdwatch Ireland	None	
Cork City Council	None	
Cork County Council	Response received regarding policy and planning, appropriate assessment and ecology and heritage	Addressed as part of the planning report, biodiversity chapter and NIS
CRR-Commission for Railway Regulation	None	
CRU-Commission for Regulation of Utilities	None	
DAFM-Department of Agriculture, Food and the Marine	None	
Development Applications Unit	The line passes adjacent to the IDA site at Ballyadam. The site is known to support a notable and localised flora, typical of the east Cork limestone flora. Any assessment should also take this flora into consideration	Biodiversity surveys were conducted along the railway line and lands affected by the proposed development to identify any notable limestone flora. Three rare and protected plant species were identified during the desktop study with potential to occur in the ZoI of the proposed development, one of which is protected. However, these species were not recorded during the site walkovers
DECC-Department of Communications, Climate Action & Environment	None	
Department of Justice and Equality	Acknowledgement only. Minister's Reference: DJE-MO-02212-2022	
Department of Transport	Acknowledgement only. Ref: TTAS-MO-00935-2022	
DETE-Department of the Enterprise, Trade and Employment	None	
DHPLG-Department of Housing, Planning, and Local Government	None	
DRCD-Department of Rural and Community Development	Acknowledgement only, no comments provided. Reference: DRCD-MO-00102-2022	
EPA-Environmental Protection Agency	None	
Fáilte Ireland	None	
GSI	Details of sources for data viewers and data provided, no project specific comments	The data sources and viewers provided by the GSI were used in the Land, Soils and hydrogeology assessment.
The Heritage Council	None	
HSA-Health and Safety Authority	None	
HSE South	No comments/observations to make	

Consultee	Feedback/Comments	Addressed in EIAR
IFI-Inland Fisheries Ireland	Project traverses several salmonid bearing watercourses. Works to be in accordance with IFI Guidelines, specifically: Any crossings should be of a span nature avoiding the necessity for instream works. There should be no instream tracking of machinery. https://www.fisheriesireland.ie/media/guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters IFI requested further information.	Follow up consultation was held with IFI with regards to instream works which will only take place in the period July-September to avoid effects on salmonids. The only instream works required for the Owennacurra River is the erection of scaffolding.
IAA-Irish Aviation Authority	Based on the information provided, IAA's Safety Regulation Division - Aerodromes has no requirements for incorporation into the Environmental Scoping Assessment Report. Your email and scoping report have been forwarded to other domains within the Authority who may have further comments, i.e. IAA's Air Navigation Service Provider, En-route Engineering etc.	No further submission received; no action required.
Irish Water	Recommendations for EIAR - listed in letter regarding water supply, effluent discharge, abstraction and IW assets.	No Irish Water diversions or effects on infrastructure are required as part of the project.
Marine Institute	None	
OPW-Office of Public Works	Request for additional information on the project to assist the framing of comments. Follow up email with more detail was issued on 20/6/2022.	A meeting was held with Cork County Council and the OPW to discuss the proposed Midleton flood relief scheme and guidance was received from the OPW in relation to Section 50 consents.
Sea Fisheries Protection Agency	None	
Southern Regional Assembly	Acknowledgement only	
Teagasc	None	
TII-Transport Infrastructure Ireland (TII)	TII Ref: TII22-117477 General guidance provided ensure where there is an impact to the national road network TII Guidance is followed.	Addressed in the Roads and Traffic chapter

In addition, meetings were held with Inland Fisheries Ireland, the Heritage Section of Cork County Council and Cork County Council and the OPW.

5.3.1 Inland Fisheries Ireland

A discussion was held on 03 May 2022 regarding the proposed works at the IDA culvert. IFI stated that in principal that they do not have an issue with the proposal, subject to a review of the final design, including the reconstruction of the existing fish baffles, and provided the works are completed in the July – September fisheries works period. IFI said that this stream is an important fish watercourse downstream of our works, but he does not know about fish presence in our works area. IFI said that the existing culvert is not ideal for fish but as it was a significant improvement on the previous arrangement, prior to the track reopening, it was accepted and

therefore IFI are satisfied for it to be replicated in our works. Further detail was issued to IFI on 19 August 2022 and IFI had the following recommendations:

- Based on the detail provided it is IFI'S understanding that no instream works are proposed at the Owenacurra River crossing.
- Should instream works be envisaged please forward the details in advance of commencement.
- Regarding the culvert extensions at UBY1B, UBY1C and UBY2A IFI would ask that the culverts should be buried approximately 300mm below existing bed level and that the base of the culverts is lined with a layer of closely packs natural rock slabs. The rock slabs should be of approximate dimension 600mm(l) *6oomm(w) * 200mm(d).
- The realignment of the existing open concrete channel will require electro-fishing (Under a Section 14 licence) in advance of the works to remove any resident fish. The base of the realigned concrete channel should be lined with a layer of closely packs natural rock slabs. The rock slabs should be of approximate dimension 600mm(l) *6oomm(w) * 200mm(d).
- In relation to all sites instream works should be carried out in the dry, limited to the period July to September inclusive and undertaken in manner that does not allow the entry of polluting matter to waters.

IFI were informed subsequently that there would be instream works in the Owenacurra River which will comprise the erection of scaffolding during the period July – September.

5.3.2 Heritage Section, Cork County Council

A meeting was held on the 09 March 2022 with the Heritage Section in Cork County Council. At the time of the meeting, it was proposed that a number of NIAH listed bridges may need to be widened/replaced due to the configuration of the new twin tracks. The importance of these bridges was highlighted locally and at a wider scale. They are important features in the landscape and are of national value and therefore any works to these structures would be seen as significant.

As the design developed it was decided that a derogation from the standard would be sought to avoid having to remove or widen any NIAH listed railway bridges.

5.3.3 Coastal and Flood Projects Section, Cork County Council and the Office of Public Works

A meeting was held on 03 May 2022 to discuss the proposed Midleton flood relief scheme and the proposed Glounthaune-Midleton Twin Track Project. Cork County Council and their consultants briefed the team on the proposed flood relief scheme. OPW outlined the requirements for any Section 50 applications including modelling scenarios. .

5.4 Conclusion

The statutory and non-statutory stakeholder consultation conducted as part of the application process identified key issues from stakeholders. These issues, as far as was practical, have been addressed as part of the design and EIAR.

Chapter 6 – Description of the Proposed Development

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6 Description of the Proposed Development

6.1 Introduction

In accordance inter alia with section 39 of the 2001 Act and the provisions of the EIA Directive, CIÉ, as the applicant for this Railway Order, has ensured that this EIAR is prepared by competent experts; contains a description of the proposed railway works comprising information on the site, design, size and other relevant features of the proposed works; contains a description of the likely significant effects of the proposed railway works on the environment; contains the data required to identify and assess the main effects which the proposed railway works are likely to have on the environment; contains a description of any features of the proposed railway works, and of any measures envisaged, to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment; contains a description of the reasonable alternatives studied by the applicant – here CIÉ – which are relevant to the proposed railway works and their specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the railway works on the environment; contains a summary in non-technical language of the above information; takes into account the available results of other relevant assessments under European Union or national legislation with a view to avoiding duplication of assessments; in addition to and by way of explanation or amplification of the specified information referred above, the EIAR contains such additional information specified in Annex IV to the EIA Directive relevant to the specific characteristics of the particular railway works, or type of railway works, proposed and to the environmental features likely to be affected and in this regard Annex IV sets out the information which is referred to in Article 5(1) of the EIA Directive.

Further the EIAR includes the information that may reasonably be required for reaching a reasoned conclusion in accordance with section 42B of the 2001 Act on the significant effects of the proposed railway works on the environment, taking into account current knowledge and methods of assessment. This assessment has been undertaken in accordance with the above legislative and regulatory regime.

Accordingly, this chapter of the EIAR presents an overview of the proposed development. The proposed development is located along the existing railway track between Glounthaune to Midleton in County Cork which is mostly comprised of single track. It is proposed to construct a new and directly adjacent additional railway track which will make the route a twin track between Glounthaune and Midleton to facilitate the passage of two trains along the railway line. The proposed development route is approximately 10km in length. The proposed development comprises:

- Twin tracking of the single-track sections between Glounthaune and Midleton totalling a distance of approximately 10km;
- Reconfiguration of the operational track layouts;
- Removal of bridge (OBY08, Ballyadam House overbridge) and widening of bridge deck (UBY11, crossing the Ownenacurra River);
- Extinguishment of one level crossing (Ford CCTV XY010) and widening of one level crossing (Water-Rock CCTV XY009);
- Provision of sidings/turn back facility at Midleton Station;
- Provision of new cable containment routes from Glounthaune to Midleton to facilitate signalling upgrades and alterations;

- Associated signalling upgrades and alterations; and
- All associated works (e.g. temporary construction compounds; drainage, retaining walls, boundary treatments).

A Construction and Environmental Management Plan is presented in Appendix 6.1.

6.2 Site Location

Figure 6.1 illustrates the geographical context of the proposed development. Over the length of the route, twin tracking is currently in place over approximately 35% of the route which is ca. 10km in length. The new track will be required between these sections. These areas are shown on Figure 6.1. The existing train route runs from the Glounthaune train station between Lough Mahon and the local road (L3004 road) for approximately 850m. The line continues to run in a southerly direction between the L3004 and open ground for approximately 910m before crossing the local road network (L3004). The existing line then progresses eastwards for approximately 2.5km passing between the IDA Industrial Estate and Fota Retail and Business Park before reaching Carrigtwohill station. The line continues along mostly open ground for approximately 6km before terminating at Midleton train station.

The average working area either side of the existing railway line is ca. 20m. The majority of works will be contained within Iarnród Éireann's property boundary. Temporary landtake is required, including for five construction compounds, over an area of ca. 7ha and these are identified in the property drawings. Permanent land take by CPO will be ca. 1.4ha.

Figure 6.1: Site Location

Source: Mott MacDonald

6.3 Current Railway Line Usage

There are currently (July 2022) 31 trains running daily between Cork and Midleton from Monday to Friday and 31 trips returning from Midleton to Cork, with stops at Cork, Little Island, Glounthaune, Carrigtwohill and Midleton. On a Saturday there are 18 trains in each direction and on Sunday there are nine trains running from Cork to Midleton and nine trips returning from Midleton to Cork. The trains run from 5.45am (Cork – Midleton) with the last train running from 22.45 (Midleton – Cork) on weekdays.

The proposed development will facilitate an increase in frequency of trains of up to a 10 minute service in the future.

The design maximum line speed of the trains is 100km per hour and this will be maintained for the future operations.

6.4 Existing Stations

There are three existing train stations along the proposed development, at Glounthaune, Carrigtwohill and Midleton. No works are proposed to the existing station buildings.

6.5 Design Process

All appropriate Iarnród Éireann standards will be used in the development of the railway design, specifically the following:

- CCE-TMS-300 v1.8 Track Construction Requirements and Tolerances
- CCE-TMS-340 v1.0 Horizontal Curvature Design
- CCE-TMS-341 v1.0 Vertical Curvature Design
- CCE-TMS-344 Requirements for Undertrack Crossings and Pressure Pipelines
- CCE-TMS-345 v1.1 Engineering Requirements for Passenger Platforms and Barrow Paths
- CCE-TMS-347 Technical Standard for Breather Switches
- CCE-TMS-386 Requirements for Buffer Stops.pdf
- CCE-TMS-390 v1.1 Preparation of Drawings (Approval and Certification Process)
- CCE-TMS-410 Civil Engineering Structures Design Standard V 1.1
- I-PWY-1101 v1.1 Requirements for Track and Structures Clearances
- I-PWY-1136 Requirements for Design, Installation and Maintenance of Lineside Drainage

The following TII Publication's will be used where Iarnród Éireann infrastructure interfaces with public roads:

- DN-GEO-03031 – Rural Road Link Design, April 2017
- DN-GEO-03036 – Cross Sections and Headroom, May 2019
- DN-GEO-03060 – Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated, and compact grade separated junctions), June 2017
- DN-REQ-03034 – The Design of Road Restraint Systems (Vehicle and Pedestrian) for Roads and Bridges, May 2019

In addition to the above design documents further guidance was drawn as necessary from relevant published standards/documents including the following:

- National Transport Authority, National Cycling Manual
- Design Manual for Urban Roads and Streets (DMURS)

The drainage design will be undertaken in accordance with best practice. The following standards have been consulted during the design process;

- TII Publications for Drainage
- The Greater Dublin Strategic Drainage Study (GDSDS): Volume 2 New Development, Dublin City Council, March 2005
- CIRIA Guidance Document C753: The SuDS Manual, 2015
- I-PWY-1136 Requirements for Design, Installation and Maintenance of Lineside Drainage

The methodology behind this design (refer to the Options Selection Report in Appendix 4.1) is to create a continuous twin-track railway by connecting the existing sections of double track using the following principles:

- Optimise the design alignment to make best use of the existing rail corridor.
- To limit development outside of the existing IE boundary.
- Avoid unnecessary demolition of existing assets.
- Retain as much of the existing track asset as is feasible within the above constraints.

The proposed alignment has been designed to achieve 60mph with passive provision for 70mph.

The Horizontal and vertical alignment have been developed in line with IÉ standards to achieve desirable limits for the proposed speed.

6.6 Bridges

There are two existing bridges which will require works as part of the proposed development. These are detailed in Table 6.1 and the requirement for works is also detailed.

Table 6.1: Bridge Structures along the Glounthaune – Midleton Railway Line

Structure		Chainage		
Name	**Denotation**		**Function**	**Works required**
Ballyadam House Overbridge	OBY8	6+500m	Carries local access road on Ballyadam House property over the rail line	To be removed
Owenacurra River Bridge	UBY11	9+870m	Carries the rail line over the Owenacurra River	Deck to be widened using existing river piers.

6.6.1 Ballyadam House Overbridge (OBY8)

It is proposed to remove bridge OBY8 at Ballyadam House as part of the works. This bridge is an overpass built for agricultural purposes, to allow livestock and equipment access the farmyard at the rear of Ballyadam House. There is no traffic using this overpass. The bridge is constructed of limestone, with coursed rock-faced rusticated walls. The structure will be required to be dismantled. This bridge is not in use and would present an unjustifiable safety risk if it were retained. There are no watercourses in the vicinity of this overpass.

The dismantling of OBY8 will comprise the following:.

- Erect perimeter fencing around demolition works area.
- Undertake a photographic record of the bridge.
- Obtain railway line possession for duration of demolition works.
- Install crash mat under the span on the existing tracks.

- Remove any existing services on the deck.
- Temporarily remove existing trackside services.
- Remove stone parapets.
- Remove stone spandrel walls and retaining walls.
- Dismantle brick arch barrel and infill.
- Remove stone abutments.
- Remove approach embankments.
- Regrade embankments and remove crash mat.
- Reinstate trackside services.
- Check and adjust track and ballast levels as necessary.
- Sort demolition spoil for re-use on this and other projects including cut stone and brick.

6.6.2 Owenacurra River Bridge (UBY11)

All bridge structures (with the exception of the un-used bridge OBY8) are to be retained, however works will be required at Owenacurra River Bridge (UBY11) to widen the deck of the bridge on the existing piers to allow for a double track and the abutments are to be widened – see Figure 6.2 below. The bridge crosses the Owenacurra River. The span lengths from west to east are ca. 11m, 7m and 11m. The widening structure span arrangement, structural form and articulation will match the existing bridge. The widening deck consists of precast prestressed concrete beams with an in situ infill concrete deck which will be stitched to the existing deck. The bankseat (base of the bridge) widenings are supported on continuous flight auger piles. The existing pier capping beams will be widened to accommodate the proposed deck. The existing north walkway will be removed and reinstated on the widened deck. The existing reinforced concrete northern wingwalls will be dismantled and rebuilt to accommodate the widened deck.

The widening of the Owenacurra River Bridge will comprise the following:

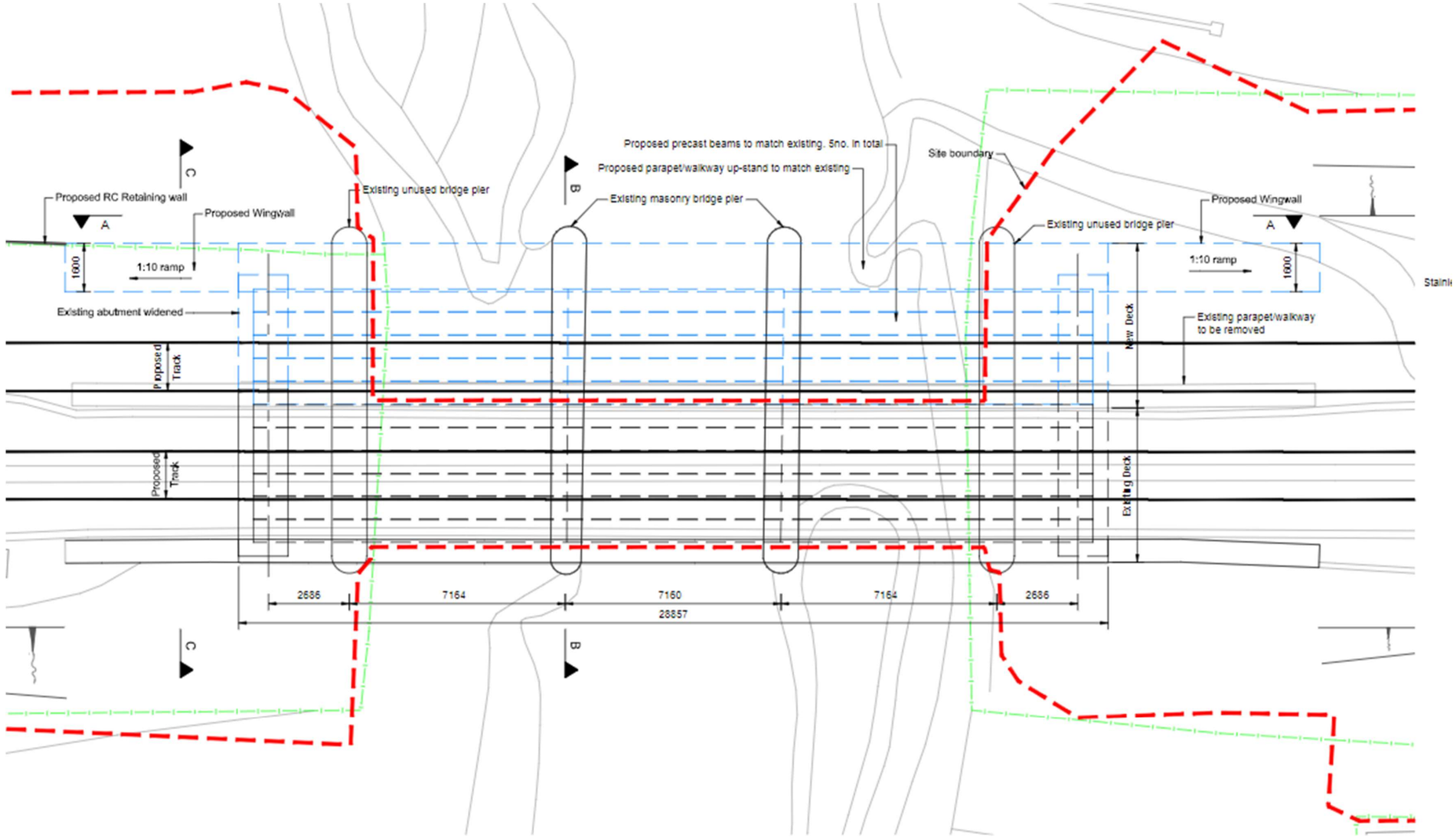
- Erect perimeter fencing around construction works area.
- Construct a temporary access track to the bridge from both east and west approaches.
- Provide storage and set-down area for the precast beams.
- Install environmental protection measures which include silt fences and water management.
- Remove rail track, ballast and granular fill on the bridge and on the approaches to the bridge.
- Excavate the existing wingwall backfill at both north-east and north-west wingwalls and remove the existing wingwalls.
- Remove / break-out the existing north concrete bridge walkway.
- Place and compact fill at both east and west abutment extension locations.
- Construct piling rig platform at both east and west abutments.
- Install piles.
- Construct in situ concrete abutment extensions.
- Install precast capping beam extension on top of two number of existing bridge piers located within the river.
- Construct temporary crane platform.
- Install precast prestressed bridge beams.
- Install precast concrete north parapet/walkway upstand.
- Install tubular metal handrail.
- Pour in situ concrete deck infill.

- Spray apply waterproof deck.
- Install granular fill on both east and west bridge approaches.
- Install precast concrete north-east and north-west wingwalls.
- Backfill wingwalls and abutments.
- Install track ballast
- Remove water management measures.
- Remove silt fences.

A scaffold will be required within the Owenacurra River as part of the works. As the works in-stream are restricted to July-September, water levels will likely be low. In this situation scaffolding is erected in the wet, founding the scaffold legs on steel plates to spread the load over the riverbed material. The piers at this location are approximately 1-2m high so the scaffolding will be a single level just above water level which will allow staff to work on the piers in the dry and also to catch any pier material from entering the river. In the unlikely event that water levels are high the scaffolding will be supported from the piers rather than the riverbed.

The works at the Owenacurra River bridge are expected to last eight weeks for preparation works and an additional one week for deck works.

Figure 6.2: Plan of Owenacurra River Bridge Widening



Source: Mott MacDonald

6.7 Culverts

There are works proposed at four culverts along the route – these are illustrated on Figure 6.3.

6.7.1 IDA Open Culvert

The existing open culvert is ca. 900m in length. The culvert consists of a u-shaped cross-section. The wall heights vary throughout the culvert length between ca. 1.4m and 2.56m. The channel width of the culvert is 1.45m.

A portion of the existing culvert is to be re-aligned by skewing to the north over a length of approximately 200m. It is proposed to re-use the existing culvert units.

An in-situ connection will be required at the interface where the repositioning begins and at the interface with the existing IDA attenuation outfall. The re-aligned culvert will tie into UBY2A which is also being lengthened with the construction of new wing walls.

A sheet pile wall will be installed just north of the works area to retain the existing embankment during construction. Refer to drawing C745-WP3_03-XX-XX-XXX-DR-MMD-SE-0240 in Appendix 6.2.

6.7.2 Culvert UBY2A

UBY2A culverts the Killacloyne. The existing culvert is ca .12m long twin cell structure. The widths are ca. 2.4m and 2.1m and the culvert internal height is ca. 1.2m. Reinforced concrete wingwalls are provided at both the inlet and outlet.

The culvert will be lengthened by ca. 2m to the north and ca. 2m to the south. The cross-section dimensions of the lengthened sections will be similar to the existing cross section. The existing north and south wingwalls will be dismantled and rebuilt to accommodate the lengthened structure. Refer to drawings C745-WP3_03-XX-XX-XXX-RP-MMD-SE-0003 UBY2A_AIP in Appendix 6.2.

6.7.3 Culvert UBY1B

UBY1B culverts an unnamed watercourse. The existing culvert is ca. 14m long single barrel structure. The width is ca. 1.5m and the culvert internal height is ca. 1m. Reinforced concrete wingwalls will be provided at both the inlet and outlet.

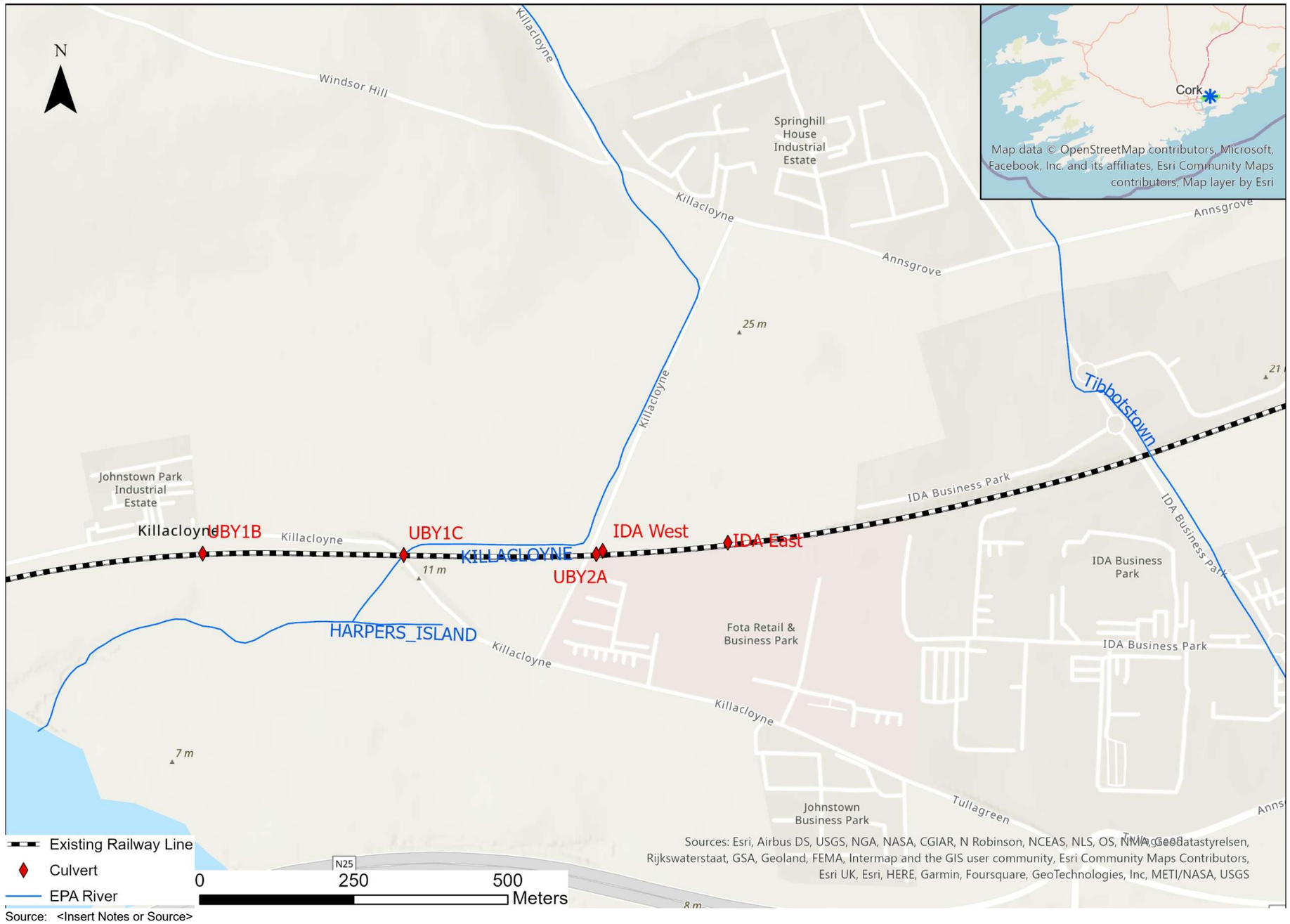
The culvert is to be lengthened by ca. 1m to the north. The cross-section dimensions of the lengthened sections will be similar to the existing cross section. The existing north wingwalls are to be dismantled and rebuilt to accommodate the lengthened structure. Refer to drawing C745-WP3_03-XX-XX-XXX-RP-MMD-SE-0007 UBY1B in Appendix 6.2.

6.7.4 Culvert UBY1C

UBY1C culverts the Killacloyne Stream. The existing culvert is a ca. 10m long single barrel structure. The width is ca. 2.1m and the culvert internal height is ca. 1m. Reinforced concrete wingwalls are provided at both the inlet and outlet.

The culvert is to be lengthened by ca. 1m to the north. The cross-section dimensions of the lengthened sections will match the existing cross section. The existing north wingwalls are to be dismantled and rebuilt to accommodate the lengthened structure. Refer to drawing C745-WP3_03-XX-XX-XXX-RP-MMD-SE-0008 UBY1C in Appendix 6.2.

Figure 6.3: Culvert Locations



Source: <Insert Notes or Source>

6.8 Level Crossings

There are three of level crossings along the route, and these are tabulated in Table 6.2.

Table 6.2: Existing Level Crossings

Level Crossing Code/Name	Location	Crossing Control Operation Type	Works	Chainage
Water Rock CCTV XY009	Castle Rock Avenue L-3618	Remotely controlled	Widen	8600
Ford CCTV XY010	un-named road	Remotely controlled	To be closed/extinguished, road not currently used.	9000
Mill Road R626 CCTV XY012	R626, Mill Road, west of Midleton Station	Remotely controlled	None	10050

It is proposed to close the Ford CCTV XY010 level crossing. The level crossing decking system will be removed together with the associated operational equipment and signage and the railway boundary secured using a 2.4m high blockwork wall in accordance with Transport Infrastructure Ireland standard construction detail CC-SCD-02401.

Water Rock level crossing (CCTV XY009) is to be widened to accommodate the twin tracks. Refer to drawings C745-WP3_03-XX-XX-XXX-DR-MMD-PR-2301 and C745-WP3_03-XX-XX-XXX-DR-MMD-PR-2302 in Appendix 6.2 for details.

6.9 Track, Retaining Structures and Ancillary Works

6.9.1 Track Works

It is proposed to construct new track alongside the existing single-track sections so that the line will have full twin tracks to facilitate an increase in train trips – this will facilitate up to a ten minute service operating at up to 100km/hr. It is necessary to realign the existing track slightly due to space constraints along the railway line. It is also proposed to construct additional sidings / turn back facilities are proposed at Midleton station.

There is existing twin track at Glounthaune and at the approaches to Carrigtwohill station and Midleton station. Over the length of the route, twin tracking is in place over approximately 35% of the ca. 10km route. The new track will be required between these sections. In some cases, the original alignment of the single track will remain in place. However, due to the existing track layout it will be required to adjust the track position to allow for the twin tracks within Iarnród Éireann's ownership boundary.

The new twin track along the railway line will require the site to be cleared of vegetation (outside of the bird breeding season which is between 01 March and 31 August, as per the Wildlife Act 1976, as amended) and soil and at some locations the embankments will need to be re-profiled to allow for the new track. In areas of cut, new sections of embankment will need to be installed. Retaining walls are also required in areas where space is restricted. The cut/fill and retaining structures in addition to the new track alignment are illustrated on C745-WP3_03-XX-XX-XXX-DR-MMD-PR-0001 to C745-WP3_03-XX-XX-XXX-DR-MMD-PR-0028.

Drainage will also be constructed as part of the main works, as described in Section 6.9.3. Subgrade drainage will be installed to prevent the line from water logging.

The new track formation will be graded and compacted then a capping material laid on top prior to the installation of the bottom ballast. Following laying, grading and compaction of the bottom ballast the railway sleepers put in place. The steel tracks can then by installed and connected to

the railway sleepers by the rail fastening system. A top layer of ballast is then distributed following which the track is brought to design position and mechanically consolidated.

For vegetation clearance the machinery will vary depending on the location, but the following will be required:

- Chainsaws, axes, and hatchets will be used to fell and remove trees.
- Stumps for trees that are removed will be ground down with stump grinders. Mulchers will be used to clear underbrush, small trees and leftover fencing (the contractor can either use a tracked or wheeled mulching machine or there are also mulching machines that can be used with equipment such as tractors or excavators which can be road-rail for use on the railway).
- Bulldozers will be used for clearing large areas where leftover structures, boulders, standing tress and debris remain.
- Tractors with frontend loaders will be used to clear rocks, smaller trees, branches etc. and for levelling/grading the land.
- Backhoes and excavators will be used in small-scale land-clearing.
- A woodchipper will be required to turn trees into woodchips for easy disposal

Ballast track construction works, as part of the horizontal alignment modifications, will involve the following typical sequence of activities.

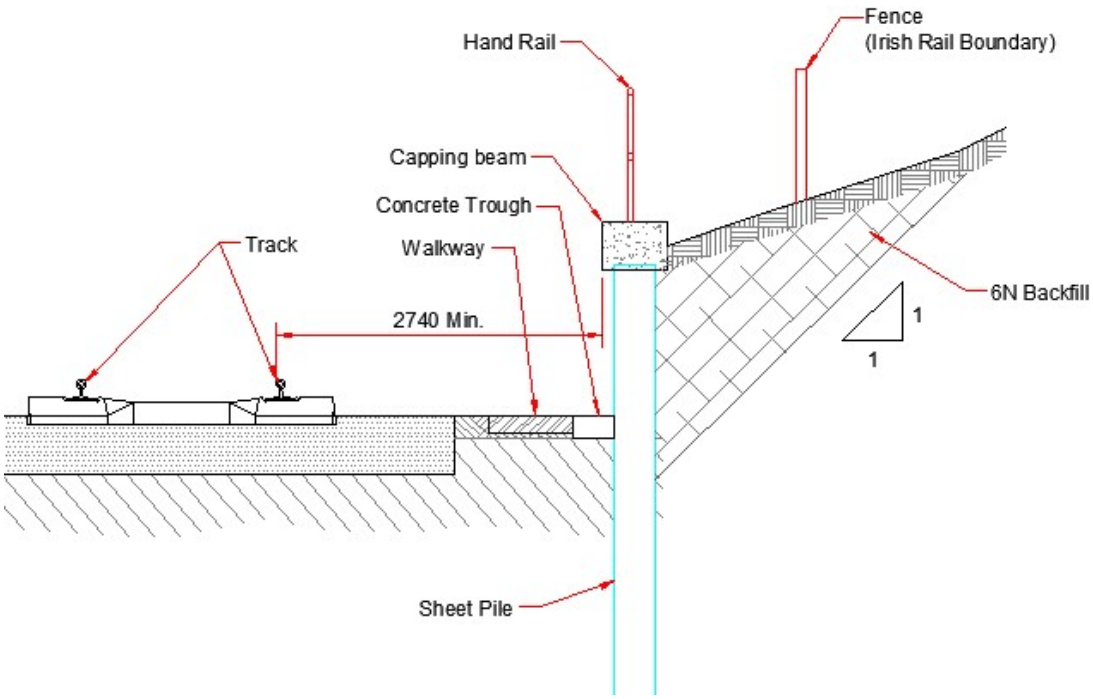
- Enabling works, such as: installation of facilities and storage areas; bringing machinery and materials on site; utilities diversions; railway operation safely cut etc.
- Rail cutting of the existing track (separate track panels of 18m length) using a rail cutting machine (if required).
- Removal of old track panels using road-rail vehicles (vehicles capable of running on both road and rails), excavators, crane on truck and other necessary engineering equipment
- Removal of degraded ballast by means of road-rail vehicles, excavators and other engineering equipment that will load the materials into an articulated dump truck (if required).
- Preparation of the track formation until required level, using road-rail vehicle excavators.
- Extension and compaction on the subgrade, using a compactor.
- Extension of the geotextile.
- Placement of the longitudinal drainage, using trucks, mini diggers and plate compactors.
- Extension and compaction of the sub-ballast layer, using wheel loader, trucks and compactors.
- Extension of first ballast layer, levelling and compaction using wheel loader, trucks and compactors.
- Laying of the sleepers with the fastening systems, using crane on trucks and excavators.
- Laying of the rails and clamping the joints, using crane on trucks and excavators.
- Extension of second ballast layer, tamping and dynamic stabilisation, using crane on trucks, excavators and a ballast tamper.
- Welding of joints and second stabilisation.
- Rail destressing.

6.9.2 Retaining Structures

Retaining walls have been identified as required to minimise impact on adjacent lands due to environmental constraints, or to maintain the railway corridor within the existing railway corridor. The retaining walls are sheet piled structures due to the reduction in temporary and permanent land take required in comparison to a reinforced concrete gravity retaining wall structures and its increased retention height ability in comparison to gabion basket gravity structures. A typical

sheet pile detail is shown in Figure 6.4 The walls will be sheet piles with a reinforced concrete capping beam and steel handrail. The piles will be driven by either a drop hammer or vibration hammer depending on ground conditions. In certain circumstances where obstacles are present in the ground pre-auguring may be required to prepare the ground for the sheet pile installation.

Figure 6.4: Typical Sheet Pile Detail



Source: Mott MacDonald

6.9.3 Drainage

Drainage is included in drawings C745-WP3_03-XX-XX-XXX-DR-MMD-DE-0001 to C745-WP3_03-XX-XX-XXX-DR-MMD-DE-0028 in Appendix 6.2. Where significant alteration to the existing track or where new track is proposed the existing drainage will be removed and new drainage will be installed.

The proposed drainage will consist of filter drains, carrier drains, open V-ditches and subsurface drains:

- Filter drains are open jointed, porous or perforated pipes laid in trenches which will be backfilled with a porous media and run longitudinally along the track both collecting water along its length and conveying water.
- Carrier drains are closed jointed and non-perforated and are used to convey water at a depth greater than the depth of filter drains.
- Open V-ditches are open channels which will intercept any overland runoff from adjacent land which slopes towards the track. These ditches will also be used to convey water to a discharge point.
- The ballast and sub-ballast provided as part of the permanent way normally consists of granular material with excellent drainage properties. The ballast and sub-ballast will be designed and graded to act as a drainage blanket in order to protect the formation and

ensure the adequate performance and durability of the ballast layer and minimise maintenance requirements. All subsurface drainage will be designed on this basis in combination with the use of filter drains, geo-membranes and geo-textiles to provide adequate sub-surface drainage and control the build-up of fines and sediment which could affect the long term performance of the ballast and sub-surface drainage facilities.

All existing outfalls will be retained and no new outfalls will be required.

The drainage design will be in accordance with '*E25. I-PWY-1136 Requirements for Design Installation and Maintenance of Lineside Drainage'* and the rainfall intensities will be factored by 20% to account for the future effects of climate change.

6.9.4 Fencing and Environmental Barriers

There is an existing property boundary fence in place along the length of the line. Additional lands are required along sections of the line and these will be fenced following the compulsory purchase order of the lands. Existing fencing will be relocated and repositioned where appropriate and where there is a change in the track location similar type fence will be relocated at a minimum. Where the track is not being moved the boundary fence will remain in place. The fence types to be used or reused are:

- Concrete post and wire;
- Timber post and wire or other timber structures;
- Steel palisade fence (security fencing);
- Acoustic timber / concrete block wall

Fencing is illustrated on drawings C745-WP3_03-XX-XX-XXX-DR-MMD-PW001-0001 to C745-WP3_03-XX-XX-XXX-DR-MMD-PW028 in Appendix 6.2.

Temporary noise barriers will be required at construction compounds to minimise noise effects.

6.9.5 Crossings of services

Service providers were contacted in relation to services within the proposed works areas and no third-party services have been identified.

6.9.6 Signage

New signage will be required along the railway line and will be developed at detailed design stage and will include speed limit signs, mileposts, gradient signs and warning signs.

6.9.7 Cable containment routes

There are currently cable routes parallel to and on either side of the existing rail track carrying operational railway communications, signalling and power cables. The cables are contained in precast concrete lidded troughs set flush with the ballast surface. To accommodate the construction of the second track ca.8500m of existing route will require to be relocated to either side of the new twin track layout. It is proposed to reuse the existing material where possible on the relocated sections of route.

6.9.8 Associated signalling upgrades and alterations

As part of a larger recontrol scheme and to enable the operation of the reconfigured railway a new signalling system is to be installed. The installation of this new system and the recovery of redundant equipment will take place in parallel with the twin tracking works with commissioning taking place during the line closure.

6.9.9 Lighting

During construction, a large proportion of the works will take place at night. The minimum light level required is 50lux and a maximum of 100lux. Illuminances provided need to be consistent, to avoid excessive contrast in illuminance, luminaires should not be spaced too far apart. Glare is determined by the light distribution of fittings, their mounting height and, for floodlights, the direction of aiming.

With large areas, the lighting design chosen depends upon:
- the degree of obstruction;
- whether illuminance is required primarily on horizontal or vertical planes

The lighting will be predominantly downward lighting to minimise light spill.

For the operational phase, additional lighting will be provided at Water Rock level crossing. The lighting will be directional. Existing lighting will be maintained at the level crossing and additional lighting will be similar to existing lighting. In line with Railway Safety Commission Guidance 'lighting should not cause glare to either road users or train drivers, interfere with the visibility of railway signals nor cause avoidable annoyance to local householders.

Walkway lighting will be provided in the new sidings in Midleton.

6.9.10 Lifting Operations

Cranes will be required at the Owenacurra River Bridge to lift the beams into place. This will be temporary. Track panels will also require lifting.

6.10 Iarnród Éireann Construction Methodology

6.10.1 Sustainable Construction Principles

Iarnród Éireann is committed to contributing to the achievement of the United Nations Sustainable Development Goals (SDGs) and together with the CIÉ Group of Companies has developed a Sustainability Strategy that coordinates actions that assist in addressing national economic, social and environmental challenges. The key themes used as a focus while designing the project include:

- Avoid, mitigate and if not possible reduce the adverse effects on communities during the construction of the project.
- Reduce the carbon footprint of the project during the design, construction, and operation and encourage more sustainable transport modes.
- Support for cleaner energy and lower emissions through implementation of an electrically powered fleet.
- Facilitating population and sustainable development growth, and a low carbon climate resilient economy.
- Designing for resilience against future demand changes and climate needs.
- Minimising waste during construction of the project, while focusing on using sustainable and reusable materials and construction methods.

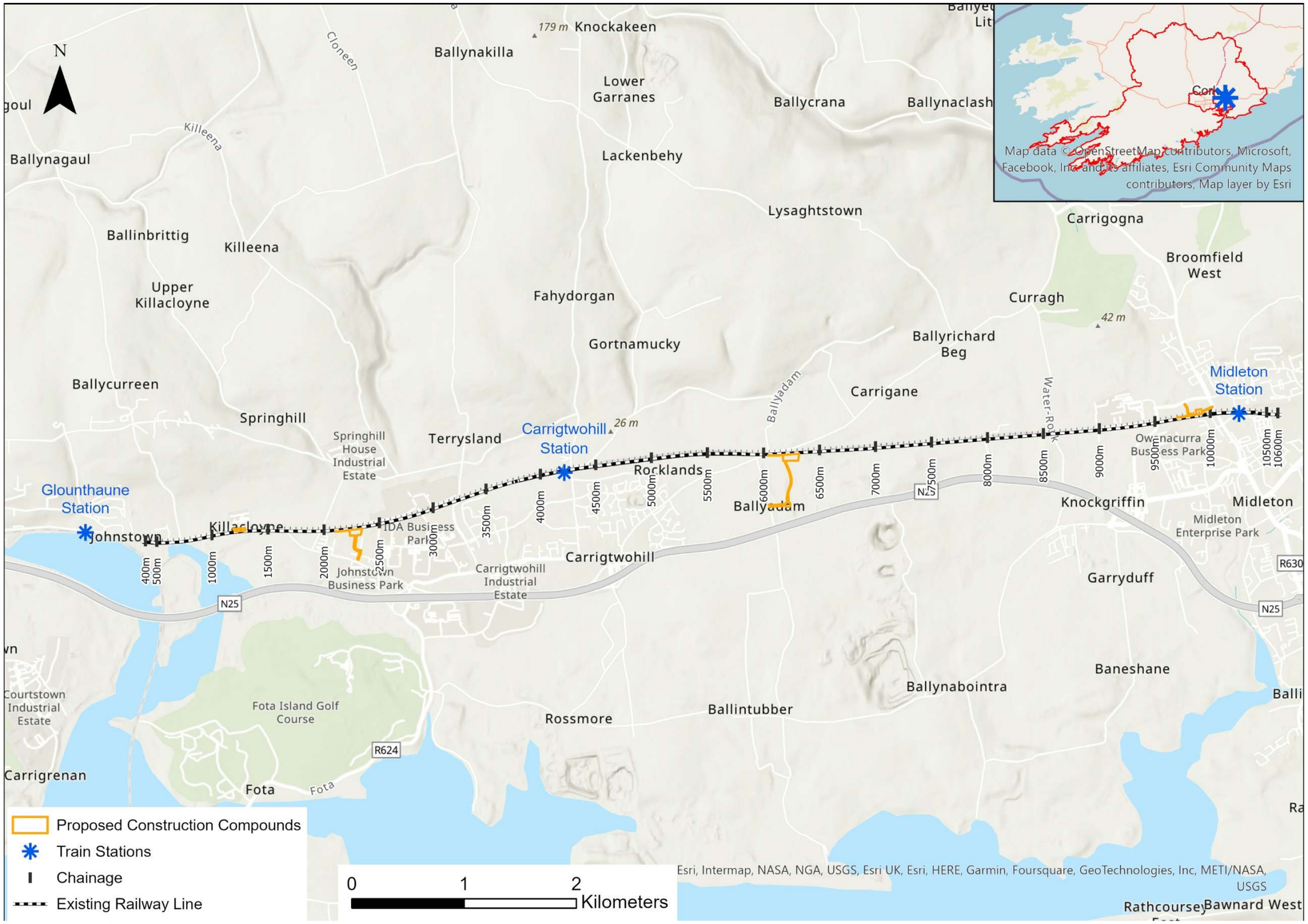
6.10.2 Construction Compounds

During the construction phase five temporary construction compounds will be required. Please refer to Figure 6.5 for locations and Appendix 6.2 for drawings of the construction compounds (C745-WP3_03-XX-XX-XXX-DR-MMD-PR-0001 to C745-WP3_03-XX-XX-XXX-DR-MMD-PR-0008) The construction compounds will contain portacabins for offices and welfare facilities, parking for construction staff and material stockpiles. Welfare facilities will be provided at these

locations and any discharges will be connected to a sealed holding tank to be emptied and disposed of off-site by a licenced contractor to an approved licenced facility. Water will be tankered onto site as required.

There are also two construction compounds proposed on the west side and east side of the Owenacurra River. The westerly compound is only to be used for access to the bridge abutments and there will be no portacabin or storage in this area. The easterly compound will be used for storage of materials. Both compounds will be set back from the riverbank by a minimum of 15m.

Figure 6.5: Location of Construction Compounds



Source: Mott MacDonald

6.10.3 Construction Hours and Programme

The proposed works comprise civil engineering, permanent way and signalling works to enable the installation of a second running line along the length of the existing railway between Glounthaune Junction and Midleton to allow the introduction of a significantly increased frequency of train operation.

To minimise disruption to the current railway operations, it is proposed to undertake the construction works over an extended period of time utilising both day and night time working. Night time working is required to deliver works on or affecting the operational railway in a safe manner with regards to both the safety of the railway and the safety of those delivering the works. The majority of works will be completed at night. A disruptive blockade will be utilised to undertake the operational tie ins between the new and existing works and to test and commission the new signalling control systems.

The proposed development will take place in a long narrow corridor, 10km in length and of varying width (generally 15 to 30m).

Subject to the grant of statutory approvals, it is anticipated that proposed works will commence in Q4 2023 and will take approximately 36 months to complete. Indicative durations for the proposed works are detailed in Table 6.3.

Table 6.3: Indicative Construction Schedule

Phase		Revised timeline
1.	Pre-construction works	Q4 2023
2.	Enabling works	Q1 2024
3.	Earthworks, drainage and track sub-base	Q2 2024 – Q3 2025
4.	Track realignment and construction	Q2 2025 – Q1 2026
5.	Signalling works	Q4 2024 – Q2 2026
6.	Commissioning	Q2 2026 – Q3 2026

In general, it is anticipated that construction will take place between 07.00 and 19.00 Monday to Sunday when outside the operational railway footprint. Works within the operational railway footprint will be undertaken between 1900 and 0700 daily (in order to ensure the safety of the railway operations and construction staff). During the period of the railway closure, works will be undertaken around the clock. It is anticipated that the closure will be up to four months and buses will be provided to transfer passengers.

Table 6.4 outlines the proposed construction activities and the timelines.

Table 6.4: Construction Activities and Timelines

Construction Activity	Description of works
Earthworks	Predominantly night-time works, with rate of progress about 150m per week on average along the track
Formation treatment	Predominantly night-time works, with rate of progress about 350m per week on average along the track
Ballasting	Predominantly night-time works, with rate of progress about 350m per week on average along the track
Track installation	Daytime and night-time works, with rate of progress about 350m per week on average along the track.
Tamping	Daytime and night-time works, with rate of progress about 1km per week on average along the track.

Construction Activity	Description of works
Stressing and welding works	Daytime and night-time works, with rate of progress about 1km per week on average along the track.
Material stockpile and haulage at site compounds	Daytime and night-time works, locomotive trains haul materials and equipment to 5 site compound locations, depending on the current location of work.

The number of construction workers required during the construction phase is expected to peak at approximately 125 persons. Staff will travel to site via a combination of public transport, cycling, carpooling, minibus and private passenger vehicles.

All works along the railway line, will be conducted in accordance with Iarnród Éireann standards, procedures and protocols for works on a live railway, to ensure the safety of workers and the public.

6.10.4 Pre-construction and Enabling Works

The pre-construction phase of development includes preparatory works and consultation with statutory bodies [Health and Safety Authority (HSA), EPA etc] and the general public as required. Following pre-construction, site clearance activities will commence.

Typical enabling works activities will include preparation of the construction working area, laydown areas and site clearance as required. Temporary and permanent boundary fencing will also be installed where required.

6.10.5 Other Consents

Section 50 consents from the OPW will be required for the realignment of the IDA culvert (UBY2A or CV3) and consent will also be required for works at the Owenacurra River bridge. Following consultation with IFI, if electrofishing is required, a licence will be required from IFI.

6.10.6 Rail Closures

It is likely that the railway line will be closed for a period of up to four months between months 29 to 32. Bus services will be used to accommodate passengers and will be run on a regular service between Cork and Midleton to minimise disruption. There will also be weekend closures for a period of eight months between 11pm on Fridays to 5.30am on Mondays..

6.10.7 Road Closures

It will be necessary to close Castle Rock Avenue to through traffic in order to facilitate level crossing upgrading works to Water Rock CCTV XY009. It is expected that the closure will last for 16 weeks with diversions via Ballyrichard More, the R626 and N25. Details of traffic diversion and road closures are presented in Chapter 15 of this EIAR. Alternative routes are available and will be sign posted. Any road closure requirements will be adhered to and will be in accordance with local authority procedures including notification to emergency services.

6.10.8 Earthworks

Reprofiling of existing embankments will be required and existing embankments will be extended. In areas of cut, embankment slopes will be reprofiled to allow for the twin track gauge and may incorporate toe retention to reduce the quantity of spoil generated. In areas where space is restricted, retaining structures will be installed. The walls will be sheet piles with a reinforced concrete capping beam and steel handrail. The piles will be driven by either a drop hammer or vibration hammer depending on ground conditions. In certain circumstances where obstacles are present in the ground pre-auguring may be required to prepare the ground for the

sheet pile installation. Ca. 40,000m^3 of cutting/excavation is required and ca. 38,000m^3 of fill is required for the works, along with ca. 14,000 m^3 of ballast.

6.10.9 Construction Traffic and Routes

The majority of construction traffic will be generated during phase three and phase four, the earthworks phase (Q2 2024 – Q3 2025) and the track construction phase (Q2 2025 – Q1 2026). As part of the earthworks phase there will be a requirement to bring engineering fill onto the site.

Where surplus spoil is unsuitable for reuse on site it will be taken to the compound areas for sorting. Spoil that cannot be re-used will be disposed of to a licenced waste disposal facility.

On completion of the earthworks phase, the track construction phase will commence. The track construction phase will see the delivery of construction material such as concrete sleepers, steel rails and ballast.

For the earthworks and track construction it is estimated that up to 5500 Heavy Good Vehicles (HGVs) loads to or from the site (11000 HGV movements) will be required (maximum of 30 loads per day) to deliver and remove material over the period of works which is expected to extend over an initial period of 11 months, with a further 4 months of ballast deliveries in the finishing stages of the works.

It is planned that sleepers and rails will be brought to site using rail haulage.

Chapter 15 of this EIAR describes the construction traffic and roads to be used as part of the works.

6.10.10 Land Acquisition

Ca. 1.4ha of land is to be compulsorily acquired for the proposed development and is comprised predominantly of hedgerows at the boundary between the railway and agricultural lands. Replacement hedgerows will be planted along the new fence line, comprising of native species. The permanent land take includes land necessary to construct, operate and maintain the proposed development and associated infrastructure and to undertake essential environmental mitigation measures as outlined in this EIAR.

Temporary landtake is required, including for the five compounds, over an area of ca. 7ha and these lands will be reinstated following completion of the construction phase.

6.11 Landscaping

The landscaping option recommended here considers the dual benefits of providing a habitat with considerable advantages for biodiversity in particular pollinators, as well as providing an aesthetically pleasing landscape with low to moderate establishment requirements, and long term with the prospect of minimal maintenance needs to sustain the habitat. The recommendation here is to create a tall flowering meadow mix, 50 to 200cm, with a blend of species that will, if left uncut, be capable of competing with more vigorous grass species that will likely establish over time even if not sown along with the meadow mix. It shall be cut once a year (Late September to Late October). The flowering period of the mixes suggested here is from May to October and largely consists of perennial and biennial species with some annuals. The species list will be as follows:

Table 6.5: Wildflower Species Composition

Common Name	Botanical Name
Alexander	*Smyrnium olusatrum*
Bladder campion	*Silene vulgaris*

Common Name	Botanical Name
Burdock	*Arctium minus*
Common vetch	*Vicia sativa*
Corn Marigold	*Glebionis segetum*
Corn poppy	*Papaver rhoeas*
Corncockle	*Agrostemma githago*
Corn flower	*Centaurea cyanus*
Field scabious	*Knautia arvensis*
Foxglove	*Dititalis purpurea*
Greater trefoil	*Lotus pedunculatus*
Hedge Garlic Mustard	*Alliaria petiolata*
Hemp agrimony	*Eupatorium cannabinum*
Cow parsley	*Anthriscus sylvestris*
Lesser knapweed	*Centaurea nigra*
Scented mayweed	*Matricaria chamomilla*
Meadowsweet	*Filipendula ulmaria*
Greater Mullein	*Verbascum thapsus*
Opium poppy	*Papaver somniferum*
Ox-eye poppy	*Leucanthemum vulgare*
Purple loosestrife	*Lythrum salicaria*
Red campion	*Silene dioica*
St. Johnsworth	*Hypericum perforatum*
Common Sorrel	*Rumex acetosa*
Teasel	*Dipsacus fullonum*
Upright hedge parsley	*Torilis japonica*
Weld yellow weed	*Reseda luteola*
Wild angelica	*Angelica sylvestris*
Wid carrot	*Daucus carota*
Yarrow	*Achillea millefolium*
Yellow Flag iris	*Iris pseudacorus*
Mugworth	*Artemisia vulgaris*
White bedstraw	*Galium album*
Yellow agrimony	*Agrimonia eupatoria*

The recommended sowing rate without grass seed would be 1.5g/sq. meter. If sown with grass seed this would increase to 5g/sq. meter. If sowing with grass it is important to avoid standard grass landscaping mixes which are frequently dominated with vigorous varieties of perennial rye grass *Lollium perenne* and in any case to choose native grass seed species. Generally, it is preferable to sow meadow mixes without grass seed, however, on a steep embankment it may be advantageous to include grass to aid rapid stabilisation of the soil and prevent erosion. Additionally grass seed may need to be included if winter green cover is an essential requirement as many of the meadow mix species will die down during the winter dormancy. In areas where grass seed is used, it is strongly recommended that the establishing sward be cut annually in October for the first 3 years, and the cut vegetation removed. This removal of vegetation is an important process in these initial years, to prevent adding fertility to the soil

which would disproportionately favour grass growth over wildflowers, potentially resulting in the suppression of the species of highest biodiversity value. Sowing rate for grass seed to be included with the meadow mix should be no higher than 5g/sq. meter. Where grass is used in the sowing mix, the below species list (Table 6.6) can be utilised.

Table 6.6: Grass Species Composition

Common Name	Botanical Name
Brown Bent	*Agrostis cappilaris*
Creeping Bent	*Agrostis stolonifera*
Yorkshire Fog	*Holcus lanata*
Meadow Fescue	*Festuca pratensis*
Timothy	*Phleum pratense*
Crested Dogs Tail	*Cynosurus cristatus*
Cocks Foot	*Dactylis glomerata*
Smooth stalked Meadow Grass	*Poa prarensis*

Where hedgerows are removed due to the works, the new fence line will be planted with a double staggered hedgerow with native species – refer to Table 6.7. As per TII/NRA guidelines:

- Height of Plants: In general, taller species such as Hawthorn (Crataegus monogyna) should be in the order of 900 to 1000mm in height while lower growing and trailing species may be between 300 to 450mm in height/length. Where trees are included and, depending on the growth rate of individual species, the majority of plants should be between 900 and 1200mm in height. Occasionally taller trees, up to and including ‘standard-sized’ plants, may be provided at random or irregular intervals along the hedgerow.
- Spacing of Plants: Hedgerows are best planted as double rows, particularly for the establishment of strong diverse plantings. Double rows should be set approximately 300 to 400mm apart, with plants at between 400 to 500mm centres, in staggered rows. In single rows, plants should be set approximately 300 to 400mm apart.
- Staking: Normal hedgerow plants should not require staking. Appropriate staking and ties should be provided for stability and establishment purposes where trees exceeding 1.5m in height are included.

Table 6.7: Hedgerow Native Species

Common Name	Botanical Name
Hawthorn	*Crataegus monogyna*
Blackthorn	*Prunus spinosa*
Holly	*Ilex aquifolium*
Dog rose	*Rosa canina*
Elder	*Sambucus nigra*
Guelder rose	*Viburnum opulus*
Hazel	*Corylus avellana*
Spindle	*Euonymus europaeus*
Optional Tree Species	
Alder	*Alnus glutinosa*
Ash	*Fraxinus excelsior*

Common Name	Botanical Name
Hawthorn	*Crataegus monogyna*
Blackthorn	*Prunus spinosa*
Holly	*Ilex aquifolium*
Dog rose	*Rosa canina*
Elder	*Sambucus nigra*
Guelder rose	*Viburnum opulus*
Hazel	*Corylus avellana*
Spindle	*Euonymus europaeus*
Optional Tree Species	
Alder	*Alnus glutinosa*
Silver birch	*Betula pendula*
Oaks	*Quercus robur, Q. petraea*
Scots pine	*Pinus sylvestris*
Willows	*Salix spp.*
Wild Cherry	*Prunus avium*

6.12 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) is included as Appendix 6.1 of this EIAR. The CEMP will be implemented during the construction phase. The CEMP will remain a 'live' document which will be reviewed regularly and revised as necessary to ensure that the measures implemented are effective.

The primary objective of the CEMP is to safeguard the environment, site personnel and nearby sensitive receptors 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 in this EIAR are translated into measurable actions and are appropriately implemented during the construction phase of the proposed development. As part of this framework, transparent and effective monitoring of the receiving environment during construction will be used to inform and manage on-going activities on site and to demonstrate effectiveness of the measures outlined therein.

Iarnród Éireann will monitor the contractor(s) performance on a regular basis and will undertake various compliance checks throughout the duration of the construction period including:

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

6.12.1 Environmental Clerk of Works

The Contractor's Environmental Clerk of Works (EnCoW) will have suitable environmental qualifications and the necessary experience and knowledge appropriate to the role. The EnCoW will be delegated sufficient powers under the construction contract 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 key stakeholders as appropriate. The EnCoW will be responsible for carrying out regular monitoring of the Contractor's CEMP and will report

monitoring findings in writing to Iarnród Éireann on a regular basis (at least weekly, but immediately in the case of incidents or accidents).

6.12.1.1 Construction Resource Waste Management Plan

Prior to commencement of the development, the appointed Contractor will implement the Construction Resource Waste Management Plan (included as part of the CEMP in Appendix 6.1 of this EIAR) which will provide for the segregation of all construction wastes into recyclable, biodegradable and residual wastes to facilitate optimum levels of re-use, recovery, and recycling operations.

The plan has been prepared in accordance with waste management guidance and principles as outlined in Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects (EPA, 2021).

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

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

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

6.13 Commissioning

The testing and commissioning of the new railway line will be a thorough and controlled process including inspections, measurements and electrical and mechanical systems commissioning.

The Commission for Railway Regulation will issue the final authorisation for the new railway line.

6.14 Operations and Maintenance

Following completion of construction and commissioning, the line will be returned to service.

In the future it is intended that trains will operate up to a 10-minute service at peak hours, when future electrified or alternative fuelled vehicles are available.

Maintenance of the railway line occurs between midnight and 6am. This night maintenance includes track ballast adjustment, termed ‘tamping’. During daylight hours boundary maintenance is carried out which includes vegetation trimming.

6.15 Decommissioning

The design life of the proposed development is a minimum of 60 years, dependent on the type of infrastructure. Iarnród Éireann do not have current plans to decommission the railway infrastructure between Glounthaune and Midleton.

Chapter 7 – Population and Human Health

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7 Population and Human Health

7.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application (also referred to herein as "the proposed Project") by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed project (comprising inter alia railway works), including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

In relation to population, the assessment considers demographics, land use, economic activity, tourism and recreation, community and amenities and human health. The Guidelines on the information to be contained in Environmental Impact Assessment Reports, hereafter referred to as the EPA Draft Guidelines 2022 state that:*'In an EIAR, the assessment of impacts on population and human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in this EIAR e.g. under the environmental factors of air, water, soil etc'*

This chapter presents an assessment of the likely and significant impacts arising from the proposed development on population and human health. This is assessment is based on the proposed development described in Chapter 6 of this EIAR.

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

In addition, the Guidelines on the information to be contained in Environmental Impact Assessment Reports, hereafter referred to as the EPA Draft Guidelines 2022 state that *'In an EIAR, the assessment of impacts on population and human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in this EIAR e.g. under the environmental factors of air, water, soil etc'*

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

- Air Quality and Climate (Chapter 8);
- Land Soils and Hydrogeology (Chapter 10);
- Surface Water and Flood Risk (Chapter 11);
- Landscape and Visual (Chapter 13)
- Roads and Traffic (Chapter 15);
- Noise and Vibration (Chapter 16); and

- Major Accidents and/or Disasters (Chapter 18).

Mitigation and monitoring measures, residual impacts and cumulative impacts are also discussed where appropriate.

7.2 Methodology and Limitations

A baseline condition was established using a desktop study that reviewed national guidance documents, publicly available datasets and resources to assess the potential impacts of the proposed development and to provide mitigation and monitoring measures where required. There were no limitations in conducting this assessment.

7.2.1 Guidelines

This chapter was prepared in line with the methodology detailed in Chapter 2 of this EIAR.

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

- Draft Advice Notes for Preparing Environmental Impact Statements (Environmental Protection Agency, 2015);
- EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Environmental Protection Agency, 2022);
- Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017); and,
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (2018).

7.2.2 Data Sources

A desk study of the proposed development location and surrounding environs was carried out to collate all relevant and available data concerning population and human health and for the study area using the following sources:

Data Sources

- Regional Spatial and Economic Strategy for the Southern Region;
- Cork County Development Plan 2022-2028;
- Iarnród Éireann Strategy 2027
- Cork Cycle Network Plan 2017
- National Spatial Strategy for Ireland 2002-2020;
- Fáilte Ireland EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects (2011 & 2019);
- Fáilte Ireland Tourism Development & Innovation a Strategy for Investment 2016-2022;
- Labour Force Survey, Central Statistics Office www.cso.ie ;
- Census 2016, Central Statistics Office www.cso.ie ;
- Geodirectory Data;
- Ordnance Survey Ireland (OSI) Mapping and aerial photography (www.osi.ie);
- Cork County Council Planning Website (https://www.corkcoco.ie/en/planning);
- Corine land cover data (www.EPA.ie);
- Central Statistics Office (www.cso.ie) ;
- Open Street Mapping (www.openstreetmap.org);
- All-Island Research Observatory (AIRO) Primary and Post Primary Schools;
- Google Street Mapping;
- Health Services Executive (www.hse.ie); and
- Fáilte Ireland (www.failteireland.ie).

7.3 Receiving Environment

The assessment of the receiving environment has been conducted with regard to the study area, which is defined by the electoral divisions in which the proposed development is situated, as well as those within proximity to, which are likely to be influenced.

The EPA Guidelines 2022 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.

A study area was developed for the assessment of population and human health. This comprises an area of 500m from the railway line, as the effects of the proposed development during construction would be contained within this area. Settlements (Glounthaune, Little Island, Carrigtwhill, Fota Island and Midleton) within the wider environs of the proposed development have also been included for this appraisal.

7.3.1 Demographic/ Economic Profile

Demographics are used to study the characteristics of a population at a specific point in time. In this assessment, demographics such as population and employment have been examined. CSO Census 2016 and 2011 data has been used to collate the most recent statistics and to assess the changes or trends over this period. While these Census statistics are now some five years old, having regard to the nature, extent and general pattern of development in the receiving environment, these figures remain representative of population and settlement in the identified area.

7.3.1.1 Population

Preliminary 2022 results published by the Central Statistics Office indicate that the population growth in Ireland increased from 4,761,865 in 2016 to 5,123,536 in 2022 (an increase of 361,671).

The total population of County Cork in 2016 was 417,211, of which 206,953 were male and 210,258 were female. This compares to a total population of 399,802 in 2011 indicating an increase of 4.35%, lower than the national county average growth at 5.3%.

Table 7.1 indicates the population increase from 2011 to 2016 on a county, municipal district and electoral division basis. Preliminary census 2022 data indicates a population of 581,231 in County Cork, a further 7.07% increase since the 2016 census.

Table 7.1: Population by County and Local Level

Area	Population 2011	Population 2016	Approximate % increase
County			
County Cork	519032	542868	4.6%
Municipal District			
East Cork	na	45,441	na
Cobh	na	56,722	na
Electoral Division			
Caherlag	6958	7481	7.5%
Carrigtwohill	6665	7334	10.0%

Area	Population 2011	Population 2016	Approximate % increase
Midleton Rural	8316	8922	7.3%
Midleton Urban	3733	3881	4.0%

Source: CSO & www.pobal.ie

7.3.1.2 Economic Profile

The wider East Cork area, including the receiving environment, is an important commuter area for employment activity within Cork City and its Environs. These include Cork City as a primary centre of employment, as well as several suburban retail and commercial locations, and locations such as the Cork Harbour, Little Island, and Ringaskiddy for pharmaceutical and other manufacturing and services industries.

Public transport services to these locations and along the existing railway line include the existing Midleton to Cork rail line, the subject of this EIAR, and bus routes serviced by Bus Éireann. A list of local bus and rail routes are listed in Chapter 15 of this EIAR.

The N25 Waterford - Cork national primary road is a busy commuter route that bypasses Midleton and continues east to Youghal. There are plans to expand part of the road to a dual carriageway as part of the N25 Carrigtwohill to Midleton Scheme.

Settlement locations in the receiving environment such as Carrigtwohill and Midleton are centres of mixed-use employment. Carrigtwohill is one of the fastest-growing Metropolitan towns in suburban Cork and is a hub for pharmaceutical and biotechnology companies with multinational corporations established in the IDA Business Park to the west of the town. Agriculture and food production are also critical sectors for the sustainable rural economy of County Cork.

7.3.1.3 Employment

According to Census 2016, there were 2,006,641 people in employment in Ireland. The number of people employed in County Cork was 179,890, representing 9% of persons employed in Ireland. Table 7.2 below shows employment figures for Q3 of 2019, 2020 and 2021. Over 2.3 million people were employed in Q3 2019. Figures from Q3 2020 show a 3% decline in employment, likely the result of the Covid pandemic. There were approximately 2.47 million people employed in Ireland in Q3 2021 showing a 10% increase from the previous year and a 6% increase from pre-covid figures. The number of persons employed in Q1 2022 was 2,505,800, an increase of 1.4% since Q3 2021.

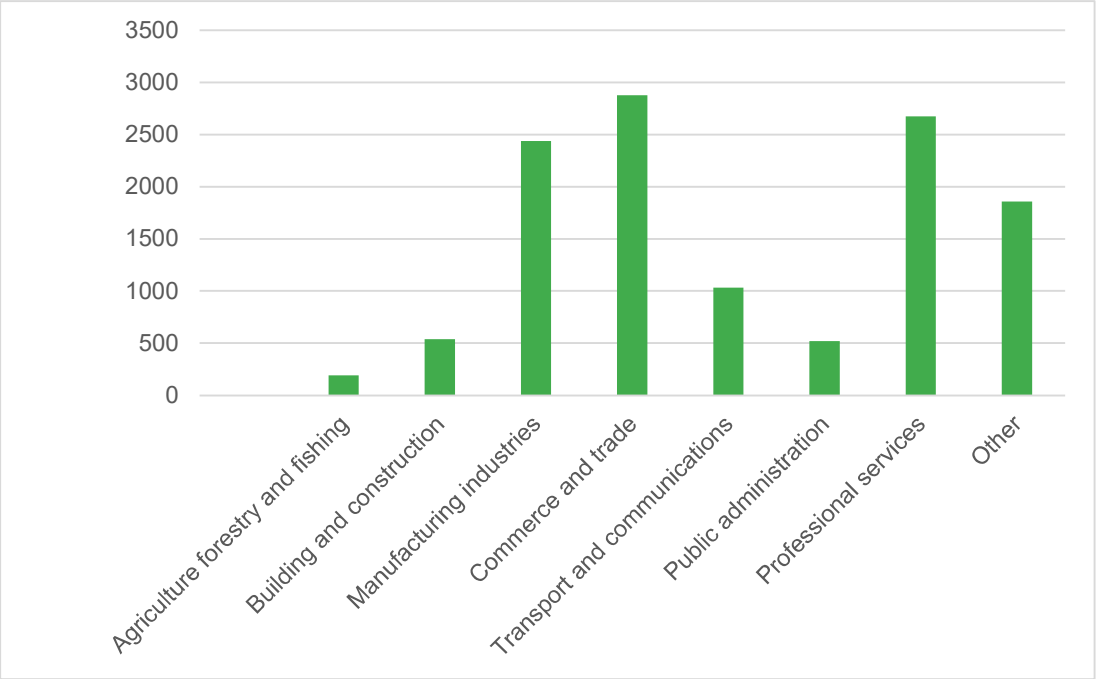
Table 7.2: Number of persons employed in Ireland

Employment in Ireland	Number of persons employed
Q3 2019	2,323,400
Q3 2020	2,250,000
Q3 2021	2,471,200
Q1 2022	2,505,800

Source: CSO Labour Force Statistics

Figure 7.1 shows employment by industry of the electoral divisions within the study area in which the proposed development is located. It is evident that the majority of professions are in commerce and trade, professional services and the manufacturing industry while the minority of professions are in transport and communications, building and construction, public administration and agriculture, forestry and fishing.

Figure 7.1: Employment by Industry of Study Area Electoral Divisions



Source: www.cso.ie

7.3.1.4 Unemployment

The live register is the most up to date information available and is indicative of the current unemployment situation in Ireland.

Since March 2020, the CSO has been producing a supplementary measure of monthly unemployment in parallel with the routine Monthly Unemployment Estimates, which incorporates those in receipt of the Pandemic Unemployment Payment (PUP) into the calculation to produce a COVID-19 Adjusted Measure of Monthly Unemployment. This new measure was published as part of the Monthly Unemployment Estimates release for January 2021 up to May 2022. The COVID-19 PUP has ended following the reopening of workplaces

The unadjusted Live Register total for August 2022 was 197,125 persons[1]. On an adjusted basis, the number of male and female claimants on the Live Register were 96,400 and 89,700 representing 51.8% and 4802% of the seasonally adjusted Live Register total respectively.

7.3.2 Housing and Land Use

7.3.2.1 Housing

The Regional Spatial and Economic Strategy for the Southern Region (RSES), which came into effect in 2020, includes Metropolitan Area Strategic Plans (MASPs) which guide the future development of the Region's three main cities and metropolitan areas – Cork, Limerick-Shannon and Waterford area. According to the Cork MASP, an objective is to progress the sustainable development of new areas for housing expansion such as the rail corridor between Carrigtwohill and Midleton. As well as residential development, the urban expansion of the area

[1] Live Register August 2022 - CSO - Central Statistics Office

between Carrigtwohill and Midleton will include cycling/pedestrian facilities, new school campus and road upgrades.

A search of recent planning applications to Cork County Council undertaken in July 2022 reveals several planning applications related to dwellings and farm buildings along the railway line. Typically, these applications relate to extensions, demolition and construction of dwellings and installation of solar panels on roofs.

A review of applications to An Bord Pleanála received under Section 34 of the Planning and Development Act 2000, as amended, show that there are currently Strategic Housing Development applications (Current Applications.pdf (pleanala.ie) within the area which are in proximity of the proposed development – refer to Chapter 2, Table 2.2.

According to available Geodirectory data, there are approximately 3,922 no. buildings located within a 500m buffer zone and 1,958 within a 250m buffer zone of the proposed development. The majority of these buildings are dwellings, primarily situated in proximity to the main settlements along the railway line - Midleton, Carrigtwohill and Glounthaune. Other dwellings and buildings are located within several clustered townland communities, with the remaining being scattered/dispersed rural properties.

It is noted that Geodirectory data lists residential, commercial, residential and commercial (both) and unknown status buildings within the buffer which are included in the above data.

Census 2016 states there are 18,702 private households within the Municipal District of Cobh and 16,091 within the Municipal District of East Cork. Table 7.3 lists the household types within East Cork and Cobh MDs and also within the Electoral Division where proposed work will be carried out. The majority of dwellings within both municipalities are houses/bungalows.

While these Census statistics are now some five years old, having regard to the nature, extent and general pattern of development in the receiving environment, these figures remain representative of population and settlement in the identified area.

Table 7.3: Households of Municipal Districts (2016)

Municipal District	**Number of households**
East Cork	There are 16,091 private households 90.7% are house/ bungalows 7.5% are flats/ apartments 0.1% are bedsits 0.3% are caravans/mobile homes 1.8% are not stated
Cobh	There are 18,702 private households 93.7% are house/ bungalows 5.1% are flats/ apartments 0.04% are bedsits 0.16% are caravans/mobile homes 1.0% are not stated
Electoral Division	
Caherlag	There are 2,423 private households 94.9% are house/ bungalows 4.0% are flats/ apartments 0.0% are bedsits 0.08% are caravans/mobile homes 1.0% are not stated
Carrigtwohill	There are 2,444 private households 90.3% are house/ bungalows

Municipal District	Number of households
	8.4% are flats/ apartments
	0.04% are bedsits
	0.08% are caravans/mobile homes
	1.0% are not stated
Midleton Urban	There are 1,566 private households
	75.2% are house/ bungalows
	22.6% are flats/ apartments
	0.19% are bedsits
	0% are caravans/mobile homes
	1.8% are not stated
Midleton Rural	There are 3,017 private households
	88.2% are house/ bungalows
	9.8% are flats/ apartments
	0.06% are bedsits
	0.13% are caravans/mobile homes
	1.7% are not stated

Source: www.cso.ie

7.3.2.2 Land Use

Land use of the receiving environment is discussed further in Chapter 10 of this EIAR. The baseline land and land use consists of six land use types within the Glounthaune to Midleton proposed new track. This predominantly includes a mix of agricultural (non-irrigated arable land, pastures, complex cultivation patterns) and urban (discontinuous urban fabric, industrial or commercial units, mineral extraction, road and rail networks and associated land) land use, with some small areas of other land use categorisation (broad-leaved forests, intertidal flats).

7.3.3 Community Facilities, Amenities, Tourism and Recreation

According to the Cork CDP 2022-2028 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 an increasing population and which are accessible to all sectors and age groups is a key component in the creation of successful sustainable communities. The Cork CDP lists social, community and multiuse facilities, childcare facilities, education, recreation and amenity, healthcare facilities and planning for all under their policies and objectives. Local sports clubs and schools function as important community assets and act as focus areas for the community.

Tourism is one of Ireland's most important economic sectors. In 2021, revenue gained from tourism was worth approximately €1.3 billion to the economy. At a national policy level, Cork is recognised as a potential growth platform for inbound traffic. 'A National Aviation Policy for Ireland', specifically identifies the unique position of Cork Airport as a 'gateway' to each of the two main tourism policy propositions – Ireland's Ancient East and the Wild Atlantic Way – and recognises that Cork Airport offers a significant advantage to the region and as a potential hub for visitors coming to Ireland.

As detailed in the CDP, County Cork has several key tourist attractions of national importance which should be protected from inappropriate development. The CDP states that the physical setting of tourist attractions is often a major component in their attractiveness. The surrounding landscape or particular features of the built environment often contribute to the setting or mystique of an attraction. However, appropriate development complimentary to their tourist function will generally be considered.

East Cork Tourism Limited, Ireland's Ancient East and Ring of Cork are tourism groups that operate throughout County Cork.

7.3.3.1 Glounthaune

It is located approximately 10km east of Cork City parallel to the N25 Cork-Midleton Road. It is situated on the north shore of Cork Harbour, on the estuary of the River Lee. The planning and development strategy and policy objectives relating to the area, is encompassed within Volume 4 (South Cork) of the Cork CDP, including land use zoning for the towns and villages of the Municipal District.

It is a mainly residential settlement positioned northeast of Little Island on the north side of the N25 national road and is accessible from the Old Dublin Road to the south with a single junction connecting the two. The village is connected to Glanmire to the north via a narrow residential road.

The village is served by the commuter railway line between Cork and Cobh and Cork to Midleton. Glounthaune railway station became the junction between the Cobh and Midleton lines after the restoration of the railway in 2009. Little Island is the next station in the Cork direction, while Fota Island is the next stop in the Cobh direction. For the Cork – Midleton railway line, Carrigtwohill is the next station in the Midleton direction.

The Glounthaune rail line offers regular daily services from Glounthaune to Carrigtwohill to Midleton (15minutes), Glounthaune to Fota to Carrigaloe to Rushbrooke to Cobh (13min) and Glounthaune to Little Island to Cork City (10 minutes).

The village has several bus services. These will be discussed further in Chapter 15-Roads and Traffic.

Locally, Glounthaune is served by several shops and commercial establishments. In terms of diesel/petrol supply and convenience retail, the population is served by the Killahoura Service Station to the east of the village and another service station to the west. Most of the services and amenities are located on the old N25 route. To the south of the railway line is the old village comprising a community centre, playground and a bar/restaurant. Several businesses are located to the west of the village. Several established residential estates are located to the east and west of the village centre. The most recent development is located at the eastern end of the lower village, northeast of the railway station.

Local Garda Stations are in Carrigtwohill and Glanmire and the area is served by the Cobh and Midleton fire stations.

Glounthaune has a host of community-oriented facilities due to its typical village function. These include the Glounthaune post office, local Catholic Church, the Glounthaune Community Centre, all of which are located around the intersection of Johnstown Close and L2968 local road. Many local community services are contained in these settlements due to the settlement's closeness and proximity to the bigger settlements of Little Island and Carrigtwohill.

Glounthaune provides several social and community projects for the benefit of its residents. These include Tidy Towns, Meals on Wheels, Men's Shed, Irish Speaking Club. Other amenities include the Erin's Own GAA Club, Glounthaune Running Club, Indoor Bowls Club, Bridge Club, Church Choir, Gramophone Circle and Cork 80th Scouts. Glounthaune Community Association won the Eco-Friendly category of the Pride in our Community 20/21 awards based on the Harper Island Wetland's project.

The community facilitate the organisation of local events which aim to bring members of the community together. Some of these events include:

- Halloween Spooky Trail;
- St. Patrick's Day Parade;
- Glounthaune 4-mile road race; and

- Family Fun Days.

7.3.3.2 Little Island

Little Island is a civil parish and primarily industrial region in County Cork, located to the east of Cork City. It is no longer an island since the northern waterway separating it from the mainland has filled in. Lough Mahon, part of Cork Harbour is located to the west and south, while Fota Island is to the east, across a channel.

The N25 Cork-Rosslare Road is built on the infilled channel between Little Island and Glounthaune. To the north and the west, the Cork-Cobh and Cork-Midleton (subject of this EIAR) railway lines are present. The Island has one railway station, which opened in 1859. Cork, Cobh and Midleton are accessible by rail.

Several commercial and industrial premises followed by residential properties are situated north of the N25 and the railway station. Beyond this are arable and pasture lands.

Development has grown since the 1990s. Little Island Business Park and East Gate Retail Park opened, bringing retail and commercial space to the area. In 2004, the Cork main drainage wastewater treatment plant for Cork City was opened. The Island is home to several pharmaceutical enterprises. According to the Little Island Business Association (2017), there were around 1,000 firms in operation in the area and as of April 2018, roughly 7,000 people were employed in the area.

There is an 'Amenity Walk and Playground' situated to the south and the Island. The Airstatic Entertainment Centre Cork – Bowling, Mini Golf, Arcade and NY Kitchen, several restaurants and the Raddison Blu Spa and Hotel are situated along the N25, on the north side of the island.

7.3.3.3 Fota Island

Fota Island Resort and Wildlife Park and Fota Island Golf Course are located within Cork harbour. Fota Island has numerous tourist attractions including Fota Island Golf Club and Resort, Fota Island House, Fota Gardens and Fota Island Wildlife Park. The Wildlife Park is a conservation centre for many endangered species and receives over 460,000 visitors annually. The island can be accessed via the N25 or by train to Fota Railway Station.

7.3.3.4 Carrigtwohill

Carrigtwohill is a suburban residential community with several community-focused, amenity and public service facilities. The town is situated along the route of the existing railway line which is the subject of this EIAR.

Carrigtwohill is well served by national road infrastructure being located on the N25 Cork – Waterford Road. The town is served by several bus routes operating between Cork City and a range of settlements in East Cork.

In 2009, the Carrigtwohill rail line re-opened and offers daily service to Cork City with a journey time of 16 minutes.

The town contains two primary schools, a girls-only secondary school, a garda station and a church. A community centre, located on the main street is available for a wide variety of activities including sports, drama, and meetings, with a playground located to the south.

The community elected Carrigtwohill Community Council organises projects for community benefit and interacts with external bodies. There are also several Residents Associations.

There are two sports amenities of note in Carrigtwohill, Carrigtwohill United AFC located at Ballyadam to the east of the town and Carrigtwohill GAA Club located south of Main Street within the town centre.

Main tourist attractions include Barryscourt Castle situated just off the N25 and Jasmine Villa Caravan and Camping Park, located in the western extent of Carrigtwohill. Barryscourt Castle was originally built in the 12th century and subsequently rebuilt in the 16th century. It has a café and gift shop and is a tourist attraction and local resource for Carrigtwohill with tours held in the summer months.

7.3.3.5 Midleton

Midleton is the central hub of business for the East Cork area and a major employment centre. Supporting a significant population, Midleton provides key social and community facilities such as sports clubs (GAA, football, rugby, and angling), a large range of educational and religious institutions, a post office, a fire station, a Garda Station and medical centres. There are two Golf Clubs located within the northern area of Midleton, Water Rock Golf Course and East Cork Golf Club.

Concerning transportation links within County Cork, the town is serviced by the N25, which bypasses the city centre to the south, and the Cork – Midleton rail line which offers daily service to Cork City with a journey time of 24 minutes.

In terms of educational facilities, there are five primary schools and four secondary schools.

Midleton has a reputation as an attractive shopping town that serves the wider rural catchment area with retail and service-based businesses.

Midleton is both a destination and a gateway for tourism within the county. Midleton and environs benefit as a strategic location on the major tourist routes between Rosslare (International Ferry Terminal), Cobh (cruise ships) and West Cork whilst facilitating access to other tourist attractions, due to proximate rail, motorway and air (Cork International Airport) infrastructure.

As a destination, Midleton and environs offer a wide range of festivals and tourist attractions predominantly clustered within Midleton town centre which include the Jameson Experience (Jameson Distillery), Midleton Pitch and Putt Club, Jungle World, Crafts on the Mall, Midleton Country Market, as well as restaurants and other amenity destinations. The Nellie Cashman Monument, the Choctaw Native American Monument and the World War 1 (WWI) memorial are popular visitor attractions. Other tourist attractions include the Midleton Country Market, one of the most prominent farmer's markets in Ireland. To the southwest of Midleton town centre, Ballyannan Woods - Midleton Forest Walk and the newly opened Pontoon walkway are popular recreational attractions.

The Paddocks Holiday Village and a Coillte owned recreational woodland, Curragh Wood is situated to the north of the town.

Development of the Midleton –Youghal Greenway along the disused railway corridor has potential for inter-regional greenway connectivity and is envisaged by Cork County Council to have huge tourism potential once constructed. It is predicted to attract approximately 250,000 visitors per annum. The Greenway is currently under construction and expected to be complete and operational by end of 2022 or the early months of 2023.

7.3.4 Modes of Travel

At a national level, the 2011 and 2016 Census data indicates that of the number of residents in the state over 15 years and at work, 52,743 people used the train, Dart or Luas in 2011. This

number increased to 63,133 in 2016. Table 7.4 details the numbers of people travelling to work and the mode of travel used in 2011 and 2016.

Table 7.4: Modes of Travel to Work

Means of Travel	Census Year	VALUE
On foot	2011	170510
On foot	2016	175080
Bicycle	2011	39803
Bicycle	2016	56837
Bus, minibus or coach	2011	91676
Bus, minibus or coach	2016	111436
Train, DART or LUAS	2011	52749
Train, DART or LUAS	2016	63133
Motorcycle or scooter	2011	8443
Motorcycle or scooter	2016	7990
Motor car: Driver	2011	1067451
Motor car: Driver	2016	1152631
Motor car: Passenger	2011	69164
Motor car: Passenger	2016	77335
Van	2011	116248
Van	2016	126029
Other, incl. lorry	2011	14770
Other, incl. lorry	2016	11593
Work mainly at or from home	2011	83326
Work mainly at or from home	2016	94955
Not stated	2011	64260
Not stated	2016	93709

Census 2016 data is available for some towns within the country including Midleton. Presented in Table 7.5 are the means of travel in 2016 for people aged 15 and over travelling to work in Midleton.

Table 7.5: Modes of Travel to Work for Midleton Area

Means of Travel	No. of Persons	%
On foot	422	4.07
Bicycle	71	0.68
Bus, minibus or coach	85	0.82
Train, DART or LUAS	146	1.41
Motorcycle or scooter	18	0.17
Motor car: Driver	3615	34.8
Motor car: Passenger	247	2.38
Van	241	0.16
Other, incl. lorry	17	0.16
Work mainly at or from home	116	1.11
Not stated	216	2.1

7.3.5 Human Health and Wellbeing

Human health has the potential to be impacted by environmental vectors such as air, noise, water and soil through which contaminants or pollutants, have the potential to cause harm if they come into contact with the population.

7.3.5.1 Health and Wellbeing

The 2016 Census asked respondents to indicate their general health, allowing the health and wellbeing of the population within the study area to be assessed. The levels were on a five-point scale, ranging from 'very good', at one end to 'very bad' at the other. The general characteristics of Cork County are presented below. The general health in the study area is presented in Table 7.6.

Table 7.6: General Health of the Population in County Cork

General Health	Male	Female	Total
Very Good	130,560	132,497	263,057
Good	55,028	55,323	110,351
Fair	13,899	14,887	28,786
Bad	2,046	2,230	4,276
Very Bad	476	491	967
Not Stated	4,944	4,830	9,774
Total	206,953	210,258	417,211

Source: CSO Census 2016

While there is no hospital located in the study area, community and healthcare facilities are provided for its population. These include but are not limited to, health centres, community centres, leisure facilities and public services including employment centres, welfare offices and schools, childcare facilities, and churches. The nearest hospitals are located in Cork City to the west.

Glounthaune. Carrigtwohill, Little Island and Midleton have a wide range of health and medical care facilities to support the settlements' current and prospective population.

7.3.5.2 Health and Safety in Design

PSDP

Mott MacDonald has been appointed by Iarnrod Eireann as PSDP. By law, the PSDP is required to coordinate the activities of designers involved in the project to ensure that the design works that can be constructed, used, maintained and demolished safely. Designers involved in the project will design out risks where possible in their designs. Designers will record the decisions they make to mitigate risks in their design. These risk assessments identify those risks that could not be mitigated so that the people responsible for constructing, using, maintaining and demolishing the works can be informed of those risks.

The PSDP will prepare a Preliminary Safety and Health Plan for the respective Contractor which will include in the background information issued to the Tenderers when the construction project goes to tender. This is to inform the tendering Contractors of the risks present on the site which are associated with the construction of the works.

On completion of the works, the PSDP will compile the Safety File. The Safety File will be a comprehensive record of the completed scheme and will serve as a reference point for the future operation and maintenance of the works and any future upgrading works.

The following is an example of the contents of a typical safety file:

- Construction (As-built) Drawings and photographs;
- Design Criteria;
- Specifications and Method Statements;
- Demolition Restrictions;
- Details of Equipment;
- Details of Maintenance Facilities;
- Operating & Maintenance Manuals;
- Certificates from suppliers, manufacturers, specialist subcontractors, MSDS Sheets, etc.;
- Details of location and nature of utilities and services encountered and diverted; and
- Details of residual risks in the use and maintenance of the works.

PSCS

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 Safety and Health Plan, co-ordinating the work of Contractors and providing the Project Supervisor Design Process (PSDP) with information required in the Safety File. The PSDP ensures coordination of the work of designers throughout the proposed development. This is to ensure effectiveness in addressing and coordinating safety and health matters from the very early stages of the project

Health and safety considerations in relation to major accidents and / or hazards have been addressed in Chapter 18 of this EIAR. Reference is made to other technical chapters of the EIAR as appropriate where further studies have been carried out, for example Chapter 11 addresses the potential for flooding.

7.4 Likely Impacts of the Proposed Development

7.4.1 Construction Phase

The potential for impacts on population and human health are associated with the construction phase due to potential impacts from noise and dust emissions and traffic on the receiving environment. Chapter 6 Description of the Development details the construction works required for the proposed development.

Construction phase effects considered include:

- Impacts on Demographic and Economic Profile
- Impacts on Housing and Land Use and Facilities
- Impacts on Tourism, Recreation and Amenities
- Human Health and Wellbeing

7.4.1.1 Demographic / Economic Profile

During the construction phase, the proposed development will create additional construction-related jobs. The number of construction workers required during the construction phase is expected to peak at approximately 125 persons. Subject to grant of statutory approvals, pre-construction works are due to commence in Q4 2023 with commissioning proposed in Q3 2026.

In addition to direct employment, the supply of building materials and the provision of professional services will generate significant off-site employment and economic activity. Revenue generated will benefit the local economy by increasing spending on local goods and services. This will have a slight positive effect on the economic profile.

It is not expected that there will be an impact on the demographic profile (population or housing) during the construction phase of the proposed development.

7.4.1.2 Housing, Land Use

A small area of land ca. 1.4ha is to be acquired through a CPO process to facilitate the proposed development. The design of the scheme is such that the area to be acquired has been minimised as far as practicable. The lands to be acquired are at the boundary to the railway line and therefore there will be no division of land parcels.

Retaining walls have been identified as required to minimise impact on adjacent lands due to environmental constraints, or to maintain the railway corridor within the existing railway corridor.

Due to the small area of land required, the effect will be permanent and slight.

There will also be temporary land take during construction. The effect will be temporary, and the land will be reinstated following construction.

There will be no direct effect on housing during the construction period. Accessibility to private properties and lands will be maintained during construction, however, there may be temporary disruptions.

7.4.1.3 Tourism, Recreation and Amenities

There will be temporary negative impacts on tourism, recreation and amenities as a result of the proposals due to potential disruption to access, and general disturbance. The train line will remain open for the majority of the construction period and when closed for approximately 4 months, a bus transfer will be in place. There will also be weekend closures for a period of eight months between 11pm on Fridays to 5.30am on Mondays. Additionally, a temporary diversion will be needed to redirect traffic away from the construction site (at Water Rock level crossing), this will require vehicles to take a longer and potentially more congested route over the 16 week road closure.

7.4.1.4 Health and Wellbeing

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. However, as with any construction project, there is still potential for adverse impacts associated with the natural environment and nuisance (such as noise and dust emissions). The potential for these effects is discussed separately within the respective chapters. There will be no significant offsite health risks.

There will be adverse temporary disturbance impacts associated with the proposals. Dust, elevated noise, increased lighting and traffic during construction may give rise to stress and anxiety. In the absence of mitigation, the effects will be slight-moderate during the construction phase. Given the nature of the development, the sensitivity of human health and wellbeing receptors to disturbance, impacts are considered moderate during the construction phase which will be sequential and temporary.

7.4.2 Operational Phase and Maintenance

The proposed development will have several long-term positive effects on the local community. The operational phase will provide the capacity to facilitate a future increase in train services from Cork City to Midleton. No significant effects are likely on the local population as a result of maintenance works.

As detailed previously, given the nature of the proposals, the impacts on population and human health is for the most part associated with the construction phase. Significant adverse impacts during the operational phase are not likely.

7.4.2.1 Demographic / Economic Profile

There will be a long-term positive effect during the operational phase of the development, with increased frequency of trains which will continue to linkcommuters to other towns such as Mallow and Cobh and further afield to Cork City, Dublin, Killarney and Limerick junction.

The overall development will likely result in positive and indirect economic benefits over the long-term for the local communities, County Cork and the Irish economy through increasing accessibility of the population to Cork City as well as economic and employment opportunities. The proposed development in conjunction with other elements of the CACR programme will improve the accessibility to population centres such as Cork City, Mallow, Cobh, Dublin and the towns/locations along the route due to the increase in train frequency.

7.4.2.2 Housing, Land Use

Several housing development applications were identified in the study area (see Section 7.3.2). As a result of the increase in connectivity between the towns along the route and Cork City as well as the improved accessibility of the train service, there will be a slight long-term positive impact on housing and facilities during the operational phase of the development.

7.4.2.3 Tourism, Recreation and Amenities

Rail services can move large numbers of people quickly and safely. There are currently 31 trains between Cork and Midleton from Monday to Friday and 31 trips returning from Midleton to Cork, with stops at Cork, Little Island, Glounthaune, Carrigtwohill and Midleton – this service currently has a 30 minute frequency. On a Saturday there are 18 return trips and on Sunday there are nine trips from Cork to Midleton and nine trips returning from Midleton to Cork. On completion of this project and other projects associated with the CACR programme, the railway line will have the capacity to facilitate a 10 minute frequency in each direction.. This will have a moderate positive impact on the population and economy and provide the benefits of improved reliability, and enhanced train frequency.

The local community will benefit through increased access to educational facilities including 3rd level institutes, increased access to medical/health centres and accessible links to population centres (Cork City, Mallow, Cobh, Dublin), resulting in slight positive effects.

During the operational phase, the increased scheduling of trains will likely have moderate positive effects on accessibility of the tourism, recreation and amenities identified in the baseline section in addition to an increase in modal shift from private car to the train.

7.4.2.4 Human Health and Wellbeing

Iarnród Éireann Strategy 2027 states that Iarnród Éireann is dedicated to safety in all of its operations, both now and in the future, through instilling a strong safety culture throughout the company. IEs safety culture will be improved through a continuous program of safety process improvement that includes:

- Increased safety awareness
- Proper implementation of safety management best practices
- Ongoing compliance with relevant national and European legislation, with a focus on human elements in risk management, and
- Occupational health initiatives, to minimise the impact on people's well-being from change during expansion.

The operational effect of the proposed development is likely to have an imperceptible effect on health and wellbeing.

7.4.2.5 Maintenance

Maintenance works along the railway line will be required on an ongoing basis as is currently the case and these works are not likely to give rise to any significant effects, effects are likely to be imperceptible.

7.4.3 Do Nothing

In the absence of the development proposal, or 'do-nothing' scenario the Glounthaune to Midleton rail line would continue to operate as normal.

Non-implementation would mean foregoing the benefits of an upgraded rail line and slowing down the development of rail connectivity and economic potential as stated in the CMATS, RSES and Cork CDP. The frequency of trains would remain at the current capacity reducing the potential travel efficiencies for commuters, students and other members of the public. The increase in population at towns along the route would not be provided for in terms of a sustainable transport option.

7.4.4 Cumulative Effects

This section considers the cumulative impact of the proposed development with other proposed development in the surrounding area. There will be temporary to short-term impacts during the construction phase.

Table 2.2 details project in the vicinity (within 500m) of the proposed development which may act cumulatively. Before the commencement of construction and during the construction phase engagement with the proponents of these developments will be carried out and where there is potential for works to be carried out in parallel, appropriate mitigation measures will be implemented including the scheduling of works and regular liaison meetings between project teams to ensure that plans are co-ordinated and impacts on the local population are minimised.

During construction, there is likely to be a slight-moderate negative nuisance effect on the local population due to traffic disruption, noise and dust which may increase anxiety and stress. However, this will be temporary and coordination and planning of the works amongst the project proponents will minimise effects.

There will be temporary, slight, positive effect on local businesses as a result of the cumulation of developments in the area due to the presence of construction workers using local facilities and purchasing goods during the construction phase.

Of the projects listed in Table 2.2, the housing developments are relevant as the increase in housing will result in an increase in the population of the area. The proposed development will facilitate an increase in the capacity and frequency of trains along the line and provide an alternative mode of transport. The cumulation of increased trains and increased housing in the area will mean that travelling or commuting by train by the local population is a viable alternative to private transport. The improved train schedule will offer local people and tourists a reliable low carbon alternative which will result in a slight-moderate positive effect.

Potential cumulative impacts during construction on air quality and climate, noise and vibration and traffic - which would have nuisance effects - are assessed in the relevant chapters of this EIAR.

7.5 Mitigation and Monitoring Measures

7.5.1 Construction Phase

A CEMP is included in Appendix 6.1 of this EIAR. The CEMP will be implemented by the contractor 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 that may cause harm or nuisance.

The appointed contractor (in collaboration with Iarnród Éireann) will be required to maintain close liaison with local community representatives, landowners and statutory consultees throughout the construction period.

The appointed Contractor will also implement the Traffic Management Plan included as Appendix 6.1 of this EIAR, which will be finally agreed upon with Cork County Council to mitigate any potential construction traffic impacts on the public road network. All construction activities, including construction traffic, will be managed through the site CEMP which is a live document.

There are no specific mitigation measures required to ameliorate potential impacts on population and human health in addition to the measures specified in other chapters of this EIAR. Specific measures to mitigate likely significant impacts on human health during the construction phase (i.e. Noise and Vibration, Air Quality and Climate, Water, Traffic and Major Accidents and/or Disasters) are dealt with separately in the relevant chapters in this EIAR.

7.5.2 Operational Phase

As there are no predicted negative effects of the proposed development on population and human health during the operational phase, no mitigation measures are required. Measures detailed in Chapters 11 (Surface Water and Flood Risk), 15 (Roads and Traffic) and 16 (Noise and Vibration) will be implemented to minimise effects on population and human health.

7.6 Residual Impacts

There will be adverse temporary .slight – moderate disturbance impacts associated with the proposals during construction, but these will be mitigated with the successful incorporation of specific mitigation measures detailed in this EIAR and CEMP.

It is anticipated that the operational effects overall will result in slight and positive effects and that cumulative effects will be slight-moderate positive.

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Chapter 8 – Air Quality

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8 Air Quality

8.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application (also referred to herein as "the proposed Project") by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed project (comprising inter alia railway works), including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

Accordingly, this chapter considers the impacts on air quality arising from the proposed development, as described in Chapter 6 of this EIAR. Any descriptions of the characteristics of the proposed development in this chapter should be read in conjunction with Chapter 6 - Description of the Proposed Development. The assessment predicts the potential likely significant air quality impacts on the surrounding environment arising from the construction and operation of the proposed development and, where appropriate, specifies mitigation measures to reduce potential impacts.

Impacts considered in this chapter include emissions of airborne pollutants that have a direct harmful effect on human health or natural habitats, such as particulate matter (PM_{10} and $PM_{2.5}$) and gases including nitrogen dioxide (NO_2) and sulphur dioxide (SO_2). Airborne dust emissions, regardless of particle diameter, are also considered as they can cause nuisance, loss of amenity, and detrimental effects on sensitive habitats. Changes to greenhouse gases emissions are not within the scope of this chapter and are covered in Chapter 9.

The assessment has primarily considered the impacts associated with construction dust and emissions from construction vehicles, construction plant and moving and stationary trains. Emissions from moving and stationary trains have been considered qualitatively, for their risk of causing exceedances of the air quality standards. The impacts of improved rail services as an outcome of the proposed development have also been qualitatively discussed.

8.2 Relevant legislation, policies and guidance

8.2.1 National legislation

8.2.1.1 Ambient Air Quality

Directive 2008/50/EC on ambient air quality and cleaner air for Europe was adopted in May 2008 and consolidates previous air quality directives (apart from the Fourth Daughter Directive). This Directive sets out a range of mandatory Limit Values for different pollutants and times by which they are to be achieved for the purpose of protecting human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.

The Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011)[1] implement the EU Ambient Air Quality Directive (2008/50/EC)[2]. The numerical Air Quality Standards (AQS) are set at concentrations below which human health impacts or ecological impacts are not expected to occur.

Table 8.1 presents the relevant air quality standards and target values for the pollutants relevant to this assessment as prescribed by EU and Irish legislation, hereafter referred to as air quality standards (AQS).

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	1 Hour	200	Not to be exceeded more than 18 times in a calendar year	1 Jan 2010
	1 Calendar Year	40	-	1 Jan 2010
SO_2	1 Hour	350	Not to be exceeded more than 24 times in a calendar year	1 Jan 2005
	24 hours	125	Not to be exceeded more than 3 times in a calendar year	1 Jan 2005
PM_{10}	24 hours	50	Not to be exceeded more than 35 times in a calendar year	1 Jan 2005
	1 Calendar year	40	-	1 Jan 2005
$PM_{2.5}$	1 Calendar year Stage 1	25	-	1 Jan 2015
	1 Calendar year Stage 2	20	-	1 Jan 2020

Source: Environmental Protection Agency Air Quality Standards[3]

The AQS 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 sets out that the limit values apply everywhere with the exception of:

- 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; and
- 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 Nuisance Dust

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the

[1] The Air Quality Standards Regulation 2011 (S.I No. 180 of 2011)

[2] European Union (April 2008) Directive on Ambient Air Quality and cleaner Air for Europe, Directive 2008/50/EC Official Journal, vol. 152, pp. 0001-0044

[3] Environmental Protection Agency (2021). 'Air Quality Standards'. Available at: https://airquality.ie/information/air-quality-standards

construction phase of a development in Ireland. Dublin City Council[4] has published a guidance document titled Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition. However, this guidance does not specify a guideline value. Therefore the approach taken for this report, as described in Section 8.3.1.1, is to qualitatively assess the risk of causing nuisance and minimise it with appropriate mitigation measures.

8.2.2 National Policy

8.2.2.1 National Air Emission Targets

Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (hereafter referred to as the National Emissions Reduction Directive) was published in December 2016.

The National Emissions Reduction Directive applied the limits set out in Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (hereafter referred to as the National Emission Ceiling Directive) until 2020 and established new national emission reduction commitments which are applicable from 2020 and 2030 for SO_2, NO_X, non-methane volatile organic compounds (NMVOC), ammonia (NH_3), $PM_{2.5}$ and methane (CH_4).

In relation to Ireland, the 2020 to 2029 emission targets are 25 kt (kilotonnes) for SO_2 (65% on 2005 levels), 65kt for NO_X (49% reduction on 2005 levels), 43kt for NMVOCs (25% reduction on 2005 levels), 108 kt for NH_3 (1% reduction on 2005 levels) and 10 kt for $PM_{2.5}$ (18% reduction on 2005 levels) as shown in Table 8.2. In relation to 2030, Ireland's emission targets are 85% below 2005 levels for SO_2, 69% reduction for NO_x, 32% reduction for VOCs, 5% reduction for NH_3 and 41% reduction for $PM_{2.5}$, also shown in Table 8.2.

The report Ireland's Air Pollutant Emissions 1990 – 2030[5] discusses the outlook for future compliance with 2030 targets. It notes that SO_2, NO_x, NH_3 and $PM_{2.5}$ targets are projected to be met in 2030 with existing policies and measures, however no measures have yet been set to ensure compliance with NMVOC emission ceiling for 2030.

Table 8.2: National Air Emission Target (Ireland Air Pollutant Emissions 2020 to 2030)

Pollutant	2020 to 2029 Reduction Commitments (kt) (and % Reduction Compared to 2005 Levels)	2030 Reduction Commitments (kt) (and % Reduction Compared to 2005 Levels)
SO_2	25.6	11.0
	-65%	-85%
NO_X	66.8	40.6
	-49%	-69%
NMVOC	56.3	51.1
	-25%	-32%
NH_3	112.1	107.5
	-1%	-5%
$PM_{2.5}$	15.6	11.2

[4] Dublin County Council (2018). Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition.

[5] Environmental Protection Agency (2022), Ireland's Air Pollutant Emissions – 1990-2030

Pollutant	2020 to 2029 Reduction Commitments (kt) (and % Reduction Compared to 2005 Levels)	2030 Reduction Commitments (kt) (and % Reduction Compared to 2005 Levels)
	-18%	-41%

8.2.2.2 Climate Action Plan 2021[6]

The Climate Action Plan was first published in 2019[7] and detailed the proposed cross-sectoral policy measures for addressing climate change by setting out 200 different actions that could be implemented to meet its 2030 targets consistent with a net zero target by 2050. Some of the main actions aimed at increasing electricity generated from renewables to 70% through the Government's flagship support scheme, reducing EU ETS industry emissions by 10-15% compared to projections, and increasing the number of EVs and LEVs to 936,000.

However, Ireland will have to reduce its total GHG emissions by 7% annually to meet its 2030 objectives, which will require a step up in its effort. This has been detailed in a new Climate Action Plan 2021 which outlines 475 actions to be undertaken by the Irish Government. These include increasing the share of electricity demand being sourced by renewables to 80%, improving public transport infrastructure to increase active travel journeys by 14%, and decarbonising heat and building materials.

It is recognised that many of the actions in the Climate Action Plan will have significant co-benefits on air quality by reducing emissions of air pollutants such as NO_x, SO_2, $PM_{2.5}$ and NH_3.

8.2.3 Local Policy

The proposed development lies within the local government area of Cork County Council, which has the potential to be affected by air quality impacts. Local government policies and strategies on air quality, where relevant to the proposed development, are summarised below.

Cork County Council

Cork County Council has not published an air quality policy or strategy. Besides national legislation, the main regulation applicable in the County is the Low Smoke Zones, established in 1995 and amended in 2012 and 2020[8], which ban the marketing, sale, and distribution of bituminous coal. The proposed development is included in the Low Smoke Zones of Cork City and its surrounding areas which includes towns such as Carrigtwohill and Midleton.

8.2.4 Guidance

In addition to the specific statutory air quality standards, the assessment has referred to national guidelines, where available, in addition to international standards and guidelines relating to the assessment of ambient air quality impacts. These are summarised below:

- National Road Authority (2011), 'Guidelines for the treatment of air quality during the planning and construction of national road schemes'.
- Environmental Protection UK and Institute of Air Quality Management (2017), 'Land-Use Planning and Development Control: Planning for Air Quality'

[6] Department of the Environment, Climate and Communications; Climate Action Plan 2021. Available at: https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/ (accessed 06/09/22)

[7] Department of the Environment, Climate and Communications; Climate Action Plan 2019. Available at: https://www.gov.ie/en/publication/ccb2e0-the-climate-action-plan-2019/ (accessed 03/05/22)

[8] Air Pollution Act (Marketing, Sale, Distribution and Burning of Specified Fuels) Regulations 2020 (S.I. No. 260 of 2020).

- Institute of Air Quality Management (2014). 'Guidance on the assessment of dust from demolition and construction
- Department for Environment, Food and Rural Affairs (2021), 'Local Air Quality Management. Technical Guidance (TG16)'.

8.3 Methodology and Limitations

8.3.1 Construction Phase Methodology

8.3.1.1 Dust emissions

Construction activities can result in temporary effects from dust. Dust is a generic term and usually refers to particulate matter in the size range of 1-75 microns in diameter. The most common impacts from dust emissions are soiling and increased ambient PM_{10} concentration. Dust can arise from numerous construction activities such as concrete batching, piling, wind erosion on material stockpiles and earth moving. It can be mechanically transported either via wind or through the movements of vehicles onto public highways (transport of debris on vehicle wheels or uncovered loads).

Guidance from the Institute of Air Quality Management (IAQM)[9] states that, where appropriate, a site can be divided into 'areas' for the dust risk assessment to allow different mitigation levels to be applied to each area. As the proposed development will consist of several different construction activities at different locations, five separate construction dust assessments have been conducted for the following areas:

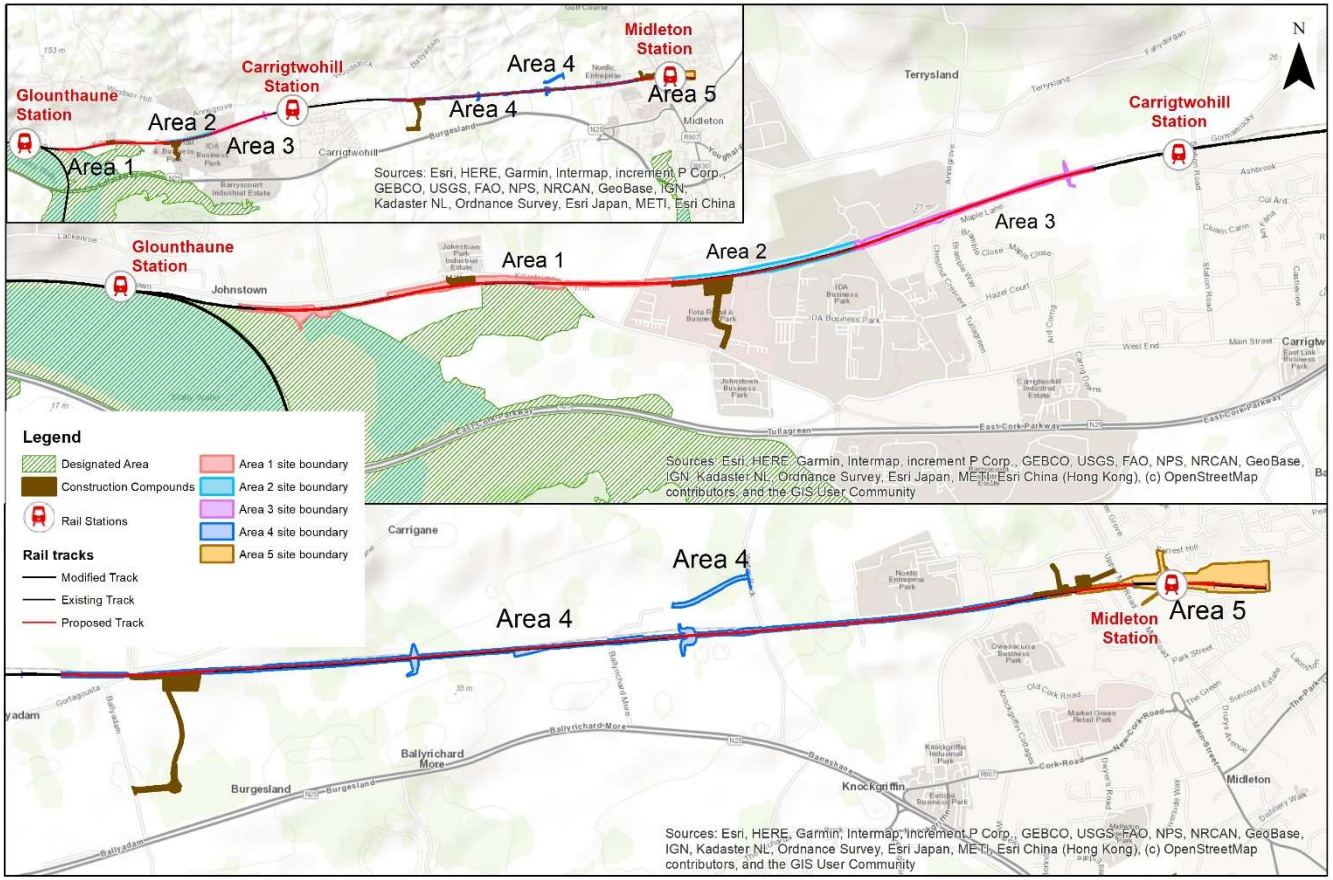
- Area 1 (East of Glounthaune)
- Area 2 (Carrigtwohill Industrial Estate)
- Area 3 (Castlelake)
- Area 4 (West of Midleton)
- Area 5 (Midleton Town)

This is to allow the most appropriate mitigation level to be applied to each construction activity which accounts for the relevant dust emission magnitude and area sensitivity, rather than applying the same generic mitigation to the entire proposed development. The extent of each area is shown in Figure 8.1.

The extent of each area has been based on the Iarnród Éireann property boundary as the best source of information available at the time of assessment. This is a worst-case assumption, as the works area is likely to be smaller and closer to the proposed tracks.

[9] Institute of Air Quality Management (2014). 'Guidance on the assessment of dust from demolition and construction.'

Figure 8.1: Dust risk areas



The construction activities for each construction dust assessment have been split into four separate source categories and the dust risk associated with each of these activities assessed individually. Each assessment has determined the risk of each of the following categories:

- Demolition;
- Earthworks;
- Construction; and
- Trackout[10].

Guidance on the assessment of dust from demolition and construction (Institute of Air Quality Management, IAQM, 2014) defines demolition as *"Any activity involved with the removal of an existing structure (or structures). This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time."*. In the context of this assessment the term demolition is used to describe the removal of Ballyadam House Overbridge (OBY8).

The risk of each source for dust effects can be described as 'negligible, 'low risk', 'medium risk' and 'high risk' depending on the nature and scale of the construction activities and the proximity of sensitive receptors to the construction activities or site boundary. Each assessment is used to identify the mitigation measures proportional to the level of risk to reduce the effects such that they are not significant.

Each assessment considers three separate effects from dust:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of human effects due to increased exposure to PM_{10}.

As per the IAQM guidance, Step 1 of each assessment applies screening criteria to the proposed development which states that an assessment will be required where there is:

- A 'human receptor' within:
  - 350m of the boundary of the site; and
  - 50m of the route(s) used by construction vehicles on the public highway up to 500m from the site entrance(s).
- An 'ecological receptor' within:
  - 50m of the boundary of the site; and
  - 50m of the route(s) used by construction vehicles on the public highway up to 500m from the site entrance(s).

No further assessment is required if there are no receptors within the defined boundaries.

To assess the likely dust risk, the need to quantify the overall dust emission magnitude (Small, Medium or Large) from each of the dust sources identified (demolition, earthworks, construction and trackout) is first established in alignment with the criteria provided in Table A.1 in Appendix 8.1.

The sensitivity of receptors is then defined (as "high", "medium" or "low") for each dust effect (dust soiling, human health and ecosystem impacts) and the sensitivity of the surrounding area determined for each activity. The sensitivity of the area is based on the distance of the source to the closest receptors, the receptors sensitivity and in the case of PM_{10} effects, the local

[10] Trackout = "The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/ demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site" as defined by the IAQM Guidance on the assessment of dust from demolition and construction

background concentration, as outline in Table A.2 to A.5 of Appendix 8.1. The highest level of area sensitivity defined for dust effect has been used in each assessment.

The final step of the assessment combines the dust emission magnitude and the sensitivity of the area to determine the dust risk categories for each activity for dust soiling and health effects, as outlined in Table A.6 to Table A.9 in Appendix 8.1.

The dust risk category defined for each dust source and effect is then used to determine appropriate site-specific mitigation measures to be adopted. It should be noted that, in line with the recommendations of IAQM guidance, significance is only assigned to construction effects following mitigation. Implementation of proportional and appropriate mitigation measures should result in construction dust having a negligible impact on air quality and the overall effect being not significant. Results of the dust assessment are presented in Section 8.6.1.

8.3.1.2 Construction site plant and machinery emissions

Construction requires the use of different equipment such as excavators, cranes and on-site generators. All construction plant has an energy demand, with some resulting in direct emission to air from exhausts. Guidance from the IAQM notes that effects from exhausts will likely not be significant. Given the nature of the site plant, effects of plant emissions on local air quality are considered of negligible significance compared to surrounding road traffic contributions on the local road network. Construction plant emissions have therefore not been assessed further with respect to air quality, however, mitigation measures to reduce the impacts on local air quality are presented in Section 8.7.

8.3.1.3 Construction road traffic emissions

The EPUK / IAQM[11] guidance indicates that an assessment of traffic emissions is only likely to be required for large, long term construction sites that will generate an additional annual average flow of greater than 100 Heavy Duty Vehicles (HDVs greater than 3.5 tonnes per day) or greater than 500 Light Duty Vehicles (LDV's less than 3.5 tonnes) per day.

As described in Chapter 6 (Description of the proposed development), the planned duration for the construction phase of the proposed development will be approximately three years, from Q4 2023 to Q3 2026. Across the three year construction period, the greatest construction traffic flows are predicted to occur during the earthworks and track construction phases, extending over an initial period of 11 months, with a further 4 months of ballast deliveries in the finishing stages of the works. A total number of 11,000 HDV movements are expected during this period, equivalent to 33 Annual Average Daily Traffic (AADT) movements over the period, and the maximum number of movements expected in a single day is 60. Further to this, no individual road is expected to have traffic flows that exceed the EPUK / IAQM criteria. Additional impacts on local traffic during the construction phase from road diversions and rail replacement buses have also been considered, as detailed in Chapter 15 (Roads and Traffic). The EPUK / IAQM criteria of a change in HDV flows of 100 AADT is therefore unlikely to be exceeded during the three year construction period.

LDV flows associated with the construction period are also not anticipated to exceed the EPUK / IAQM screening criteria of 500 AADT.

Guidance from Transport Infrastructure Ireland (TII), formerly the National Roads Authority (NRA), 'Guidelines for the Treatment of Air Quality During the Planning and Construction of

[11] Environmental Protection UK and Institute of Air Quality Management (2017), 'Land-Use Planning and Development Control: Planning for Air Quality'

National Road Schemes'[12], offers alternative criteria to establish if a detailed assessment of construction traffic is needed.

The TII guidance states that an assessment of impacts associated with vehicle emissions during the construction phase is required where there would be a significant change in annual average daily traffic (AADT) flows (equivalent to a change in AADT of more than 10%) on roads near to sensitive receptors. The largest percentage increase from baseline traffic as AADT is predicted in 2025, on the L7642 road in Ballyadam, between the construction compound entrance and N25. Existing traffic flows on this road in 2025 are predicted to be approximately 235 AADT and the potential increase in vehicle traffic on this road during the construction period is predicted to be 40 HDVs and 168 cars and LDVs, for a total of 208 additional vehicles AADT, equivalent to a 89% increase.

The percentage increase from baseline traffic as AADT is also predicted to exceed 10% on two other roads in 2025; L7642 (northbound) between the construction compound entrance and Carrigane Road, and Ballyrichard More (westbound) between Castle Rock Avenue and L7642.

However, the increases in AADT flows on these roads are small and do not exceed the criteria threshold stated in EPUK / IAQM[13] guidance (i.e. a change of at least 100 HDV and 500 LDV). The construction phase is also expected to last approximately three years and as such any increases in pollutant emissions as a result of additional vehicles on these roads will be temporary. Further to this, as discussed in Section 8.5.2 background pollutant concentrations across the project area are low and therefore it is unlikely that pollutant concentrations from construction vehicles will increase to the extent that exceedances of annual mean objectives will occur. As such, it is not expected that there will be any significant effects from construction road traffic on ambient air quality and no further consideration has been given to the effects.

8.3.2 Operation Phase Methodology

8.3.2.1 Emissions from trains

Diesel stationary trains can give rise to high short-term NO_2 and SO_2 concentrations near railway stations or depots. Additionally, moving trains can contribute to elevated short-term NO_2 and SO_2 concentrations close to the track.

The UK Local Air Quality Management Technical Guidance (TG16)[14] includes indicative criteria to determine if air quality standards are at risk of being exceeded due to train emissions.

Trains could contribute to a risk of exceedance of the short-term SO_2 standard, if they are regularly (at least three times a day) stationary for periods of 15 minutes or more, and there is relevant exposure within 15m of the stationary trains.

Trains could also contribute to a risk of exceedance of the long-term NO_2 standard when moving past locations of relevant exposure (such as residential properties) within 30m of the railway tracks, and where the background annual mean NO_2 concentration is above 25µg/m^3.

The impacts of train emissions on ambient air quality have considered qualitatively according to the above and the results are included in Section 8.6.

[12] National Road Authority (2011), 'Guidelines for the treatment of air quality during the planning and construction of national road schemes'.

[13] Environmental Protection UK and Institute of Air Quality Management (2017), 'Land-Use Planning and Development Control: Planning for Air Quality'

[14] Department for Environment, Food and Rural Affairs (2021), 'Local Air Quality Management. Technical Guidance (TG16)'.

8.3.2.2 Operational road traffic emissions

The EPUK/IAQM[15] guidance indicates that an assessment of traffic emissions is only likely to be required where a development generates an additional annual average flow of greater than 100 HDVs per day or greater than 500 LDVs per day. Considering the number of operational staff required by the railway, it is unlikely that increased daily staff movements will exceed these thresholds at any point during the operational phase.

Wider impacts of increased rail provision on air quality emissions from passenger traffic have previously been considered in the Cork Metropolitan Area Transport Strategy (CMATS) 2040[16], which the proposed development supports. As explained in Chapter 3 – Need for the Development, the Cork County Development Plan 2022-2028[17] includes goals to increase the population living along the railway and commuting for work and study into Cork. Population growth has the potential to increase private traffic, and traffic emissions to air, on the roads connecting to Cork. Increased provision of rail services along the line as a result of the proposed development would provide an alternative to car journeys, and is likely to have a net beneficial effect on traffic emissions to air.

Localised increases in traffic and emissions to air in the vicinity of existing and proposed stations on the Glounthaune to Midleton railway line cannot be excluded, as a result of anticipated increases in passenger numbers. The TII guidance[18] indicates that a screening model should be used to quantitatively estimate predicted concentrations with traffic increases, and if these are predicted to exceed or approach (greater than 90%) the air quality standards, a detailed air quality assessment is required.

Future passenger numbers at each station are not known however it is likely that many will access the station via active travel and therefore increases in car movements are likely to be small. In addition, existing pollutant concentrations in the area (as described in Section 8.5) are likely to be well below 90% of the relevant standards, and additional road traffic due to increases in passenger numbers at the stations on the line is unlikely to cause exceedances of the air quality standards.

Moreover, the increase in traffic and emissions at local stations due to commuters to Cork who would use the Glounthaune to Midleton railway line as a park-and-ride service is likely to be offset by a reduction in traffic and emissions within the city of Cork, where NO_2 concentrations are likely to be higher than in the study area (see Section 8.5.2), resulting in a potential net beneficial effect.

Although an increase in the frequency of queues at level crossings is anticipated due to the increase in service frequency, it is considered that due to the low pollutant concentrations existing in the area, more frequent queues are not likely to cause an exceedance or raise pollutant concentrations to 90% of the relevant standards.

On this basis, no further considerations have been given to the effects of operational road traffic on ambient air quality.

[15] Environmental Protection UK and Institute of Air Quality Management (2017), 'Land-Use Planning and Development Control: Planning for Air Quality'

[16] National Transport Authority (2020), 'Strategic Environmental Assessment Environmental Report for the Cork Metropolitan Area Transport Strategy 2040'.

[17] Cork County Development Plan 2022-2028 | Cork County (corkcoco.ie)

[18] National Road Authority (2011), 'Guidelines for the treatment of air quality during the planning and construction of national road schemes'.

8.4 Study Area

For the construction phase, the study area covers human health receptors and ecologically designated sites within 350m of the construction site boundary and within 50m of the routes used by construction vehicles on the public highway, up to 200m from the site entrances.

For the operational phase, the study area covers moving and stationary trains that are part of the proposed development.

As mentioned above, no further considerations have been given to the effects of operational and construction traffic and construction plant. As such these have not been included in the study area.

8.5 Receiving Environment

8.5.1 Overview

Information on existing air quality in Ireland can be obtained from the Environmental Protection Agency (EPA) who undertake 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 with population >15,000 (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.[19]

8.5.2 Background air concentrations

The proposed alignment is located within Zone D (rural Ireland), and its western edge is adjacent to the boundary of Zone B (Cork).

The Zone D monitoring station closest to the proposed development is located in Cobh Carrignafoy Co. Park, a background site monitoring PM_{10} and $PM_{2.5}$ approximately 6.3km south of the proposed alignment. However, NO_2 is not monitored at this site. Therefore, data have also been presented from the Zone D monitoring site at Castlebar, which is located at 226km distance from the proposed development in a similar suburban background environment. NO_2, PM_{10} and ozone are monitored at this site. Other monitoring sites in Zone D are closer to the proposed development, but are less representative of the study area. The closest Zone B monitoring site is located in Heatherton Park, approximately 6.5km south west of the proposed alignment, where PM_{10} and $PM_{2.5}$ are monitored.

Monitoring data from two suburban monitoring sites (South Link Road and University College Cork (UCC) Distillery Fields) in Zone B (Cork) have also been reviewed due to their closer proximity to the site (11-12km west of the proposed development). At the South Link Road roadside station SO_2, NO_2, carbon monoxide, ozone, PM_{10}, and benzene are monitored. At the UCC background station, NO_2, $PM_{2.5}$ and ozone are monitored.

Locations and pollutants monitored at each station are summarised in Table 8.3, together with the rationale for reporting each station.

[19] Environmental Protection Agency (2021), 'Air Quality Zones'. Available at; https://airquality.ie/information/air-quality-zones

Table 8.3: Air quality monitoring stations

Site Name	Location		Site Type	Distance from proposed development	Pollutants monitored	Rationale for reporting
	X	Y				
Cobh Carrignafoy, Co. Cork	580174	567027	Suburban background Zone D	6.3km	PM_{10}, $PM_{2.5}$	Closest to project area
Heatherton Park, Cork	568530	570068	Suburban background Zone B	9.6km	PM_{10}, $PM_{2.5}$	Close to project area
South Link Road, Cork	567977	569693	Suburban Traffic Zone B	10.3km	NO_2, PM_{10}, SO_2, CO, O_3, benzene	NO_2 and PM_{10} monitoring close to proposed development (not representative of project area)
University College Cork (UCC) Distillery Field	566533	572094	Suburban background Zone B	11.2km	NO_2, $PM_{2.5}$, O_3	NO_2 monitoring close to project area
Castlebar	514462	789842	Suburban background Zone D	226km	NO_2, PM_{10}, O_3	Representative site in Zone D, same as proposed development

Source: EPA Annual Air Quality Reports

Table 8.4 to Table 8.6 present the NO_2, PM_{10} and $PM_{2.5}$ monitoring results from these sites between 2016 and 2020.

Table 8.4: Annual mean NO_2 concentrations

Site Name	Site Type	Annual mean NO_2 concentrations ($\mu g/m^3$)				
		2016	2017	2018	2019	2020
Castlebar	Suburban background Zone D	9 (99%)	7 (99%)	8 (99%)	8 (98%)	6 (93%)
University College Cork (UCC) Distillery Field	Suburban background Zone B	-[(a)]	-[(a)]	11 (95%)	10 (100%)	8 (100%)
South Link Road, Cork	Suburban Traffic Zone B	23 (89%)	27 (82%)	25 (70%)	21 (100%)	14 (99%)

Source: EPA Annual Air Quality Reports
Data Capture is presented in parenthesis
Cobh Carrignafoy and Heatherton Park do not monitor NO_2 so are not presented above
(a) No data available (not yet operational or low data capture)

Table 8.5: Annual mean PM_{10} concentrations

Site Name	Site Type	Annual mean PM_{10} concentrations ($\mu g/m^3$)				
		2016	2017	2018	2019	2020
Cobh Carrignafoy, Co. Cork	Suburban backgroundZone D	-[(a)]	-[(a)]	-[(a)]	13 (100%)	13 (100%)
Castlebar	Suburban background Zone D	12 (99%)	11 (96%)	11 (93%)	16 (93%)	14 (96%)

Site Name	Site Type	Annual mean PM_{10} concentrations ($\mu g/m^3$)				
		2016	2017	2018	2019	2020
Heatherton Park, Cork	Suburban background Zone B	12 (100%)	10 (98%)	11 (79%)	12 (95%)	11 (99%)
South Link Road, Cork	Suburban Traffic Zone B	18 (98%)	17 (100%)	17 (99%)	18 (89%)	15 (92%)

Source: EPA Annual Air Quality Reports
Data Capture is presented in parenthesis
UCC Distillery Fields does not monitor PM_{10} so is not presented above
(a) No data available (not yet operational or low data capture)

Table 8.6: Annual mean $PM_{2.5}$ concentrations

Site Name	Site Type	Annual mean $PM_{2.5}$ concentrations ($\mu g/m^3$)				
		2016	2017	2018	2019	2020
Cobh Carrignafoy, Co. Cork	Suburban background Zone D	-(a)	-(a)	-(a)	8 (100%)	8 (100%)
Heatherton Park, Cork	Suburban background Zone B	7 (100%)	6 (100%)	8 (28%)	8 (95%)	8 (99%)
University College Cork (UCC) Distillery Field	Suburban background Zone B	-(a)	-(a)	9 (85%)	8 (94%)	7 (88%)

Source: EPA Annual Air Quality Reports
Data Capture is presented in parenthesis
Castlebar and South Link Road do not monitor $PM_{2.5}$ so are not presented above
(a) No data available (not yet operational or low data capture)

Annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations monitored at these sites are all well below the respective national AQS. Overall, on average, annual mean NO_2 concentrations have decreased between 2016 and 2020, although this is in part due to the coronavirus pandemic and the associated impact on reduced road travel in 2019 and 2020. Annual mean PM_{10} and $PM_{2.5}$ concentrations on the other hand have increased slightly overall on average across the same period. This is likely to have been caused by conditions other than road traffic, such as industrial, agricultural and construction work.

Monitoring results from four suburban background stations (Castlebar, Cobh Carrignafoy, University College Cork, Heatherton Park), which could be considered representative of the project area, show annual average NO_2 concentrations of up to 11 $\mu g/m^3$ and annual average PM_{10} concentrations of up to 16 $\mu g/m^3$ in the past five years. Monitoring results from South Link Road station, which is located next to a major road, are not considered representative of the project area, and are well below the air quality standards.

8.5.3 Summary

Based on the concentrations monitored in the years 2016 - 2020 at locations representative of the project area, NO_2, PM_{10} and $PM_{2.5}$ in the project area are likely to be below the relevant air quality standards.

In particular, annual average NO_2 concentrations are likely to be up to 11$\mu g/m^3$, well below the value of 25$\mu g/m^3$ relevant for the train emissions assessment, and the value of 36$\mu g/m^3$ (90% of the annual average limit value) relevant for the operational road traffic emissions assessment.

Annual average PM_{10} concentrations are likely to be up to 16µg/m^3, well below the value of 24µg/m^3 relevant for the dust risk assessment, and the value of 36µg/m^3 (90% of the annual average limit value) relevant for the operational road traffic emissions assessment.

Annual average $PM_{2.5}$ concentrations are likely to be up to 9µg/m^3.

8.6 Likely Significant Impacts of the Proposed Project

8.6.1 Construction Phase

8.6.1.1 Dust emissions

For the purpose of this assessment, multiple construction dust assessments have been undertaken to assess the impacts associated with the proposed development on areas of different sensitivities. Five areas have been identified along the railway line between Glounthaune and Midleton:

- Area 1 (East of Glounthaune)
- Area 2 (Carrigtwohill Industrial Estate)
- Area 3 (Castlelake)
- Area 4 (West of Midleton)
- Area 5 (Midleton Town)

The extent of each area is shown in Figure 8.1. The sensitivity and risk level of each area is described in the sections below.

The magnitude and sensitivity descriptors that have been applied to assess the overall effect of the construction phase are presented in Appendix 8. Table 8.7 presents a summary of the dust emission magnitude assigned to each construction activity based on these descriptors.

Table 8.7: Dust Emission Magnitude

Activity	Dust emission magnitude	Justification	Areas affected
Demolition	Small	Ballyadam House Overbridge (OBY8) is the only structure to be demolished. The overall volume of the structure is well below 20,000m^3 and the height of the bridge is less than 10m.	Area 4 only.
Earthworks	Medium	Laying, grading and compaction of track formation and ballast along the new twin track sections. Embankment and cutting re-profiling where needed. Based on the total number of hauling truck movements planned, the material moved in each area is likely to be less than 100,000 tonnes.	All areas.
Construction	Small	Widening of the Owenacurra River Bridge (UBY11). Installation of drainage, culverts, cable containment routes, signaling, lighting and fencing. The overall construction volume in each area is likely to be less than 25,000m^3.	All areas.
Trackout	Medium	It is estimated that a maximum of 30 HDV movements would take place in a single day. As a worst case, it has been considered that these could take place at a single construction compound.	Areas 1, 2, 4, 5

Area 1 (East of Glounthaune)

Area 1 includes the area of works on the railway tracks east of Glounthaune village, starting from the beginning of the proposed twin track on the west, and ending 130m east of the Maly's Bridge under Killahora road (OBY2). It also includes Construction Compound 1. Sensitive receptors in the vicinity of the works area include residential properties and places of work on Johnsontown Close and Killahora road, farms and Carrigtwohill Community College.

Table 8.8 presents the sensitivity of the area to effects caused by construction activities and is based on the criteria presented in Table A.2 to Table 8.5 in Appendix 8.1.

Table 8.8: Area Sensitivity – Area 1

Activity	Dust soiling		Health effects of PM_{10}	
	Sensitivity	Comment	Sensitivity	Comment
Demolition	N/A	No demolition is planned in this area.	N/A	No demolition is planned in this area.
Earthworks	High	There are between 10 and 100 high sensitivity receptors (residential properties and a community college) within 20m and up to 10 medium sensitivity receptors (places of work) within 50m of the works area. There is also at least 1 low sensitivity receptor (farm) within 350m of the works area.	Low	Background monitored annual PM_{10} concentrations in 2016-2020 ranged from 10-16µg/m^3. There are between 10 and 100 high sensitivity receptors (residential properties and a community college) within 20m and up to 10 medium sensitivity receptors (places of work) within 50m of the works area. There is also at least 1 low sensitivity receptor (farm) within 350m of the works area.
Construction	High		Low	
Trackout	Medium	There are up to 10 high sensitivity receptors within 20m of the route used by construction vehicles, up to 200m from the compound entrance (residential properties) and at least one medium sensitivity receptor (place of work).	Low	There are up to 10 high sensitivity receptors within 20m of the route used by construction vehicles, up to 200m from the compound entrance (residential properties) and at least one medium sensitivity receptor (place of work).

Two designated ecological receptors are adjacent to the redline boundary of the proposed development in Area 1:

- Cork Harbour Special Protection Area (SPA) and proposed Natural Heritage Area (NHA) and
- Great Island Channel Special Area of Conservation (SAC)

For the purpose of this assessment these areas are considered as “high sensitivity” as a worst-case assumption, due to the potential presence of species sensitive to dust, such as bryophytes. Table 8.9 presents the sensitivity of the area to ecological impacts.

Table 8.9: Sensitivity of the area to ecological impact – Area 1

Activity	Ecology	
	Sensitivity	Comment
Demolition	N/A	No demolition is planned in this area.
Earthworks	High	There are two high sensitivity ecological receptors (a SPA,p/NHA and a SAC) found within 20m of the works area.
Construction		
Trackout	N/A	No ecological receptors are present within 50m of the route used by construction vehicles, up to 200m from the compound entrance.

Figure 8.2 presents the dust assessment buffers used for determining the proximity of sensitive receptors in Area 1. The extent of the dust emission area has been based on the Iarnród Éireann property boundary as the best source of information available at the time of assessment. This is a worst-case assumption, as the works area is likely to be smaller and

closer to the proposed tracks. The trackout routes from Construction Compound 1 in Area 1 are presented in Figure 8.3.

Figure 8.2: Construction Dust Assessment Buffers (Demolition, Earthworks and Construction) – Area 1

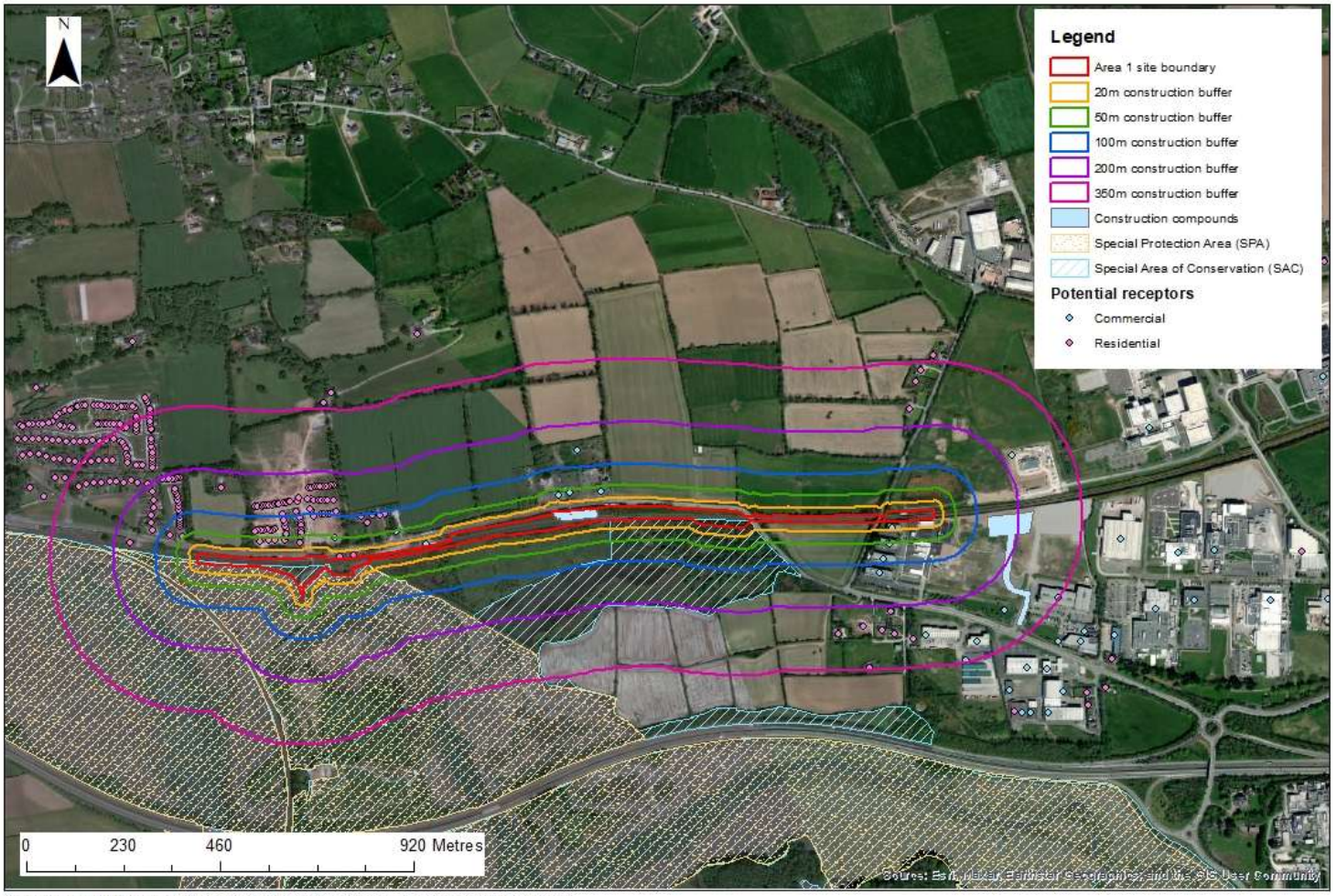
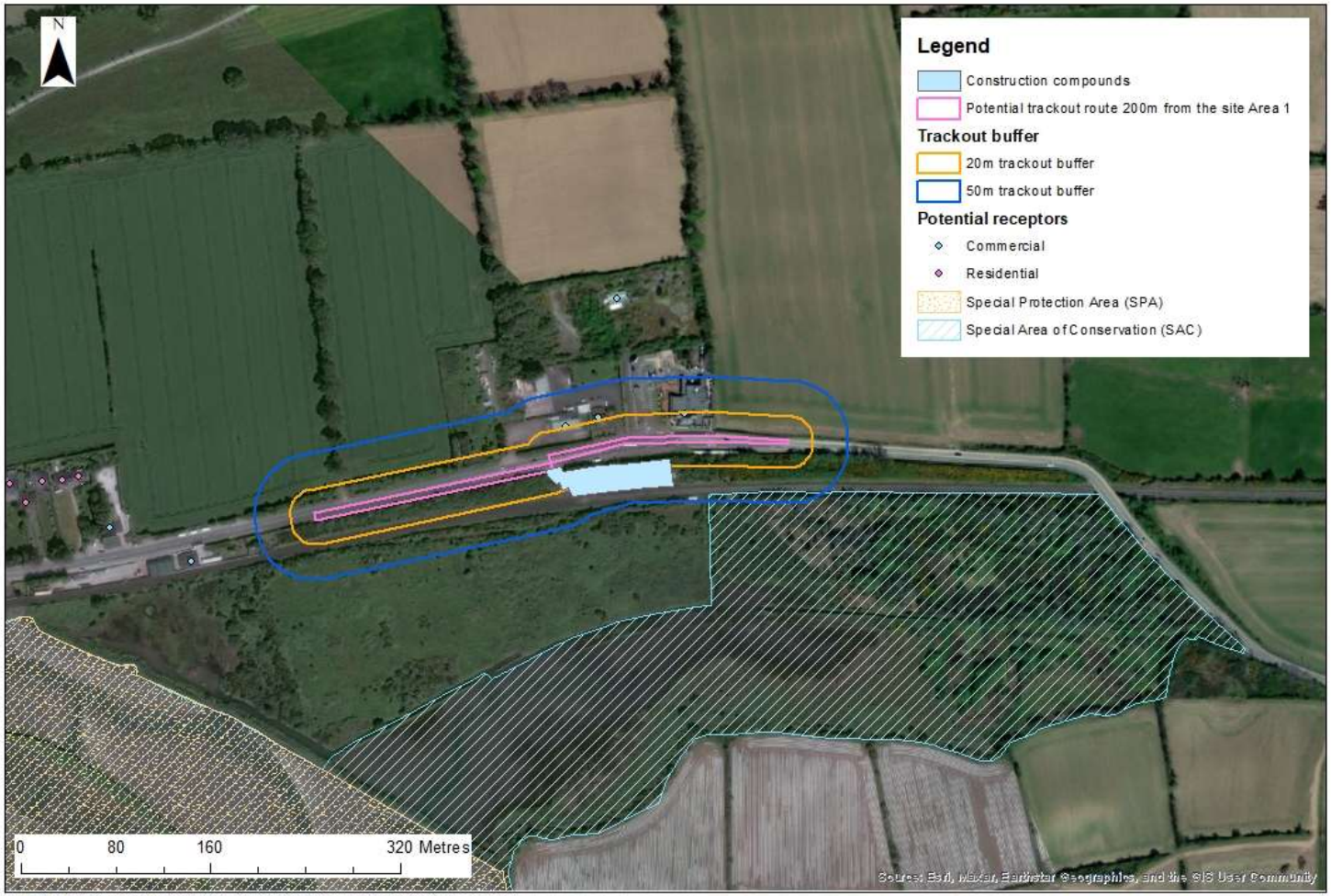


Figure 8.3: Construction Dust Assessment Buffers (Trackout) – Area 1



Dust emission magnitudes in Area 1 are summarised in Table 8.10.

Table 8.10: Dust emission magnitude in Area 1

Activity	Dust emission magnitude
Demolition	No emissions
Earthworks	Medium
Construction	Small
Trackout	Medium

The overall risk of receptors to dust effects in Area 1 is presented in Table 8.11 based on the criteria presented in the tables in Appendix 8.1.

Table 8.11: Summary of the risk of construction dust activity in Area 1

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	N/A	Medium Risk	Low Risk	Low Risk
Health effects	N/A	Low Risk	Negligible Risk	Low Risk
Ecological	N/A	Medium Risk	Low Risk	N/A

Based on the above, the overall effect of dust nuisance and/ or loss of amenity from the construction phase in Area 1 is described as 'negligible to medium risk', without mitigation.

Area 2 (Carrigtwohill Industrial Estate)

Area 2 includes the area of works on the railway tracks between Glounthaune village and the town of Carrigtwohill, starting east of the Maly's Bridge under Killahora road (OBY2), and ending near the IDA bridge (OBY3A). It also includes Construction Compound 2. The area in the vicinity of the works is largely industrial, including the Cobh Cross, Fota and IDA industrial and technology parks and farmland.

Table 8.12 presents the sensitivity of the area to effects caused by construction activities and is based on the criteria presented in Table A.2 to Table A.5, Appendix 8.1.

Table 8.12: Area Sensitivity – Area 2

Activity	Dust soiling		Health effects of PM_{10}	
	Sensitivity	Comment	Sensitivity	Comment
Demolition	N/A	No demolition is planned in this area.	N/A	No demolition is planned in this area.
Earthworks	Low	There are up to 10 medium sensitivity receptors (places of work) within 50m of the works area. There is also at least 1 low sensitivity receptor (farm) within 350m of the works area.	Low	Background monitored annual PM_{10} concentrations in 2016-2020 ranged from 10-16µg/m^3. There are up to 10 medium sensitivity receptors (places of work) within 50m of the works area. There is also at least 1 low sensitivity receptor (farm) within 350m of the works area.
Construction	Low		Low	
Trackout	Medium	There are up to 10 medium sensitivity receptors within 20m of the route used by construction vehicles, up to 200m from the compound entrance	Low	There are up to 10 medium sensitivity receptors within 20m of the route used by construction vehicles, up to 200m from the compound entrance (commercial area car parks, garden centre).

Activity	Dust soiling		Health effects of PM_{10}	
	Sensitivity	Comment	Sensitivity	Comment
		(commercial area car parks, garden centre).		

No designated ecological receptors are within 50m of the proposed development in Area 2.

Figure 8.4 presents the dust assessment buffers used for determining the proximity of sensitive receptors in Area 2. The extent of the dust emission area has been based on the Iarnród Éireann property boundary as the best source of information available at the time of assessment. This is a worst-case assumption, as the works area is likely to be smaller and closer to the proposed tracks. The trackout routes from Construction Compound 2 in Area 2 are presented in Figure 8.5.

Figure 8.4: Construction Dust Assessment Buffers (Demolition, Earthworks and Construction) – Area 2

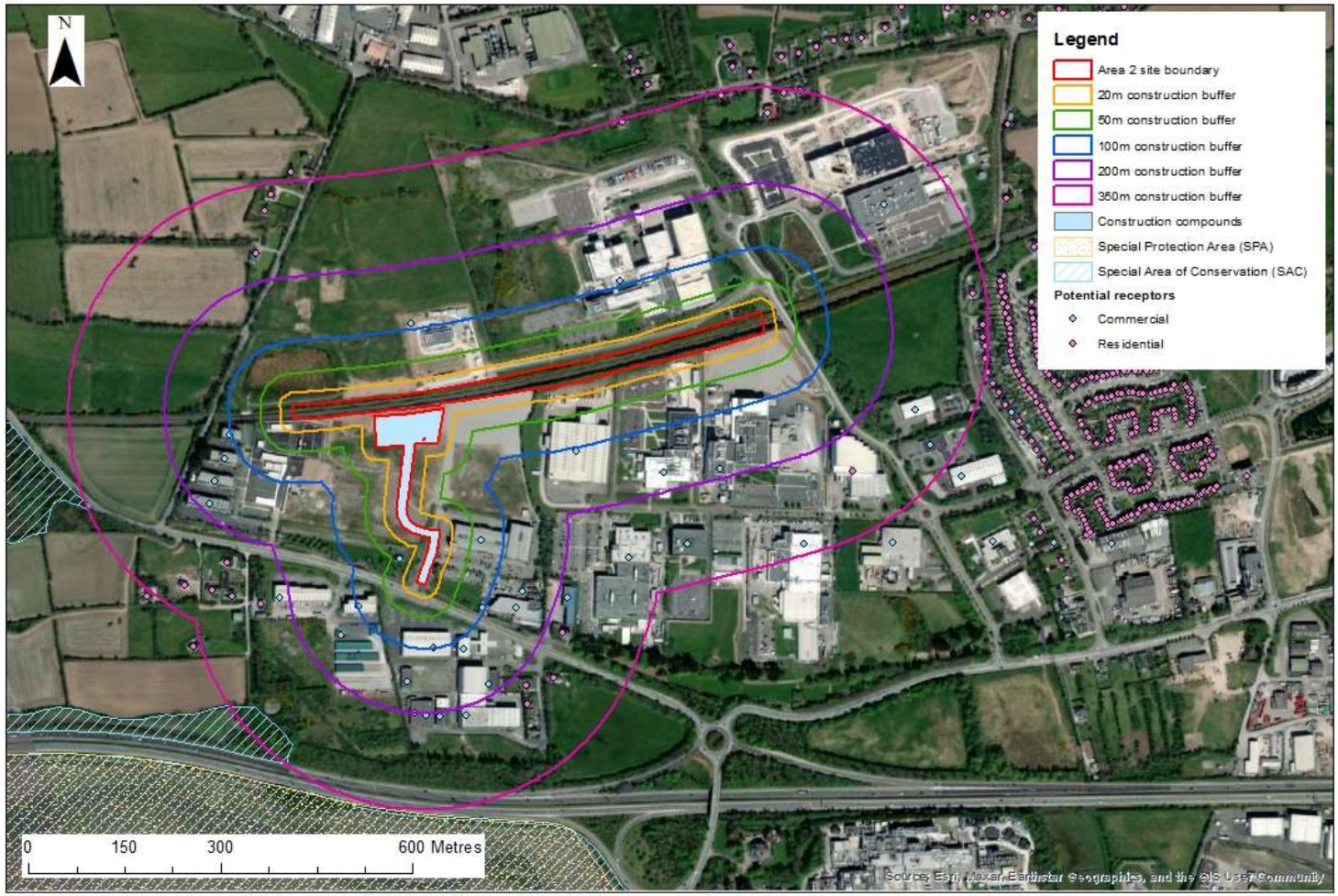
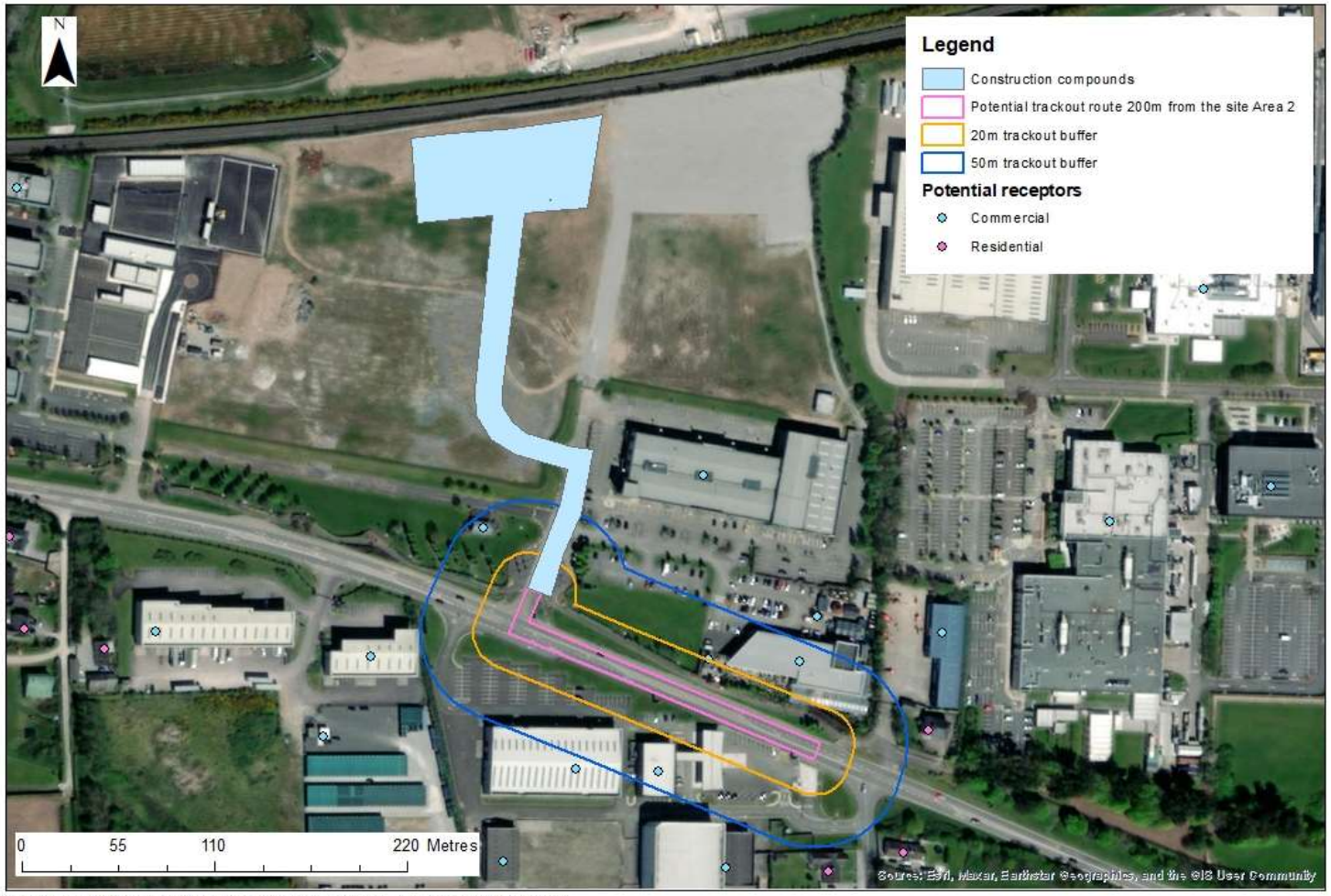


Figure 8.5: Construction Dust Assessment Buffers (Trackout) – Area 2



Dust emission magnitudes in Area 2 are summarised in Table 8.13.

Table 8.13: Dust emission magnitude in Area 2

Activity	Dust emission magnitude
Demolition	No emissions
Earthworks	Medium
Construction	Small
Trackout	Medium

The overall risk of receptors to dust effects in Area 2 is presented in Table 8.14 based on the criteria presented in the tables in Appendix 8.1

Table 8.14: Summary of the risk of construction dust activity in Area 2

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	N/A	Low Risk	Negligible Risk	Low Risk
Health effects	N/A	Low Risk	Negligible Risk	Low Risk
Ecological	N/A	N/A	N/A	N/A

Based on the above, the overall effect of dust nuisance and/ or loss of amenity from the construction phase in Area 2 is described as 'negligible to low risk', without mitigation.

Area 3 (Castlelake)

Area 3 includes the area of works on the railway tracks west of Carrigtwohill town, starting from the IDA bridge (OBY3A) in the industrial estate, and ending with the end of the proposed twin track approximately 300m west of Carrigtwohill station. No construction compounds are proposed in this area. Sensitive receptors in the vicinity of the works area include residential properties in the Castlelake residential estate and farmland.

Table 8.15 presents the sensitivity of the area to effects caused by construction activities and is based on the criteria presented in Table A.2 to Table 8.5 in Appendix 8.1.

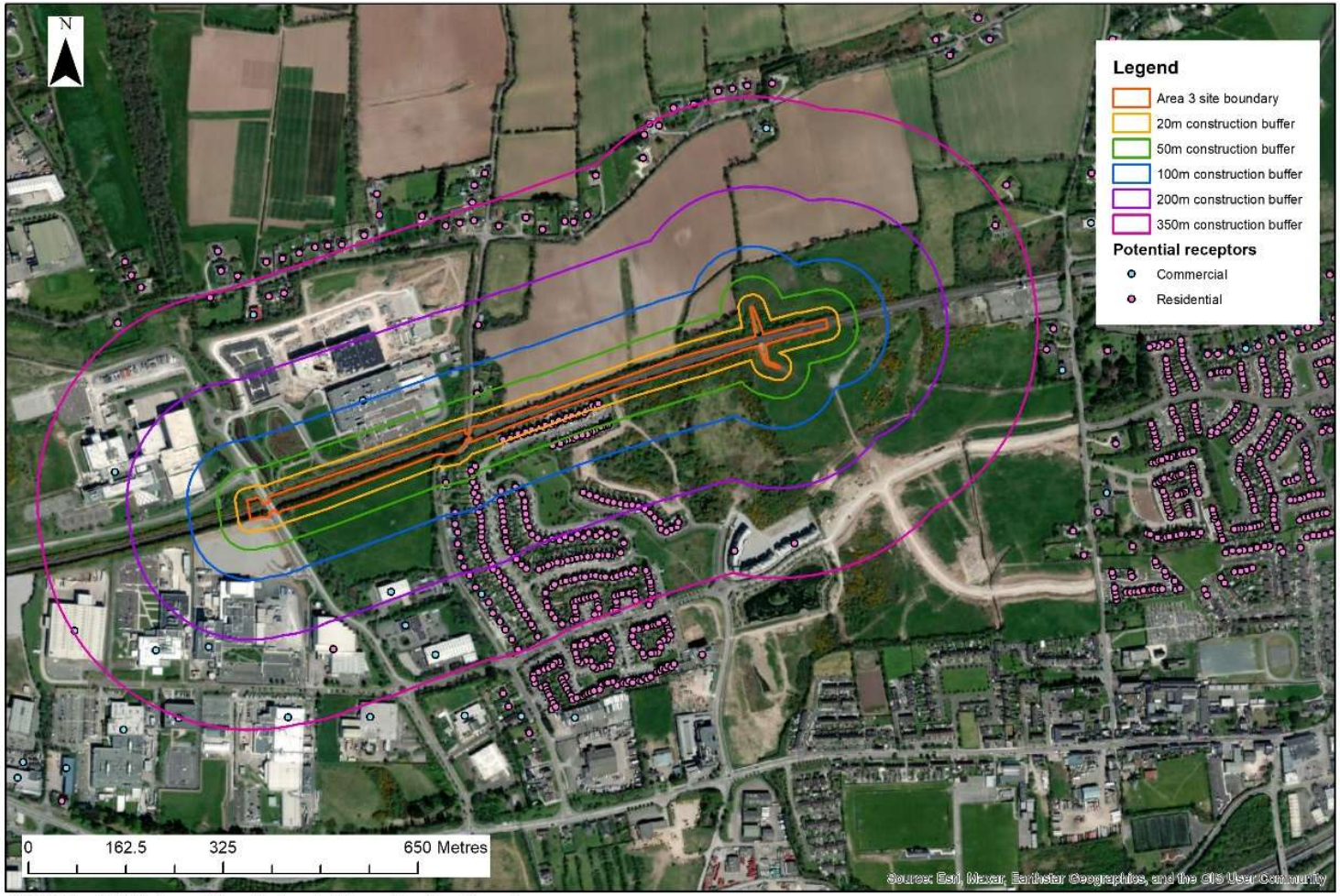
Table 8.15: Area Sensitivity – Area 3

Activity	Dust soiling		Health effects of PM_{10}	
	Sensitivity	Comment	Sensitivity	Comment
Demolition	N/A	No demolition is planned in this area.	N/A	No demolition is planned in this area.
Earthworks	High	There are between 10 and 100 high sensitivity receptors (residential properties) within 20m of the works area. There is also at least 1 low sensitivity receptor (farm) within 350m of the works area.	Low	Background monitored annual PM_{10} concentrations in 2016-2020 ranged from 10-16µg/m^3. There are between 10 and 100 high sensitivity receptors (residential properties) within 20m of the works area. There is also at least 1 low sensitivity receptor (farm) within 350m of the works area.
Construction	High		Low	
Trackout	N/A	There are no construction compounds in this area.	N/A	There are no construction compounds in this area.

No designated ecological receptors are within 50m of the proposed development in Area 3.

Figure 8.6 presents the dust assessment buffers used for determining the proximity of sensitive receptors in Area 3. The extent of the dust emission area has been based on the Iarnród Éireann property boundary as the best source of information available at the time of assessment. This is a worst-case assumption, as the works area is likely to be smaller and closer to the proposed tracks.

Figure 8.6: Construction Dust Assessment Buffers (Demolition, Earthworks and Construction) – Area 3



Dust emission magnitudes in Area 3 are summarised in Table 8.16.

Table 8.16: Dust emission magnitude in Area 3

Activity	Dust emission magnitude
Demolition	No emissions
Earthworks	Medium
Construction	Small
Trackout	No emissions

The overall risk of receptors to dust effects in Area 3 is presented in Table 8.17 based on the criteria presented in the tables in Appendix 8.1.

Table 8.17: Summary of the risk of construction dust activity in Area 3

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	N/A	Medium Risk	Low Risk	N/A
Health effects	N/A	Low Risk	Negligible Risk	N/A
Ecological	N/A	N/A	N/A	N/A

Based on the above, the overall effect of dust nuisance and/ or loss of amenity from the construction phase in Area 3 is described as 'negligible to medium risk', without mitigation.

Area 4 (West of Midleton)

Area 4 includes the area of works on the railway tracks west of Midleton town, starting from the beginning of the proposed twin track approximately 1.5km east of Carrigtwohill station, and ending approximately 100m west of the Owenacurra River. It also includes Construction Compound 3 and Ballyadam House Overbridge (OBY8) proposed to be demolished. Sensitive receptors in the vicinity of the works area include residential properties and places of work on Castle Rock Avenue and Ballyrichard More, places of work in the Northern Point and Owenacurra business parks, and farmland.

Table 8.18 presents the sensitivity of the area to effects caused by construction activities and is based on the criteria presented in Table A.2 to Table A.5 in Appendix 8.1.

Table 8.18: Area Sensitivity – Area 4

Activity	Dust soiling		Health effects of PM_{10}	
	Sensitivity	Comment	Sensitivity	Comment
Demolition	Medium	There are up to 10 high sensitivity receptors (residential properties) within 20m and up to 10 medium sensitivity receptors (places of work) within 50m of the works area. There is also at least 1 low sensitivity receptor (farm) within 350m of the works area.	Low	Background monitored annual PM_{10} concentrations in 2016-2020 ranged from 10-16µg/m^3. There are up to 10 high sensitivity receptors (residential properties) within 20m and up to 10 medium sensitivity receptors (places of work) within 50m of the works area. There is also at least 1 low sensitivity receptor (farm) within 350m of the works area.
Earthworks	Medium		Low	
Construction	Medium		Low	
Trackout	Medium	There are between 1 and 10 high sensitivity receptors (residential properties) within 20m of the route used by	Low	There are between 1 and 10 high sensitivity receptors within 20m of the route used by construction vehicles, up to

Activity	Dust soiling		Health effects of PM_{10}	
	Sensitivity	Comment	Sensitivity	Comment
		construction vehicles, up to 200m from the compound entrance.		200m from the compound entrance.

No designated ecological receptors are within 50m of the proposed development in Area 4.

Figure 8.7 presents the dust assessment buffers used for determining the proximity of sensitive receptors in Area 4. The extent of the dust emission area has been based on the Iarnród Éireann property boundary as the best source of information available at the time of assessment. This is a worst-case assumption, as the works area is likely to be smaller and closer to the proposed tracks. The trackout routes for from Construction Compound 3 in Area 4 are presented in Figure 8.8.

Figure 8.7: Construction Dust Assessment Buffers (Demolition, Earthworks and Construction) – Area 4

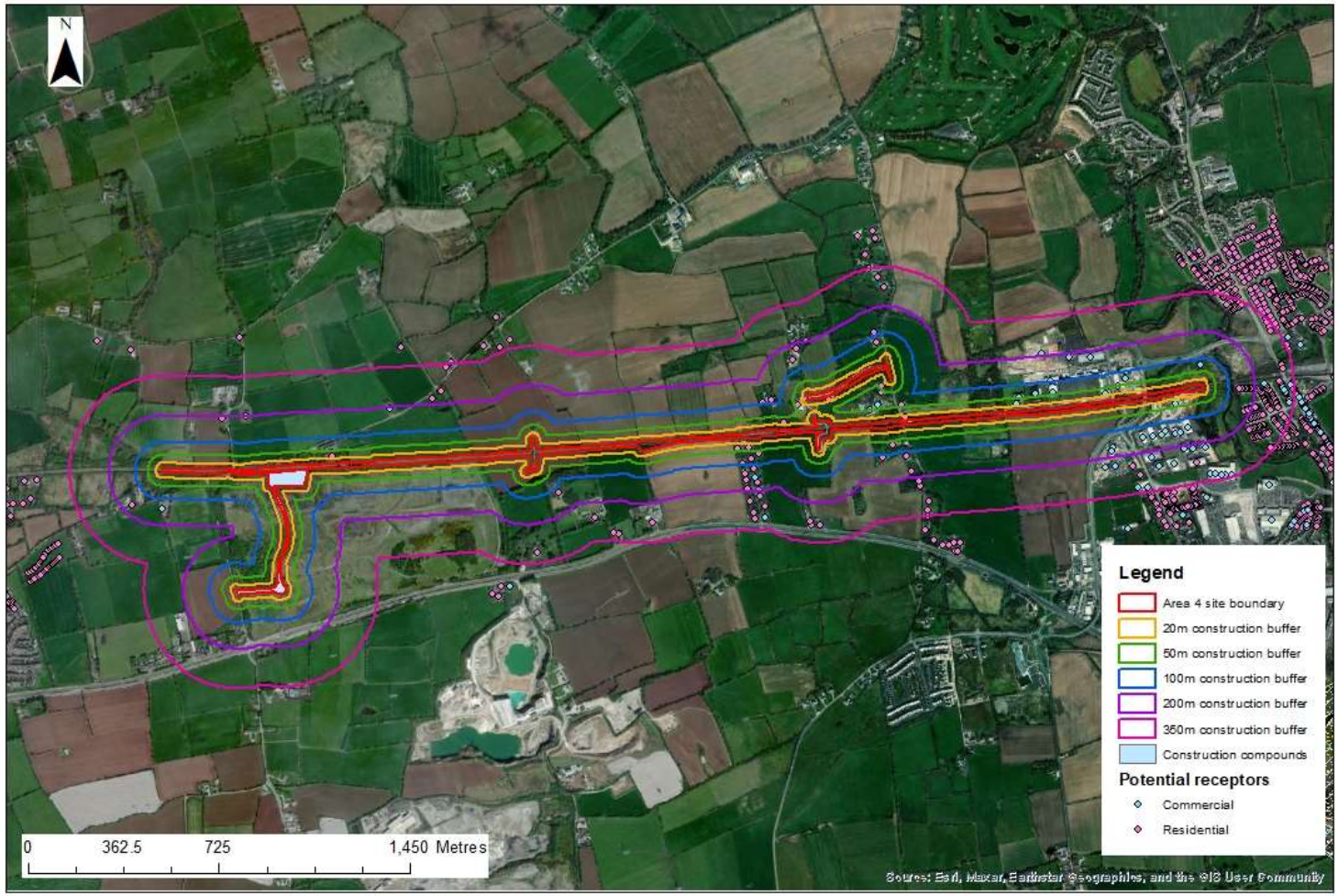
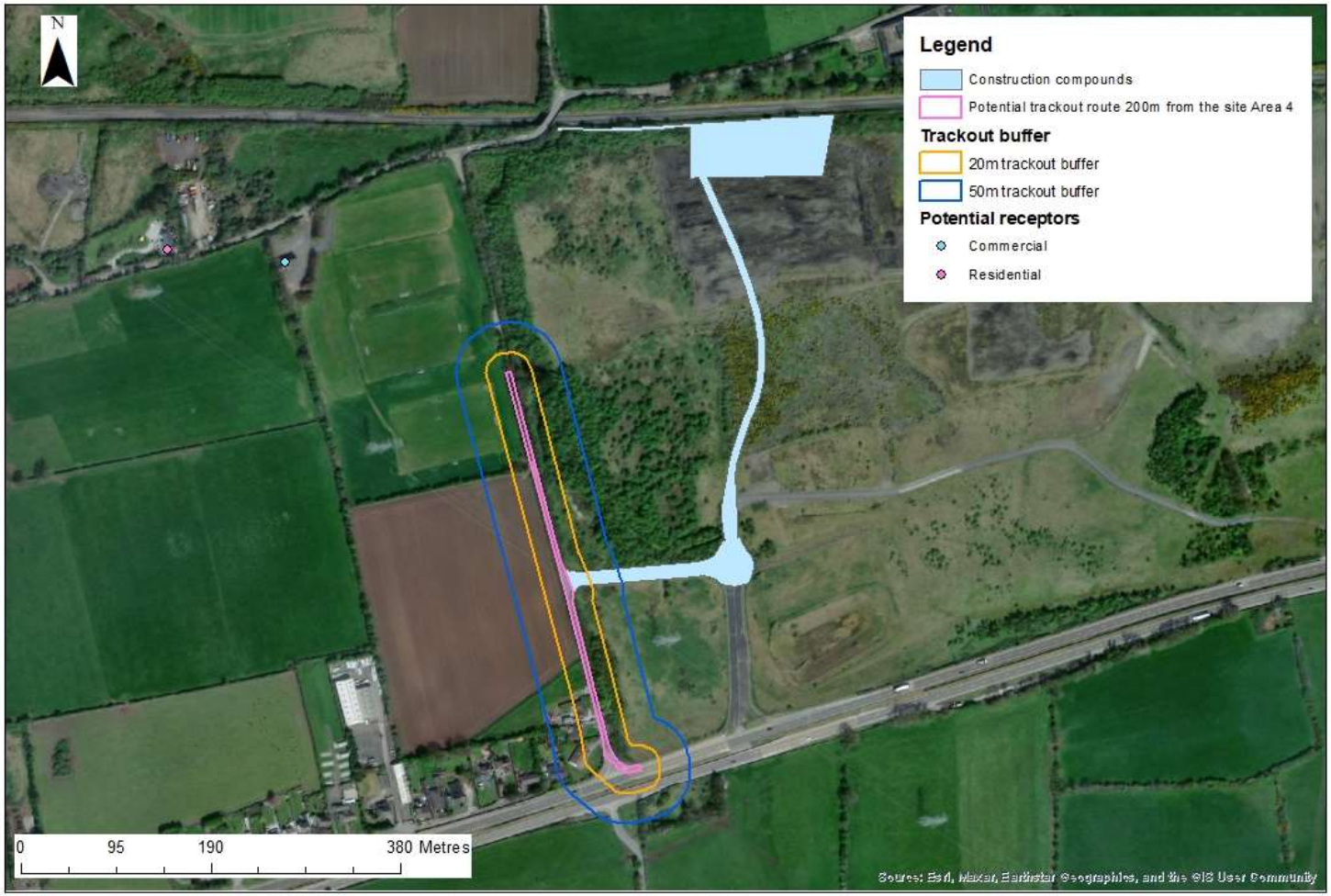


Figure 8.8: Construction Dust Assessment Buffers (Trackout) – Area 4



Dust emission magnitudes in Area 4 are summarised in Table 8.19.

Table 8.19: Dust emission magnitude in Area 4

Activity	Dust emission magnitude
Demolition	Small
Earthworks	Medium
Construction	Small
Trackout	Medium

The overall risk of receptors to dust effects in Area 4 is presented in Table 8.20 based on the criteria presented in the tables in Appendix 8.1.

Table 8.20: Summary of the risk of construction dust activity in Area 4

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	Low Risk	Medium Risk	Low Risk	Low Risk
Health effects	Negligible Risk	Low Risk	Negligible Risk	Low Risk
Ecological	N/A	N/A	N/A	N/A

Based on the above, the overall effect of dust nuisance and/ or loss of amenity from the construction phase in Area 4 is described as 'negligible to medium risk', without mitigation.

Area 5 (Midleton Town)

Area 5 includes the area of works on the railway tracks in and around the town of Midleton, starting approximately 100m west of the Owenacurra River and ending with the sidings east of Midleton station. It also includes the Owenacurra River Bridge (UBY11) and Construction Compounds 4 and 5. Sensitive receptors in the vicinity of the works area include residential properties on Millbrook Drive, Millbrook Avenue, R626, McSweeney Terrace, Copperfields and Forrest Hill.

Table 8.21 presents the sensitivity of the area to effects caused by construction activities and is based on the criteria presented in Table A.2 to Table A.5 in Appendix 8.1.

Table 8.21: Area Sensitivity – Area 5

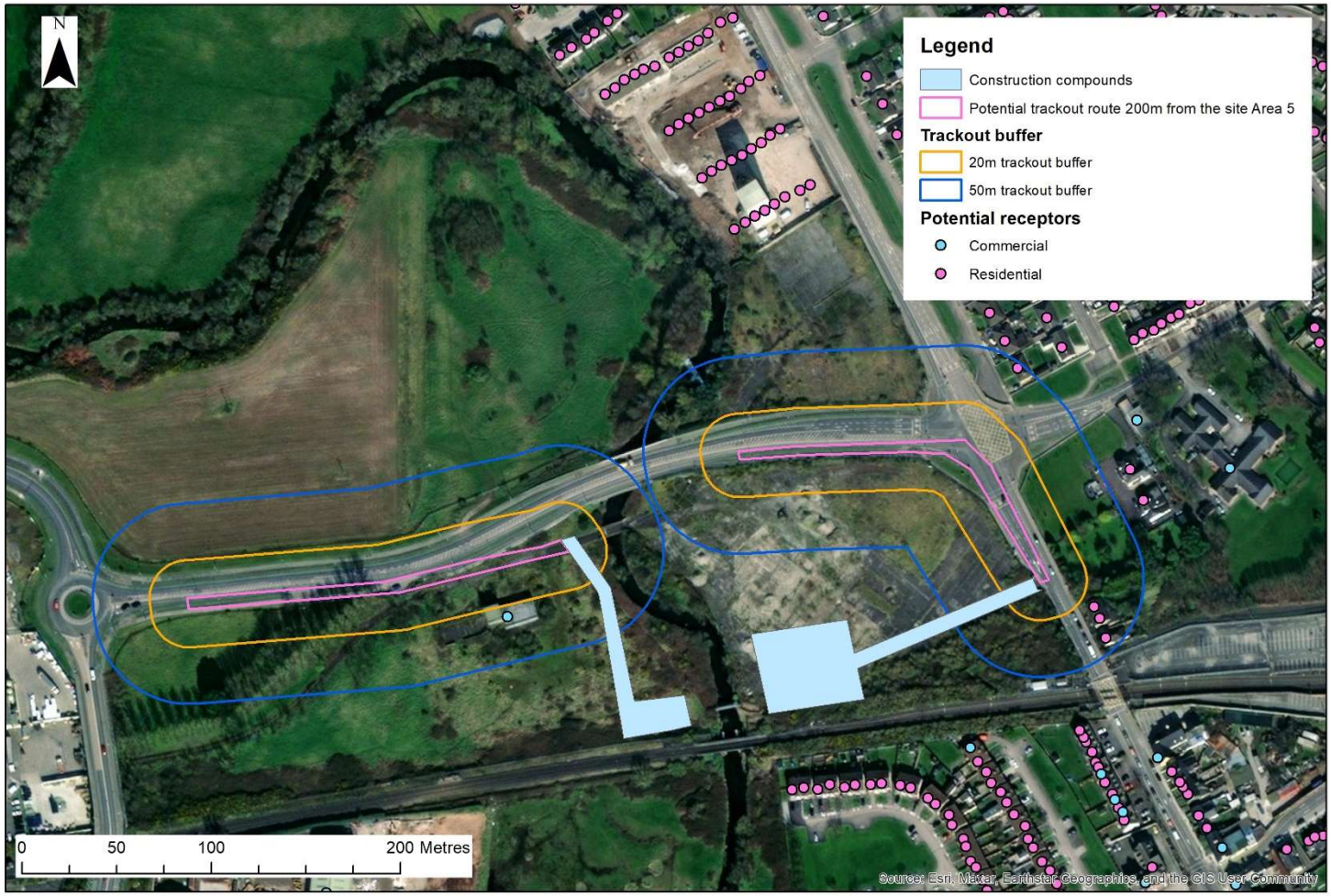
Activity	Dust soiling		Health effects of PM_{10}	
	Sensitivity	Comment	Sensitivity	Comment
Demolition	N/A	No demolition is planned in this area.	N/A	No demolition is planned in this area.
Earthworks	High	There are between 10 and 100 high sensitivity receptors (residential properties) within 20m of the works area.	Low	Background monitored annual PM_{10} concentrations in 2016-2020 ranged from 10-16µg/m^3. between 10 and 100 high sensitivity receptors (residential properties) within 20m of the works area.
Construction	High		Low	
Trackout	Low	There are between 1 and 10 high sensitivity receptors (residential properties) within 50m of the route used by construction vehicles, up to 200m from the compound entrance.	Low	There are between 1 and 10 high sensitivity receptors within 50m of the route used by construction vehicles, up to 200m from the compound entrance.

No designated ecological receptors are within 50m of the proposed development in Area 5.

Figure 8.9 presents the dust assessment buffers used for determining the proximity of sensitive receptors in Area 5. The extent of the dust emission area has been based on the Iarnród Éireann property boundary as the best source of information available at the time of assessment. This is a worst-case assumption, as the works area is likely to be smaller and closer to the proposed tracks. The trackout routes for from Construction Compound 4 in Area 5 are presented in Figure 8.10: Construction Dust Assessment Buffers (Trackout) – Area 5.

Figure 8.9: Construction Dust Assessment Buffers (Demolition, Earthworks and Construction) – Area 5

Figure 8.10: Construction Dust Assessment Buffers (Trackout) – Area 5



Dust emission magnitudes in Area 5 are summarised in Table 8.22.

Table 8.22: Dust emission magnitude in Area 5

Activity	Dust emission magnitude
Demolition	No emissions
Earthworks	Medium
Construction	Small
Trackout	Medium

The overall risk of receptors to dust effects in Area 5 is presented in Table 8.23 based on the criteria presented in the tables in Appendix 8.1.

Table 8.23: Summary of the risk of construction dust activity in Area 5

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	N/A	Medium Risk	Low Risk	Low Risk
Health effects	N/A	Low Risk	Negligible Risk	Low Risk
Ecological	N/A	N/A	N/A	N/A

Based on the above, the overall effect of dust nuisance and/ or loss of amenity from the construction phase in Area 5 is described as ‘negligible to medium risk’, without mitigation.

Summary

The overall level of risk of impacts from dust emissions in the vicinity of each works area, before mitigation, is summarised in Table 8.24.

Table 8.24: Summary of the maximum risk of construction dust activity in each works area

Works area	Risk			
	Demolition	Earthworks	Construction	Trackout
Area 1 (East of Glounthaune)	N/A	Medium Risk	Low Risk	Low Risk
Area 2 (Carrigtwohill Industrial Estate)	N/A	Low Risk	Negligible Risk	Low Risk
Area 3 (Castlelake)	N/A	Medium Risk	Low Risk	N/A
Area 4 (West of Midleton)	Low Risk	Medium Risk	Low Risk	Low Risk
Area 5 (Midleton Town)	N/A	Medium Risk	Low Risk	Low Risk

These impacts will also be temporary for each section of railway, since construction activities will last for a short period, before moving on to the next section of tracks.

Further to this, in general, there should be no cumulative impact associated with construction dust due to phasing of the construction period and the geographic extent of the proposed development. There will be more than 350m separating different construction compounds so sensitive receptors will not experience cumulative effects from construction dust generated from the inside the compounds or their trackout routes. Work activities along the track are likely to be completed sequentially in small sections, therefore the risk of cumulative impacts is negligible.

Mitigation measures appropriate for the proposed development have been presented in Section 8.758.6.5, divided by level of risk. These measures will be incorporated within a Construction Environmental Management Plan (CEMP) included in Appendix 6.1 to further reduce the risk to ‘negligible’ level.

8.6.1.2 Construction plant and traffic

As anticipated in Section 8.3.1, the effects of construction plant emissions on local air quality are considered of negligible significance compared to surrounding road traffic contributions on the local road network. Construction plant emissions have therefore not been assessed further with respect to air quality.

Construction traffic is anticipated not to exceed the criteria set by guidance (an increase of 100 or more heavy duty vehicles, or 500 or more light duty vehicles as an annual average, according to EPUK / IAQM guidance, or an increase in total number of vehicles of more than 10% as an annual average, according to TII guidance) for assessment of traffic impacts on any road in the study area. The effects of construction road traffic on ambient air quality can therefore be considered negligible across the study area.

8.6.2 Operation Phase and Maintenace

8.6.2.1 Emissions from trains

Given the timetable of the train service Mallow – Cork – Midleton between the stations of Glounthaune and Midleton, trains are likely to be stationary or idling for more than 15 minutes only at Midleton station or its sidings. There are no residential properties or other receptors relevant for long-term exposure within 15m of the proposed tracks at the station or sidings. Areas within 15m where members of the public could be exposed include the station, its platforms and the adjacent car parks, and it is considered unlikely that members of the public would regularly spend one hour or more in these areas. It is then considered that the risk of exceedance of the 1-hour SO_2 standard in these areas due to emissions from stationary trains is considered negligible.

As detailed in Section 8.4, the background annual mean NO_2 concentration in the study area (within 30m of the railway tracks) is likely to be well below 25µg/m^3, therefore the risk of exceedance of the long-term NO_2 standard in this area due to emissions from moving trains is considered negligible.

8.6.2.2 Operational road traffic emissions

As explained in Section 8.3.2.2, given the existing pollutant concentrations are likely to be well below 90% of the relevant standards, the risk of localised effects around the stations and level crossings resulting in exceedances of the air quality standards is considered negligible.

Any increases in traffic and emissions at local stations due to commuters to Cork who would use the Glounthaune to Midleton railway line as a park-and-ride service are likely to be offset by a reduction in traffic and emissions within the city of Cork, where NO_2 concentrations are likely to be higher than in the study area (see Section 8.5.2), resulting in a potential net beneficial effect.

8.6.3 ‘Do nothing’ scenario

As explained in Chapter 3 (Policy and Need for the Proposed Development), the Cork County Development Plan 2022-2028[20] includes goals to increase the population living along the railway and commuting for work and study into Cork. In a ‘do nothing’ scenario, the increase in population is likely to result in an increase in private traffic on the roads connecting commuter belt towns and villages to Cork, and to existing railway stations on the Glounthaune to Midleton line. An increase in emissions from traffic would result in a deterioration of ambient air quality along those routes and stations. Impacts due to traffic emissions in this scenario have not been

[20] Cork County Development Plan 2022-2028 | Cork County (corkcoco.ie)

quantified, but are likely to be larger than in the operational phase of the proposed development.

In this scenario, no construction or demolition would take place, therefore no impacts from dust emissions are anticipated on amenity, human health or ecological habitats. No impacts from emissions to air from construction traffic are anticipated.

8.6.4 Decommissioning effects

The impact associated with the decommissioning phase is similar to the impacts associated with the construction phase for air quality. The impacts and mitigation measures stated for the construction phase would also be relevant for the decommissioning phase. Therefore, provided that appropriate mitigation is used, the impact of the decommissioning phase on air quality should be reduced to a level such that no significant effects would occur.

The mitigation measures detailed in Section 8.77 are however applicable to reducing the impact of decommissioning and would be considered by the overseeing organisation, contractor and designer facilitating the decommissioning.

8.6.5 Cumulative effects

There is a risk of cumulative construction dust impacts associated with the construction phases of the proposed development occurring at the same time as the construction phases of nearby committed developments (see Table 2.2 in Chapter 2 of this EIAR for further details of these developments). It is therefore recommended, in line with IAQM guidance, that regular liaison meetings are held with construction sites within 500m of the site boundary to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. Provided this and other appropriate mitigation measures are implemented, such as those outlined in Section 8.7 of this chapter, the cumulative air quality impact associated with the construction phase will not be significant.

Chapter 15 (Roads and Traffic) describes the impacts of cumulative construction traffic from the proposed development and other committed developments. Traffic impacts from other developments which are unlikely to occur at the same time as the construction phase of the proposed development, or are already included in the traffic growth assumptions, have not been considered further. The construction traffic impacts from the proposed Celtic Interconnector project, which are planned to take place in the same period as the proposed development between January and August 2024, have been quantitatively assessed together with construction traffic from the proposed development. On routes where impacts from both developments could overlap, the total increase in HDV movements traffic is still unlikely to be higher than 100 AADT or 10% of existing traffic flows. Traffic emissions on those routes are therefore not likely to require further assessment.

8.7 Mitigation and Monitoring Measures

8.7.1 Construction dust emissions

Mitigation measures included in the CEMP (refer to Appendix 6.1) are set out below and have been adapted from best practice guidance from the IAQM, based on the dust risk identified in Section 8.6 and considering the duration of the construction period.

Different mitigation measures have been recommended for different areas, based on construction activities and level of risk. With the implementation of these measures, fugitive emissions of dust from the proposed development will be negligible and therefore not significant.

The CEMP will facilitate stakeholder communications and community engagement prior to the commencement of construction.

8.7.1.1 All areas

All areas are predicted to have at least 'low risk' in terms of dust soiling and PM_{10} effects due to earthworks activities, with no mitigation in place. Best practice mitigation measures which will be implemented for these activities are presented below:

- Communication:
  - Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary; and
  - Display the head or regional office contact information.
- Site Management:
  - Record all dust and air quality complaints, identify causes and take appropriate measures to reduce emissions in a timely manner and record the measures taken;
  - Make the complaints log available to the local authority when asked; and
  - 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 and record inspection results, and make an inspection log available to the local authority when asked; and
  - 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.
- 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;
  - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site; and
  - Avoid site runoff of water or mud.
- Operating vehicles/ machinery and sustainable travel:
  - Ensure all vehicles switch off engines when stationary – no idling vehicles; and,
  - 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;
  - 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; and
  - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Waste management:
  - Avoid bonfires and burning of waste materials.

8.7.1.2 Area 4 ('Low' risk from demolition activities)

In addition to all measures specified in Section 8.5 (All areas):

- Measures specific to demolition:
  - Ensure effective water suppression is used during demolition operations;
  - Avoid explosive blasting, using appropriate manual or mechanical alternatives; and
  - Bag and remove any biological debris or damp down such material before demolition.

8.7.1.3 Areas 1, 3, 4 and 5 ('Medium' risk from earthworks activities)

In addition to all measures specified in Section 8.5 (All areas):

- Communication:
  - Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Monitoring:
  - Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary.
- Preparing and maintaining the site
  - Keep site fencing, barriers and scaffolding clean using wet methods;
  - Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
  - Cover, seed or fence stockpiles to prevent wind whipping.
- Operating vehicles/ machinery and sustainable travel:
  - Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Operations:
  - Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

8.8 Residual Impacts

With the successful incorporation of best practice mitigation as detailed in the CEMP (refer to Appendix 6.1), the residual impacts on dust emissions from construction activities would be negligible.

There are no significant impacts predicted during the construction and operational phases for air quality with the successful incorporation of best practice mitigation.

8.9 Summary

This chapter provides an assessment of the impacts on air quality arising from the proposed development.

As discussed in Section 8.3, air quality impacts associated with road vehicle traffic and construction plant during construction and operation of the proposed development are anticipated to be of negligible significance so have been scoped out of the assessment.

A qualitative assessment of construction dust effects has however been undertaken for the different construction activities associated with the proposed development. Across the different construction activities, the level of risk of dust creating nuisance and/or loss of amenity and PM_{10} leading to adverse health effects (without mitigation) is predicted to range from 'negligible' to 'medium risk'. Following the appropriate implementation of the mitigation measures, such as

those presented in Section 8.7, the air quality impacts associated with dust are predicted to be not significant.

Air quality impacts from the operation of additional diesel trains have been assessed qualitatively, and considered to be negligible and not significant.

As the air quality impacts associated with the proposed development are not significant and ambient pollutant concentrations are well below the relevant air quality standards, no exceedances of air quality standards are anticipated.

8.10 References

The Air Quality Standards Regulation 2011 (S.I No. 180 of 2011)

Environmental Protection Agency (2021), 'Air Quality Zones'. Available at; https://airquality.ie/information/air-quality-zones

National Road Authority (2011), 'Guidelines for the treatment of air quality during the planning and construction of national road schemes'.

Environmental Protection UK and Institute of Air Quality Management (2017), 'Land-Use Planning and Development Control: Planning for Air Quality'

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European Union (April 2008) Directive on Ambient Air Quality and cleaner Air for Europe, Directive 2008/50/EC Official Journal, vol. 152, pp. 0001-0044

Institute of Air Quality Management (2014). 'Guidance on the assessment of dust from demolition and construction

Department for Environment, Food and Rural Affairs (2021), 'Local Air Quality Management. Technical Guidance (TG16)'.

National Transport Authority (2020), 'Strategic Environmental Assessment Environmental Report for the Cork Metropolitan Area Transport Strategy 2040'.

Cork County Council (2022), 'Cork County Development Plan 2022-2028'. Available at: https://www.corkcoco.ie/en/cork-county-development-plan-2022-2028

Chapter 9 - Climate

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9 Climate

9.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

This chapter considers the impacts on climate change arising from the proposed development. Any descriptions of the proposed development should be read in conjunction with Chapter 6 Description of the Proposed Development. The assessment predicts the potential greenhouse gas emissions[1] (GHG) arising from the construction and operation of the proposed development and, where appropriate, specifies mitigation measures to reduce potential impacts.

The following chapter has been prepared in accordance with the EPA Guidelines (2022) as set out in Chapter 2 and the European Commission's (EC) "Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EIA)"[2].

9.2 Relevant legislation and policies

The principal legislation and policies relevant to the assessment of the environmental impact of the proposed development on climate are outlined below.

The proposed project is a key component in providing improved regional public transport and reducing the share of private vehicle journeys. Although the proposed project will lead to GHG emissions through construction and operation, in the long term it is intended to help reduce transport emissions and reduce congestion related emissions. With this in mind, the proposed project is consistent with the following plans, strategies and objectives specified in section 15 of the Climate Action and Low Carbon Development Act 2015, as amended ("the 2015 Act"):

- The National Climate Objective;
- The most recent Climate Action Plan;
- The most recent National Long-Term Climate Action Strategy;
- The most recent National Adaptation Framework; and

[1] Greenhouse Gases (GHGs) refer to the seven gases covered by the Kyoto Protocol: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3). These are measured in units of carbon dioxide equivalent (CO2e) which expresses the impact of each gas in terms of the amount of CO2 that would create the same impact. GHGs are commonly referred to as carbon.

[2] EC (2013), Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment. Available at: https://climate-adapt.eea.europa.eu/metadata/guidances/guidance-on-integrating-climate-change-and-biodiversity-into-environmental-impact-assessment (accessed 19/05/2022).

- The objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State.

The 2015 Act defines the National Climate Objective as the objective '… to pursue and achieve by no later than the end of the year 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy ….' ;

Under section 3(2) of the 2015 Act the requirement for the relevant Minister to make the Climate Action Plan, the National Long-Term Climate Action Strategy and the National Adaptation Framework is for the purpose of achieving the National Climate Objective.

The National Climate Objective (again, the objective of becoming 'climate neutral' by 2050) is the same objective (and is to be achieved within the same timeframe) as the climate objective that the EU as a whole has set for itself (in Regulation (EU) No 2021/1119 (the 'European Climate Law'). The 'European Climate Law', writes into law at EU level the goal set in the 'European Green Deal' for the EU to achieve climate neutrality (or, 'net zero' greenhouse gas emissions) by 2050.

None of the Irish plans, strategies or objectives that are mentioned in Section 15 of the 2015 Act require specific significant and quantified greenhouse gas emissions' reductions from Irish-related transport in the short term. However, those plans, strategies or objectives do recognise that in order for transport to make an important contribution to the achievement of the common/shared Irish and EU objective of achieving climate neutrality by 2050, that emissions generally will have to consistently reduce over the long-term - to 2050….”

9.2.1 International Climate Change Legislation and Policy

Ireland is a party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. Both provide a legal framework for addressing global climate change. Building on the UNFCCC process, the Paris Agreement is a global treaty established with the intention of developing a unified approach to combating climate change. Agreed in December 2015, the Paris Agreement aims to restrict global temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C[3].

9.2.2 EU legislation

9.2.2.1 EU Effort Sharing Regulation[4]

Under the EU Effort Sharing Regulation, Ireland has a target of reducing GHG emissions not included in the EU Emissions Trading Scheme (EU ETS)[5] by 20% below 2005 levels by 2020 and a 30% reduction by 2030. These sectors include the following:

- Transport (except aviation and non-domestic shipping);
- Buildings;
- Agriculture;
- Industrial installations and gases not covered by the EU ETS and their waste;
- as well as non-combustion related emissions from energy and product use.

[3] UNFCCC (2015), Paris Agreement. Available at: Paris Agreement (All language versions) | UNFCCC (accessed 03/05/2022).

[4] EU (2018), Regulation (EU) 2018/842. Available at: EUR-Lex - 32018R0842 - EN - EUR-Lex (europa.eu) (accessed 11/10/21)

[5] The EU ETS covers CO_2 from energy intensive industry, electricity and heat generation, and aviation; N_2O from the production of nitric, adipic and glyoxylic acids and glyoxal; and Perfluorocarbons (PFCs) from the production of aluminium.

9.2.2.2 Fit for 55[6]

As part of the EU's commitment to reach climate neutrality by 2050, "Fit for 55" is a set of proposed revisions to EU legislation to help meet the interim goal of 55% reduction by 2030. The EU released five new proposals as part of its "Fit for 55" package. Most notably, the new emissions net reduction target was changed to 55% from 40% compared to 1990 levels. Revisions include increasing the uptake of renewable energy from 32% to 40%, a 42% reduction of non-ETS GHGs instead of 30% for Ireland in the Effort Sharing Regulation, and the introduction of a Carbon Border Adjustment Mechanism (CBAM). Although this new package has not yet become legally binding, it is currently being discussed by the European Parliament and European Council.

9.2.3 National legislation

9.2.3.1 Climate Action and Low Carbon Development Act 2015[7]

The Climate Action and Low Carbon Development Act 2015 set out the legislative framework in which the Irish Government will ensure the transition to "a low carbon, resilient and environmentally sustainable economy by the end of the year 2050". The main goals of the Act are to lay out the tools through which the transition will be achieved, these being:

- The national mitigation plan, which specifies the policy measures that will be required to manage and remove GHGs at a level appropriate to achieve the transition. It must be published at least every five years, the first was published in 2017.
- The national adaptation framework, which details the strategy that different sectors and local authorities must follow to reduce the vulnerability of the Irish State with regards to the effects of climate change. This too must be published at least every five years.
- An independent Climate Change Advisory Council, which will advise the Government in its preparation, submission, and approval of the mitigation plan and adaptation framework, as well as publishing its own report on the progress made by the Irish State.

The progress made in tackling climate change is presented yearly in the Annual Statement.

9.2.3.2 Climate Action and Low Carbon Development (Amendment) Act 2021[8]

The Climate Action and Low Carbon Development Act 2015 was amended in 2021 with a new objective for 2050 of a "climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy". The purpose of the amendment was to strengthen the ambition of the Irish Government in addressing climate change by setting in legislation some of the suggestions made by the Climate Action Plan[11] (see below) such as the five-year Carbon Budgets. These must be consistent with the Paris Agreement and other international obligations and will include all forms of GHG. The first two carbon budgets, over a period up to 2030, will have to lead to a 51% reduction in emissions compared to the 2018 baseline with the first carbon budget formally being approved by the Irish Parliament in 2022. The Government will then decide what the sector-specific emission ceilings will be within these budgets and detail possible actions in an annually updated Climate Action Plan. Finally, local authorities will also have to prepare their own action plans for adaptation as well as mitigation, rather than just adaptation as set in the original Act.

[6] Council of the European Union (2022): Fit for 55, The EU's plan for a green transition. Available online at: https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/ (accessed 16/09/22)

[7] Irish Government (2015); Climate Action and Low Carbon Development Act 2015 (2015). Available online at: Climate Action and Low Carbon Development Act 2015 (irishstatutebook.ie) (accessed 11/10/21)

[8] Irish Government (2021); Climate Action and Low Carbon Development (Amendment) Act 2021. Available online at: Climate Action and Low Carbon Development (Amendment) Act 2021 (irishstatutebook.ie) (accessed 11/10/21)

9.2.3.3 Climate Change & Low Carbon Development Act 2015 as amended by the Climate Action & Low Carbon Development (Amendment) Act 2021 ("together referred to as the 2015 Act")

The Climate Action and Low Carbon Development Act 2015 was amended by the Climate Action and Low Carbon Development (Amendment) Act 2021 (also referred together herein as "the 2015 Act") and defines the National Climate Objective as "… *to pursue and achieve by no later than the end of the year 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy* …."

Under section 3(2) of the 2015 Act the requirement for the Minister for the Environment, Climate & Communications to make the Climate Action Plan, the National Long-Term Climate Action Strategy and the National Adaptation Framework is for the purpose of achieving the National Climate Objective. The National Climate Objective (again, the objective of becoming 'climate neutral' by 2050) is the same objective (and is to be achieved within the same timeframe) as the climate objective that the EU as a whole has set for itself (in Regulation (EU) No 2021/1119 (the 'European Climate Law'). The 'European Climate Law', writes into law at EU level the goal set in the 'European Green Deal' for the EU to achieve climate neutrality (or, 'net zero' greenhouse gas emissions) by 2050.

Section 15 of the Climate Action and Low Carbon Development Act 2015 was *inter alia* amended by section 17 of Climate Action and Low Carbon Development (Amendment) Act 2021 with effect from 7 September 2021 (S.I. No. 468 of 2021).

Section 15 of the 2015 Act, as amended with effect from 7 September 2021, now provides:

"(1) A relevant body shall, in so far as practicable, perform its functions in a manner consistent with—

(a) the most recent approved climate action plan,

(b) the most recent approved national long term climate action strategy,

(c) the most recent approved national adaptation framework and approved sectoral adaptation plans,

(d) the furtherance of the national climate objective, and

(e) the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State."

The most recent approved climate action plan is the *Climate Action Plan 2021*, which was published on 4 November 2021. Section 15 of the 2015 Act relates to the duties of certain bodies and requires that such bodies perform their respective functions, in so far as is practicable, in a manner "consistent with" specified matters.

Within this chapter and this EIAR the application for this Railway Order between Glounthaune to Midleton is considered against the matters set out in subsection 15(1) above. For the reasons set out below, in relation to the proposed development, it is considered that An Bord Pleanála can perform its functions in relation to the consideration and granting of this application for a Railway Order in a manner consistent with the matters set out at section 15(1)(a) to (e) of the 2015 Act, and the granting of a Railway Order for the proposed development would not involve any inconsistency with the matters set out at section 15(1)(a) to (e) of the 2015 Act.

- The proposed development will facilitate an increase in the use of public transport and a modal shift from private car to train – the Climate Action Plan sets out a target for 2030 of an additional 500,000 daily public transport and active travel journeys.

- The *National Adaptation Framework – Planning for a Climate Resilient Ireland* (2018) sets out the planning for adaptation within sectors and local authorities, a framework for delivering climate resilience and identifies the governance of same. In relation to the transport sector, *Adaptation Planning – Developing Resilience to Climate Change* was published in 2019, following a draft in 2016. The vulnerability of the transport sector to climate change is assessed and options for adaptation discussed. Chapter 11 Surface Water and Flood Risk assessed the effects of the proposed development with regard to flood risk. Chapter 18 assesses the potential for disasters and major accidents in relation to the proposed development.
- The proposed development, by facilitating an increase in train journeys and encouraging a modal shift from private car to public transport, will further the national climate objectives and facilitate a reduction in greenhouse gas emissions.

9.2.4 National policy

9.2.4.1 National Policy Position, 2014[9]

The National Policy Position recognised the challenge of reducing Ireland's emissions as well as setting the objective of an 80% reduction of CO_2 emissions by 2050 compared to 1990 across the electricity generation, built environment and transport sectors, as well as "approaching" carbon neutrality in the agricultural and land-use sector. The strategies set out to achieve this were first outlined in the first National Mitigation Plan (2017)[10]. Moving forward, climate policy in Ireland will be a continual and dynamic process with frequently updated national plans to be adopted over the period to 2050.

9.2.4.2 Climate Action Plan 2021[11]

The Climate Action Plan was first published in 2019[12] and detailed the proposed cross-sectoral policy measures for addressing climate change by setting out 200 different actions that could be implemented to meet its 2030 targets consistent with a net zero target by 2050. Some of the main actions aimed at increasing electricity generated from renewables to 70% through the Government's flagship support scheme, reducing EU ETS industry emissions by 10-15% compared to projections, and increasing the number of EVs and LEVs to 936,000.

Ireland will have to reduce its total GHG emissions by 7% annually to meet its 2030 objectives, which will require a step up in its effort. This has been detailed in a new Climate Action Plan (Climate Action Plan 2021) which outlines 475 actions to be undertaken by the Irish Government. These include increasing the share of electricity demand being sourced by renewables to 80%, improving public transport infrastructure to increase active travel journeys by 14%, and decarbonising heat and building materials.

[9] Department of the Environment, Climate and Communications; National Policy Position. Available at: gov.ie - National Policy Position on Climate Action and Low Carbon Development (www.gov.ie) (accessed 11/10/21)

[10] Department of the Environment, Climate and Communications; National Mitigation Plan 2017. Available at: gov.ie - National Mitigation Plan (www.gov.ie) (accessed 11/10/21)

[11] Department of the Environment, Climate and Communications; Climate Action Plan 2021. Available at: gov.ie - Climate Action Plan 2021 (www.gov.ie) (accessed 03/05/22)

[12] Department of the Environment, Climate and Communications; Climate Action Plan 2019. Available at: https://www.gov.ie/en/publication/ccb2e0-the-climate-action-plan-2019/ (accessed 03/05/22)

9.2.5 Local policy

9.2.5.1 Climate Action Charter[13]

Cork County Council is a signatory to the Climate Action Charter, which commits the county to reduce GHG emissions, address the impacts of Climate Change, and acknowledge that a holistic approach that includes all levels of government is essential. There are no specific targets associated with this charter.

9.2.5.2 Cork County Council Climate Change Adaptation Strategy (2019-2024)[14]

The strategy is focused on adaptation in the County, by identifying what the major future risks are and what their impacts may be, such as extreme weather events and the impacts these may have on the built environment. Importantly, it also identifies the major actions the county can take to help local communities be resilient to these impacts.

9.2.5.3 Establishment of Climate Action Regional Offices (CAROs)[15]

Four regional offices were set up, funded by the Department of Environment, Climate and Communications, to coordinate regional and local level action on climate change, as a response to the National Adaptation Framework published in 2018. The Atlantic Seaboard South CARO is led by Cork County Council. CAROs align with national climate policies and Local Authority climate action charter. CAROs cover climate adaptation, mitigation, communication and citizen engagement, training and education, knowledge development, and office management and partnership. Mitigation work includes developing guidance for Local Authorities on energy and emissions management, as well as planning and carbon offsetting.

9.2.6 Other policy and guidance

9.2.6.1 PAS 2080:2016 Carbon Management in Infrastructure[16]

Following the Infrastructure Carbon Review in 2013[17] which identified infrastructure as responsible for more than half of the UK's GHG emissions, the Publicly Available Specification (PAS) 2080 was developed in 2016 to set out a common approach and understanding to managing whole life carbon in the provision of economic infrastructure. The PAS promotes reduced carbon, reduced cost infrastructure delivery, more collaborative ways of working, and a culture of challenge in the infrastructure value chain.

9.2.6.2 Iarnród Éireann sustainability

Iarnród Éireann are committed to aligning with Ireland's Climate Action Plan (detailed above), the EU's "Fit for 55", and the United Nation's (UN) Sustainable Development Goals (SDGs). This is reflected in their goals and commitments for 2030, some of which have been highlighted below and should influence the future operation of the railway:

- 51% reduction in carbon emissions;
- Net Zero Energy Building standard in all new buildings and upgrading old buildings;

[13] Cork County Council, Energy & Climate Change, Available at: Energy & Climate Change | Cork County (corkcoco.ie) (accessed 06/05/2022)

[14] Cork County Council. Climate Change Adaptation Strategy (2019-2024). Available online at: https://www.corkcoco.ie/en/environment/energy-climate-change (accessed 17/10/21)

[15] CARO.ie (2022). Available online at: https://www.caro.ie/

[16] BSI (2016) PAS 2080: Carbon management in infrastructure

[17] HM Treasury (2013) Infrastructure Carbon Review. Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/260710/infrastructure_carbon_review_251113.pdf (accessed 09/06/21)

- Increasing passenger journeys to 80 million (from 50 million pre-Covid levels);
- Promoting EVs or hybrid road vehicles by building rapid chargers at stations;
- Maximising the recycling of materials and increasing the share of purchases from recycled materials.

The Iarnród Éireann 2027 strategy[18] aims to develop and modernise Ireland's rail system to create a sustainable transport asset for the growing economy. Key climate action goals and strategy outcomes are highlighted below:

- 27 million passenger journeys switching from diesel to electric per year by 2027.
- 10% of Network km electrified in 2027.
- Use of more fuel-efficient technologies for 10% fuel savings, including transition to hybrid trains.
- Meet energy and environmental standards to improve management of waste, energy, and water.

9.2.6.3 Cork Metropolitan Area Transport Strategy (CMATS) 2040[19]

Cork is expected to become the fastest-growing city region in Ireland with a projected population increase of 50-60% by 2040; this will result in a significant increase in the demand for travel. CMATS addresses some key challenges including the expansion of transport capacity to cater for the increasing population, and the decarbonisation of transportation. The rail improvements within the strategy include the dual track to Midleton, as part of wider improvements to increase connectivity.

9.3 Methodology and Limitations

A qualitative approach was taken to complete the assessment of the proposed development. The method for this report was as follows:

- Identify a local or national baseline of publicly available GHG emissions data including transport and construction emissions.
- Assess the impact of the activities related to the proposed project by detailing these and determining whether these will have a positive or negative effect on climate compared to a scenario without the proposed project scenario.
- Highlight how these impacts are being mitigated against.

9.3.1 Significance Criteria

There is currently no nationally accepted threshold of GHG emissions which, if exceeded, can be defined as significant from an EIA perspective, this is also compounded by the fact that there is currently no calculated GHG emissions associated with the proposed development. In line with the methodology in Chapter 2, the EPA generalised degrees of significance are utilised as a means of determining the significance of the activities.

9.3.2 Limitations

A qualitative assessment has been conducted in the absence of quantitative design data at the time of assessment. The overall effect has been assessed based on professional judgement.

[18] The Iarnród Éireann (Irish Rail) 2027 strategy. Available online at: IE-Strategy-2027_Final_One-Page_20210114.pdf (irishrail.ie)

[19] The Cork Metropolitan Area Transport Strategy (CMATS) 2040. Available online at: Cork metropolitan area transport strategy - National Transport

9.4 National Baseline

The latest emission data for Ireland can be obtained from the EPA who collect the country's GHG database[20]. There was a 3.6% reduction of emissions in 2020 compared to 2019, which is due in the most part to Covid-19 restrictions. Ireland has the second highest GHG per capita in the EU, this is partly due to the fact that the significant emissions coming from agricultural emissions contribute to higher-than-average emissions from CH_4 and N_2O.

In 2021, the first assessment of emissions related to construction was conducted by the Irish Green Building Council (IGBC)[21], which identified that 23 M_tCO2e per year are related to the Built Environment of which 9 $MtCO_2e$ (14% of total Irish emissions) were related to embodied carbon. With current growth rates in infrastructure, embodied carbon emissions could increase significantly (to 25.9 $MtCO_2e$) by 2030.

2020 Transport emissions amount to 17.9% of total (9.7 Mt CO_2e) emissions in Ireland, with these estimated to increase by approximately 2 Mt CO_2e by 2030 if no additional policies are implemented, and road transport usage continues to grow[15]. If additional measures are put in place such as the implementation 2021 Climate Action Plan which includes the increase in walking, cycling and public transport journeys, then a 0.6 Mt CO_2e decrease by 2030 is projected.

9.5 Likely Significant Impacts of the Proposed Development

The impacts of the proposed development including all phases of construction, as well as the operational activities, have been scoped into this report and are summarised hereafter. Table 9.1 summarises these.

9.5.1 Construction Phase

The proposed development has been divided into six phases with the second to fourth phases having the most significant impact given these are composed of demolition, earthworks, and construction activities, respectively. All these activities will require the usage of additional material such as fill, concrete, and steel, their transport, and the disposal of excavated materials offsite. Additionally, a temporary diversion will be needed to redirect traffic away from the construction site (at Water Rock level crossing), this will require vehicles to take a longer and potentially more congested route over the 16 week road closure.

- **Pre-construction emissions:** Preparatory works and consultations with statuary bodies and the public.
- **Enabling works:** preparatory works such as site clearance and installation of boundary fencing, which will require vehicle on site usage although the effects are expected not to be significant. OBY8 (Bridge at Ballyadam House) is also set to be dismantled, which will require the operation of vehicles on site as well as provision of infill onto the site and removal of waste material to various licenced waste disposal facilities.
- **Earthworks, drainage and track sub-base:** the new railway line will require the reprofiling and removal of some embankments, the addition of new cuttings, new embankments and in certain cases retaining walls, and the installation of subgrade drainage.
- **Track realignment and construction emissions:** this phase of the project will necessitate the installation of additional track, widening of a bridge, extension of two culverts, as well as the realignment of a culvert and lengthening of the culvert.

[20] Environmental Protection Agency, Greenhouse Gas Emissions (GHG); Latest emissions data. Available at: Latest emissions data | Environmental Protection Agency (epa.ie) (accessed 06/05/2022).

[21] Irish Green Building Council (IGBC) (2022); Whole Life Carbon in Construction and the Built Environment in Ireland – Today & 2030. Available at: https://www.igbc.ie/resources/whole-life-carbon-in-construction-and-the-built-environment-in-ireland-2-draft/ (accessed 20/05/2022)

- **Signalling works:** some cabling works will have to be done to allow for upgrades to the signalling where, as much of current cables will be reused. The new signalling will be installed to enable the operation of the reconfigured railway.
- **Commissioning:** ensure that the proposed project has been delivered in full working order to requirements.

9.5.2 Operational Phase and maintenance

The operational emissions will be an important contributor to the overall emissions as these will occur over the whole lifetime of the project. These include the operational energy and fuel use as well as maintenance of the infrastructure.

- **Operation and maintenance emissions:** maintenance and operations will have moderate adverse effects compared to the 'do nothing' scenario; increased frequency of trains will necessitate increased maintenance and energy usage. This programme is intended to help reduce overall transport emissions and reduce congestion related emissions through modal shift from car to train. The anticipated operational emissions would be further reduced when the new infrastructure is made suitable for electrified trains or trains powered by other low-carbon or renewable sources, rather than diesel engines.

9.5.3 Overall likely impacts of the proposed development

IEMA guidance (2022)[22] on assessing GHGs in environmental impact assessment considers that the significance of a project's emissions is based on the net impact over the project lifetime. This guidance sets out that all GHG emissions can be considered significant, regardless of scale, unless projects implement emissions reduction measures and reduce residual emissions at all stages, with reductions on a pathway moving towards net zero.

Table 9.1 summarises the activities and emissions sources likely to arise from the proposed development. It should be noted that all sources of emissions have an adverse effect. The impacts have not been quantified and so the likely level of significance is assessed overall for the proposed development based on professional judgement. This is subject to change once emissions can be quantified and mitigation measures are set out. Overall, given the impact of new construction, the proposed development is likely to have a significant effect.

Table 9.1: Summary of likely effects from proposed project

Phase	Construction Activity	Emission Source
Pre-construction	Preparatory works and consultations	Embodied emissions (from production of construction materials such as concrete, aggregate, and steel), vehicle movements and energy and water usage
Enabling Works	Boundary Fencing	Embodied emissions, vehicle movements
	Site Clearance	Vehicle movements
	Demolition of OBY8 Bridge	Vehicle movements and energy usage
	Demolition of OBY8 Bridge	Transport of waste
	Demolition of OBY8 Bridge	Waste processing and disposal
	Provision of infill	Vehicle movements and embodied emissions
Earthworks, drainage and track sub-base	Earthworks (removal and reprofiling of embankments)	Vehicle movements, energy usage and removal of excavation
	Earthworks (new embankments, cuttings, and retaining structures)	Embodied emissions, transport of fill, and site activities including energy and water use

[22] IEMA (2022) Environmental Impact Assessment Guide to Greenhouse Gas Emissions and Assessing their Significance. Available at: IEMA - Launch of the Updated EIA Guidance on Assessing GHG Emissions (accessed 24/05/2022).

Phase	Construction Activity	Emission Source
	Drainage	Embodied emissions, transport of materials, and installation
Construction	Culverts	Embodied emissions, transport of materials, and installation
	Culvert realignment	Embodied emissions, transport of materials, and installation
	Widening of bridge	Embodied emissions, transport of materials, and installation
	Track installation	Embodied emissions, transport of track, and installation
	Diversions	Additional traffic kilometres due to works
Signalling works	Cabling works	Vehicle movements, transport of materials, installation, some additional materials
	New signalling	Vehicle movements, transport of materials, installation, some additional materials
Commissioning works	Ensuring project delivery	Vehicle movements
Operation and maintenance	Maintenance, repair, and replacement	Vehicle movements, product usage/replacement, water and energy usage
	Operational energy use emissions	Operation of trains
	Impact on road users	Potential for increased road congestion at level crossing.
Decommissioning	Deconstruction and demolition	Vehicle movements and energy usage
	Removal of waste material	Vehicle movements
	Treatment of waste material	Waste processing and disposal

9.6 Mitigation and Monitoring Measures

Ireland's Climate Action and Low Carbon Development (Amendment) Bill 2021 commits to net-zero carbon emissions by 2050. To support this, the development shall seek to reduce GHG emissions as far as practicable in all cases to contribute to a net reduction in carbon emissions. The proposed development will also provide an improvement in public transport infrastructure, which is one of the Climate Action Plan 2021 targets - *provide for an additional 500,000 daily public transport and active travel journeys*.

It is recommended that emissions reduction measures are put in place as part of the proposed development at design stage.

In the different stages of the development lifetime, several best practice mitigation measures will be implemented as detailed through the Construction Environmental Management Plan (CEMP):

- Ensuring all vehicles are switched off when stationary;
- Increasing the use of biofuel blends in petrol and diesel;
- Avoid using diesel- or petrol-powered generators, using battery or powered or mains electricity where practicable;
- Regular maintenance of construction plant to limit GHG emission intensity;
- No bonfires or burning of waste materials;
- Construction works should be carried out in accordance with the best practicable means, to reduce fumes or emissions which may result in additional GHG emissions. Plant equipment

and vehicles to be used on the proposed project should be selected based on their relative environmental performance.

A Construction Traffic Management Plan (Appendix 6.1, Appendix A) will include measures to minimise congestion during construction, and to coordinate efficient delivery to minimise the number of vehicle movements.

A Construction Resource Waste Management Plan (Appendix 6.1, Appendix B) has also been developed, detailing additional measures that will further help mitigate the impact of the project. This includes:

- Reduce the use of virgin resources, e.g. concrete reuse/recovery target of 85%;
- Keeping materials in the economy as long as possible;
- Where suitable source materials locally and use more sustainable / lower carbon intensity materials;
- Maintain the intrinsic value/quality of materials as high as possible.

During operation the following measures will be taken:

- Regular maintenance of train engines to limit GHG emission intensity;
- Electrical switchgear which contains SF_6 is compliant with European F-Gas Regulations to reduce leakage rates. Where possible non-SF6 equipment is preferred from a GHG emissions perspective.

9.7 Residual Impacts

While opportunities for carbon reduction (mitigation) have been identified in Section 9.6, as they are not quantifiable at this stage of the project, this residual effect assessment assumes that no mitigation has been implemented thereby presented a worst-case assessment of significant adverse impacts. As the design develops and more precise quantities are known, this assessment can be revised.

9.8 Summary

This chapter provides an assessment of the impacts on climate arising from the proposed development. The assessment includes for the construction and operation of the proposed development including construction road traffic and trains and the increased frequency of same. This assessment does not take into account of future electrification or the anticipated reduction in car journeys which could reduce emissions in the future.

A qualitative assessment of the GHG emissions has been undertaken in this chapter and is detailed in section 9.5. Overall, it is expected that the works necessary for the construction and operation of the development will have significant negative impacts. Measures are being taken to mitigate the impact of these and are listed in 9.6.

2022 IEMA guidance suggests that the carbon footprint of the project should be contextualised to the country's Net Zero trajectory[23]. The proposed project is a key component in the region's programme in providing improved public transport for the local population and reduce the share of private vehicle journeys. Regional models have found that use of public transport could increase from 5 to 21% by 2036, whilst also accounting for a 19% population increase[24]. This programme is therefore intended to help reduce transport emissions and reduce congestion related emissions. Therefore, the proposed project's overall significance may be qualified as minor adverse or negligible when accounting for the predicted modal shift occurs. This

[23] IEMA (2022) Environmental Impact Assessment Guide to Greenhouse Gas Emissions and Assessing their Significance. Available at: IEMA - Launch of the Updated EIA Guidance on Assessing GHG Emissions (accessed 24/05/2022).

[24] AECOM (2021) Cork Area Commuter Rail Programme, Strategic Assessment Report

anticipated operational saving would be further reduced when future new infrastructure is made suitable for electrified trains or trains powered by other low-carbon or renewable sources, rather than diesel engines.

Chapter 10 – Land, Soils and Hydrogeology

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10 Land, Soils and Hydrogeology

10.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application (also referred to herein as "the proposed Project") by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed project (comprising inter alia railway works), including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors. This chapter presents the assessment of the likely significant impacts arising from the proposed development on 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 detailed in Chapter 6 Description of the Proposed Development (and summarised in Section 10.3), prior to the implementation of additional mitigation measures. The methodology is based on that described in Chapter 2 EIAR Methodology with additional discipline-specific methods and assumptions is detailed in section 10.2.

This chapter considers the potential impacts during construction, operation (including maintenance) and decommissioning associated with:

- Land and land use;
- Soils and geology; and
- Hydrogeology.

Proposed environmental control measures and additional mitigation measures to prevent, reduce and/or offset the anticipated potential impacts are presented as appropriate.

The assessment of the likely significant effects arising from the proposed development on surface water is presented in Chapter 11 Surface Water and Flood Risk. The assessment of impacts on biodiversity is discussed in Chapter 12: Biodiversity.

10.2 Methodology and Limitations

10.2.1 Legislative and Policy Context

This chapter has been prepared in accordance with the requirements of the 2001 Act and the EIA Directive. In addition, the requirements of inter alia the following legislation have also been complied with:

- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012;

and S.I. No. 77/2019 and giving 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) and;

- S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) establishing a framework for the Community action in the field of water policy and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration. Since 2000, water management in the EU has been directed by the Water Framework Directive (2000/60/EC) (as amended by Decision No. 2455/2011/EC; Directive 2008/32/EC; Directive 2008/105/EC; Directive 2009/31/EC; Directive 2013/39/EU; Council Directive 2013/64/EU; and Commission Directive 2014/101/EU (WFD). The WFD was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003);
- S.I. No. 684 of 2007: Waste Water Discharge (Authorisation) Regulations 2017, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);S.I. No. 106 of 2007: European Communities (Drinking Water) Regulations 2007and S.I. No. 122 of 2014: European Communities (Drinking Water) Regulations 2014, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) and EU Directive 2000/60/EC; and
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended by S.I. No. 389/2011; S.I. No. 149/2012; S.I. No. 366/2016; the Radiological Protection (Miscellaneous Provisions) Act 2014; and S.I. No. 366/2016).
- Cork County Development Plan 2022-2028 and Cobh and East Cork Local Area Plans.

10.2.2 Relevant Guidelines

The assessment was carried out in accordance with the following guidance and tailored accordingly based on professional judgement and experience:

- Institute of Geologists Ireland (IGI) (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (NRA) (2009): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes; and
- CIRIA (2006): Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London.
- EPA (2022): Guidelines on the information to be contained in Environmental Impact Assessment Reports

10.2.3 Data Sources

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.

- Ordnance Survey Ireland 1:50,000 topographic maps.
- Geological Survey of Ireland (GSI) online mapping;
- Environmental Protection Agency (EPA) database (www.epa.ie);
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Teagasc Subsoil Mapping (2004) (www.gis.teagasc.ie/soils/map.php)
- Teagasc Soils Mapping (2007) (www.gis.teagasc.ie/soils/map.php)
- National Parks & Wildlife Service (NPWS) Public Map Viewer (www.npws.ie);

- Water Framework Directive Catchments Map Viewer (www.catchments.ie);
- Geological Survey of Ireland - Groundwater Body Characterisation Reports;
- CORINE Land Cover mapping (Copernicus, 2018)
- Glounthaune to Midleton Railway Geotechnical Interpretative and Design Report (AGEC Ltd, 2006)
- Glounthaune to Midleton Railway Addendum to Geotechnical Interpretative and Design Report (AGEC Ltd, 2006)
- Collation of groundwater wells, springs and karstic data were undertaken using GSI datasets and historic ground investigation reports only (e.g. AGEC Ltd, 2006a; 2006b)
- Information from site walkovers carried out by the wider project team in support of the proposed development.

A ground investigation specific to the proposed development was not carried out. Therefore, it is possible that there are additional features present, which are absent from the GSI / historic ground investigation dataset and hence not included within the baseline assessment. Where this uncertainty results in likely significant effects, appropriate mitigation measures have been proposed in the sections below.

10.2.3.1 Consultation

Public consultation raised a number of concerns from local residents about damage to caves at Water Rock. Specifically, that:

- The limestone cutting to the west of the Water Rock level crossing will need to be widened to allow construction of the twin track;
- The area is known to include caves including one into which the Water Rock stream drains;
- The area has been subject to historical flooding. Drainage to caves provide part of the natural flood alleviation in the area; and
- Residents are concerned that cutting (or the vibrations associated with cutting) will damage the cave system and increase the risk of flooding.

10.2.4 Methodology

10.2.4.1 Study Area

Unless otherwise stated, the study area for this assessment is defined as the area crossed by the proposed development (including the new track between Glounthaune and Midleton), areas of modified or replaced bridge works, sidings, and other associated works) and the area extending 500m from this, as recommended by the NRA (2009) guidance.

10.2.4.2 Identification of Receptors

The methodology used to identify the various baseline receptors across land and land use, soils and geology, and hydrogeology within the study area is summarised below in Table 10.1.

Table 10.1: Scope for identification of baseline receptors

Receiving Environment	Scope
Land and land use	• Land use types and potential contaminant profiles
Soils and geology	• Soils, subsoils, bedrock geology and other geological features, further to a review of GSI data

Receiving Environment	Scope
	• Mapped karst landforms including boreholes, caves, dry valleys, enclosed depressions, estavelles, springs, superficial solution features, swallow holes and turloughs • Traced underground connections of known water dye trace studies and results • Geological heritage sites (within 1km of the proposals) • Geohazards: recorded events, primarily landslides, within 1km of the proposals

Hydrogeology	• Groundwater body and both quantitative and qualitative status classification as assigned under the WFD
	• Groundwater: Groundwater abstractions from Public Supply Schemes, Group Water Schemes, and local domestic/agricultural wells (with varying degrees of location accuracy) mapped by the GSI
	• Groundwater Drinking Water Protection Areas
	• Aquifer Type, as assigned by the GSI; relates to the aquifers productivity in terms of well yields as detailed below:
	  ○ Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
	  ○ Lm - Bedrock which is Generally Moderately Productive
	  ○ Lk – Locally Important Aquifer – Karstified to a limited degree or area
	  ○ Rkd - Regionally Important Aquifer-Karstified (diffuse)
	  ○ Lg – Locally Important Aquifer- Sand and gravel
	• Aquifer Vulnerability
	• Designated sites that are hydrologically or hydrogeologically connected to the proposal
	• Aquifer Vulnerability
	• Designated sites that are hydrologically or hydrogeological connected to the proposed site
	• Groundwater Flooding risk is dealt with in Chapter 11 Water and Flood Risk

10.2.4.3 Assessment of Importance / Sensitivity of Receptors

The importance / sensitivity of the identified receptors across land and land use, soils and geology, and hydrogeology, were assessed on completion of the baseline assessment.

Specific guidance regarding the importance / sensitivity of land and land use is not available within the NRA (2009) guidance. As such, professional judgement has been used to assign receptor values based on the perceived ecological, economic and societal value of land use types.

The criteria used for assessing the importance / sensitivity of the soil and geological environments within the study area is outlined in Table 10.2 This is based on the NRA (2009) guidance, with additional criteria for the assessment of ground stability.

Table 10.2: Criteria for the estimation of the importance / sensitivity of soil and geological receptors.

Importance	Criteria	Typical Example
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 • Volume of peat and/ or soft organic soil underlying route is significant on a national or regional scale • Ground instability is significant on a national or regional scale	• Geological feature rare on a regional or national scale (e.g., Natural Heritage Area (NHA)) • Large existing quarry or pit • Proven economically extractable mineral resource • Major historical landslide or widespread subsidence
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 • Volume of peat and / or soft organic soil underlying site is significant on a local scale. Ground instability is significant on a local scale	• Contaminated soil on site with previous heavy industrial usage • Large recent landfill site for mixed wastes. • Geologically 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 • Large or small repeated historical landslide or localised subsidence
Medium	• Attribute has a moderate quality, significance or value on a local scale • Degree or extent of soil contamination is moderate on a local scale • Volume of peat and / or soft organic soil underlying site is moderate on a local scale • Ground instability is moderate on a local scale	• Contaminated soil on site with previous light industrial usage • Small recent landfill site for mixed wastes • Moderately drained and / or moderate fertility soils • Small existing quarry or pit • Sub-economic extractable mineral resource • Minor historical landslide or historical subsidence
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 • Volume of peat and / or soft organic soil underlying site is small on a local scale • Ground instability is very limited and only on a local scale	• Large historical and / or recent site for construction and demolition wastes • Small historical and / or recent site for construction and demolition wastes • Poorly drained and / or low fertility soils • Uneconomically extractable mineral resource • No historical landslides, weak or no evidence of any localised subsidence

Source: NRA (2009) and Mott MacDonald

The criteria used for assessing the importance / sensitivity of the hydrogeological environments within the study area is outlined out in Table 10.3. This is informed by the NRA (2009) guidance.

Table 10.3: Criteria for the estimation of the importance / sensitivity of hydrogeological receptors.

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	• Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation, e.g., Special Area of Conservation (SAC) or Special Protection Area (SPA) status
Very High	Attribute has a high quality or value on a regional or national scale	• Regionally Important Aquifer with multiple wellfields • Groundwater supports river, wetland or surface water body ecosystem protected by national legislation - NHA status • Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source
High	Attribute has a high quality or value on a local scale	• Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers • Locally important potable water source supplying > 1000 homes • Outer source protection area for regionally important water source • Outer source protection area for locally important source
Medium	Attribute has a moderate quality or value on a local scale.	• Locally important Aquifer • Potable water source supplying >50 homes • Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale.	• Poor Bedrock Aquifer Potable water source supplying <50 homes

Source: NRA (2009) and Mott MacDonald

10.2.4.4 Assessment of Magnitude of Impacts and Significance of Effects

Specific guidance relating to the assessment of impacts upon land and land use is not available within the NRA (2009) guidance. As such, professional judgement has been used to assess the magnitude of impacts considering the potential changes to ecological, economic and societal value.

The criteria used to assess the magnitude of impact on the geological environments within the study area is outlined in Table 10.4. This is informed by the NRA (2009) guidance.

Table 10.4: Criteria for rating geological impact significance

Magnitude of Impact	Criteria	Typical Examples
High Adverse	Results in loss of attribute and /or quality and integrity 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
Medium Adverse	Results in moderate 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
Low 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
Low Beneficial	Results in minor improvement of attribute quality	• Minor enhancement of geological heritage feature
Medium Beneficial	Results in moderate improvement of attribute quality	• Moderate enhancement of geological heritage feature
High Beneficial	Results in major improvement of attribute quality	• Major enhancement of geological heritage feature

Source: NRA (2009) and Mott MacDonald

The criteria used to assess the magnitude of impact on the hydrogeological environments within the study area is outlined in Table 10.5. This is informed by the NRA (2009) guidance and the criteria in EPA (2022).

Table 10.5: Criteria for rating hydrogeological impact significance

Magnitude of Impact	Criteria	Typical Examples
High 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
Medium Adverse	Results in moderate 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
Low Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	• Removal of small proportion of aquifer • 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
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
Low Beneficial	Results in minor improvement of attribute quality	• Minor enhancement of hydrogeological feature
Medium Beneficial	Results in moderate improvement of attribute quality	• Moderate enhancement of hydrogeological feature
High Beneficial	Results in major improvement of attribute quality	• Major enhancement of hydrogeological feature

Source: (NRA, 2009) and Mott MacDonald

As detailed in Chapter 2, the criteria used for assessing the significance of impact within the study area, based upon the magnitude of impact and importance of attribute, is summarised in Table 10.6.

Table 10.6: Rating of significant environmental impacts

Importance of Attributes / Magnitude of Impact	High	Medium	Low	Negligible
Extremely High	Profound	Profound	Very Significant	Not Significant
Very High	Very Significant	Significant	Moderate	Not Significant
High	Significant	Moderate	Slight	Not Significant
Medium	Significant	Moderate	Slight	Not Significant
Low	Moderate	Slight	Slight	Imperceptible

10.2.4.5 WFD Assessment Methodology

The design of the proposed development was screened against the characteristics for groundwater bodies numbered below. This determines whether the physical works require a further assessment to be compliant with the WFD and should be repeated if the proposed works are significantly altered in the future.

1. Water balance;
2. Groundwater abstraction related deterioration of dependent surface water body status;
3. Groundwater dependent terrestrial ecosystems (GWDTE); and
4. Saline or other intrusion test.

Following these assessments, where mitigation can be incorporated to maximise opportunities for enhancement, the works will be considered to have very low residual risk and will therefore be compliant with the WFD. Where mitigation cannot be incorporated, assessment against criteria presented in WFD Article 4(7) 'deterioration of status or non-achievement of good status or potential under certain distinct conditions' (WFD, 2000) will be required.

10.2.5 Limitations of this EIAR

No data from project specific ground investigations is available. This assessment is therefore based upon desktop data, including data from historical ground investigations and information from site walkovers. This includes published databases and historic ground investigation reports (AGEC Ltd, 2006a; 2006b) as referenced in Section 10.2.3. It is assumed that these data sources, as referenced in Section 10.2.3, are complete and comprehensive. As such, the assessment will only consider features identified within these data sources.

With regards to the WFD assessment, the embedded and additional mitigation detailed and proposed as part of this EIAR will be implemented when dealing with any such features to ensure that the proposed development will not cause them to deteriorate and will not in any way prevent them from meeting the biological and chemical characteristics for good status.

10.3 Receiving Environment

The following sections present an overview of the baseline features within the receiving environments: land and land use, soils and geology and hydrogeology. The baseline has been identified using the methodology outlined in Section 10.2.4.

The proposed works intersect three WFD groundwater bodies: the Ballinhassig East (IE_SW_G_004); Littleisland (IE_SW_G_090); and Midleton (IE_SW_G_058). Details of the WFD groundwater bodies may be found in Section 10.3.3.1.

10.3.1 Land and Land Use

The land and land use baseline (Table 10.7) has been defined based upon the CORINE (2018) land use inventory and divides the study area into several land use types for which potential contaminant profiles may be assigned.

Land Use and track chainage is shown in Drawing 22910163-MMD-00-XX-GIS-C-0001 in Appendix 10.1.

The baseline land and land use consists of six land use types within the Glounthaune to Midleton proposed new track. This predominantly includes a mix of agricultural (non-irrigated arable land, pastures, complex cultivation patterns) and urban (discontinuous urban fabric, industrial or commercial units, mineral extraction, road and rail networks and associated land) land use, with some small areas of other land use categorisation (broad-leaved forests, intertidal flats).

Table 10.7: Land use baseline

Land Use Type	Receptor Value	Distribution
Broad-leaved forest	Medium	Very small area at edge of study area approximately 470m north of Chainage 2700m.
Intertidal flats	Medium	Area south of track to Ch. 1200m.
Mineral extraction sites	Medium	Small area approximately 440m south of Ch. 7000m.
Pastures	Medium	Underlies track and/or study area, largest areas between Ch. 1620m – Ch. 2500m, Ch. 2925m – Ch. 5900m, Ch. 6175m - 7600m, Ch. 7980m – Ch. 9400m.
Non-irrigated arable land	Medium	Underlies track and/or study area at Ch. 350m – Ch. 2000m, Ch. 5625m – Ch. 8350m, Ch. 8900m – Ch. Ch. 9900. Present > 200m north of Ch. 2750m – Ch. 4350m
Complex cultivation patterns	Medium	Underlies a small area approximate at 120 m north of Ch.6500m.
Discontinuous urban fabric	Low	Underlies track at Ch. 350m to Glounthaune Station, Ch. 3160m – Ch. 3700m, Ch. 4050m – Ch. 4850m and Ch. 9650m – 10600m. Underlies Midleton Station.
Industrial or commercial units	Low	Underlies track at Ch. 2000m – Ch. 2925m and Ch. 9200m – 9620m.
Road and rail networks and associated land	Low	Approximately on the 500m buffer line south of Ch. 1250m – Ch. 3050m.

10.3.2 Soils and Geology

The soils and geology baseline has been defined considering soil, subsoil, bedrock geology, areas of geohazards and sites of geological heritage. Soil and subsoil receptors have been identified using Teagasc (2004; 2007) databases, which include the national Quaternary sediments database. Bedrock geological receptors have been identified using the data from the GSI. For the purpose of this assessment, geohazards have been identified as any karst features or areas susceptible to landslides/subsidence that would need to be considered prior to development (NRA, 2009). Karst features include caves, enclosed depressions, sinkholes, some type of springs, swallow holes and turloughs.

Maps and track chainage are shown in Appendix 10.1 for:

- Soils - Drawing 22910163-MMD-00-XX-GIS-C-0002
- Subsoils - Drawing 22910163-MMD-00-XX-GIS-C-0003
- Bedrock geology and karst features - Drawing 22910163-MMD-00-XX-GIS-C-0004
- Landslide susceptibility - Drawing 22910163-MMD-00-XX-GIS-C-0005

The baseline receptors and their corresponding receptor values, are outlined below and in Table 10.8.

- There are a wide range of soil types interspersed throughout the study area. Clashmore, which is a coarse loamy drift with siliceous stones, is the primary subsoil receptor identified. The soil is well drained and likely to be greater than 80 cm deep. There is also a variety of river and marine alluvium, tidal marsh, urban and Clonroche (fine loamy drift with siliceous stones) deposits, in addition to bedrock outcrops at certain points along the proposed development.
- Similarly, a range of subsoils (or superficial / quaternary deposits) have also been identified across the study area. These predominantly consist of Tills derived from Devonian sandstones, but also includes areas of alluvial, estuarine and gravel deposits. Small areas of karstified and non-karstified bedrock outcrop and/or subcrop have also been identified.

- The rocks of the region form part of a series of folds on east west axes with Carboniferous Limestones preserved in the synclines and older Old Red Sandstone exposed on the anticlines[1]. The study area is located within and aligned sub-parallel to one such east-west trending syncline (comprising Carboniferous limestones), referred to as the Youghal syncline. Hence, the bedrock geology underlying the proposed development predominantly consists of Carboniferous limestone deposits, including the Waulsortian Limestone (massive unbedded lime-mudstone), Ballysteen Formation (dark muddy limestone, shale) and to a small extent the Cork Red Marble Formation (red brecciated calcilutite limestone).
- Adjacent to these deposits are the Ringmoyland Shale Formation (calcareous shales and crinoidal limestones), Cuskinny member (flaser-bedded sandstone and mudstone), Castle Slate Member of the Kinsale Formation (grey-black slaty mudstone), Old Head Sandstone Formation (flaser-bedded sandstone and minor mudstone) and Gyleen Formation (sandstone with mudstone and siltstone). The area has been widely impacted by localised faulting, with generally north-south trending faults.
- Caves, enclosed depressions, turloughs, a swallow hole, a spring and areas of landslide susceptibility are all noted in or near the study area.
- No audited Geological Heritage Sites have been identified.
- Water Rock (a known sinking stream) is in close proximity to the track (*c.* Ch. 8550m). There is thin overburden depth (1.5m) in this area[2].

The classification of receptor values for the identified soil and geological receptors was based on Table 10.3. Soils identified as well drained and/or highly fertile are classified as high value, while poorly drained and/or low fertility soils classified as low value (NRA, 2009). Where soil was identified as potentially significantly contaminated at the local scale this was also identified as a receptor of high importance. Marine alluvium, river alluvium and urban soil type were receptors identified with a risk of a high level of contamination within the scope of this EIAR.

[1] GSI (2004) Midleton GWB: Summary of Initial Characterisation.

[2] APEC (2006). Glounthaune to Midleton Railway Addendum to Geotechnical Interpretative and Design Report

Table 10.8: Soil and geology baseline

Receptor	Receptor Value	Distribution
Soils		
Clashmore (Coarse loamy drift with siliceous stones)	High	Underlies most of the new track except for sections west of Chaingae 400m and between Ch. 9100m – Ch. 10380m.
Ross Carbery (Coarse loamy drift with siliceous stones)	High	Very small area 450m N of Midleton station (Ch. 10250m).
Clonroche (Fine loamy drift with siliceous stones)	High	> 250m N of Ch. 0 – Ch. 1700m. > 400m N of Ch. 2700m – Ch. 4800m
Marine alluvium	High	Narrow E-W trending strip underlies part of the route east of Glounthaune station (Ch. 0 – Ch. 400).
River alluvium	High	Underlies UBY11 (Ch. 9855m). Underlies the study area approximately 270m SE of Midleton station (Ch. 10250m).
Tidal marsh	High	Underlies the study area south of the new track between Glounthaune station and Ch. 1400m.
Urban	High	Underlies Midleton station (Ch. 10250m). Urban areas found north of the track at Glounthaune station, south of the track between Ch. 2150m and Ch. 2550m, and east (Ch. 9855m – Ch. 10550m) and west (Ch. 9000m – Ch. 9650m) of UBY11.
Rock	High	Very small area c. 400 m north of the track at Ch. 4900m.
Subsoils (superficial deposits)		
Alluvium	High	Underlies UBY11 (Ch. 9855m). Narrow strip underlying Glounthaune station. Underlies study area E of Midleton Station (Ch. 10500 to end of study area)
Estuarine silts and clays	High	Underlies the study area south of new track and Glounthaune station (Ch. 0m – Ch.1400m).
Gravels derived from Devonian sandstones	High	Underlies track and study area between Ch. 750m and Ch. 3350m, Ch. 7850m and Ch. 8500m, Ch. 8500m and Ch. 9650m. Small area underlying track between Ch. 6480m and UBY11 (Ch. 9855m). Small areas present E and NE of Glounthaune station. Small areas present N and NE of Middelton Station.
Kartsified bedrock outcrop or subcrop	High	Small area underlies track at Ch. 8550m. Small area immediately north of track at Ch. 8050m. Other small areas *c.* 50m – 350m north and south of track between Ch. 4750m – Ch. 8750m.
Till derived from Devonian sandstones	Medium	The predominant subsoil underlies large parts of the study area and track from Ch. 3350m to about Ch. 7850m. Underlies the study area north and east of Glounthaune station.

Receptor	Receptor Value	Distribution
Urban	High	Underlies Midleton Station (Ch. 10250m) and the study area north of new track and Glounthaune Station (Ch. 0m – Ch. 300m).
Bedrock outcrop or subcrop	High	Small areas c. 500m NW of Glounthaune Station. Small areas *c.* 400m – 500m north of track between Ch. 3750m and Ch. 6035m. Small areas NE of Midleton station (Ch. 10250m)
Bedrock		
Gyleen Formation (Sandstone with mudstone& siltstone)	Medium	Underlies the study area north and east of Glounthaune station. Small area *c.* 400 m north of Ch. 2700m – Ch. 3900m.
Cuskinny Member (Flaser-bedded sandstone & mudstone)	Medium	Underlies the study area (N of new track) between Glounthaune Station and Ch. 5850m. Small areas north of the new track between Ch. 7950m – Ch. Ch. 8850m and Ch. 9850m – Ch. 10450m. Displaced by a fault at Ch. 2700m.
Cork Red Marble Formation (red brecciated calcilutite limestone)	High	Small area *c.* 500 m SE of Ch. 1975 – Ch. 2600m.
Ballysteen Formation (Dark muddy limestone, shale)	Medium	Underlies Ch. 2700m – Ch. 5300m. N of new track Ch. 150m – Ch. 7000m and Ch. 7500m - Midleton station. Displaced by faults at Ch. 2700m and Ch. 9850m.
Old Head Sandstone Formation (Flaser-bedded sandstone & minor mudstone)	Medium	Underlies study area *c.* 400m north of Ch. 2650m – Ch. 4350m.
Waulsortian Limestones (Massive unbedded lime-mudstone)	High	Underlies a significant portion of the track (Ch. 0m – Ch. 2700m, Ch. 5300m – Midleton Station) and wider study area. Present south of the new track throughout the study area. Displaced by faults at Ch. 2700m and Ch. 9850m.
Ringmoylan Shale Formation (Calc. shales & crinoidal limestones)		Thin unit present between Ballysteen Formation and Cuskinny Member.
Castle Slate Member of Kinsale Fm. (Grey-black slaty mudstone)		Thin unit present between Cuskinny Member and Old Head Sandstone Formation.
Geohazards - Karst features		
Cave – BROOMFIELD Q.C. EAST (1707SEK019). Limestone, clean, unbedded. It is a “water table” cave.	High	Located approximately 175m north of Midleton station (Ch. 10250m)
Cave – BROOMFIELD Q.C. WEST (1707SEK020). Limestone, clean, unbedded. It is a “water table” cave.	High	Located approximately 215m north of Midleton station (Ch 10250m)
Cave (1707SEK015). Limestone, clean, unbedded. Located at Water-Rock, Cork. There are three openings in the north face of the limestone crag. The most easterly cave has a stream permanently flowing into it. Water enters the other two caves at times of high flow. Fluvial cobbles and pebbles are found on the cave floor.	High	25m south of the track Ch. 8550m
Cave – SCIATHAN LEATHAIR (1707SWK002). Limestone, clean, unbedded	High	Located *c.* 260 m south of track (Ch 4850m).

Receptor	Receptor Value	Distribution
Cave - CARRIGTWOHILL Q.C. (1707SWK001). Limestone, clean, unbedded	High	Located *c.* 250 m south of track (Ch 5100m).
Swallow hole – CARRIGTWOHILL STR. S (1707SWK004). Limestone, clean, unbedded	High	Located approximately 300m south of track (Ch. 4850m).
Cave – FOXS QUARRY CAVE (1707SEK017). Limestone, clean, unbedded. There are three openings in the Quarry face, but only one has been explored.	High	Located approximately 1000m ESE of Midleton station, 100 m beyond the study area.
Cave – MIDLETON COLLEGE CAVE (1707SEK001). Limestone, clean, unbedded	High	Located approximately 850m SE of Midleton station, 150m south of the study area.
Cave, Park North, Cork (1707SEK002). Limestone, clean, unbedded	High	Located approximately 600m SE of Midleton station, at the edge of the study area.
Cave (1707SWK009). Limestone, clean (>=90% CaCO3), unbedded	High	Located c. 700 m S of track (Ch. 4500m).
Turlough (1707SWK005) located at CARRIGANE, Cork. Limestone, clean, unbedded	High	Lies *c.* 150 north of track (Ch. 6400m).
Turlough (1707SWK006) located at CARRIGANE, Cork. Limestone, clean, unbedded	High	Immediately north of track at Ch. 6300m.
Enclosed depression	High	Lies approximately 300m south-east of Ch.6035m. *c.* 300m south of the track (Ch 8100m).
Enclosed depression	High	Lies *c.* 300m south of the track (Ch. 6200m).
Swallow hole (1707SWK007). Located at Ballyadam, Cork. Limestone, clean, unbedded	High	Lies approximately *c.* 300m south of track (Ch 6450m).
Swallow hole - CARRIGTWOHILL STR. S (1707SWK004). Swallow hole may be connected to a spring in Ballinturbid (1707SWK003) (located 2.4 km S of study area at Great Island Channel SAC).	High	Located *c.* 300 m south of Ch 6700m between Ch. 3750m and Ch. 6035m..
Swallow hole (1707SEK014) – Castle Rock stream sink. Located at Water-Rock, Cork. There are three openings in the limestone crag. The stream flows into the most easterly cave normally, in wet periods, the water overflows into the other two cave openings.	High	Adjacent to track at Ch. 8500.
Swallow hole (1707SEK018). Located at Foxs Quarry Cave. Limestone, clean, unbedded.	High	Located approximately 1000m ESE of Midleton station, 100 m beyond the study area.

Receptor	Receptor Value	Distribution
Spring (1707SEK016) located at Water-Rock, Cork. Apparently fed by castle rock stream sink (1707SEK014).	High	Lies approximately 630m south of track (Ch 8700m). Almost directly south of swallow hole 1707SEK014.
BH3,WD12,21,32,34,36 3 x (200 mm diameter) boreholes and 37 x (50 mm diameter) rotary percussive drills (1707SEK005). Of these, 1 borehole and 5 drillholes encountered cavities.	High	Located approximately 925m SE of Midleton station, 250m south of the study area.
Karst features identified from previous GI work include[3]: • 1 spring, 1 surface depression and 22 swallow holes	High	• A spring 50m north of the track *c.* Ch 6400m • Surface depression/pond 50m south of the track *c.* Ch 5600m • Six swallow holes 250m – 500m south of the track c. Ch 8000m – Ch 8500m • Nine swallow holes 0 – 150m north of the track *c.* Ch 10800m – Ch 11700m • Five swallow holes 50 – 300m south of the track c. Ch 10800m – Ch 11300m • Two swallow holes 300m north Midleton station (Ch. 10250m)
Geohazards - Landslide		
Area of high landslide susceptibility	High	Lies approximately 500m N of Ch. 2800m. Associated with area of outcropping bedrock (Gyleen Formation) in Tibbotstown Stream valley.
Area of moderately high landslide susceptibility	High	Lies approximately 400m N of Ch. 4000m. Associated with area of outcropping bedrock (Old Head Sandstone Formation).
Area of moderately high landslide susceptibility	High	Lies approximately 740m N of Ch. 4000m. Associated with area of outcropping bedrock (Gyleen Formation).
Areas of moderately high - high landslide susceptibility	High	Lie approximately 500 - 700m north of the new track between Ch. 3750m and Ch. 6035m. Associated with area of outcropping bedrock (Gyleen Formation and Old Head Sandstone Formation).
Area of moderately high landslide susceptibility	High	Lies approximately 1km NE of Ch. 6480m. Associated with area of outcropping bedrock (Gyleen Formation, Old Head Sandstone Formation and Cuskinny Member).
Areas of moderately high landslide susceptibility	High	Lie approximately 500 - 700m north of the new track between Ch. 3750m and Ch. 6035m. Associated with area of outcropping bedrock (Gyleen Formation, Old Head Sandstone Formation and Cuskinny Member).
Area of high landslide susceptibility	High	Lies within the study area, approximately 1000km west of Glounthaune station. Associated with area of outcropping bedrock (Gyleen Formation).

[3] APEC (2006). Glounthaune to Midleton Railway Addendum to Geotechnical Interpretative and Design Report

Receptor	Receptor Value	Distribution
Area of high landslide susceptibility	High	Lies approximately 300m NE of Glounthaune station (outside study area). Associated with area of outcropping bedrock (Gyleen Formation).
Areas of moderately low – moderately high landslide susceptibility	High	Lies approximately 300m north of the track between Glounthaune Station and Ch. 1660m. On Till derived from Devonian sandstones. Associated with steep ground to north of track.
Area of moderately low – moderately high landslide susceptibility	High	Underlies study area and track between Ch. 2800m and Ch. 30000m. Associated with Tibbotstown Stream valley.
Area of moderately high landslide susceptibility	High	Lies approximately 600m NE of Midleton station (Ch.10250m). Associated with area of outcropping bedrock (Cuskinny Member).
Recorded Landslides	-	None present within 1km of track.
Geohazards – Mines and quarries		
Active quarries and mines	Medium	None recorded in GSI datasets within 1km of track. Previous GI investigation[4] found: 1 x quarry 100m north of the track at *c.* Ch 8200m 1 x quarry 350m north of the track at *c.* Ch 8900m 1 x quarry 200m south of the track at *c.* Ch 9300m 1 x quarry 250m north Midleton station (Ch.10250m) 1 x sand and gravel pit 200m south of the track at *c.* Ch 9800m. 1 x sand and gravel pit adjacent to the track at *c.* Ch 10100m 1 x sand and gravel pit 250m north of the track at *c.* Ch 10850m. 1 x sand and gravel pit 150m north of the track at *c.* Ch 11600m 2 x sand and gravel pits 50 – 100m north of Midleton station (Ch. 10250m) 4 x sand and gravel pits 500 – 100m east of Midleton station (Ch. 10250m)
Geological Heritage		
Geological Heritage Audited Sites	-	None present within 1km of track.

[4] APEC (2006). Glounthaune to Midleton Railway Addendum to Geotechnical Interpretative and Design Report

10.3.3 Hydrogeology

Groundwater along most of the route is controlled by the groundwater regime within the Youghal syncline[5]. Due to the proximity to the estuary, a tidal influence on groundwater levels is likely. The underlying limestones are reported to be in hydraulic conductivity with overlying sand and gravel deposits (e.g. in the Carrigtohill area)[6]. Where Till deposits are present, recharge to the underlying bedrock aquifer is likely to be restricted. The water table is generally within 10 m of surface with annual fluctuations of 6 – 7 m anticipated[54]. Groundwater level observations from previous ground investigation[53] include:

- Structure SO5A (Ch. 3750m) – groundwater strike at 17.2m.
- Earthwork Element No. 9 (Ch. 4170m – 4670m) – groundwater encountered in a few trail pits at depths ranging from 0.5 m below ground level (bgl) to deeper;
- Earthworks Element No. 10 (Ch. 4670m – 5320m) – groundwater strikes in trial pits at 1 - 1.8 m bgl;
- Earthworks Element N0 17 (Ch. 8500m – 8560m) – limestone encountered at base of the cutting with evidence of Karst features. Standing water on top of bedrock.
- Structure SO8B (Ch. 8300m) – groundwater strikes between 9-13 m bgl in glacial till; Limestone bedrock at 15 m bgl;
- Reinforced Soil Wall at SO1 (Ch. 600m) – groundwater strikes at 4 and 7.2 m bgl in sand and gravel underlying glacial till and overlying limestone bedrock.
- Midleton Station – no groundwater strikes in trial pits (n. 8) except one at 2mbgl.

The hydrogeology receptors have been identified as aquifers, boreholes/abstractions, sites of groundwater-surface water interactions and karst features. These have been identified using relevant GSI and EPA datasets. The aquifer types identified throughout the proposed development have been described by both the aquifer productivity and bedrock aquifer types. Only springs listed within 500m of the proposed development in the GSI dataset were included within the baseline. Sites of groundwater-surface water interactions were defined as any designated ecological sites that may be influenced by the local hydrogeological regime.

Aquifers and wells (along with track chainage) are shown in Drawing 22910163-MMD-00-XX-GIS-C-0006 in Appendix 10.1 and Karst features are shown in Drawing 22910163-MMD-00-XX-GIS-C-0004 in Appendix 10.1.

The baseline receptors and their corresponding receptor values are outlined below and in Table 10.9.

- Four aquifer bodies underlie the study area. One (Waulsortian Limestone) is classified as a regionally important aquifer. Three (Ballysteen Formation, Cuskinny Member and Glyeen Formation) are classified as local important aquifers.
- Numerous boreholes/abstractions have been identified in the study area. Reported yields range from poor to excellent, and include agricultural, domestic and industrial use. There are no public supply source protection areas within the study area.
- Three sites of groundwater-surface water interactions have been identified in the study area. This includes the Cork Harbour Special Protection Area (SPA) and Great Island Channel Special Area of Conservation (SAC), which lie immediately south of the western end of the track (Glounthaune station to the end of the track) and extend to approximately 500m SW of OBY1.

[5] APEC (2006). Glounthaune to Midleton Railway Addendum to Geotechnical Interpretative and Design Report
[6] GSI (2004) Midleton GWB: Summary of Initial Characterisation

  - The site provides a range of habitats including intertidal flats, salt marshes, a brackish lake and wet grassland. SPA priority habitats are various water birds and wetlands[7]. SAC priority habitats are “Mudflats and sandflats not covered by seawater at low tide” and “Atlantic salt meadows”[8].
  - Conservation objectives for the SPA include that “the permanent area occupied by the wetland habitat should be stable”. Conservation objectives for the SAC include that habitat areas should be stable or increasing (including the transition from saltmarsh to brackish saltmarsh and wet grassland) and that sediment/organic matter circulation should be restored (road construction has modified the shorelines).
  - Swallow holes within the study area (e.g. CARRIGTWOHILL STR. S - 1707SWK004) may provide a connection to the SPA/SAC outside the study area.
- Numerous karst features including caves, enclosed depressions, turloughs, a swallow hole, a spring are all noted in or near the study area.
- Water Rock (a known sinking stream) is in close proximity to the track (*c.* Ch. 8550m). There is thin overburden depth (1.5m) in this area[9].

The classification of receptor values for the identified hydrogeological receptors was based on Table 10.3. For each aquifer body the productivity of the aquifer was used to assign the receptor value. For boreholes/abstractions the receptor value was assigned based on the productivity of the source, and use of the abstraction for public, domestic or agricultural supply.

Aquifer vulnerability is a function of subsoil permeability. It is High along most of the route. Areas of Extreme vulnerability and Rock at or near Surface or Karst are associated with outcropping bedrock. Areas of Estuarine silts and clays and Till south and east of Glounthaune station and around OBY4 – UBY5A are Moderate vulnerability.

Table 10.9: Hydrogeological receptors

Receptor	Receptor value	Location/Distribution
Aquifers		
Waulsortian Limestones - Regionally Important Aquifer - Karstified (diffuse)	High	Underlies a significant portion of the track (Ch. 0m – Ch. 2700m, Ch. 5300m – Midleton Station) and wider study area. Present south of the new track throughout the study area. Displaced by faults at Ch. 2700m and Ch. 9850m.
Ballysteen Formation – Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones	Medium	Underlies Ch. 2700m – Ch. 5300m. N of new track Ch. 150m – Ch. 7000m and Ch. 7500m - Midleton station. Displaced by faults at Ch. 2700m and Ch. 9850m.
Cuskinny Member – Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones	Medium	Underlies the study area (N of new track) between Glounthaune Station and Ch. 5850m. Small areas north of the new track between Ch. 7950m – Ch. Ch. 8850m and Ch. 9850m – Ch. 10450m. Displaced by a fault at Ch. 2700m.
Gyleen Formation – Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones	High	Underlies the study area north and east of Glounthaune station. Small area *c.* 400 m north of Ch. 2700m – Ch. 3900m.

[7] https://www.npws.ie/protected-sites/spa/004030

[8] https://www.npws.ie/protected-sites/sac/001058

[9] APEC (2006). Glounthaune to Midleton Railway Addendum to Geotechnical Interpretative and Design Report

Receptor	Receptor value	Location/Distribution
Old Head Sandstone Formation - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones	High	Underlies study area *c.* 400m north of Ch. 2650m – Ch. 4350m.
Carrigtohill Gravel Body - Underlies northern part of study area between UBY5A and Midleton Station	High	Associated with Gravels derived from Devonian sandstones. Underlies study area from Glounthaune Station to Ch. 4850m. Underlies Ch. 1660m, Ch. 1975m and Ch. 3240m. Underlies track Ch. 800m – Ch. 4250m.
Midleton Gravel Body – Underlies study area south and west of Midleton station	High	Associated with Gravels derived from Devonian sandstones and Alluvium. Underlies Midleton station (Ch. 10250m) and UBY11 (Ch. 9855m). Underlies track Ch 9100m – Ch10250 and study area from Ch. 9100m – its eastern end.
Boreholes/Abstractions		
1 x borehole (1707SEW075). Depth is 85.3m. Source use: Industrial with good yield class	High	Location accurate to 1km. Possibly within 500m study area S of Midleton station (Ch. 10250m) and UBY11 (Ch. 9855m).
1 x borehole (1707SEW037). Depth is 42.7m. Source use: Unknown with excellent yield class.	Very high	Location accurate to 1km. Possibly within 500m study area S of Midleton station (Ch.10250m) and UBY11 (Ch. 9855m).
1 x borehole (1707SWW050). Depth is 1.8m. Source use: Domestic with poor yield class.	Low	Location accurate to 1km. Possibly within 500 m study area N of Ch.1550m.
3 x (200 mm diameter) boreholes and 37 x (50 mm diameter) rotary percussive drills (1707SEK005). Of these, 1 borehole and 5 drillholes encountered cavities.	Low	c. 160 m SW of Midleton College Cave (1707SEK001)
1 x borehole (1707SWW109). Unknown use and depth.	Low	28 m north of track, 150 m east of Glounthaune station (Ch. 150m). Location accurate to 50m.
1 x borehole (1707SWW105). Depth is 22.6m. Source use: Agri & domestic use with unspecified yield.	Medium	170m south of the track Ch. 2100. In Carringtonhill Gravel body. Location accurate to 50m.
1 x borehole (1707SWW107). Depth is 24.1m. Source use: Agri & domestic use with unspecified yield.	Medium	330m south of the track Ch. 2550m. In Carringtonhill Gravel body. Location accurate to 50m.
1 x borehole (ILC 5021 - 1707SWW134). Depth is 59.1m. Source use: Agri & domestic use with unspecified yield.	Medium	120m south of the track between Ch. 2550m. In Carringtonhill Gravel body. Location accurate to 50m.
1 x borehole (IDA Industrial Estate, Carrigtwohill BH #7 - 1707SWW171). Depth is 46m. Source use: Agri & domestic use with unspecified yield.	Medium	100m south of the track Ch. 2550m. In Carringtonhill Gravel body. Location accurate to 20m.
1 x borehole (PW #3 - 1707SWW084). Depth is 41.4m. Source use: Industrial use with Excellent yield.	Very high	110m south of the track Ch. 2275m. In Carringtonhill Gravel body. Location accurate to 20m.
1 x borehole (PW #1 - 1707SWW116). Depth is 40m. Source use: Industrial use with Excellent yield.	Very high	250m south of the track Ch. 2600m. In Carringtonhill Gravel body. Location accurate to 20m.
1 x borehole (PW #2 - 1707SWW049). Depth is 27.4m. Source use: Industrial use with Good yield.	High	290m south of the track Ch. 2500m. In Carringtonhill Gravel body. Location accurate to 50m.

Receptor	Receptor value	Location/Distribution
1 x borehole (PW #1 - 1707SWW048). Depth is 31.1m. Source use: Industrial use with Good yield.	High	270m south of the track Ch. 2100m. In Carringtonhill Gravel body. Location accurate to 20m.
1 x borehole (BH #5 - 1707SWW129). Depth is 38m. Source use: Other with unspecified yield.	Low	290m south of the track Ch. 3000m. In Carringtonhill Gravel body. Location accurate to 20m.
1 x borehole (BH #6 - 1707SWW130). Depth is 34m. Source use: Other with unspecified yield.	Low	300m south of the track Ch. 2600m. In Carringtonhill Gravel body. Location accurate to 20m.
1 x borehole (1707SWW104). Depth is Unknown. Source use: Unknown with unspecified yield.	Low	210m north of the track Ch. 2125m. In Carringtonhill Gravel body. Location accurate to 50m.
1 x borehole (1707SWW106). Depth is 24m. Source use: Unknown with unspecified yield.	Low	480m south of the track Ch. 2550m. In Carringtonhill Gravel body. Location accurate to 50m.
1 x borehole (IDA Industrial Estate, Carrigtwohill BH #9 - 1707SWW173). Depth is 5m. Source use: Unspecified with unspecified yield.	Low	195m south of the track Ch. 2900m. In Carringtonhill Gravel body. Location accurate to 20m.
1 x borehole (IDA Industrial Estate, Carrigtwohill BH #10 - 1707SWW177). Depth is 24.7m. Source use: Unspecified with unspecified yield.	Low	360m south of the track Ch. 2900m. In Carringtonhill Gravel body. Location accurate to 20m.
1 x borehole (1707SWW160). Depth is 11m. Source use: Unspecified with unspecified yield.	Low	120m south of the track Ch. 4500m. In Carringtonhill Gravel body. Location accurate to 10m.
1 x borehole (1707SEW055). Depth is Unknown. Source use: Industrial with Excellent yield.	Very high	7m south of the track Ch. 8900m. c. 1km west of UBY11 (Ch. 9855m). Location accurate to 50m.
1 x borehole (1707SEW063). Depth is 60.9m. Source use: Unknown with unspecified yield.	Low	1m north of the track Ch. 9550m. *c.* 305m west of UBY11 (Ch. 9855m). Location accurate to 50m.
1 x borehole (1707SEW090). Depth is 8m. Source use: Unknown with unspecified yield.	Low	160m north of Midleton station (Ch. 10250m). Location accurate to 50m.
1 x borehole (1707SEW108). Depth is 3.4m. Source use: Other with unspecified yield.	Low	174m NE of Midleton station (Ch. 10250m). Location accurate to 50m.
1 x borehole (1707SEW109). Depth is 3.2m. Source use: Other with unspecified yield.	Low	116m north of Midleton station (Ch. 10250m). Location accurate to 50m.
1 x borehole (1707SEW110). Depth is 5m. Source use: Unknown with unspecified yield.	Low	166m NE of Midleton station (Ch. 10250m). Location accurate to 50m.
1 x borehole (1707SEW111). Depth is 10m. Source use: Unknown with unspecified yield.	Low	125m NNE of Midleton station (Ch. 10250m). Location accurate to 50m.
1 x borehole (1707SEW076). Depth is 42.7m. Source use: Other with unspecified yield.	Low	Location accurate to 100m. 80m NE of UBY11 (Ch. 9855m).
Groundwater/Surface Water Interactions		
Cork Harbour SPA (004030). Overlies the regionally Important Karstified Waulsortian Aquifer.	Extremely High	Lies immediately south of the western end of the track (Glounthaune station to Ch. 750m) and extends to approximately 500m S of Ch. 1400m.
Great Island Channel (001058) proposed National Heritage Area (pNHA). Overlies the regionally Important Karstified Waulsortian Aquifer and connects with Tibbotstown_010 River sub-Basin.	High	Lies immediately south of the western end of the track (Glounthaune station to Ch. 750m). Limb of pNHA extends to within 20m of Ch. 1350 - Ch. 1660m

Receptor	Receptor value	Location/Distribution
Great Island Channel SAC (001058). Overlies the regionally Important Karstified Waulsortian Aquifer and connects with Tibbotstown_010 River sub-Basin).	High	Lies immediately south of the western end of the track (Glounthaune station to Ch. 750m). Limb of SAC extends to within 20m of Ch. 1350 - Ch. 1660m.
Spring (1707SEK016) located at Water-Rock, Cork	High	Lies approximately 630m south of Cave (1707SEK015) located at Water-Rock which is in close proximity to the new track at c. Ch. 8550m.
Karst features		
Cave – BROOMFIELD Q.C. EAST (1707SEK019). Limestone, clean, unbedded. It is a "water table" cave.	High	Located approximately 175m north of Midleton station (Ch. 10250m)
Cave – BROOMFIELD Q.C. WEST (1707SEK020). Limestone, clean, unbedded. It is a "water table" cave.	High	Located approximately 215m north of Midleton station (Ch 10250m)
Cave (1707SEK015). Limestone, clean, unbedded. Located at Water-Rock, Cork. There are three openings in the north face of the limestone crag. The most easterly cave has a stream permanently flowing into it. Water enters the other two caves at times of high flow. Fluvial cobbles and pebbles are found on the cave floor.	High	25m south of the track Ch. 8550m
Cave – SCIATHAN LEATHAIR (1707SWK002). Limestone, clean, unbedded	High	Located *c.* 260 m south of track (Ch 4850m).
Cave - CARRIGTWOHILL Q.C. (1707SWK001). Limestone, clean, unbedded	High	Located *c.* 250 m south of track (Ch 5100m).
Swallow hole – CARRIGTWOHILL STR. S (1707SWK004). Limestone, clean, unbedded	High	Located approximately 300m south of track (Ch. 4850m).
Cave – FOXS QUARRY CAVE (1707SEK017). Limestone, clean, unbedded. There are three openings in the Quarry face, but only one has been explored.	High	Located approximately 1000m ESE of Midleton station, 100 m beyond the study area.
Cave – MIDLETON COLLEGE CAVE (1707SEK001). Limestone, clean, unbedded	High	Located approximately 850m SE of Midleton station, 150m south of the study area.
Cave, Park North, Cork (1707SEK002). Limestone, clean, unbedded	High	Located approximately 600m SE of Midleton station, at the edge of the study area.
Cave (1707SWK009). Limestone, clean (>=90% CaCO3), unbedded	High	Located c. 700 m S of track (Ch. 4500m).
Turlough (1707SWK005) located at CARRIGANE, Cork. Limestone, clean, unbedded	High	Lies *c.* 150 north of track (Ch. 6400m).
Turlough (1707SWK006) located at CARRIGANE, Cork. Limestone, clean, unbedded	High	Immediately north of track at Ch. 6300m.
Enclosed depression	High	Lies approximately 300m south-east of Ch.6035m. *c.* 300m south of the track (Ch 8100m).
Enclosed depression	High	Lies *c.* 300m south of the track (Ch. 6200m).

Receptor	Receptor value	Location/Distribution
Swallow hole (1707SWK007). Located at Ballyadam, Cork. Limestone, clean, unbedded	High	Lies approximately *c.* 300m south of track (Ch 6450m).
Swallow hole - CARRIGTWOHILL STR. S (1707SWK004). Swallow hole may be connected to a spring in Ballinturbid (1707SWK003) (located 2.4 km S of study area at Great Island Channel SAC).	High	Located *c.* 300 m south of Ch 6700m between Ch. 3750m and Ch. 6035m..
Swallow hole (1707SEK014) – Castle Rock stream sink. Located at Water-Rock, Cork. There are three openings in the limestone crag. The stream flows into the most easterly cave normally, in wet periods, the water overflows into the other two cave openings.	High	Adjacent to track at Ch. 8500m.
Swallow hole (1707SEK018). Located at Foxs Quarry Cave. Limestone, clean, unbedded.	High	Located approximately 1000m ESE of Midleton station, 100m beyond the study area.
Spring (1707SEK016) located at Water-Rock, Cork. Apparently fed by castle rock stream sink (1707SEK014).	High	Lies approximately 630m south of track (Ch 8700m). Almost directly south of swallow hole 1707SEK014.
BH3,WD12,21,32,34,36 3 x (200 mm diameter) boreholes and 37 x (50 mm diameter) rotary percussive drills (1707SEK005). Of these, 1 borehole and 5 drillholes encountered cavities.	High	Located approximately 925m SE of Midleton station, 250m south of the study area.
Karst features identified from previous GI work include[10]: 1 spring, 1 surface depression and 22 swallow holes	High	• A spring 50m north of the track *c.* Ch 6400m • Surface depression/pond 50m south of the track *c.* Ch 5600m • Six swallow holes 250m – 500m south of the track c. Ch 8000m – Ch 8500m • Nine swallow holes 0 – 150m north of the track *c.* Ch 10800m – Ch 11700m • Five swallow holes 50 – 300m south of the track c. Ch 10800m – Ch 11300m Two swallow holes 300m north Midleton station (Ch. 10250m)

10.3.3.1 WFD Groundwater Bodies

There are a total of two WFD groundwater bodies (GWBs) within the study area of the proposed development: Ballinhassig East[11] (IE_SW_G_004); and Midleton[12] (IE_SW_G_058). Details of the status of these groundwater bodies is summarised in Table 10.10.

Midleton is a karstic groundwater body of Dinantian pure unbedded Limestone units. These units are Regionally Important Aquifers with karstified, diffuse flow mechanisms; groundwater flowing through karst features/conduits to discharge points at springs and rivers. Karst features result in high aquifer vulnerability, and could aid contaminant transport and flow through the groundwater body. Midleton groundwater body may be hydrogeologically connected to the Great Island Channel SAC and Cork Harbour SPA.

[10] APEC (2006). Glounthaune to Midleton Railway Addendum to Geotechnical Interpretative and Design Report

[11] http://spatial.dcenr.gov.ie/GSI_DOWNLOAD/Groundwater/Reports/GWB/BallinhassigGWB.pdf

[12] http://spatial.dcenr.gov.ie/GSI_DOWNLOAD/Groundwater/Reports/GWB/MidletonGWB.pdf

The Midleton groundwater body underlies a major part of the study area extending from Midleton to Glounthaune Station, with a spring lying approximately 1.8km southwest of the former. It is expected to have high groundwater flow velocities especially around karstified features.

The Ballinhassig East groundwater body underlies the study area to the north of the new track over much of the study area. It is < 10m from the new track between *c.* Ch. 2750m and Ch. 4400m. It is a poorly productive bedrock groundwater body, comprised of Devonian Old Red Sandstones and Dinantian mudstone and sandstone units. These units are Locally Important Aquifers that are moderately productive only in local zones. Their productivity may be aided by the occurrence of approximately north-south trending bedrock aquifer faults occurring at 100m east of Glounthaune Station and at Ch. 2700m and Ch. 9850m.

Table 10.10: WFD Groundwater Bodies

WFD classification	Ballinhassig East (IE_SW_G_004)	Midleton (IE_SW_G_058)
Overall Groundwater Status (2013-2018)	Good	Good
Quantitative Groundwater Status (2013- 2018)	Good	Good
Chemical Groundwater Status	Good	Good
High Status Objective:	No	No

10.4 Likely Significant Impacts of the Proposed Development

10.4.1 Construction Phase

Construction phase effects considered include those which have the potential to impact the following receiving environments:

- Land and Land Use
- Soils and Geology
- Hydrogeology

Certain characteristics of the proposed construction phase activities have the potential to impact land, soils and hydrogeology. The specific construction activities which may pose a risk of causing potential impacts include:

- The construction of a new twin tack along the existing railway line which will require the clearance of vegetation and soils and the acquisition of additional land to facilitate the works (including the construction of laydown areas and site compounds);
- The realignment of one culvert (IDA culvert) and the extension of three culverts (1B, 1C and 2A) to accommodate the new track. A sheet pile wall is to be installed just north of the works area of the IDA Open Culvert to retain the existing embankment during construction. The sheet pile wall will be the same length as the IDA culvert diversion (205m) and is estimated to be 6m driven depth and a maximum height of 2.5m;
- Sheet piling is proposed to retain existing earthworks at:
  - Ch. 1985m – Ch. 2180 m (IDA culvert, estimated depth 6m)
  - Ch. 3535 – Ch. 3600m (estimated depth 4 m)
  - Ch. 3710 – Ch. 3800m (estimated depth 4 m)
  - Ch. 5600m – Ch. 6015m (estimated depth 3.4 m)
  - Ch. 6075m – Ch. 6250m
  - Ch. 6320m – Ch. 6450m
  - Ch. 7725 Ch. 7950m
  - Ch. 9710m – Ch. 9805m (estimated depth 2.2 m)

  The sheet pilling in the IDA culvert is in Gravels derived from Devonian sandstones (the Carrigtohill Gravel Body)

  All other pilling works are in Till derived from Devonian sandstones;
- Areas of cutting and filling are proposed along much of the route to enable the laying of the twin track. Excavation will take place to widen existing cuttings where insufficient space exists for two tracks currently. Excavation will require material to be removed from site and disposed of. Infill and construction materials will be required to be brought onto the site. There is no proposal to deepen any cuttings and hence dewatering or groundwater control is not expected during construction. The most significant stretches of cutting include:
  - Ch. 2200m – Ch. 7400m (in Gravels derived from Devonian sandstones)
  - Ch. 5960m – Ch. 7400m (in Till derived from Devonian sandstones)
  - Ch. 7950m – Ch. 8350m (in Gravels derived from Devonian sandstones)
  - Ch. 8450 – 8750 (in Till derived from Devonian sandstones/outcropping limestone bedrock. Includes the Water Rock cutting)

  Estimated cut and fill quantities are:
  - Excavation of existing formation 35,673.37 m^3
  - Excavation of existing embankment 3,622.50 m^3

  - Imported fill 38,050.83 m^3
  - Imported track ballast 13,487.03 m^3;
- Owenacurra River Bridge (UBY11) is to be widened. Deck widening will occur on existing piers with no additional foundation works to be undertaken;

A summary of the potential impacts to the receiving environments as a result of these construction phase activities is summarised in Table 10.11. This assessment takes into account embedded mitigation. Full design details of the development, including embedded mitigation, may be found in Chapter 6 (Description of the Proposed Development) and Chapter 2 (Methodology) of this volume of the EIAR. The Construction Environmental Management Plan (CEMP) is found in Appendix 6.1.

Table 10.11: Likely Significant Impacts (Construction Phase)

Receiving Environment	Construction Phase Impacts	Duration of Impact	Magnitude of Impact	Maximum Significance of Effect
Land and land use	The majority of the proposed works will be undertaken within the existing boundary of Iarnród Éireann's land ownership. Therefore, no impact to land use is anticipated for these sections of works. Limited sections of land adjacent to the proposed development will be acquired to facilitate the works. This is predominantly of pasture land use and is small in comparison to the local extent. This is therefore considered to result in negligible impact (Not Significant) on land and land use.	Permanent	Negligible	Land Use (Medium Value) Not Significant
	The construction of site compounds and laydown areas will be outside of Iarnród Éireann's land boundary. There may also be some localised increase in traffic associated with access. These impacts will be temporary and the land is to be restored to its original condition following completion of the works. Therefore, negligible permanent impact to land use is anticipated for these sections of works. There will be a temporary low adverse (Slight) impact associated with the temporary loss of land while the laydown areas are in use.	Temporary	Low	Land Use (Medium Value) Slight
Soils and Geology	There will be disruption to the underlying soils and geology during construction due to ground damage from construction vehicles and machinery. Damage can include rutting, increased erosion and/or compaction of soils. As such, a low adverse impact (Slight) to the soils and subsoils from excavation is anticipated.	Permanent	Low Adverse	Soils (High Value) Slight Subsoils (High Value) Slight
	There will be loss of soils/subsoils associated with removal of material during cutting. However, the volumes removed / areas impacted will be small in comparison to the local extent of the deposits. As such, a low adverse impact (Slight) to the soils and subsoils from excavation is anticipated.	Permanent	Low Adverse	Soils (High Value) Slight Subsoils (High Value) Slight
	There is a risk that the construction works (notably excavation in cuttings) could create pathways for surface flow into the bedrock aquifer. This is of particular risk in areas of karst, where enhanced surface water flow may increase dissolution of karst.	Permanent	Medium Adverse	Karst features (High Value) Significant
	Several areas of high landslide susceptibility have been identified adjacent to the proposed development, associated with areas of outcropping bedrock. The nearest of which is located approximately 300m from the proposed development. However, there is a risk that additional unrecorded areas of geohazard located closer to the development are present. Construction activities associated with the works, including excavation of soils and materials, and construction traffic may result in an increased	Permanent	Medium Adverse	Landslide susceptibility (High Value) Moderate

Receiving Environment	Construction Phase Impacts	Duration of Impact	Magnitude of Impact	Maximum Significance of Effect
	risk of failure. Prior to additional mitigation measures, the magnitude of impact is therefore considered as medium adverse (Moderate).			
	There is a risk of ground collapse associated with karst cavities in bedrock. The construction of site compounds, access tracks and other construction activities, may result in temporary alterations to the distribution of groundwater recharge and/or surface flow pathways. In areas of outcropping karstic bedrock / karst features this could result in localised enhanced erosion, the creation of void features and/or subsidence. As such a medium adverse impact (Moderate) to the soils and geology is anticipated.	Temporary	Medium Adverse	Geohazards – Karst features (High Value) Moderate
	No geological heritage sites have been identified within 1km of the proposed development. Several active quarries / sand and gravel pits have been identified within the study area, but none are directly intercepted by the proposed development. As such is it considered that magnitude of impact to these receptors in considered negligible (Not significant).	Permanent	Negligible	Geohazards – Mines and quarries (Medium Value) Not Significant
	Limestone cutting west of Water Rock level crossing may directly (or indirectly via vibrations) impact the integrity of the Water Rock caves. As such, the magnitude of the impact is considered High Adverse (Significant).	Permanent	High Adverse	Geohazards – Karst features (High Value) Significant
Hydrogeology	There is a risk of pollution to the underlying aquifers from the construction works, specifically from unplanned fuel or chemical spillage, or the mobilisation of sub-surface contamination during excavation. The removal of the top layer of ground during excavation will increase the risk of groundwater pollution. This is of particular risk in areas of karst, due to the presence of voids and conduits which may provide preferential pathways for contaminant transport. However embedded mitigation such as the CEMP and a construction waste management plan will reduce this risk, and as such a negligible impact (Not significant) to the hydrogeology is anticipated.	Permanent	Negligible	Aquifers (High Value) Not Significant Boreholes/Abstractions (Very high value) Not Significant Karst features (High Value) Not significant
	There is a risk that excavation during cutting will mobilise existing contamination within the soil which may lead to groundwater pollution. Soils that have been identified as at high risk of contamination are found to the eastern end of the track (Ch. 9100m – Ch. 10450m) where shallow cutting is proposed. The risk is exacerbated as this is an areas of karst (where groundwater vulnerability is high , extreme, or rock at or near Surface or Karst) due to the risk of thin superficial cover and the presence of voids and conduits which may provide preferential pathways for contaminant transport. Outside these areas, this risk of encountering contamination is likely to be low in the rural and historically agricultural study area. Embedded mitigation, such as the CEMP, will	Permanent	Medium Adverse	Aquifers (High Value) Significant Karst features (High Value) Significant

Receiving Environment	Construction Phase Impacts	Duration of Impact	Magnitude of Impact	Maximum Significance of Effect
	reduce these pollution risks but the magnitude of impact is still considered medium adverse (Significant).			
	There is a risk of pollution (predominantly a sediment/turbidity risk) to underlying aquifers from improper storage of material (including excavated material, soil, imported embankment fill and imported ballast) or runoff from constructed embankments where fine grained material may be present. The risk is highest in areas of karst where groundwater vulnerability is high, extreme, or rock at or near Surface or Karst. Embedded mitigation, such as the CEMP, will reduce these pollution risks but the magnitude of impact is still considered medium adverse (Significant).	Permanent	Medium Adverse	Aquifers (High Value) Significant Karst features (High Value) Significant
	Several sites of groundwater-surface water interaction have been identified close to the proposed development, including Cork Harbour SPA. There is the potential that karst features in close proximity to the proposed development may be connected to these sites. This includes a potential connection between a swallow hole at Carrigtwohill and a spring at Ballintubid (Great Island Channel SAC). There is a risk that any pollution incident arising from construction near karst features could impact the identified designated sites. Embedded mitigation, such as the CEMP, will reduce these pollution risks but the magnitude of impact is still considered medium adverse (Profound).	Permanent	Medium Adverse	Groundwater/Surface Water Interactions (Extremely High Value) Profound
	There is a risk that the construction of the proposed development would result in impacts to groundwater recharge and flow pathways due to alteration of ground surface permeability underlying the development. In particular, the construction of site compounds and laydown areas may result in the creation of impermeable land-surface, reducing groundwater recharge in these areas. Ground damage from the movement of construction vehicles and machinery also has the potential to result in soil compaction and decreased permeability. However, the areas impacted by site compounds and laydown areas are small relative to the size of the aquifer bodies, and are temporary. A negligible permanent impact (Not Significant) to the hydrogeology is anticipated.	Permanent	Negligible	Aquifers (High Value) Not Significant
	There is a risk that sheet piling into the Carrigtwohill Gravel Body to retain the existing embankment during the realignment of the IDA culvert would result in pollution (particularly a sediment/turbidity risk) to nearby wells. There are no wells considered at high risk of impacts (< 50m distance).	Temporary	Medium Adverse	Boreholes/Abstractions (Very high value) Significant

Receiving Environment	Construction Phase Impacts	Duration of Impact	Magnitude of Impact	Maximum Significance of Effect
	Nearby wells include 1707SWW048 (270m S), 1707SWW084 (110m S), 1707SWW104 (210m N) and 1707SWW105 (170m S) which are considered at medium-low risk of temporary water quality impacts. A temporary, medium adverse (Significant) impact to hydrogeology is anticipated.			
	Sheet piling on Till takes place in areas of GW vulnerability classified as High, Extreme or Rock at near Surface of Karst. A review of historical GI suggests it is unlikely that sheet piling will penetrate to the bedrock. However, there remains a low risk that limestone bedrock may be encountered during piling. Sheet piling to (or near) the bedrock may provide a preferential pathway for contamination to the limestone. However, soils at risk of a high level of contamination have not been identified in these areas of piling so the risk of contamination is considered low. If bedrock is encountered an alternative to driven sheet piles is required. A permanent, low adverse (Significant) impact to hydrogeology is anticipated.	Permanent	Low Adverse	Aquifers (High Value) Significant
	Soils at high risk of contamination are present at Ch. 9710m – Ch. 9805m where shallow (2.2 m) piling is proposed. Drive piling may mobilise existing contamination by allowing potentially contaminated soil to be dragged down or along the shaft or below the base of the shaft during piling. Bedrock groundwater vulnerability is classified as medium as superficial deposits (gravel and alluvium) are present in this area. However, at the nearest well c. 150 m to the west (1707SEW063, 60.9m deep) bedrock was met at 30.4 m bgl. Hence, piling into or close to the limestone bedrock is not anticipated. Given its depth relative to the depth of bedrock, the nearest well (1707SEW063) is likely to target the bedrock aquifer. However, the superficial deposits are classified as a locally important gravel aquifer and may be at risk from mobilised contamination. A permanent medium adverse impact (Significant) to hydrogeology is anticipated.	Permanent	Medium Adverse	Aquifers (High Value) Significant

10.4.2 Operational and Maintenance Phase

Operational phase effects considered include those which have the potential to impact the following receiving environments:

- Land and Land Use
- Soils and Geology
- Hydrogeology

Certain characteristics of the proposed operational and maintenance phase activities have the potential to impact land, soils and hydrogeology. The specific operational and maintenance activities which pose a risk of causing potential impacts include:

- The provision of new and/or altered drainage along the route of the new development, which includes transverse and linear filter and or sealed drains. These will discharge to either culverts or natural watercourse via carrier pipes or ditches. There are no additional outfalls proposed;
- The proposed development will allow for additional train services to operate between Glounthaune and Midleton. The maintenance regime will not differ from the current maintenance regimes of the existing infrastructure.

A summary of the potential impacts to the receiving environments as a result of the operational and maintenance phase are summarised in Table 10.12. This assessment takes into account embedded mitigation. Full design details of the development, including embedded mitigation, may be found in Chapter 6 (Description of Development) and Chapter 2 (Methodology) of this volume of the EIAR. The Construction Environmental Management Plan (CEMP) is found in Appendix 6.1.

Table 10.12: Likely Significant Impacts (Operational Phase) further to Section 10.4

Receiving Environment	Operational Phase Impacts	Duration of Impact	Magnitude of Impact	Maximum Significance of Effect
Land and land use	The majority of the proposed development will be located within the existing boundary of Iarnród Éireann's land ownership. Limited sections of land adjacent to the proposed development are required to be purchased to facilitate the development. This is predominantly pasture land use and is small in comparison to the local extent. This is therefore considered to result in negligible impact on land and land use.	Permanent	Negligible	Land Use (Medium Value) Not Significant
Soils and Geology	The construction and/or alteration of drainage for the proposed development includes sub-surface drainage through the track ballast, and the diversion of flows via collector pipes and ditches to existing outfall locations in nearby surface water courses. There is a risk that in areas of outcropping karstic bedrock / karst features this could result in on-going enhanced erosion, resulting in the formation of sub-surface cavities and subsidence. Prior to additional mitigation measures, the magnitude of impact is considered as medium adverse.	Permanent	Medium Adverse	Karst features (High Value) Moderate
Hydrogeology	The construction and/or alteration of drainage for the proposed development includes sub-surface drainage through the track ballast, and the diversion of flows via collector pipes and ditches to existing outfall locations in nearby surface water courses. The operation of additional services between Glounthaune and Midleton will increase the risk of potential spillage of fuels, oils and lubricants from passing train services. It is therefore considered that there is an increased risk of pollution of the underlying aquifer bodies and/or karstic features from polluted run-off. Prior to additional mitigation measures, the magnitude of impact is therefore considered as medium adverse.	Permanent	Medium Adverse	Karst features (High Value) Moderate Aquifers (High Value) Moderate Boreholes/Abstractions (Very high value) Significant
	There is a risk that sheet piling to retain the existing embankment during the realignment of the IDA culvert would result in changes to groundwater flow pathways or recharge. The proposed sheet piling is 205 m long, a maximum of 2.5 m high and estimated to be 6 m deep (subject to further GI). The sheet piling will take place within the Carrigtohill Gravel Body (associated with Gravels derived from Devonian sandstones). It is unlikely that the sheet piling will penetrate to bedrock, Nearby wells (1707SWW048 and 1707SWW084, 270m and 110m S of the new track with depths of 31.1 m bgl and 41.1 m bgl respectively) did not encounter bedrock.	Permanent	Negligible	Aquifers (High Value) Not Significant

Receiving Environment	Operational Phase Impacts	Duration of Impact	Magnitude of Impact	Maximum Significance of Effect
	Bedrock was not encountered in any trial pits or boreholes during previous GI local to the IDA culvert[13]. There is a possibility that sheet piling may intersect the water table. Groundwater was encountered at shallow depths in trial pits at Ch. 1700m and Ch. 2650m but not in trial pits and boreholes closer to the IDA culvert. The gravel body is likely to be highly permeable and groundwater will find its way around the sheet pilling. Hence, any changes in groundwater flow are likely to be localised and changes to river baseflow or wider flows to rivers are not anticipated. Given the depths of the nearby wells, change to water supply to the wells are not anticipated. It is unlikely that vertical sheet piling into a gravel aquifer will impact groundwater recharge to the gravel or into the underlying bedrock aquifer. Significant changes to groundwater flow or recharge as a result of sheet piling in the Till (which is expected to be low permeability with limited groundwater flow) are not anticipated. A negligible permanent impact (Not Significant) to the hydrogeology is anticipated.			
	There is a risk that cutting may change groundwater flow volumes or levels where it extends below the water table. However, cutting is only proposed to widen the existing track. There are no proposals to deepen cuttings so no changes (or additions) to cuttings that intersect the water table are anticipated. Hence, significant changes to the radius of influence or drawdown of groundwater levels associated with the existing track are not anticipated. A negligible permanent impact (Not Significant) to the hydrogeology is anticipated.	Permanent	Negligible	Aquifers (High Value) Not Significant Boreholes/Abstractions (Very high value) Not Significant

[13] APEC (2006). Glounthaune to Midleton Railway Addendum to Geotechnical Interpretative and Design Report

10.4.3 Do Nothing

The 'Do-nothing' alternative describes the circumstance where no development occurs. The baseline environment is unlikely to change in the absence of the proposed development as the majority of the proposed development falls within the Iarnród Éireann's land ownership, and the existing rail network will continue to operate as at present. Therefore, there will be no impact on land, soil or hydrogeology environments if the 'Do-nothing' scenario is followed.

10.4.4 Decommissioning Phase

Impacts during decommissioning are anticipated to be similar to those predicted during construction as similar types of activities would be undertaken. Therefore, provided that appropriate mitigation is used, the impacts of the decommissioning phase should be, as a worst-case scenario, similar to those at construction phase.

Any works required to remove infrastructure as part of the decommissioning phase, will however be subject to relevant consent applications, and associated environmental assessments.

10.4.5 Cumulative Effects

An assessment of the cumulative impacts associated with other planning applications within the vicinity of the proposed development, has been completed. A summary of those developments which have the potential to result in cumulative impacts to the receiving environment with respect to land and land use, soils and geology, and hydrogeology is provided in Table 10.13.

It is assumed that assessment, construction and embedded mitigation (such as the development of an appropriate CEMP) of a similar standard detailed herein would be incorporated into the below developments. Cumulative risks beyond those discussed in Table 10.13 are therefore considered negligible. This includes risks to land and land use, which are considered to have been pre-assessed by the planning application process as negligible.

Table 10.13: Summary of cumulative impacts

Development	Relevant Characteristics of Development	Inter-Project Impacts
Burys Bridge, Kilcoolishal to Carrigtwohill via Glounthaune Pedestrian and Cycle scheme.	Construction of 3m wide shared pedestrian and cycle path.	These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in infiltration and recharge to the aquifer system. However, permanent impacts to aquifer recharge are not anticipated from the proposed development. As such, the cumulative impacts are considered minimal.
Carrigtwohill to Midleton Inter-Urban Cycleway -	Construction of a 4m wide shared pedestrian and cycle path. Construction of two pedestrian / cyclist bridges, one railway underpass (existing structure) and one road underpass	These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in infiltration and recharge to the aquifer system. Permanent impacts to aquifer recharge are not anticipated from the proposed development. As such, the cumulative impacts are considered minimal. The construction of bridges / underpasses is likely to require the excavation of sub-surface material, disturbing the soil / geological environment. However, the extent of the works are considered to be small relative to the spatial extent of local soil and geological deposits. There may be a slight cumulative adverse impact on soils/subsoils due to the cumulation of all projects in this table.

Development	Relevant Characteristics of Development	Inter-Project Impacts
Ballinacurra to Midleton pedestrian and cycle route	A mixture of segregated cycle facilities, shared use pedestrian and cycle paths and greenway.	These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in infiltration and recharge to the aquifer system. However, permanent impacts to aquifer recharge are not anticipated from the proposed development. As such, the cumulative impacts are considered minimal.
Ballyadam Proposed new 110kv substation	New 110kv substation within existing site boundary.	Negligible predicted impacts on land and land-use, soils and geology or hydrogeology anticipated.
Water Rock Urban Expansion Area Infrastructure Works	Bridge over Railway and Extension to Services Corridor Link Road New railway stop including platform and shelter, drop-off area, cycle parking, disabled parking and access, ticket machines and ancillary works.	These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in infiltration and recharge to the aquifer system. However, permanent impacts to aquifer recharge are not anticipated from the proposed development. As such, the cumulative impacts are considered minimal. The construction of a bridge is likely to require the excavation of sub-surface material, disturbing the soil / geological environment. However, the extent of the works are considered to be small relative to the spatial extent of local soil and geological deposits. There may be a slight cumulative adverse impact on soils/subsoils due to the cumulation of all projects in this table.
North Midleton Wastewater pumping station	New wastewater pumping station and associated infrastructure (rising mains and gravity sewers).	The installation of rising mains and gravity sewers could result in disruption to the hydrogeological regime / groundwater flow. However, no impacts to flow are associated with the the proposed development proposed development, as such cumulative impacts are considered negligible. There is an operational risk to water quality from leakage of the wastewater system, but this is considered low assuming an appropriate maintenance regime is followed.
South Midleton Wastewater Network Diversion Project	New wastewater pumping station and associated infrastructure (rising mains and gravity sewers).	The installation of rising mains and gravity sewers could result in distribution to the hydrogeological regime / groundwater flow. However, no impacts to flow are associated with the the proposed development proposed development, as such cumulative impacts are considered negligible. There is an operational risk to water quality from leakage of the wastewater system, but this is considered low assuming an appropriate maintenance regime is followed.
Celtic Interconnector	Onshore connection of an electricity transmission interconnector.	The installation of below ground infrastructure could result in distribution to the hydrogeological regime / groundwater flow. However, no impacts to flow are associated with the proposed development, as such cumulative impacts are considered negligible.
Various residential and mixed-use developments, including: Ballynaroon housing developments, Harpers Creek, BAM Property Limited, Bluescape Development, Castle Rock Homes Ltd, Church Road Development, Cork Cooperative Marts, Park Hill View Estates, Murnane & O'Shea Ltd, Ancelstierre	Residential housing and mixed-use developments	These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in infiltration and recharge to the aquifer system. However, permanent impacts to aquifer recharge are not anticipated from the proposed development. As such, the cumulative impacts are considered minimal.

Development	Relevant Characteristics of Development	Inter-Project Impacts
Investments Ltd, Barlow Properties, Compass Homes Ltd, Vella Homes Ltd, Connaught Trust Ltd, and EMR Projects Ltd		Any sub-surface excavation required for construction may result in disruption to the soil / geological environment. However, the extent of the works are considered to be small relative to the spatial extent of local soil and geological deposits. There may be a slight cumulative adverse impact on soils/subsoils due to the cumulation of all projects in this table.
Stryker Ireland	Extension to nanomanufacturing facility.	These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in infiltration and recharge to the aquifer system. However, permanent impacts to aquifer recharge are not anticipated from the proposed development. As such, the cumulative impacts are considered minimal. Any sub-surface excavation required for construction may result in disruption to the soil / geological environment. However, the extent of the works are considered to be small relative to the spatial extent of local soil and geological deposits. There may be a slight cumulative adverse impact on soils/subsoils due to the cumulation of all projects in this table.
Smithkline Beecham (Cork) Ltd	Construction of a new single storey laboratory and car park spaces.	These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in infiltration and recharge to the aquifer system. However, permanent impacts to aquifer recharge are not anticipated from the proposed development. As such, the cumulative impacts are considered minimal. Any sub-surface excavation required for construction may result in disruption to the soil / geological environment. However, the extent of the works are considered to be small relative to the spatial extent of local soil and geological deposits. There may be a slight cumulative adverse impact on soils/subsoils due to the cumulation of all projects in this table.
Midleton Association Football Club Ltd	Construction of a new all-weather playing surface, floodlighting, fencing and associated works.	Negligible predicted impacts on land and land-use, soils and geology or hydrogeology anticipated.
Park Hill View Estates	Temporary wastewater treatment system including ancillary links.	The installation of underground infrastructure could result in distribution to the hydrogeological regime / groundwater flow. No impacts to flow are associated with the proposed development proposed development, as such cumulative impacts are considered negligible. There is an operational risk to water quality from leakage of the wastewater system, but this is considered low assuming an appropriate maintenance regime is undertaken.
IDA Ireland	New site access, internal stub road, and local road improvement works.	These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in infiltration and recharge to the aquifer system. However, permanent impacts to aquifer recharge are not anticipated from the proposed

Development	Relevant Characteristics of Development	Inter-Project Impacts
		development. As such, the cumulative impacts are considered minimal.
Cruachan Investment Limited Partnership	Construction of 13 no. warehouse / light industrial units, with ancillary offices and associated site works.	These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in infiltration and recharge to the aquifer system. However, permanent impacts to aquifer recharge are not anticipated from the proposed development. As such, the cumulative impacts are considered minimal. Any sub-surface excavation required for construction may result in disruption to the soil / geological environment. However, the extent of the works are considered to be small relative to the spatial extent of local soil and geological deposits. There may be a slight cumulative adverse impact on soils/subsoils due to the cumulation of all projects in this table.

10.5 Mitigation and Monitoring Measures

10.5.1 Land and Land-Use

No impact on land or land use is predicted. As such no mitigation, beyond the embedded mitigation, is proposed.

10.5.2 Soils and Geology

The following mitigation and monitoring measures are proposed for soils and geology:

- Ground investigation will be carried out to establish the potential presence of any made ground or contamination along the route. This will target areas of soils identified as having a high risk of contamination.
- The CEMP will include protocols to deal with unexpected contamination including:
  - An appropriately qualified person will be present on site during construction to identify visual and olfactory evidence of contamination during excavation; and
  - Any contaminated ground will be characterised according to Waste Acceptance Criteria and dealt with as soon as possible via a bespoke remediation strategy or a materials management plan. Any waste arising will be managed in accordance with the Waste Management Act 1996 (as amended) and associated Regulations.
  - To reduce the risk of contamination, stockpiling of contaminated material is prohibited.
  - If it is not possible to immediately remove contaminated material then it will be stored on, and covered by, polythene sheeting to prevent rain water infiltrating through the material.
  - In-situ remediation of contaminated soils will be used in preference to offsite disposal where practicable.
- A pre-construction survey will be completed to confirm the presence of identified areas of landslip hazard, and identify further areas of risk absent from this desk-study. Additionally, a Geotechnical Risk Register will be created to ensure any landslide and slope stability risks are systematically captured. This register will quantify the risk of failure and propose location-specific mitigation. The location of any identified areas of hazard will be incorporated into construction site management plans. Excavation, the use of heavy machinery, and site traffic routes will be planned to avoid these areas.

- A pre-construction survey of karstic features will be carried out to confirm the presence of listed features and identify features absent from this desk-study assessment. The design of drainage, and temporary construction features (e.g. site compounds and access tracks) will be as such to avoid discharge of surface run-off to any identified karst feature or area of karst bedrock. This will include the use of lined ditches or impermeable pipes to direct collected water away from such features.
- If excavation exposes limestone bedrock, an impervious liner will be used to mitigate against the risks of surface water directly entering into the karstified rock. Karst features will be assessed by a suitably qualified professional to determine their extent across the proposed development. Any Karst features will be filled with an appropriate granular material (to preserve hydraulic connectivity) and sealed before the liner is used.
- Extensive GI will be carried out at the location of the limestone cutting at Water Rock to confirm the location of subsurface karst features including caves. The cutting at Water Rock will use an experienced contractor who will avoid caves and karst features. A geotechnical expert will be appointed by the contractor to closely monitor vibrations during cutting. Vibrations will be kept to within TII specifications[14] which will ensure no disturbance to wider karst features including caves. In the unlikely event that vibration limits are exceeded, cutting will cease on site until the reason for the increased vibration is determined.
- If GI or site work identifies potentially contaminated land at piling locations, an alternative (non-piling) method of embankment retention will be used. Where this is not possible, a Piling Risk Assessment will be carried out to select an appropriate piling method and identify any specific mitigation and monitoring measures required.
- Where GI identifies that bedrock is likely to be encountered at proposed piling locations an alternative to drive piling will be required. This is likely to be either:
  - an alternative embankment retention method (reinforced concreate or gabion baskets). These alternatives may require additional excavation and land take; or
  - an alternative to drive piling (e.g. concrete sockets into bedrock). Socket piling will not be used in areas where GI has identified contaminated land due to the risk of mobilising contamination to the sensitive limestone bedrock. If socket piling is proposed into limestone:
    - a detailed karst stability assessment will be carried out. The objective will be to assess the ground stability and the need for reinforcement;
    - Impermeable liners will be used during socket piling to prevent loss of concrete to the limestone.
- As a basis for a worst-case assessment, the quantities of material to be excavated and imported during construction have been assessed. This assessment assumes that no material can be reused. To the greatest extent possible, excavated material will be appropriately stored and reused on site to minimise the volume required for offsite disposal. The Contractor will ensure acceptability of the material for re-use within the proposed development. GI will be carried out to assess the properties of the material to be excavated. A construction earthworks programme will be implemented as part of the CEMP, which will categorise the source of material for each fill section and ensure it is appropriate.
- Where non-granular fill material is used for embankment construction (e.g. reuse of local material) measures (e.g. the use of geotextile separator) will be taken to minimise washout of fines and/or sediment runoff from the embankment.
- Where offsite disposal of excavated material is required, it will be managed in accordance with the Waste Management Act 1996 (as amended) and associated Regulations.

[14] TII (2011) Specification for Road Works Series 100 – Preliminaries – section 109 and Appendix 1/9

10.5.3 Hydrogeology

A pre-construction verification survey of the identified boreholes / wells within 150m of the new track or construction compounds will be carried out to confirm whether they remain in use, and the nature of use.

If they are used for drinking water purposes, water quality testing of the boreholes (for standard drinking water parameters including turbidity) will be carried out. Water quality testing will be carried out monthly for 12 months before construction, monthly during construction and for at least 12 months after construction to ensure no degradation of water quality as a result of the construction activities.

A pre-construction survey of karstic features will be carried out to confirm the presence of listed features and identify features absent from this desk-study assessment. Due to the sensitivity and connectivity of the karstic environment, including the risk of potential connections between karst features and sensitive receptors outside of the study area, additional mitigation measures to reduce the risk of impact will be used. These include that:

- a buffer area (at least 20 m) will be provided surrounding each identified karst feature, whereby no construction activity, including storage of materials will occur.
- Storage of materials (including excavated materials and fill and ballast) will avoid areas at risk of surface water or groundwater flooding or areas of convergence of flow; and
- The use of additional pollution prevention measures, such as double silt fencing, will be used where excavation occurs adjacent to an identified feature.

It is anticipated that all existing drainage outfalls will be retained and that no new outfalls will be required. Where new drainage will be installed (in areas where significant alterations are proposed to the track), the design of the drainage will avoid discharge of surface run-off to any identified karst feature or area of karst bedrock. This will include the use of lined ditches or impermeable pipes to direct collected water away from such features.

Regular inspection and maintenance of trains (and other machinery) operating on the proposed development will occur. This will reduce the risk of accidental spillage of fuels, lubricants and chemicals, and subsequent pollution of run-off.

10.6 WFD Groundwater Body Status

The WFD groundwater screening assessment is summarised in Table 10.14, below. The small extent of the scheme relative to the magnitude of the WFD waterbodies is deemed to pose very low risk to the delivery of long term WFD no deterioration and status objectives, such that no further (additional) assessment is required.

Table 10.14: WFD Groundwater Assessment

Test	Residual Impact Assessment
Water balance	There is a risk that the construction of the proposed development would result in impacts to groundwater recharge due to alteration of ground surface permeability underlying the development. In particular, the construction of site compounds and laydown areas may result in the creation of impermeable land-surface, reducing groundwater recharge in these areas. Ground damage from the movement of construction vehicles and machinery also has the potential to result in soil compaction and decreased permeability. However, the areas impacted are small relative to the size of the WFD groundwater bodies, and temporary in nature. No dewatering or groundwater control is expected during construction. As such, no impact on the water levels or flows within the groundwater body are anticipated.
Groundwater abstraction related deterioration of dependent surface water body status	Construction of the development is limited in extent and requires limited sub-surface activities. No dewatering or groundwater control is expected during construction. As such, no deterioration of surface water bodies is anticipated.
Groundwater dependent ecosystems (GWDTE)	Cork Harbour SPA and Great Island Channel SAC may be hydrogeologically connected via karst features to the proposed development. However, proposed embedded and additional mitigation measures (including a CEMP (Appendix 6.1) and waste management plan, pre-construction surveys and ground investigations of karst features, delineation of buffer zones, and drainage design) result in no change to the status of GWDTE being anticipated.
Saline or other intrusion test	No impact on saline intrusion is expected due to shallow and small spatial extent of works.

10.7 Residual Impacts

During construction and operation, no permeant impacts to land and land use have been identified. As such, it is assessed that there is a negligible permanent residual impact during construction and operation to land and land use. A temporary slight adverse residual impact is associated with the loss of land for the site laydown areas.

There is a low adverse residual impact to soils and geology during construction. This is associated with the excavation and disruption of underlying soils and geology as required to facilitate the construction of the development. However, geohazard impacts associated with landslide susceptibility and karst erosion during both construction and operation are negligible following implementation of the additional mitigation and monitoring proposed in Section 10.5.2.

Following implementation of the additional mitigation and monitoring proposed in Section 10.5.3, it is assessed that there is negligible residual impact during construction and operation to hydrogeology.

With the implementation of the embedded and additional mitigation measures proposed, the proposed development will not result in a change in status of any WFD quality elements or prevent any groundwater bodies from reaching good status in the future.

10.8 Summary

This EIAR for land and land use, soils and geology and hydrogeology, has undertaken a desk-top assessment on the basis of the relevant legislation and guidelines. It presents a detailed analysis of the baseline environment in terms of land and land use, soils and geology, and hydrogeology for the proposed development.

The characteristics of the proposed development and embedded mitigation have been described, alongside the anticipated construction phase and operational phase activities. The likely significant impacts of the proposed development have been assessed and, where significant uncertainties or risks remain, requirements for additional mitigation and monitoring measures have been stated.

Taking into account the embedded mitigation, residual impacts to land and land use are considered negligible.

Additional mitigation and monitoring requirements, which go beyond the mitigation embedded in the proposed design and within the proposed CEMP (Appendix 6.1), have been proposed to mitigate identified impacts to soils and geology and hydrogeology. This includes:

- Site surveys (and monitoring) of boreholes, karst features and areas of landslide hazard in proximity to the proposed development.
- Production of a Geotechnical Risk Register considering site-specific requirements to mitigate the risk of landslide hazard.
- A drainage design informed by site surveys and conditions to avoid areas of karst bedrock / features, reducing enhanced erosion and subsidence risk.
- Provision of buffer areas and/or additional pollution protection measures around identified karst features.
- Adequate inspection and maintenance of trains (and other machinery) operating on the proposed development to reduce the risk of accidental spillage of fuels, lubricants and chemicals, and subsequent pollution of run-off.

Considering these additional mitigation and monitoring requirements, residual impacts to the hydrogeology are negligible. Residual impacts to soils and geology associated with geohazards (landslide hazard and karst subsidence) are also negligible. A small adverse residual impact has been identified on soils and geology, associated with the localised excavation and disruption of underlying soils and geology required to facilitate the construction of the development. This will result in a slight residual significance of effect.

The assessment also indicates that the proposed development will not result in a change in status of any WFD quality elements or prevent any groundwater bodies from reaching good status in the future.

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11 Surface Water and Flood Risk

11.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application (also referred to herein as "the proposed Project") by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act'). An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed project (comprising inter alia railway works), including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors. This chapter presents the assessment of the likely significant effects arising from the proposed development as described in Chapter 6, on surface waters in terms of surface water quality and flood risk.

Existing surface water quality and flood risk in the vicinity of the proposed development has been established based on a desktop study and field surveys conducted by Triturus Environmental Ltd. in 2022. The full Triturus report is presented in Appendix 12.1. This chapter considers the potential impacts during construction, operation (including maintenance) and decommissioning associated with:

- Surface waters;
- Water supply and wastewater discharge (including drinking water supply network, foul water and the drainage network);
- Water Framework Directive (WFD) surface water objectives; and
- Flood risk.

Proposed mitigation measures to prevent, reduce and/or offset the anticipated potential impacts are presented as appropriate.

The assessment of the likely significant effects arising from the proposed development on groundwater is presented in Chapter 10 Land, Soils and Hydrogeology.

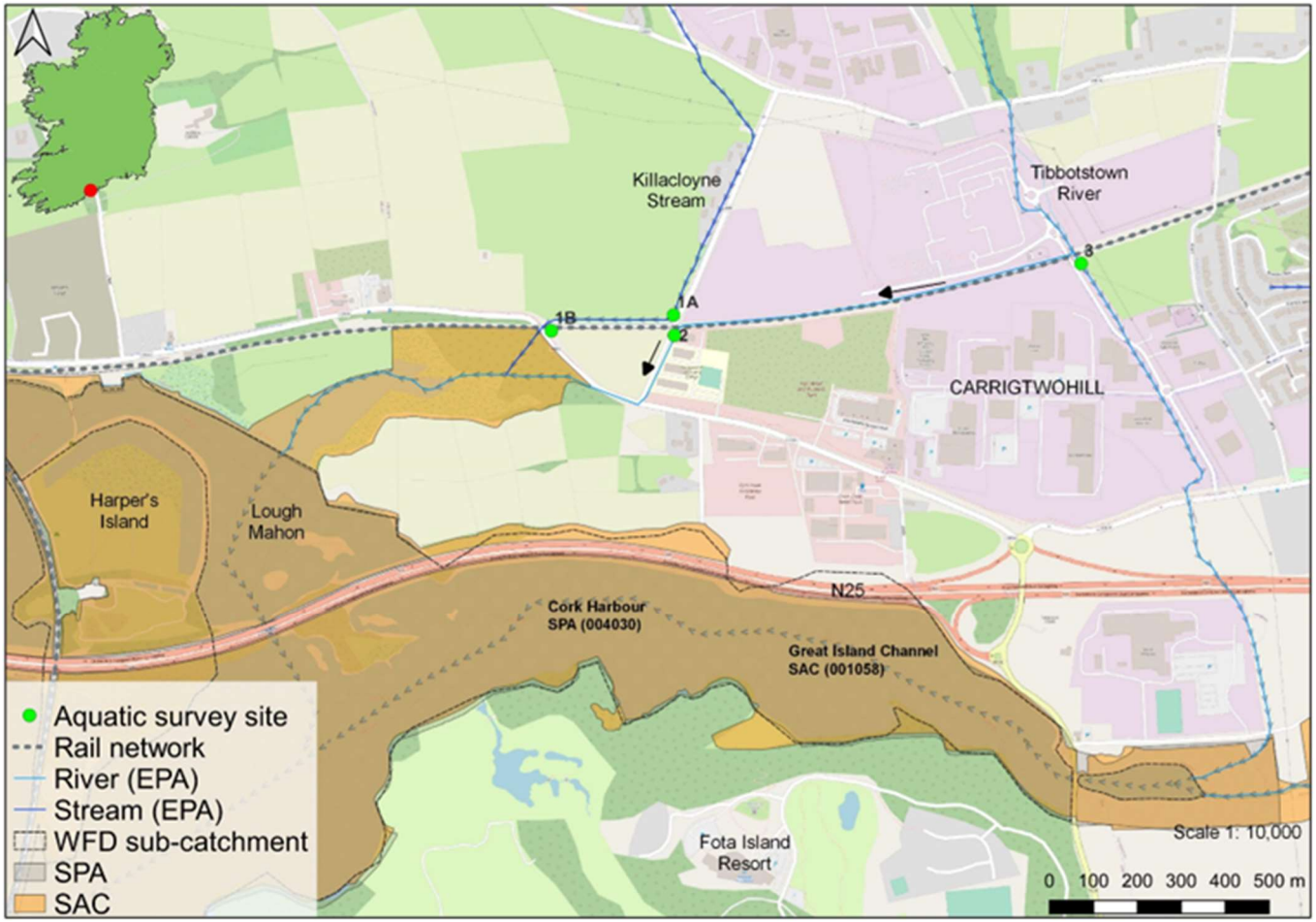
11.2 Methodology and Limitations

11.2.1 Study Area

The study area which is assessed includes surface waters adjacent to the proposed development and surface waters which are culverted beneath the railway tracks. Figure 11.1 and Figure 11.2 illustrate the surface waters which are the basis for assessment. The zone of influence for surface waters extends downstream from works areas in terms of potential effects on surface water quality. The zone of influence will differ dependent on the potential pollutants, for sediment the zone of influence may extend for ca. 200m-300m, however, for oils/chemicals this may extend for ca. 1km.

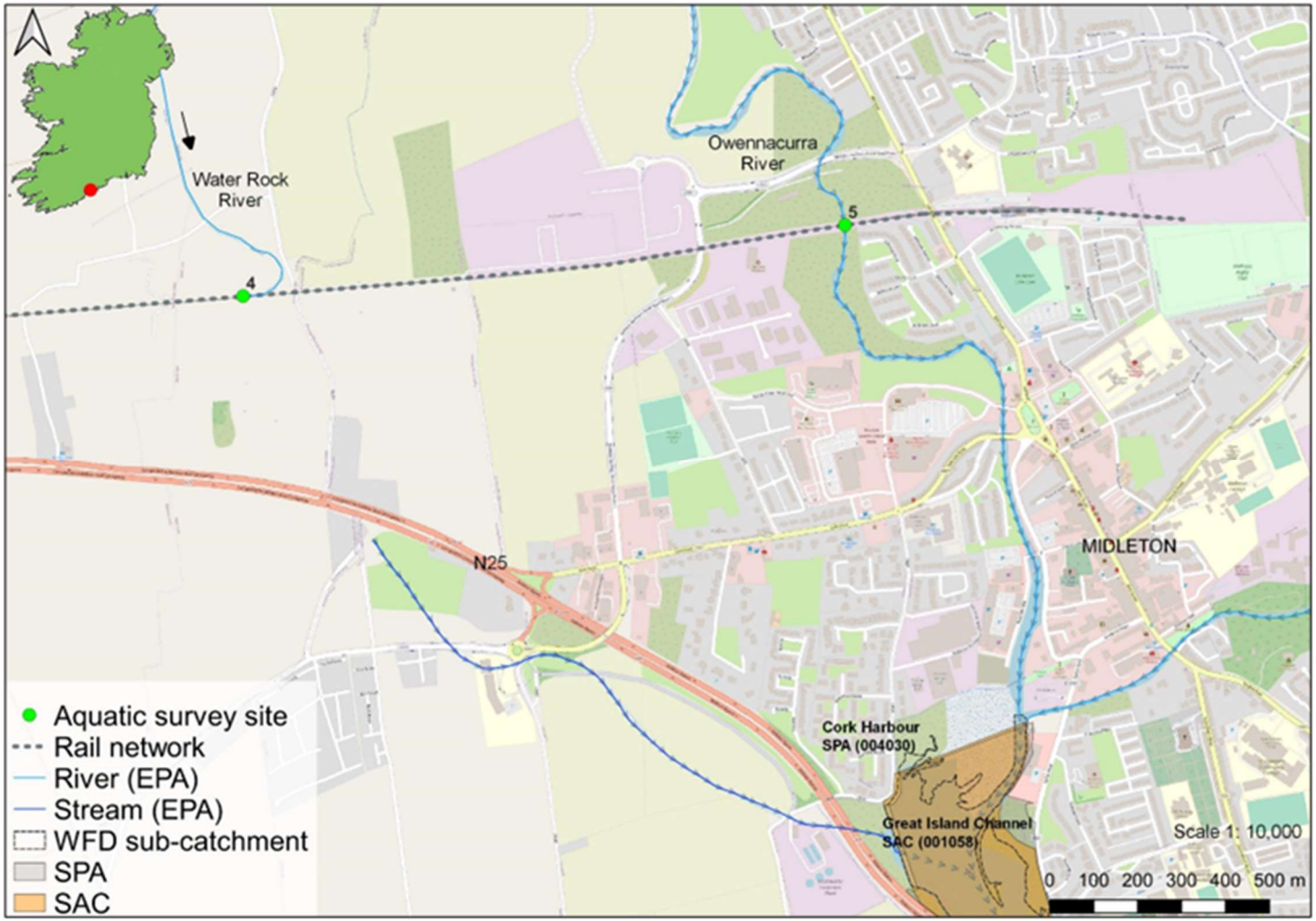
All samples, with regard to Q sampling, were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a two-minute sample, with an additional one-minute hand search of instream substrata, as per EPA methodology (Feeley et al., 2020a). Samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification. Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005).

Figure 11.1: Surface Waters in the study area (western section)



Source: Triturus

Figure 11.2: Surface waters in the study area (eastern section)



Source: Triturus

11.2.2 Legislative Context

This chapter has been prepared in accordance with the requirements of the 2001 Act and the EIA Directive. In addition, the requirements of inter alia the following legislation have also been complied with:

- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving 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), which gave legal effect to the WFD in Ireland.

11.2.2.1 Water Framework Directive

The WFD 2000/60/EC commits EU member states to achieve good qualitative and quantitative status of all inland and coastal waters at six-year intervals.

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 for all waterbodies, some waterbodies require extra protection by virtue of their location in a protected area or their function as a drinking water or bathing water. In accordance with the requirements of the 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.

11.2.2.2 EU ‘Floods’ Directive 2007

The national flood risk policy aligns with the requirement of the EU ‘Floods’ Directive (2007/60/EC). The Directive requires EU Member States to coordinate their flood risk management practices in shared river basins and to take account of long term developments, including climate change, and sustainable land use practices in preparing flood risk management plans. The Flooding Directive is to be carried out in coordination with the WFD.

The EU 'Floods' Directive was transposed into Irish law by the European Communities (Assessment and Management of Flood Risks) Regulations 2010, S.I. No. 122 of 2010 and amended by the European Communities (Assessment and Management of Flood Risks) (Amendment) Regulations 2015, S.I. No. 495 of 2015.

11.2.2.3 Climate change

It is acknowledged by almost all scientists that average global temperatures are currently rising due to increased greenhouse gases in the atmosphere. As a result of global warming, the Earth's climate will change and it is expected that over the next 100 years, Ireland will experience significant changes in rainfall characteristics and increased sea levels around the coast. The climate also has implications for the sizing of drainage systems.

The latest Climate change guidance[1] has been considered in this study when assessing the impact of the future climate change on flood risk.

11.2.3 Evaluation and Significance

With regard to surface water Q assessments, the Site Evaluation Criteria area assessed in accordance with Guidelines for the Ecological Assessment of National Road Schemes (NRA, 2009) and detailed in Table 11.1. Table 11.2 details criteria for rating attributes as per *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes* (NRA, 2009) and Table 11.3 details Reference Values for Q Value / WFD Status.

The significance of impacts has been assessed in terms of the magnitude of the effect/impact and the importance of that receptor, based on the criteria outlined in the *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes* (NRA, 2009).

Table 11.1: Site Evaluation Criteria (NRA, 2009)

Ecological Value	Description
Internationally Important	Sites designated (or qualifying for designation) as a SAC or SPA under the EU Habitats or Birds Directives
	Undesignated sites that fulfil criteria for designation as a European Site
	Features essential to maintaining the coherence of the Natura 2000 network
	Sites containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive
	Resident or regularly occurring populations of birds listed in Annex I of the Birds Directive and species listed in Annex II and/or Annex IV of the Habitats Directive
	Ramsar Sites
	World Heritage Sites
	Biosphere Reserves
	Sites hosting significant species populations under the Bonn Convention
	Sites hosting significant populations under the Berne Convention
	Biogenetic Reserves
	European Diploma Sites
	Salmonid waters
Nationally Important	Sites or waters designated or proposed as an NHA
	Statutory Nature Reserves
	Refuge for fauna and flora protected under the Wildlife Acts
	National Parks

[1] Flood Risk Management, Climate Change Sectoral Adaptation Plan, prepared by the Office of Public Works, September 2019

Ecological Value	Description
	Undesignated sites fulfilling criteria for designation as a NHA; Statutory Nature Reserves; Refuge for Fauna and Flora protected under the Wildlife Act and/or a National Park; Resident or regularly occurring populations (assessed to be important at the national level) of species protected under the Wildlife Acts and/or species listed on the relevant Red Data list) Sites containing viable areas of the habitat types listed in Annex I of the Habitats Directive
County Importance	Areas of Special Amenity Areas subject to a Tree Preservation Order Areas of High Amenity, or equivalent, designated under the County Development Plan Resident or regularly occurring populations (assessed to be important at the County level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed on the relevant Red Data list Site containing area(s) of the habitat types listed in Annex I of the Habitats Directive that do not fulfil criteria for valuation as of International or National Importance County important populations of species, or viable area of semi-natural habitats or natural heritage features identified in the National or local Biodiversity Action Plan Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level
Local Importance (higher value)	Locally important populations of priority species or habitats or natural heritage features identified in the Local Biodiversity Action Plan Resident or regularly occurring populations (assessed to be important at the Local level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed in the relevant Red Data list Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value
Local Importance (lower value)	Sites containing small areas of semi-natural habitat that are of some local importance for wildlife Sites of features containing non-native species that are of some importance in maintaining habitat links

Table 11.2: Criteria for Rating Site Attributes (NRA, 2009)

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities

Importance	Criteria	Typical Examples
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding Amenity site used by small numbers of local people

Source: Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2009)

Table 11.3: Reference Values for Q Value / WFD Status (Riverine only)

Q Value*	WFD Status	Pollution Status	Condition**
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory

Source: Environmental Protection Agency Ireland (epa.ie)

Notes:

* These Values are based primarily on the relative proportions of pollution sensitive to tolerant macroinvertebrates (the young stages of insects primarily but also snails, worms, shrimps etc.) resident at a river site.

** "Condition" refers to the likelihood of interference with beneficial or potential beneficial uses.

Table 11.4: Criteria for Rating Flood Risk Receptors

Importance/Sensitivity to Flood Risk	Criteria	Typical Examples
Extremely High	Flood Risk Vulnerability Classification “Essential Infrastructure”	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including infrastructure for electricity supply including generation, storage and distribution systems; including electricity generating power stations, grid and primary substations storage; and water treatment works that need to remain operational in times of flood. Wind turbines. Solar farms.
Very High	Flood Risk Vulnerability Classification “Highly Vulnerable”	Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. Emergency dispersal points. Basement dwellings. Caravans, mobile homes and park homes intended for permanent residential use. Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such

Importance/Sensitivity to Flood Risk	Criteria	Typical Examples
		installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure'.)
High	Flood Risk Vulnerability Classification "More Vulnerable"	Hospitals Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. Non–residential uses for health services, nurseries and educational establishments. Landfill* and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Medium	Flood Risk Vulnerability Classification "Less Vulnerable"	Police, ambulance and fire stations which are not required to be operational during flooding. Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill* and hazardous waste facilities). Minerals working and processing (except for sand and gravel working). Water treatment works which do not need to remain operational during times of flood. Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place. Car parks.
Low	Flood Risk Vulnerability Classification "Water Compatible"	Flood control infrastructure. Water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel working. Docks, marinas and wharves. Navigation facilities. Ministry of Defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Source: National Planning Policy Framework in the UK (https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification)

Table 11.5: Criteria for Rating Impact Magnitude

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Loss or extensive change to a waterbody or water dependent habitat Increase in predicted peak flood level >100mm Extensive loss of fishery Calculated risk of serious pollution incident >2% annually[2] Extensive reduction in amenity value
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Increase in predicted peak flood level >50mm Partial loss of fishery Calculated risk of serious pollution incident >1% annually Partial reduction in amenity value
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Increase in predicted peak flood level >10mm Minor loss of fishery Calculated risk of serious pollution incident >0.5% annually Slight reduction in amenity value
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Negligible change in predicted peak flood level Calculated risk of serious pollution incident <0.5% annually
Minor Beneficial	Results in minor improvement of attribute quality	Reduction in predicted peak flood level >10mm Calculated reduction in pollution risk of 50% or more where existing risk is <1% annually
Moderate Beneficial	Results in moderate improvement of attribute quality	Reduction in predicted peak flood level >50mm Calculated reduction in pollution risk of 50% or more where existing risk is >1% annually
Major Beneficial	Results in major improvement of attribute quality	Reduction in predicted peak flood level >100mm

Source: Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2009)

Table 11.6: Rating of Significant Environmental Impacts

Importance of Attribute	Magnitude of Impact			
	Negligible	**Small**	**Moderate**	**Large**
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant /	Profound /	Profound

[2] Refer to Annex 1 of HA216/06 Highways Agency (2006) Road Drainage and the Water Environment (HA216/06), Design Manual for Roads and Bridges (DMRB). The UK DMRB suggests that where the probability of a serious pollution incident is greater than1%/year, spill-containment measures should be considered. It also suggests that, in particularly sensitive waters, areas at lower risk of serious pollution may also warrant special measures. The formula is however tailored for road developments where increasing traffic densities and higher proportions of heavy goods vehicles (HGVs) are likely to lead to an increased risk of accidents that could give rise to hazardous spills. While the calculation is not appropriate for use on this project, having regard to the characteristics of the proposals as detailed in Section 11.3, regard has been had to the proposed mitigation as appropriate.

Importance of Attribute	Magnitude of Impact			
		Moderate	Significant	
High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

Source: Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2009)

11.2.4 Guidance

This assessment follows guidelines established by Transport Infrastructure Ireland (TII) / National Roads Authority (NRA) 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. Regard has also been had 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);
- Control of Water Pollution from Construction Sites - Guide to Good Practice (C532) (CIRIA, 2001); 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 runoff;
- 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, depending on if they are zone A, B or C respectively. Table 11.7 provides a definition of each Flood Zone.

The flood risk likelihood is defined as a percentage risk of occurring in any year. For example, a flood event may be described as having an annual exceedance probability (AEP) of 1%, this can also be written as a 1 in 100 year event. Critical infrastructure vulnerable to flooding should be located in Flood Zone C.

Table 11-7: Definition of Flood Zones

Flood Zone	Description
A	The AEP of flooding from rivers and seas is highest (greater than 1%AEP for flooding, or 0.5%AEP for coastal flooding)
B	The AEP of flooding from rivers and the sea is moderate (between 0.1% AEP and 1% AEP for river flooding, and between 0.1% AEP and 0.5% AEP for coastal flooding)
C	The probability of flooding from rivers and the sea is low (less than 0.1% AEP 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 Office of Public Works, The Planning System and Flood Risk Management, Guidelines for Planning Authorities (November 2009).

In general, potential sources of flood risk to a development are as identified in Table 11.8.

Table 11-8 Categories of Flood Risk

Category	Mechanism
Fluvial flooding	Exceedance of the flow capacity of the channel of a river, stream or other natural watercourse (which may be culverted). Fluvial flooding is typically associated with heavy rainfall events, and excess water spills onto the river floodplain.
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 tidelocking, flooding can occur as a result of high tidal levels and high fluvial flows in combination
Pluvial flooding (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.
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.
Flooding from artificial drainage systems	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
Flooding from infrastructure failure	Structural, hydraulic or geotechnical failure of infrastructure that retains, transmits, or controls the flow of water. Examples include hydro-power dams, water supply reservoirs, canals, flood defence structures, underground conduits (e.g. sewers), and water treatment tanks.

Source: CIRIA (2004) Development and Flood Risk, C624, Box 2.3

The proposed development has been screened for all potential sources of flooding. The key sources of information to determine the existing flood risk were the flood maps on the OPW flood information portal, namely Floodinfor.ie. The online flood maps come from different studies as follows:

- The Flood Maps provide information based on the National Catchment-based Flood Risk Assessment and Management (CFRAM) study from 2012. The flood maps present the river and coastal flood extents for the present-day scenario.
- The Coastal Maps provide information from the National Coastal Flood Hazard Mapping in 2021. These maps produced updated national scale coastal flood extents and depths maps for a wider range of return periods for the present day and future scenarios.
- The National Indicative Fluvial Mapping (NIFM) provide a second generation of indicative fluvial spatial data of a higher quality and accuracy.

11.3 Limitations of this EIAR

Identification of surface water features / waterbodies, such as rivers and lakes, has been based on site walkovers, desktop data such as those detailed on Environmental Protection Agency (EPA) datasets and mapping, and consultation with statutory and non-statutory bodies.

There were no other limitations encountered in compiling the information required to carry out this assessment of likely significant impacts on the water environment as a result of the proposed development.

11.4 Receiving Environment

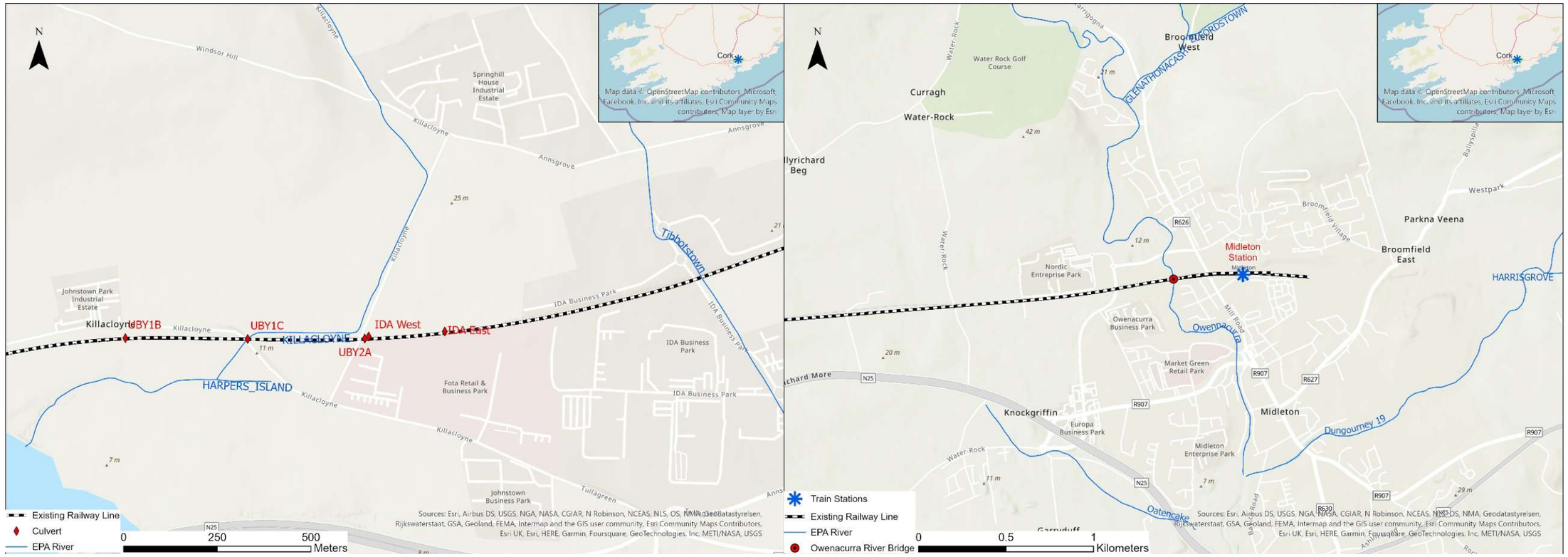
This section describes surface waters and water quality, protected areas, drainage, water supply, wastewater and flood risk. The study area is described in Section 11.2.1 and includes surface waters crossed by the proposed development and those adjacent to the proposed development. With regards to water quality, the zone of influence extends downstream along the watercourses which potentially could be affected by the proposed works.

An overview of the culvert and bridge works is detailed below, and the location and extent of the railway line are shown in Figure 11.3. Figure 11.4 illustrates the location of the Owenacurra Bridge and the culverts.

Figure 11.3: Overview of Proposed Development

Source: Mott MacDonald

Figure 11.4: Culvert and Bridge Locations



Source: Mott MacDonald

11.4.1 Bridge and Culvert Works

11.4.1.1 Owennacurra River Bridge

Works will be required at Owennacurra River Bridge (IE Code: UBY11) at chainage 9850 to widen the deck of the bridge on the existing piers to allow for a double track. Railway Underbridge UBY11 is a three span continuous deck with integral abutments. The bridge crosses the Owenacurra River at 0^0 skew. Refer to drawing C745-WP3_03-XX-XX-XXX-MMD-SE-0230.

The span lengths from west to east are ca. 10.85m, 7.16m and 10.85m. The proposed widened structure span arrangement, structural form and articulation, will be similar to the existing bridge. The widening deck consists of precast prestressed concrete beams with an in-situ infill concrete deck which will be stitched to the existing deck.

The bankseat (base of the bridge) widening will be supported on continuous flight auger piles. The two existing piers in the river channel were built to accommodate future widening of the bridge deck and are sufficiently wide and therefore no works are proposed. The existing pier capping beams will be widened to accommodate the proposed deck widening. The existing north walkway will be removed and reinstated on the widened deck. The existing reinforced concrete northern wingwalls will be demolished and rebuilt to accommodate the extension. Scaffolding will be required within the river during the works, this is the only instream work required.

11.4.1.2 IDA Open Culvert

This culverts a drain at the IDA lands. The existing open culvert is approximately 900m in length. The culvert consists of a u-shaped cross-section. The wall heights vary throughout the culvert length between ca. 1.4m and 2.56m. The channel width of the culvert is 1.45m.

A portion of the existing culvert is to be re-aligned by skewing to the north over a length of approximately 200m. It is proposed to re-use the existing culvert units which are fitted with lifting eyes and have a tongue and groove joint detail.

An in-situ connection will be required at the interface where the repositioning begins and at the interface with the existing IDA attenuation outfall. The re-aligned culvert will tie into UBY2A which is also being lengthened with the construction of new wing walls.

A sheet pile wall will be installed just north of the works area to retain the existing embankment during construction.

11.4.1.3 Culvert UBY2A

UBY2A culverts the Kilacloyne. The existing culvert is a ca .12m long twin cell structure. The widths are ca. 2.4m and 2.1m and the culvert internal height is ca. 1.2m. Reinforced concrete wingwalls are provided at both the inlet and outlet.

The culvert will be lengthened by ca. 2m to the north and ca. 2m to the south. The cross section dimensions of the lengthened sections will be similar to the existing cross section. The existing north and south wingwalls will be demolished and rebuilt to accommodate the lengthened structure.

11.4.2 Culvert UBY1B

UBY1B culverts an unmapped (EPA maps) watercourse. The existing culvert is ca. 14m long single barrel structure. The width is ca. 1.5m and the culvert internal height is ca. 1m. Reinforced concrete wingwalls will be provided at both the inlet and outlet.

The culvert is to be lengthened by ca. 1m to the north. The cross section dimensions of the lengthened sections will be similar to the existing cross section. The existing north wingwalls are to be demolished and rebuilt to accommodate the lengthened structure.

11.4.2.1 Culvert UBY1C

UBY1C culverts the Killacloyne. The existing culvert is a ca. 10m long single barrel structure. The width is ca. 2.1m and the culvert internal height is ca. 1m. Reinforced concrete wingwalls are provided at both the inlet and outlet.

The culvert is to be lengthened by ca. 1m to the north. The cross section dimensions of the lengthened sections will match the existing cross section. The existing north wingwalls are to be demolished and rebuilt to accommodate the lengthened structure.

11.4.3 Hydrology (Surface Water)

11.4.3.1 Water Framework Directive Overview

The study area is located within the WFD catchment: Lee, Cork Harbour and Youghal Bay and comprises of Lough Mahon, Killacloyne Stream Tibbotstown River, an unnamed watercourse at Water Rock and the Owenacurra River and estuary.

The latest WFD status for transitional waterbodies is as follows:

- Lough Mahon – Moderate
- North Channel Great Island (including Owenacurra Estuary) - Moderate

The proposed development between chainages 400 to 750 is located immediately north of Lough Mahon (Harper's Island) transitional waterbody. The water quality of Lough Mahon over the period 2018 – 2020 is classified as 'intermediate'. The Owennacurra River discharges into the Owenacurra Estuary ca. 1.4km to the south of the railway line. This transitional waterbody has a status of 'potentially eutrophic'.

River waterbodies within the zone of influence of the proposed development are detailed in Table 11.9 below and illustrated in Figures 11.1 and 11.2. The site number refers to the field study sites which were assessed in March 2022 by Triturus.

Table 11.9: Watercourses in the vicinity of the proposed development assessed by Triturus in March 2022

Site no. (Field assessment number)	Watercourse Name and Code	Location	X (ITM)	Y (ITM)
1A	Killacloyne IE_SW_19T250870	Upstream of railway crossing	579732	573328
1B	Killacloyne Stream	Old Youghal Road	579454	573292
2	Tibbotstown IE_SW_19T250870	Downstream of railway at Carrigtwohill Community College	579734	573282
3	Tibbotstown IE_SW_19T250870	Downstream of railway adjoining Carrigtwohill Business & Technology Park	580660	573445
4	Unmapped watercourse (Water Rock River)	West of local road L3618	586146	574159

Site no. (Field assessment number)	Watercourse Name and Code	Location	X (ITM)	Y (ITM)
5	Owennacurra River IE_SW_19O030500	North-west of Millbrook Drive (Midleton)	587516	574321

Detailed in Table 11.10 is the WFD status of EPA mapped waterbodies which have the potential to be affected by the proposed development.

Table 11.10: WFD Status

EPA Watercourse Name and Code	WFD Status	Instream Works required
Killacloyne IE_SW_19T250870	Moderate (assessment technique: expert judgement)	Yes-culverts to be extended: UBY2A, UBY1C
Owennacurra River IE_SW_19O030500	Moderate (assessment technique: monitoring)	Yes – scaffolding required: UBY11

In terms of biological water quality, no EPA biological water quality data was available for the Killacloyne. Biological water quality data was, however, available for the Owennacurra River both upstream and downstream of the existing railway crossing. The biological water quality 3.2km upstream of the railway crossing at the R626 Bridge crossing north of the Water Rock Golf Course was classed as (Q4-5) during 2020 at EPA station RS19O030400. However, biological water quality declined significantly 0.8km downstream of the railway crossing in the town centre at a bridge site over the New Cork Road (EPA station RS19O030500). At this location Q3-4 (moderate status) biological water quality was recorded. The Lower Owennacurra River is also considered 'at risk' of failing its Water Framework Directive objectives by 2027 based on the 2020 assessment made by the EPA catchments unit.

Biological water quality of the watercourses in the vicinity of the proposed development was assessed on 13 March 2022. The results are presented in Table 11.11 below.

Table 11.11: Biological Water Quality Status

Site no. (field assessment number	Watercourse	Ecological evaluation of importance[3]	Q Value	NRA (2009) Importance Classification
1A	Killacloyne Stream	Local importance (lower value)	Q3-4 (moderate status)	Low
1B	Killacloyne Stream	Local importance (lower value)	Q3-4 (moderate status)	Low
2	Tibbotstown River	Local importance (lower value)	Q3-4 (moderate status)	Low
3	Tibbotstown River	Local importance (lower value)	Q4 (good status)	Low
4	Water Rock River	Local importance (higher value)	Q4 (good status)	Low
5	Owennacurra River	**County Importance**	Q4 (good status)	Very high
n/a	Lough Mahon Estuary between	**International Importance**	N/A – transitional waterbody	Extremely high

[3] In accordance with TII/NRA Guidelines 'Guidelines for Assessment of Ecological Impacts of National Road Schemes. Revision 2, 2009.

Site no. (field assessment number	Watercourse	Ecological evaluation of importance[3]	Q Value	NRA (2009) Importance Classification
	Harper's Island and Killahoura			

11.4.4 Protected Areas

The railway line borders Cork Harbour SPA, Great Island Channel SAC and Great Island Channel pNHA. There are no proposed works within these designated sites. The Killacloyne and Owenacurra are drinking water sources. The following watercourses have been identified as nutrient / urban wastewater sensitive areas:

- Owennacurra Estuary / North Channel (IE_SW_060_0400) to the south of Midleton; and
- Lee Estuary / Lough Mahon (IE_SW_060_0750) to the west of Carrigtwohill.

11.4.5 On-site Surface Water Drainage

Where the tracks are to be retained unchanged, the existing drainage system will be retained pending condition surveys. Where significant alteration to the existing track or where new track is proposed the existing drainage will be removed and new drainage will be installed.

The proposed drainage will consist of filter drains, carrier drains, open V-ditches and subsurface drains:

- Filter drains are open jointed, porous or perforated pipes laid in trenches which will be backfilled with a porous media and run longitudinally along the track both collecting water along its length and conveying water from the track.
- Carrier drains are closed jointed and non-perforated and are used to convey water from the track at a depth greater than the depth of filter drains.
- Open V-ditches are open channels and will intercept any overland runoff from adjacent land which slopes towards the track. These ditches will also be used to convey water to discharge points.

The ballast and sub-ballast provided as part of the permanent way consists of granular material with excellent drainage properties. The ballast and sub-ballast will be designed and graded to act as a drainage blanket in order to protect the formation and ensure the adequate performance and durability of the ballast layer and minimise maintenance requirements. All subsurface drainage will be designed on this basis in combination with the use of filter drains, geo-membranes and geo-textiles to provide adequate sub-surface drainage and control the build-up of fines and sediment which could affect the long-term performance of the ballast and sub-surface drainage facilities. It is anticipated that all existing outfalls will be retained and that no new outfalls will be required.

11.4.6 Water Supply & Wastewater

With regard to the track infrastructure, there are no existing water supply requirements or wastewater discharges.

11.4.7 Flood Risk

11.4.7.1 Existing Coastal Flood Risk

Coastal flood risk – CFRAM study

A review of the Flood Maps[4] from CFRAM study has been carried out. The CFRAM Coastal flood extents are available for the following present day scenarios:

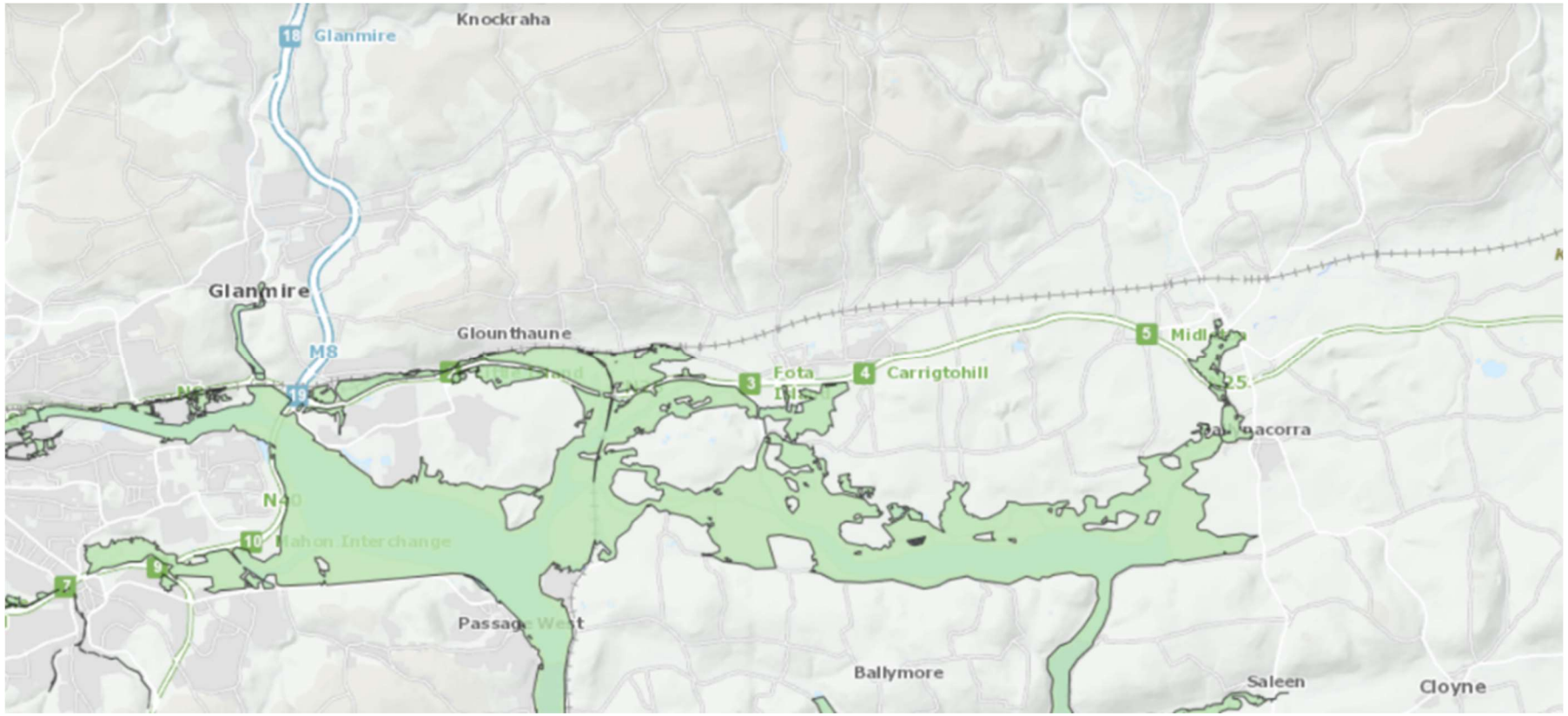
- Low Probability flood events have an indicative 1-in-a-1000 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 0.1%.
- Medium Probability flood events have approximately a 1-in-a-200 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 0.5%.
- High Probability flood events have approximately a 1-in-a-10 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 10%.

The initial approximate 2000m of the proposed development is at risk of coastal flooding from Lough Mahon, which is a sea lough in the north-western part of Cork Harbour. The sea lough flows under the N25 Road Bridge and fills the coastal area north of the road. The proposed development runs along the coastline and is predicted to be at risk of coastal flood in its lower sections, especially at the chainage 0 – 1500m, i.e. from Glounthaune to the L3004 Road bridge crossing.

The 0.1% AEP (or 1 in 1000yr) flood extent is presented in Figure 11.5. Further maps are provided in Appendix A.

[10] Home - Floodinfo.ie

Figure 11.5: 0.1% AEP Flood Risk Map (CFRAM)



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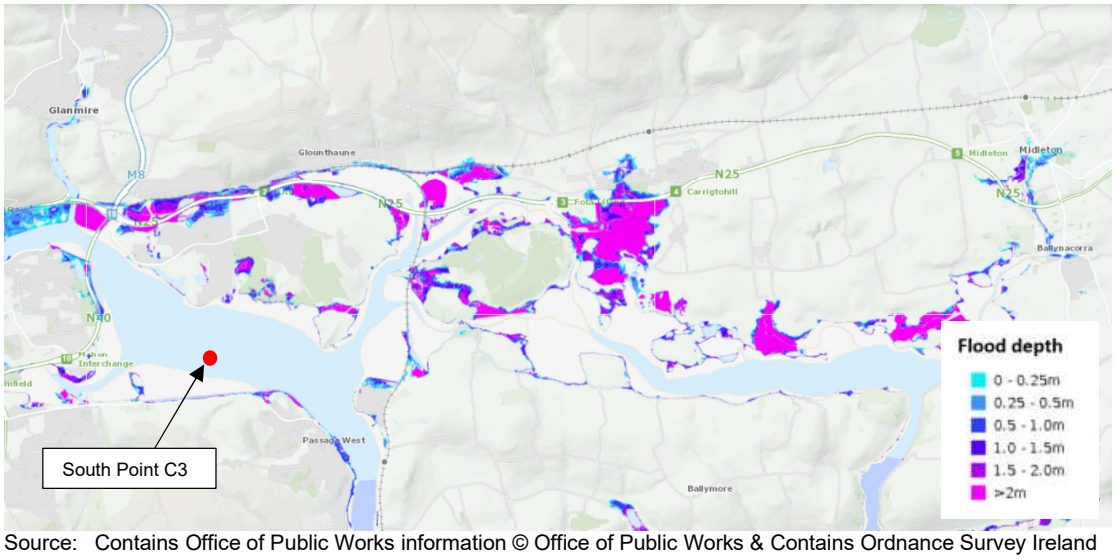
Coastal flood risk – Coastal Flood Hazard Mapping study

The 2021 National Coastal Flood Hazard Mapping provides more detailed picture of the coastal flooding in Ireland. The study provides not only the flood extents but also flood depths and flood level information for key locations along the coastline for a wide range of return periods.

The new coastal flooding maps are very similar to the CFRAM study flood maps and indicate that the proposed development is at risk of coastal flooding on its initial sections at Glounthaune, i.e. approximately the first 1800m when it runs between the coast line and L3004 Road. The remaining section of the track are not predicted to be at risk of coastal flooding for the events assessed.

Figure 11.6 shows the extents and flood depths for the 0.1%AEP (or 1 in 1000yr) flood event. Further maps are provided in Appendix 11.1 of this EIAR.

Figure 11.6: 0.1% AEP Flood Depths (Coastal Flood Hazard)



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The National Coastal Extreme Water Levels Estimation Points[5] has been examined. The estimation point 'South Point C3' provide extreme sea levels location inside Lough Mahon. The summary of these levels is provided in Table 11.12. The location of the 'South Point C3' point is in Figure 11.6 above.

Table 11-12: South Point C3 – sea water levels (OD Malin OSGM15 in meters)

AEP	Present Day	MRFS*	HEFS**	H+EFS***	H++EFS****
50%	2.55	3.05	3.55	4.05	4.55
20%	2.67	3.17	3.67	4.17	4.67
10%	2.76	3.26	3.76	4.26	4.76
5%	2.84	3.34	3.84	4.34	4.84
2%	2.95	3.45	3.95	4.45	4.95
1%	3.03	3.53	4.03	4.53	5.03
0.5%	3.12	3.62	4.12	4.62	5.12
0.1%	3.31	3.81	4.31	4.81	5.31

[5] Dataset providing estimate of extreme water levels around the coast of Ireland (Coastal Map - Floodinfo.ie)

* - MRFS – Mid-Range Future Scenario (mean sea level rise by 500mm by 2100)
** - HEFS – High End Future Scenario (mean sea level rise by 1000mm by 2100)
*** - H+EFS – High+ End Future Scenario (mean sea level rise by 1500mm by 2100)
*** - H++EFS – High++ End Future Scenario (mean sea level rise by 2000mm by 2100)

A review of available information on the railway track levels indicates that the existing track level is approximately 3m AOD at its initial sections at Chainage 1300m. This suggests that the track is at risk of 1% AEP (or 1 in 100yr) coastal flood event in the present-day scenario. However, this will reduce to approximately 50% AEP (or 1 in 2yr) coastal flood event considering the Mid-Range Future Scenario (MRFS) sea level rise by 2100.

11.4.7.2 Existing Fluvial Flood Risk

Fluvial flood risk – CFRAM study

A review of the Flood Maps[6] from CFRAM study has been carried out. The CFRAM Coastal flood extents are available for the following scenarios:

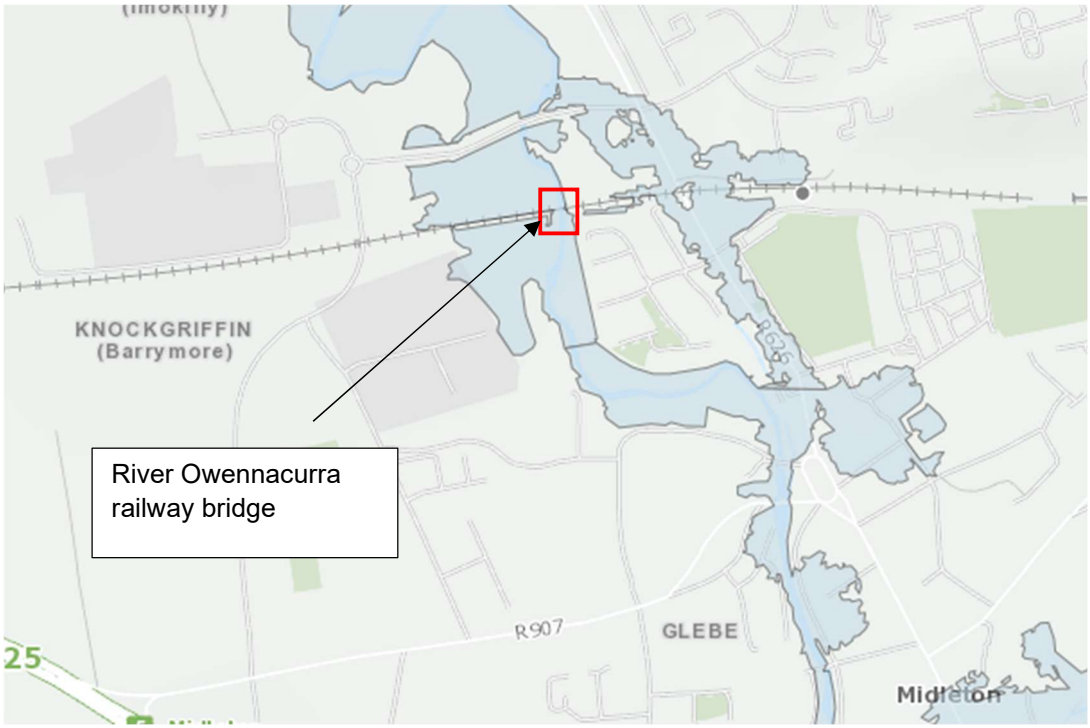
- Low Probability flood events have an indicative 1-in-a-1000 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 0.1%.
- Medium Probability flood events have approximately a 1-in-a-100 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 1%.
- High Probability flood events have approximately a 1-in-a-10 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 10%.

The CFRAM river flood extent maps predict that the proposed development is within the 0.1% AEP fluvial extent from the River Owennacurra in the Midleton area. The flood water for the 0.1% AEP is predicted to spill out of the channel upstream of the railway track and flood low lying areas along the R626 Road and railway track. The River Owennacurra railway bridge is also predicted to be of insufficient capacity and the railway track is predicted to be overtopped by the flood water.

Figure 11.7 shows the predicted flood extents from the 0.1% AEP (or 1 in 1000yr) river flood extents from the CFRAM study for the present day scenario. Further maps are provided in Appendix A.

[10] Home - Floodinfo.ie

Figure 11.7: 0.1% AEP CFRAM River Flood Extent Map



Source: Contains Office of Public Works information © Office of Public Works & Contains Ordnance Survey Ireland information © Ordnance Survey Ireland

Fluvial flood risk – NIFM study

A review of the Flood Maps[7] from the National Indicative Fluvial Mapping (NIFM) study has been carried out. The NIFM River flood extents are available for the following present day scenarios:

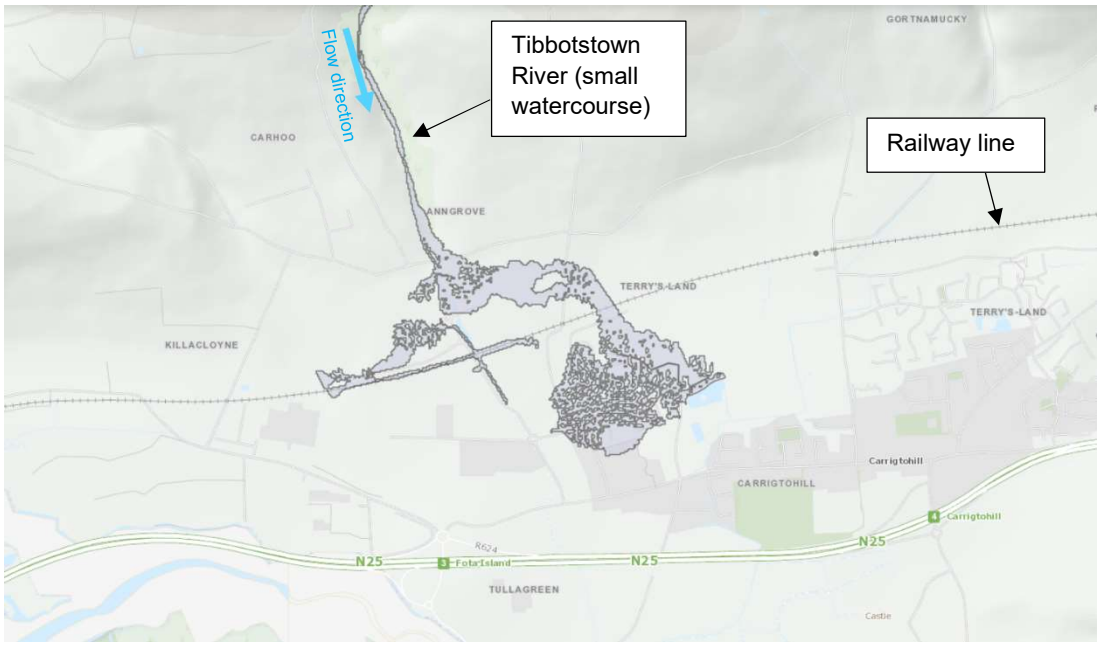
- Low Probability flood events have an indicative 1-in-a-1000 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 0.1%.
- Medium Probability flood events have approximately a 1-in-a-100 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 1%.

In addition to the Midleton area, the NIFM study predicts fluvial flood risk at the Anngrove crossing. The small local watercourse is predicted to spill out of the bank and flood low lying sections of the railway track. The indicative fluvial flooding occurs from chainage 2300m to 3500m.

Figure 11.8 shows the predicted flood extent of the 0.1% AEP fluvial flood event from the NIFM study.

[10] Home - Floodinfo.ie

Figure 11.8: NIFM study – 0.1% AEP flooding extent at Anngrove



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Smaller watercourses and culvert

The OS Maps and available information on the railway structures have been reviewed to determine whether there are other potential sources of fluvial flooding from smaller watercourses that have been too small to be included in the two national studies (i.e. the CFRAM and NIFM study).

The review identified several minor water features with culvert crossings under the existing railway line. These are summarised in Table 11.13.

Table 11.13: Small Watercourse features

NGR (Easting/Northing)	Chainage (m)	Description	Proposed works during twin-tracking
179153 073241	1350	UBY1B Culvert – precast concrete box, currently single-track section, width of 1.5m	**Length of the culvert to be extended.**
179506 073239	1700	UBY1C Culvert Killacloyne – precast concrete box at the start of the IDA side channel, currently single-track section, width of 2.1m	**Length of the culvert to be extended.**
179792 073240	1985	UBY2A Culvert – precast concrete box, currently single-track section, width of 4.8m	**Length of the culvert to be extended.**
X = 79757.100 Y = 573307.306 (Westerly point) X = 79960.326	1700 to 2900	IDA open culvert along the north side of the track. The channel drains the Anngrove area, which is an identified source of fluvial flooding in Section 4.2.2	**Open channel section to be re-positioned**

Y = 573320.614 (Easterly point)			
181686 073722	3950	UBY5E Carrigtohill – concrete precast pipe, currently twin-track section, width of 0.60m	No works proposed
181763 073738	4020	UBY5C Culvert Carrigtohill – concrete pre-cast box, currently twin-track section, width of 1.8m	No works proposed
183042 073916	5300	UBY6B Culvert – concrete pre-cast box, currently twin-track section, width of 1.5m.	No works proposed
183185 073925	5460	UBY6C Culvert – concrete pre-cast box, currently twin-track section, width of 2.1m	No works proposed
186248 074100	8520	Water Rock watercourse – no culvert identified	No works proposed

Comments: Refer to Appendix A for chainage sections for site area.

Four locations at the small watercourses have proposed works as part of this development, namely UBY1B, UBY1C, UBY2A culverts and IDA open culvert. The proposed modifications at UBY2A Culvert and IDA open culvert are in the area where the fluvial flood risk is identified by the NIFM study. Therefore, a more detailed hydraulic assessment has been carried out to quantify the potential impacts on flood risk. The details of the hydraulic modelling are in Appendix 11.1 of this EIAR.

There is limited information about the existing flood risk at UBY1B and UBY2B Culverts and no further hydraulic modelling has been carried out. Instead, it has been assumed that the flood risk and potential changes in flood risk due to the proposed development will be the same as at the UBY2A Culvert and the same conclusions/recommendations will need to be applied.

The other structures along the proposed development are not proposed to be modified and therefore there will be no further change in the fluvial flood risk.

11.4.7.3 Existing Pluvial Flood Risk

No pluvial flood maps are available for the Glounthaune / Midleton area on Floodinfo.ie. However, the existing track runs along hill sides and intercepts rainfall runoff. The existing track is at risk of pluvial flooding if the track drainage is not sufficient, especially on lower lying areas and cuttings. The proposed track is of a similar level to the existing and so could be at pluvial flood risk.

As part of the twin-tracking works, drainage provision for the track (particularly the ballast) will be provided by a combination of transverse and linear filter and / or sealed drains which in turn will discharge to ditches or carrier pipes conveying the runoff to the nearest outfall point, either a culvert or natural watercourse. However, it is not proposed to change the existing pluvial flood risk from runoff, so flood risk elsewhere will not be increased.

11.4.7.4 Existing Groundwater Flood Risk

Groundwater flooding occurs when the water stored within the ground rises above the land surface. This is normally related to prolonged rainfall causing water table rise in the limestone lowland areas in the west of the country.

An online Groundwater Flooding Data Viewer[8] has been reviewed and there is no area of High, Medium or Low Probability of groundwater flooding along the proposed development.

[8] Groundwater Flooding Data Viewer (arcgis.com)

However, the Geological Survey of Ireland Spatial Resources[9] indicates that the primary bedrock geology makeup, along the railway, comprises largely of limestone, in many places covered by variable thickness of glacial till, consisting predominantly of clay but with significant presence of silts, sands and gravels. There are several known cave systems in the area and many features associated with subterranean drainage including sinking streams, ephemeral springs, sinkholes/ground collapses and turloughs. This is why some of the surface water courses in the area appear to disappear: they entirely sink to ground, rising down-hydraulic gradient as springs, or as seepage/discharge in river beds or the coastal zone. Due to the proximity to the estuary, a tidal influence on groundwater levels is likely. Further details on the hydrogeology and groundwater levels are presented in Chapter 10 - Land, Soil and Hydrogeology.

Therefore, the proposed development is deemed to be at moderate to high risk of groundwater flooding.

Hydrogeology analyses in Chapter 10 concluded that the proposed development is expected to have a negligible permanent impact to the existing hydrogeology and groundwater conditions.

11.4.7.5 Existing Flooding from Artificial Drainage System and Infrastructure

The proposed twin-tracking of the railway track will follow the route of the existing railway. The review of the OS map did not identify any water holding or water conveying infrastructure that could potentially cause further flood risk to the new track.

A request was made to Irish Water for detailed information on their network in the project area. All potable water and waste water information was provided to the project in drawing form. No impact on Irish Water infrastructure was identified and therefore no effects are likely.

Therefore, the proposed development is deemed not to be at risk of flooding from the artificial drainage system of infrastructure failure. As the new track is proposed along the same route as the old track, the proposed development will not increase flood risk elsewhere.

11.4.7.6 Summary of the existing flood risk

The proposed development consists of the construction of a twin-track railway between Glounthaune and Midleton. The railway line is ca. 10km in length and is at risk of flooding at several places.

It is recognised that the main receptor of the flood risk is the railway track, which is classified as essential transport infrastructure and therefore is a receptor in the highest category of Importance and Sensitivity to Flood Risk. For this reason, all areas identified as being at risk of flooding have been evaluated as being of ‘Extremely High’ Importance.

In addition to the railway track there are other essential receptors within the identified flood risk areas, especially in the Glounthaune and Midleton urban area, which further supports the selection of the ‘Extremely High’ Importance category.

As the railway track is currently at risk of flooding and the new track will also be exposed to the same level of flood risk, a Justification Test has been undertaken to assess the appropriateness of the development being considered in the area of flood risk. The Justification Test is presented in the Appendix 11.2 (FRA Stage 1).

The summary of the existing flooding and its evaluation is provided in Table 11.14.

[9] Geological Survey Ireland Spatial Resources (arcgis.com)

Table 11-14 Summary of existing flood risk and its evaluation

Flood risk category	Area	Chainage	Existing flood risk	Evaluation of Importance Sensitivity to Flood Risk
Fluvial flooding	IDA open culvert	2300-3500	NIFM study predicts out of bank flow from a local watercourse for the 1 in 100yr flood return period. Flooding affects the existing railway track and the area around the track, including commercial and residential properties.	Extremely High
	River Owennacurra	9700-10400	CFRAM and NIFM studies predict out of bank flow from the River Ownnacurra at Midleton for the flood event as frequent as 1 in 10 year fluvial flood. The out of bank flow becomes more significant for the 1 in 100yr flood when larger urban area, existing railway track and R626 Road become flooded.	Extremely High
	UBY2A culvert,	1980	UBY2A Culvert conveys water from the IDA open culvert under the railway track from north to south. NIFM study predicts out of bank flow from a local watercourse for the 1 in 100yr flood return period. Additional hydraulic modelling by Mott MacDonald (see Appendix B) determined that only the 1000yr flood event overtops the railway track.	Extremely High
	Other small watercourses and culverts (including UBY1B, UBY1C Culverts)		Flood risk at other small watercourse is unknown as these watercourses were not assessed during the latest national flood studies. However, it is assumed that the flood mechanism at these locations will be similar to the UBY2A culvert	Extremely High
Coastal and tidal flooding	Lough Mahon	0-2000	The sea lough flows under the N25 Road Bridge and fills the coastal area north of the road. The initial section of the existing railway track is at a low level and at risk of coastal flooding. The track is predicted to be at risk of 1% AEP (or 1 in 100yr) coastal flood event in the present-day scenario.	Extremely High
Pluvial flooding (overland flow)	Low lying areas	n/a	Low lying areas and cuttings of the railway track might be at risk of pluvial flooding if the track drainage is not effective. There is no further information on existing pluvial flooding or any records of pluvial flood event at the existing track.	Extremely High
Groundwater flooding	Low lying areas	n/a	Geological Survey of Ireland indicates that the local bedrock geology comprises largely of limestone with several known cave systems. This may pose groundwater flood risk to the existing railway track at various locations. Therefore, the proposed development is deemed to be at moderate to high risk of groundwater flooding. To further quantify the groundwater flooding a detailed assessment would be required.	Extremely High
Flooding from artificial drainage systems or infrastructure failure	n/a	n/a	No existing flood risk identified.	Extremely High

11.5 Likely Significant Impacts

11.5.1 Construction Phase

Given the nature of the proposed development, the potential for impacts on the water environment are for the most part associated with the construction phase of the proposed development and are similar to any civil engineering project. These include:

- Impacts to surface water quality from sediment runoff, spillages, discharges or physical modification of culverts.
- Impacts on drainage patterns from working in or near watercourses.
- Impacts on water supply and drainage infrastructure.
- Impacts on flood risk.

11.5.1.1 Surface Water Quality

Culverts are to be extended along the Killacloyne Stream (UBY1C and UBY2A), the open IDA culvert and at an unnamed watercourse (UBY1B). These works have the potential to affect water quality in the absence of mitigation. There are limited instream works within the Owenacurra River, as a scaffold will be required to be erected during the widening of the bridge deck and abutment works. In addition, there is potential during construction for groundwaters to become contaminated which may affect surface waters: several sites of groundwater-surface water interaction have been identified close to the proposed development, including Cork Harbour SPA. There is the potential that karst features in close proximity to the proposed development may be connected to these sites.

Vegetation clearance, excavations, removal and repositioning of ballast can pose a risk to surface water quality through surface water run-off and the release of sediment to watercourses. Ground damage from construction vehicles and machinery can also cause rutting and increased erosion of soils. Access tracks used during construction may affect surface run-off patterns, creating alternative flow paths, promoting erosion and localised flooding.

Elevated levels of sediment could impact on spawning fish, through issues including the sedimentation of spawning gravels, clogging of fish gills and reduction in dissolved oxygen.

Accidental release of potentially polluting substances such as oils (hydrocarbons) can result in significant impacts on the aquatic environment. The release of hydrocarbons can impact water dependent species resulting in disruption to neurosensors, abnormal behaviour and development issues as well as direct impacts on fertility. Oil spills can reduce the capacity of a waterbody to exchange oxygen as well as result in oil coating the gills of aquatic species causing lesions on respiratory surfaces. This can result in significant respiratory difficulties for aquatic organisms. Benthic invertebrates can be adversely affected if fractions of hydrocarbons settle and accumulate in sediments. This can result in the mortality of populations and prevent future colonisation.

Concrete and cement are highly alkali 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 impacts upon water bodies.

Schedule 5 of SI 272 of 2009 (European Communities Environmental Objectives (Surface Waters) Regulations 2009) includes the following (WFD) pH limits for rivers and lakes:

- Soft water 4.5< pH < 9.0, where soft water is ≤100 mg/1 $CaCO_3$; and
- Hard water 6.0< pH < 9.0, where hard water is >100mg/l $CaCO_3$.

The sensitivity of the receiving surface water environment ranges from low (small streams) to very high (Lough Mahon is part of Cork Harbour SPA and Great Island SAC).

The magnitude of adverse surface water quality impacts in the absence of additional mitigation is expected to be Small to Moderate resulting in Moderate to Significant adverse impacts of temporary duration prior to the implementation of mitigation measures.

11.5.2 Impacts on water supply and drainage infrastructure.

A request was made to Irish Water for detailed information on their network in the project area. All potable water and wastewater information was provided to the project in drawing form. No impact on Irish Water infrastructure was identified and therefore no effects are likely.

During construction, welfare facilities will be provided at compounds and any discharges will be connected to a sealed holding tank to be emptied and disposed of off-site by a licenced contractor to an approved licenced facility. Water will be tankered onto site as required. Consequently, significant adverse impacts on utility services during the construction phase are not likely.

11.5.3 Flood risk

There are areas where construction works may affect flow area of the existing watercourses and potentially impact the existing fluvial flood risk. This mainly applies to the proposed works at the Owennacurra River bridge, where a temporary scaffolding at the piers will be required. In addition, the IDA open culvert will be re-positioned. The construction works at the culverts requiring lengthening will also temporarily impact the flows through the channel.

It is proposed that any works affecting in-channel flood flows or works inside the existing floodplain during the construction phase are discussed with the flood risk specialist from the design team and if necessary further mitigation put in place.

It is proposed that any runoff from the construction site is managed by appropriate drainage system that will limit the surface water runoff to the existing quantity not to increase flood risk elsewhere.

In general, the proposed construction compounds will be located outside flood zones A and B. However, it is necessary to locate some construction compounds within these zones. If located in the flood risk area there will be no changes to existing ground levels, no changes to watercourses and no buildings locate in compound, so as to minimise the potential for changing flood risk elsewhere. In addition, an early flood warning system will be set up to allow the removal of plant and material from the compound in events of flood warning. The review of construction compound locations indicates that those located within flood zone A and/or B are Compound 4 (at Chainage 9800) and Compound 5 (Chainage 9900).

The impact of construction on other sources flooding, such as coastal and groundwater flooding, is deemed to be negligible.

11.5.4 Operational Phase and Maintenance

Effects during the operational phase are limited to oil and coolant leaking from trains, oil/greases/lubricant release from point switches and track curves, accidental spillage of chemicals. There will also be maintenance works along the railway line, however, this will be intermittent. Maintenance works may include vegetation trimming, application of herbicide, replacement of ballast and repair of track elements. Effects arising include spillage of chemicals/herbicide and dust/soil movement entering nearby watercourses. As per the construction phase, the effects on surface water quality would vary from moderate to significant dependent on the status of the watercourse affected and in the absence of mitigation.

A detailed flood risk assessment (Stage 3) has been carried out to assess the impact of the proposed development on existing flood risk. The assessment included a construction of the 1d hydraulic model of the IDA and UBY2A culverts and review of the CFRAM hydraulic model results at the Owennacurra River bridge. The details of the assessment are presented in Appendix 11.1 of this EIAR.

Although it is recognised that the existing railway track is at risk of flooding at various locations, the analysis determined that the proposed development will not increase flood risk to the railway track or elsewhere.

11.5.5 Do Nothing

The 'Do-nothing' alternative describes the circumstance where no development occurs. It is predicted that, in the absence of the development proposal or 'do-nothing' scenario that surface water quality would not be affected adversely as works would be limited to existing maintenance along the operational railway line. There will be no further change to flood risk considering that the watercourses and culvert are regularly maintained.

11.5.6 Decommissioning

The activities associated with the decommissioning phase will be similar to those associated with the construction phase. Therefore, provided that appropriate mitigation is used, the impacts of the decommissioning phase should be, as a worst-case scenario, similar to those at construction phase.

11.5.7 Cumulative Effects

Cumulative effects may occur in the event that works in the vicinity of the same watercourse occur concurrently or immediately subsequently. Before the commencement of construction and during the construction phase, engagement with the proponents of other developments (refer to Table 2.2 in Chapter 2 of this EIAR) will continue and where there is potential for works to be carried out in parallel, appropriate mitigation measures will be implemented including the scheduling of works and regular liaison meetings between project teams to ensure that plans are co-ordinated and impacts on water are mitigated and minimised. Following the implementation of mitigation measures detailed in this EIAR and the measures to be implemented by other projects, significant adverse effects are not likely to occur.

11.6 Mitigation and Monitoring Measures

11.6.1 Construction Phase

11.6.1.1 General

The following mitigation measures will be implemented prior to commencement and throughout the duration of the proposed works.

- A full-time on-site Environmental Clerk of Works (EnCoW) will be appointed prior to commencement of works.
- Confirmatory pre-construction surveys will be carried out and seasonal constraints will be confirmed in agreement with IFI and National Parks and Wildlife Service (NPWS) and Cork County Council, as appropriate.
- Works will be carried out in accordance with the guidelines set out by IFI in *'Guidelines on Protecting Fisheries During Construction Works in and Adjacent to Waters'* (IFI, 2016).

- The IFI Biosecurity Protocol for Field Survey Works[10] will be complied with.

11.6.1.2 Surface Water Quality Protection Measures

The following water quality mitigation measures will be implemented prior to commencement and throughout the duration of the works:

- Water quality monitoring will be conducted upstream and downstream of the works prior to works commencing and at regular intervals during 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 i.e. 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 10m will be maintained between storage and working areas and watercourses, taking account of the minimum working area required to facilitate the works.
- The time period over which areas of clearance are left open will be reduced insofar as is reasonably practicable.
- Re-instatement 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 avoided where possible.
- The Contractor will ensure that all concrete truck wash watering / cleaning is undertaken offsite where possible and remote 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 in accordance with established best practice guidelines; and
  - Spill kits will be provided at all compound locations and carried by all crews during underground cable installation works.
- Works will not be carried out during extreme rainfall or high flow events. An early flood warning system will be set up to allow the removal of plant and material from construction compounds located in Flood Zones A and B in the events of flood warning.
- 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 to inform adaptive management as required. The locations of same will be determined by the EnCoW.
- Site restoration post works will be carried out, in agreement with IFI with regard to the IDA culvert and works at the Owenacurra River Bridge. These works may include riverbank stabilization, gravel replacements etc. In all cases, the site will be restored post installation.
- There are also two construction compounds proposed on the west side and east side of the Owenacurra River. The westerly compound is only for access to the bridge abutments and there will be no portacabin or storage in this area. The easterly compound will be used for storage of materials. Both compounds will be set back from the riverbank by a minimum of 15m.

[10] file.html (fisheriesireland.ie)

- The works to extend/reconfigure culverts will be conducted during the period July – September to avoid effects on fisheries.
- Catch netting will be installed on the underside of the Owenacurra River Bridge to prevent any material from entering the watercourse.

Silt Control Measures

- 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 include silt traps which can be located in small drains where flow is small and silt fences where runoff from large areas needs to be controlled.
- Silt fences must 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 30m from the watercourse will be maintained.
- 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 curtain must contain the area where silt is generated and must 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 metre intervals.
- Once installed the silt fence will be inspected regularly, 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. Re-instatement method statements will be subject to approval by the EnCoW.
- The silt fencing must 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.
- 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.
- In sensitive areas a series of silt traps will be placed in the drain.
- The silt trap will not be pulled from the ground but cutaway at ground level and posts removed.
- A record of when it was installed, inspected and removed will be maintained by the EnCoW.

Karst measures

Due to the sensitivity and connectivity of the karstic environment, including the risk of potential connections between karst features and sensitive receptors outside of the study area, additional mitigation measures to reduce the risk of impact will be used. These include that:

- A buffer area (at least 20 m) will be provided surrounding each identified karst feature, whereby no construction activity, including storage of materials will occur.
- Storage of materials (including excavated materials and fill and ballast) will avoid areas at risk of surface water or groundwater flooding or areas of convergence of flow; and
- The use of additional pollution prevention measures, such as double silt fencing, will be used where excavation occurs adjacent to an identified karst feature.

The design of drainage will be as such to avoid discharge of surface run-off to any identified karst feature or area of karst bedrock. This will include the use of lined ditches or impermeable pipes to direct collected water away from such featuresFlood Risk Protection Measures

Any construction activities inside the watercourse or impeding flow area of the existing watercourse or inside the existing floodplain should be consulted with a Flood Risk Specialist. The Flood Risk Specialist will determine if a further assessment or mitigation measures are required. The mitigation measures may include the creation of a flood plan and putting an early flood warning system in place.

Appendix 11.3 (FRA Stage 3) identified the potential risks and mitigation in relation to the construction works on culverts and the Ownennacurra Bridge. Should the construction method change, a new assessment will be required by the Flood Risk Specialist.

11.6.2 Operational Phase and Maintenance

During the operational phase 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:

- Trains will be regularly inspected for any leaks;

- All collected waste will be managed in accordance with the Waste Management Act 1996, as amended and associated Regulations:
- Fuels, chemicals (including herbicide), 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 in accordance with established best practice guidelines; and
- Spill kits will be provided to all crews carrying out maintenance activities.

It is recognised that the existing track and the future twin tracked line will be at risk of fluvial and coastal flooding. Considering the future climate change the flood risk is likely to become more frequent. It is therefore recommended that an early flood warning system is incorporated into the operation phase of the new railway track.

11.7 Residual Impacts

With the implementation of the mitigation measures proposed, the proposed development will not result in a change in status of any WFD quality elements or prevent any waterbodies from reaching good status in the future.

During the construction phase impacts on surface water quality are anticipated to be localised and temporary in duration and the residual effect will be of imperceptible-slight significance. The residual impacts during the operational phase are expected to be imperceptible.

The existing track is at risk of coastal, pluvial and fluvial flooding. The proposed track is of a similar level to the existing and will therefore continue to be at the same flood risk. However, there will be no increase in flood risk elsewhere as a result of the proposals.

It is recognised that the initial section of the track is at risk of coastal erosion. Additional mitigation measures will be constructed where necessary to protect the track.

11.8 Summary

This Surface Water and Flood Risk chapter has undertaken a desk-top assessment on the basis of the relevant legislation and guidelines. It presents a detailed analysis of the receiving environment in terms of surface water hydrology and water quality, on-site surface water drainage, water supply and wastewater and flood risk for the proposed development.

The characteristics of the development and mitigation have been described, alongside the anticipated construction phase and operational phase activities. The likely significant impacts of the proposed development have been assessed and, where significant uncertainties or risks remain, requirements for additional mitigation and monitoring measures have been stated.

Taking into account the mitigation, residual impacts to the water environment and flood risk are considered negligible with imperceptible significance.

11.9 References

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);

Control of Water Pollution from Construction Sites - Guide to Good Practice (C532), (CIRIA 2001);

The Planning System and Flood Risk Management, Guidance for Planning Authorities, (OPW, November 2009)

Flood Risk Management, Climate Change Sectoral Adaptation Plan, Prepared under National Adaptation Framework, (OPW, September 2019);

Glounthaune and Midleton Railway Upgrade, Flood Risk Assessment Stage 1, (Mott MacDonald, March 2022);

Glounthaune and Midleton Railway Upgrade, Flood Risk Assessment Stage 3, (Mott MacDonald, July 2022);

Flood Risk Maps from various national studies, Available at: Home - Floodinfo.ie

Chapter 12 - Biodiversity

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12 Biodiversity

12.1 Introduction

This chapter assesses the likely significant effects from the Glounthaune to Midleton Twin Track Project on biodiversity and the wider ecological environment which could potentially be affected by the development, as described in Chapter 6.

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

The potential effects on biodiversity from the proposed development are assessed. Mitigation measures are provided to avoid / reduce significant effects on biodiversity receptors and residual effects are determined.

12.2 Methodology

In assessing the likely significant effects on Biodiversity, the following data sources were consulted and considered:

- Guidance and legislation
- Desktop assessment of available data
- Consultation with relevant stakeholders
- Field surveys

Details relating to the methodology of each of these is presented below in Sections 12.1.1 to 12.1.5.

12.2.1 Guidance and Legislation

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

This chapter addresses biodiversity.

In carrying out an EIA in respect of an application made under section 37 of the 2001 Act, An Bord Pleanála is required, where appropriate, to co-ordinate the assessment with any assessment under the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora) or the Birds Directive (Directive

2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds). Ireland has given effect to the Habitats and Birds Directives through Part XAB of the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) as amended ("the Habitats Regulations" or "the Habitats Regulations 2011 to 2021").

The Habitats Regulations were amended *inter alia* by the European Union (Birds and Natural Habitats) (Sea-fisheries) Regulations 2013 (S.I. No. 290 of 2013); the European Communities (Birds and Natural Habitats) (Amendment) Regulations 2013 (S.I. No. 499 of 2013); the European Communities (Birds and Natural Habitats) (Amendment) Regulations 2015 (S.I. No. 355 of 2015); Chapter 4 of the Planning, Heritage and Broadcasting (Amendment) Act 2021 (No.11 of 2021) and the European Union (Birds and Natural Habitats) (Amendment) Regulations 2021 (S.I. No. 293 of 2021). The Habitats Regulations list priority habitats and species of international (European Union) conservation importance, which require protection. This protection is afforded in part through the designation of European sites – areas that represent significant occurrences of listed habitat types and populations of listed species within a European context. Areas designated for bird species are classed as Special Protection Areas (SPAs), while those designated for other protected species and/or habitats are classed as Special Areas of Conservation (SACs). Wild bird species in SPAs, and habitats and species listed on Annexes I and II (respectively) to the Habitats Directive that are contained in SACs, are legally protected.

Additionally, species listed on Annex IV to the Habitats Directive are strictly protected wherever they occur – whether inside or outside the Natura 2000 network. This protection is afforded to animal and plant species by Sections 51 and 52, respectively, of the Habitats Regulations. Annex I habitats outside of SACs are still considered to be of national and international importance and, under Section 27(4)(b) of the Habitats Regulations, public authorities have a duty to strive to avoid the pollution or deterioration of Annex I habitats and all habitats integral to the functioning of SPAs.

The Wildlife Acts (which include *inter alia* the Wildlife Act 1976, the Wildlife (Amendment) Act 2000, the Wildlife (Amendment) Act 2010, the Wildlife (Amendment) Act 2012, the Heritage Act 2018, including Part 3 thereof, the Planning, Heritage and Broadcasting (Amendment) Act 2021, including Chapter 3 thereof) are the principle legislative mechanism for the protection of wildlife in Ireland. A network of nationally protected Nature Reserves, which public bodies have a duty to protect, is established under the Wildlife Acts. Sites of national importance for nature conservation are afforded protection under planning policy and the Wildlife Acts. Natural Heritage Areas (NHAs) are sites that are designated under the Wildlife Acts for the protection of flora, fauna, habitats and geological features of interest. Proposed Natural Heritage Areas (pNHAs) are published sites identified as of similar conservation interest, but which have not been statutorily proposed or designated – but are nonetheless afforded some protection under planning policies and objectives.

The Wildlife Acts also protect species of conservation value from injury, disturbance and damage to individual entities or to their breeding and resting places. All species listed on the relevant Schedules to the Wildlife Acts must, therefore, constitute a material consideration in the planning process. An additional piece of national legislation for the protection of wild flora, i.e. vascular plants, mosses, liverworts, lichens and stoneworts, is the Flora (Protection) Order, 2022, which makes it illegal to cut, uproot or damage listed species in any way or to alter, damage or interfere in any way with their habitats.

In addition to the above, in assessing the likely significant effects on the prevailing biodiversity arising from the proposed works (including decommissioning works), due regard, where relevant, has been given to relevant legislation and guidance, including the following:

- EIA Directive (2014/52/EU);
- Planning and Development Acts 2000, as amended and the Planning and Development Regulations 2001, as amended;
- Wildlife Act 1976, as amended;
- Flora (Protection) Order 2015;
- EU Water Framework Directive 2000/60/EC;
- European Communities (Birds and Natural Habitats) Regulations 2011 (as amended);
- National Biodiversity Action Plan 2017 - 2021
- EU Biodiversity Strategy for 2030 (EU, 2020);
- EU Strategy on Green Infrastructure (EU, 2013);
- National Biodiversity Action Plan for 2017-2021 (Department of Culture. Heritage and the Gaeltacht, 2017);
- National Parks and Wildlife Service (NPWS) Threat Response Plans (NPWS, Various);
- Cork County Development Plan 2022-2028;
- Local Area Plans for the municipal districts of East Cork and Cobh

In addition, the assessment was carried out having regard to the following guidance documents:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.1. [Chartered Institute of Ecology and Environmental Management (CIEEM), 2018, updated 2019];
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR) (EPA 2022);
- Advice Notes for Preparing Environmental Impact Statements DRAFT (EPA, September 2015);
- Biodiversity Net Gain. Good practice principles for development. A practical guide. (CIRIA C776a, 2019);
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Union, 2013);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2009);
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (National Roads Authority, 2009);
- Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (National Roads Authority, 2005);
- Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes (National Roads Authority, 2008);
- Guidelines for the Treatment of Bats During the Construction of National Road Schemes (National Roads Authority, 2005);
- A Guide to Habitats in Ireland (Fossit, 2000);
- Best Practice Guidance for Habitat Survey and Mapping (Smith et al., 2011);
- Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters;
- Countryside Bird Survey (2012) CBS Manual Guidelines for Countryside Bird Survey participates;
- Bat Surveys: Good Practice Guidelines, Third Edition (Bat Conservation Trust, 2016).

12.2.2 Desktop Assessment

A desktop assessment was carried out to identify features of ecological importance which have potential to be affected by the proposed development. The assessment included an interrogation of aerial imagery and available GIS datasets to investigate the potential for connectivity to designated and ecologically sensitive areas. Habitats which might be affected by the development were identified and their suitability to support sensitive, rare and protected species was assessed (having regard to the typical ranges of species known to occur in the locality).

Principal sources of information utilised for the desktop assessment included:

- Existing relevant mapping and databases e.g. species (protected and rare) and habitat distribution sourced from the Environmental Protection Agency (EPA), the National Biodiversity Data Centre (NBDC) and the National Parks and Wildlife Services (NPWS);
- Published and unpublished NPWS reports on protected habitats and species including Irish Wildlife Manual reports, Article 17 Reports, Species Action Plans and Conservation Management Plans;
- Published data from Bat Conservation Ireland;
- Published data from BirdWatch Ireland;
- Published data from the Botanical Society of Britain & Ireland Database;
- EPA (Water Framework Ireland Map viewer) databases for information on surface water features within proximity to the proposed development; and
- Water Quality in Ireland 2010-2015 (EPA, 2017).

A review of findings of previous ecological surveys undertaken in proximity to the proposed development site was also carried out.

Information from these surveys, and their location and relevance to the proposed project, are provided in Section 12.3 below.

Known records of protected and rare plant and animal species occurring in the vicinity of the proposed development site were provided to MMD previously by the NPWS Scientific Unit provided.

12.2.3 Field Survey Methodology

12.2.3.1 Site Walkover

The proposed development Site and lands up to 50 meters from the Site, where access was possible, was surveyed by experienced qualified ecologists as follows;

- between 6th and the 12th of April 2022 (APEM);
- 21st July, 3rd August, 9th of August 2022 (Mott MacDonald)

Habitats were classified to level three according to the scheme outlined in "*A Guide to Habitats in Ireland*" (Fossitt, 2000). Fit to European Annex 1 habitats was informed with reference to the EU Interpretation Manual for EU Habitats (European Commission, 2013) having regard to the Irish Vegetation Classification where relevant.

Habitat survey methods in accordance with '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith et al., Heritage Council, 2011). During site walkovers searches were conducted for Invasive species listed under the Third Schedule to the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011), as amended.

During these surveys potential habitat for rare and protected plants and invertebrates were recorded (e.g. Marsh Fritillary *Euphydryas aurinia*).

Where access was not possible, assessment was carried out using available desktop resources including aerial photography of the relevant areas.

Evidence of breeding birds was recorded during the April survey. Potential suitable habitat for breeding bird species of conservation concern was also recorded

12.2.3.2 Aquatic Ecology

Detailed aquatic ecology and fisheries assessments were conducted by Triturus Ltd of all stream and river crossings. During these surveys otter and Annex 1 aquatic habitats including floating river vegetation were also recorded. The methodologies and results, along with survey locations are outlined in detail in the Aquatic baseline report provided in Appendix 12.1.

12.2.3.3 Breeding Bird Surveys

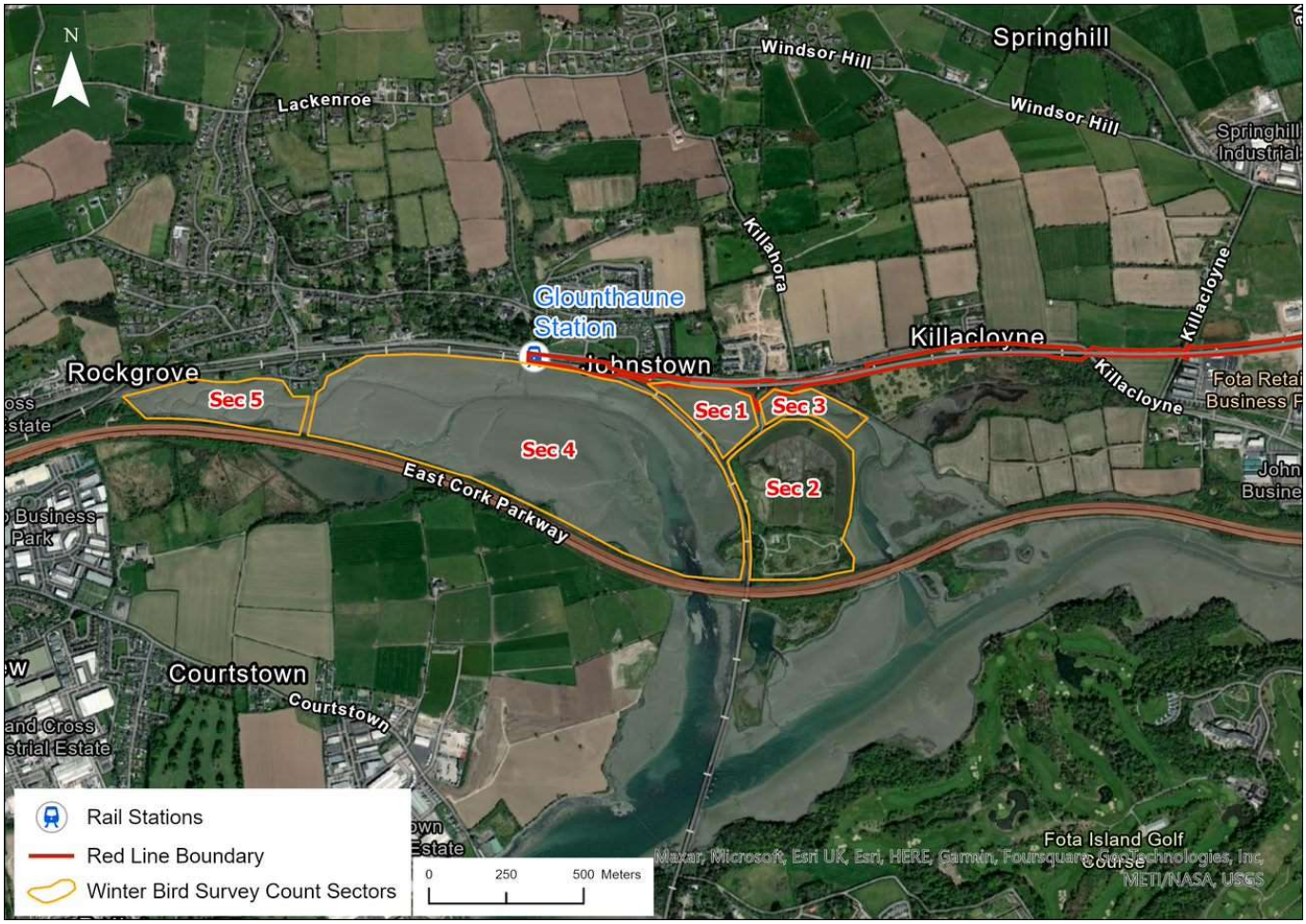
Incidental sightings of birds were noted by APEM while walking the study area. These surveys were conducted during the bird breeding season (April 2022). The majority of the proposed works area (train track and adjacent areas) is unsuitable for breeding birds. Common passerine species will nest in linear woody vegetation on the edge of the track.

River habitats within the study area were evaluated for their potential to support breeding kingfisher *Alcedo atthis*. Suitable breeding habitats for kingfisher include exposed sandy riverbanks suitable for tunnelling and these were identified if present. Bridge crossings were checked for evidence of riparian birds including breeding kingfisher, grey wagtail (*Motacilla cinerea*) and dipper (*Cinclus cinclus*).

12.2.3.4 Wintering Bird Surveys

Winter bird surveys counts were conducted within Cork Harbour SPA. The surveys were conducted each month between January and March 2022 inclusive. The scope of the surveys was to identify if any waterfowl roosts or foraging areas occur in the vicinity of the proposed development, where it occurs within approximately 1km of the SPA boundary. The surveys also included monthly counts of water birds from Vantage Points (Figure 12.1) of sectors of the Cork Harbour SPA located close (potential Zone of Influence) of the project.

Figure 12-1: Winter Bird Survey Location (Sectors)



Source: Mott MacDonald 2022

Drive round surveys / counts of waterfowl were also conducted of potentially suitable lands (farmland) within approximately 0.5km of the SPA boundary, including the proposed development, that could be viewed from public roads.

The surveys aimed to confirm high tide roost locations within the SPA where the proposed development runs close to the SPA boundary (adjacent) and up to 500m from the SPA boundary. This focussed study area is between Glounthaune station east to chainage 850m. This is where the proposed development runs adjacent to the SPA boundary (intertidal mudflats) and is the considered Zone of Influence of the development that may possibly be disturbed during the construction phase of the proposed development. No significant areas of potential suitable habitat for wintering birds will be permanently impacted by the proposed development.

12.2.3.5 Mammal Surveys

Badger Surveys

Survey for badger (*Meles meles*) was carried during the walkover surveys. These surveys followed *Surveying Badgers*[1] . Where landowner access was available, the extent of survey area was defined with regard to (NRA, 2006)[2] as 150m beyond the red line boundary.

Bat Surveys

An initial survey was carried out by APEM ecologists during their site walkover. An additional targeted follow up survey, and emergence survey was carried out by Mott MacDonald Ecologists. The bat survey was carried out in accordance with *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn) (Collins, 2016)*[3] and included a daytime visual assessment of bridges and trees. The visual assessment was carried out in line with *Bat Tree Habitat Key (Andrews, H et al., 2013)* to determine potential roost features. Trees which might be affected by the works were examined for potential roost features which included:

- Horizontal / vertical cracks along tree limbs /trunk;
- Knot holes and cankers in trees
- Voids in trees; and
- Crevices including lifting bark or thick ivy growth (where stems are a minimum of 50mm diameter).

The suitability of habitat features for bats, within the survey area, were assessed in accordance with Collins (2016) as described in Table 12.1 below.

Table 12.1: Guidelines for Assessing Potential Bat Roosts

Suitability	Description/Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions, and/or suitable surrounding habitat likely to be used on a regular basis by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain potential roost features but with none seen from the ground or with features seen only with very limited roost potential.	Habitats, that could be used by small numbers of commuting bats such as gappy hedgerows or unvegetated streams, but are isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions, and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland, or water.
High	A structure with one or more potential roost sites that could be used that are obviously suitable for use by larger numbers of bats on a more regular basis and	Continuous high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys,

[1] Harris, S., Cresswell, P., Jefferies, D., (1989) Surveying Badgers. The mammal Society – No.9.

[2] National Roads Authority (NRA) 2006. *Guidelines for the Treatment of Badgers during the Construction of National Road Schemes.*

[3] Collins, J. 2016. Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

Suitability	Description/Roosting Habitats	Commuting and Foraging Habitats
	potentially for longer periods of time due to their size, shelter, protection, conditions, and surrounding habitat.	streams, hedgerows, lines of trees and woodland edges. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses, and grazed parkland. Site is close to and connected to known roosts.

Source: Collins 2016

Trees and buildings / structures which were assessed as having a Moderate or High suitability for bats were examined further for evidence of bat activity. Evidence of bat activity includes:

- Bat droppings
- Signs of bat use, such as polishing / smoothing of potential roost features and oily marks (from fur) around possible access points and roost areas
- Feeding remains such as moth wings or other insect parts
- Urine stains (staining / blackening of entrance to potential roost feature and below the feature)
- Direct evidence including dead bats and squeaking noises

A dusk emergence survey was carried out on the 26th of July between 21:00 and 23:35 at a building (Figure 12.18) adjacent to the proposed development (Chainage 6150m) identified as having 'high suitability' as a bat roost. The survey aim was to watch, listen for, and record any bats entering and exiting the structure, thereby identifying the structure as an active roost. The survey also aimed to identify nearby features being used by bats for foraging and commuting habitat.

12.2.4 Limitations

All areas within the footprint of the proposed development were accessed for survey. No significant limitations to the surveys arose.

12.2.5 Ecological Valuation and Assessment of Impacts

12.2.5.1 Zone of Influence

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

The ZoI varies depending on the construction and operational activity and the sensitivity of the receptor (e.g., flora, birds, terrestrial mammals) to the effect encountered.

The ZoI identified for the various ecological receptors are as outlined below:

- The footprint of the proposed development for direct damage to habitats
- A study carried out on the potential for effects via impacts on air quality and climate arising from the proposed development has been carried out as part of this EIAR. Within this assessment the ZoI for dust effects to ecological receptors was identified as 50m. As such, the ZoI is taken as 50m for dust effects within this NIS.

- 40m for detectable noise effects[4] to wetland bird species. The noise study found that the construction phase works noise will fall to below 65dB within up to 40m of the proposed development. As such, areas of suitable mudflat habitat in the vicinity of works are taken as the ZoI for the construction related noise impacts to wintering birds.
- 150m for breeding otter holts, (NRA 2006) [5]
- Catchment wide ZoI for surface waterbodies

12.2.5.2 Ecological Value

The *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009) were adopted as part of this methodology for the purpose of evaluating the importance of ecological features within the survey area. The site evaluation criteria from this assessment methodology is reproduced in Table 12-2 below.

In accordance with NRA guidelines (2009) and CIEEM (2018), impact assessment is only undertaken of Key Ecological Receptors (KERs). These are features within the zone of influence of the proposed scheme which are "both of sufficient value to be material in decision making and likely to be affected significantly". According to NRA guidelines (NRA, 2009), KERs are of local importance (higher value) or higher as per NRA value criteria. Features of local importance (lower value) are not considered in the guidance to be KERs and are therefore excluded from impact assessment.

Table 12-2: Site Evaluation Criteria (NRA, 2009).

Ecological Value	Description
Internationally Important	Sites designated (or qualifying for designation) as a SAC or SPA under the EU Habitats or Birds Directives
	Undesignated sites that fulfil criteria for designation as a European Site
	Features essential to maintaining the coherence of the Natura 2000 network
	Sites containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive
	Resident or regularly occurring populations of birds listed in Annex I of the Birds Directive and species listed in Annex II and/or Annex IV of the Habitats Directive
	Ramsar Sites
	World Heritage Sites
	Biosphere Reserves
	Sites hosting significant species populations under the Bonn Convention
	Sites hosting significant populations under the Berne Convention
	Biogenetic Reserves
	European Diploma Sites
	Salmonid waters
Nationally Important	Sites or waters designated or proposed as an NHA
	Statutory Nature Reserves
	Refuge for fauna and flora protected under the Wildlife Acts
	National Parks
	Undesignated sites fulfilling criteria for designation as a NHA; Statutory Nature Reserves; Refuge for Fauna and Flora protected under the Wildlife Act and/or a National Park;
	Resident or regularly occurring populations (assessed to be important at the national level) of species protected under the Wildlife Acts and/or species listed on the relevant Red Data list)

[4] Cutts, N., Phelps, A., & Burdon, D. (2009). Construction and waterfowl: Defining sensitivity, response, impacts and guidance. Report to Humber INCA by the Institute of Estuarine and Coastal Studies, University of Hull. EN (2003) The Humber Estuary European Marine Site: English Nature's advice given under Regulation, 33(2).

[5] National Roads Authority (2006). Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes.

Ecological Value	Description
	Sites containing viable areas of the habitat types listed in Annex I of the Habitats Directive
County Importance	Areas of Special Amenity Areas subject to a Tree Preservation Order Areas of High Amenity, or equivalent, designated under the County Development Plan Resident or regularly occurring populations (assessed to be important at the County level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed on the relevant Red Data list Site containing area(s) of the habitat types listed in Annex I of the Habitats Directive that do not fulfil criteria for valuation as of International or National Importance County important populations of species, or viable area of semi-natural habitats or natural heritage features identified in the National or local Biodiversity Action Plan Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level
Local Importance (higher value)	Locally important populations of priority species or habitats or natural heritage features identified in the Local Biodiversity Action Plan Resident or regularly occurring populations (assessed to be important at the Local level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed in the relevant Red Data list Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value
Local Importance (lower value)	Sites containing small areas of semi-natural habitat that are of some local importance for wildlife Sites of features containing non-native species that are of some importance in maintaining habitat links

Source: NRA, 2009

12.2.5.3 Assessment of Impact

Impacts were assessed and characterised in accordance with the '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*' EPA (2022) as reproduced in Table 12.3 below.

Table 12.3: Impact Magnitude and Duration Criteria (EPA, 2022).

Impact Magnitude	Definition
Quality of Effects	**Positive Effects** A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative/adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).
Significance of Effects	**Imperceptible** An effect capable of measurement but without significant consequences.
	Not significant

Impact Magnitude	Definition
	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
Duration and Frequency of Effects	**Momentary Effects** Effects lasting from seconds to minutes
	Brief Effects Effects lasting less than a day
	Temporary Effects Effects lasting less than a year
	Short-term Effects Effects lasting one to seven years
	Medium-term Effects Effects lasting seven to fifteen years.
	Long-term Effects Effects lasting fifteen to sixty years.
	Permanent Effects Effects lasting over sixty years
	Reversible Effects Effects that can be undone, for example through remediation or restoration
	Frequency of Effects Once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually

Source: EPA, 2022

12.3 Receiving Environment

12.3.1 Desktop Assessment Results

12.3.1.1 Designated Sites

Sites of International Importance

European Sites

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

and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and other regularly occurring migratory birds and their habitats.

European Sites in the wider landscape surrounding the proposed development are presented below in Table 12.4. and outlined in Appendix 12.2.

Table 12.4: European Sites in Relation to the Proposed Development

Designated Site	Qualifying Interests/Special Conservation Interests	Distance and potential connectivity
Great Island Channel SAC (001058) (NPWS, 2014)	• Mudflats and sandflats not covered by seawater at low tide [1140] • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	The red line boundary for the proposed development is located directly adjacent to the Great Island Channel SAC boundary. The proposed development also crosses three watercourses with downstream connectivity to the Great Island Channel SAC boundary. Given the location of the proposed development relative to the European site boundary, and the identified downstream hydrological connectivity, **a viable source pathway connector link has been identified.**
Blackwater River (Cork/Waterford) SAC (002170) (NPWS, 2012)	• Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Perennial vegetation of stony banks [1220] • Salicornia and other annuals colonising mud and sand [1310] • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] • Mediterranean salt meadows (*Juncetalia maritimi*) [1410] • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] • Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae)* [91E0] • *Margaritifera* (freshwater pearl mussel) [1029] • *Austropotamobius pallipes* (white-clawed crayfish) [1092] • *Petromyzon marinus* (sea lamprey) [1095]	The closest extent of the Blackwater River (Cork/Waterford) SAC is located approximately 12km to the north of the proposed development. The SAC is located in a separate catchment to the proposed development.

Designated Site	Qualifying Interests/Special Conservation Interests	Distance and potential connectivity
	• *Lampetra planeri* (brook lamprey) [1096] • *Lampetra fluviatilis* (river lamprey) [1099] • *Alosa fallax fallax* (twaite shad) [1103] • *Salmo salar* (salmon) [1106] • *Lutra lutra* (otter) [1355] • *Trichomanes speciosum* (Killarney fern) [1421]	
Cork Harbour SPA (004030) (NPWS, 2014)	• Little grebe (*Tachybaptus ruficollis*) [A004] • Great crested grebe (*Podiceps cristatus*) [A005] • Cormorant (*Phalacrocorax carbo*) [A017] • Grey heron (*Ardea cinerea*) [A028] • Shelduck (*Tadorna tadorna*) [A048] • Wigeon (*Anas penelope*) [A050] • Teal (*Anas crecca*) [A052] • Pintail (*Anas acuta*) [A054] • Shoveler (*Anas clypeata*) [A056] • Red-breasted merganser (*Mergus serrator*) [A069] • Oystercatcher (*Haematopus ostralegus*) [A130] • Golden plover (*Pluvialis apricaria*) [A140] • Grey plover (*Pluvialis squatarola*) [A141] • Lapwing (*Vanellus vanellus*) [A142] • Dunlin (*Calidris alpina*) [A149] • Black-tailed godwit (*Limosa limosa*) [A156] • Bar-tailed godwit (*Limosa lapponica*) [A157] • Curlew (*Numenius arquata*) [A160] • Redshank (*Tringa totanus*) [A162] • Black-headed gull (*Chroicocephalus ridibundus*) [A179] • Common gull (*Larus canus*) [A182] • Lesser black-backed gull (*Larus fuscus*) [A183] • Common tern (*Sterna hirundo*) [A193] • Wetland and waterbirds [A999]	The SPA is located directly adjacent to the proposed development. Given the location of the proposed development relative to the European site boundary, and the identified downstream hydrological connectivity, **a viable source pathway connector link has been identified.**

Designated Site	Qualifying Interests/Special Conservation Interests	Distance and potential connectivity
Ballycotton Bay SPA (004022)	• Teal (*Anas crecca*) [A052] • Ringed plover (*Charadrius hiaticula*) [A137] • Golden plover (*Pluvialis apricaria*) [A140] • Grey plover (*Pluvialis squatarola*) [A141] • Lapwing (*Vanellus vanellus*) [A142] • Black-tailed godwit (*Limosa limosa*) [A156] • Bar-tailed godwit (*Limosa lapponica*) [A157] • Curlew (*Numenius arquata*) [A160] • Turnstone (*Arenaria interpres*) [A169] • Common gull (*Larus canus*) [A182] • Lesser black-backed gull (*Larus fuscus*) [A183] • Wetland and waterbirds [A999]	Given the potential for ex situ SCI species to occur within mudflat habitat directly adjacent to the proposed development, **a viable source pathway connector link has been identified.**

Ramsar Sites

Ramsar sites are wetland sites designated to be of international importance under the Ramsar Convention. The Ramsar Convention is an intergovernmental environmental treaty which was established in 1971 by UNESCO and came into force in 1975.

No Ramsar sites were identified within the footprint of the proposed development. Two Ramsar sites were recorded in the wider landscape surrounding the proposed developments. These are:

- Cork Harbour (000837) located approximately 1km south of the proposed development
- Ballycotton Bay (000830) located approximately 13km to the east of the proposed development.

The boundaries for these RAMSAR sites are largely contiguous with that of Cork Harbour SPA, and Ballycotton Bay SPA.

Sites of National Importance

Natural Heritage Areas

Natural Heritage Areas (NHA) are the basic wildlife designation in Ireland. These areas are considered nationally important for the habitats present or which holds species of plants and animals whose habitats needs protection. Under the Wildlife Amendment Act (2000), NHAs are legally protected from damage from the date they are formally proposed for designation (source: www.npws.ie). Proposed Natural Heritage Areas (pNHA) were published on a non-statutory basis in 1995 and have not since been statutorily proposed or designated.

No NHAs are located within 15km of the proposed development.

Proposed Natural Heritage Areas

Proposed NHAs (pNHAs) are sites which were published on a non-statutory basis in 1995 (and again in the 2010s) but have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats. Prior to statutory designation, pNHAs are still subject to limited protection, in the form of:

- Agri-environmental farm planning schemes support the objective of maintaining and enhancing the conservation status of pNHAs;
- There is a requirement for the Forest Service to gain NPWS approval before they will pay afforestation grants on pNHA lands; and,
- A recognition of the ecological value of pNHAs by Planning and Licencing Authorities.

The location of pNHAs in relation to the proposed development is set out in Table 12.5 and outlined in Appendix 12.2.

Table 12.5: Proposed Natural Heritage Areas

Site Name	Approximate Distance (km) from Proposed Development	Corresponding European Sites
Great Island Channel	0km	Great Island Channel SAC and Cork Harbour SPA
Carrigshane Hill	1.8km	None
Rockfarm Quarry, Little Island	2km	None
Ballynaclashy House, North Of Midleton	2.8km	None
Leamlara Wood	2.8km	None
Dunkettle Shore	3.7km	Cork Harbour SPA
Loughs Aderry And Ballybutler	3.7km	None

Site Name	Approximate Distance (km) from Proposed Development	Corresponding European Sites
Douglas River Estuary	3.9km	Cork Harbour SPA
Glanmire Wood	5km	Cork Harbour SPA
Cuskinny Marsh	5.3km	None
Rostellan Lough, Aghada Shore And Poulnabibe Inlet	6.5km	Cork Harbour SPA
Monkstown Creek	7.1km	Cork Harbour SPA
Clasharinka Pond	8.3km	None
Whitegate Bay	9.1km	Cork Harbour SPA
Carrigacrump Caves	9.2km	None
Lough Beg (Cork)	9.4km	Cork Harbour SPA
Ballyquirk Pond	10.3km	None
Owenboy River	10.6km	Cork Harbour SPA
Cork Lough	11.2km	None
Ballycotton, Ballynamona And Shanagarry	11.7km	Ballycotton Bay SPA
Templebreedy National School, Crosshaven	12.2km	None
Lee Valley	13.6km	None
Blarney Bog	14.1km	None
Fountainstown Swamp	14.4km	None

Other National Sites

Other sites of nature conservation in relation to the proposed development are discussed hereunder.

- No National Parks occurs within the vicinity or have connectivity to the proposed development.
- Harpers Island forms part of Cork Harbour SPA. It is a Nature Reserve primarily for birds and is owned and managed by Cork County Council.
- Two wildfowl sanctuaries were identified
  - Lough Aderry (centroid located 5km to the east of the proposed development). This sanctuary corresponds with part of the Loughs Aderry and Ballbutler pNHA boundary.
  - Ballynamona and Shanagarry (centroid 13km to the south east of the proposed development). This sanctuary corresponds with Ballycotton bay SPA, and the Ballycotton, Ballynamona, and Shanagarry pNHA.

12.3.1.2 Records of Rare and Protected Species and Habitat

A review of published records of plants and animals protected under law, and invasive species listed in the Third Schedule of the Birds and Habitats Regulations was undertaken.

The findings are summarised hereunder.

National Parks Area and Protected Species Data

Known records of protected or rare flora species occurring within a 2km buffer of the works area supplied by the NPWS Scientific Unit were examined. These records are provided below in Table 12.6.

Table 12.6: National Parks Rare and Protected Species Data

Common Name	Scientific Name	Habitat Associations	Most Recent Record	Protection/Red List Status[67]	Potential to Occur within the ZoI
Little robin	*Geranium purpureum*	This species is noted as occurring in stony or rocky places near the sea, on sheltered cliffs, disused railway lines, and shingle beaches	2007	Red Listed	Yes
Round leaved cranes'-bill	*Geranium rotundifolium*	This species is noted as being an annual of hedgerows, dry roadside-banks and wall-tops, especially close to the sea, but spreading to roadside verges, rubble heaps, railway ballast and waste ground.	1992	Red Listed	Yes
Wood small - reed	*Calamagrostis epigejos*	This species is noted as occurring in damp woods, ditches, fens, ungrazed or lightly grazed grasslands, and on sheltered sea-cliffs and sand dunes; also as a colonist of artificial habitats such as old quarries, roadsides and railway banks.	1993	Red listed, protected under Flora protection order, 2022	Yes

National Biodiversity Data Centre

A search of the National Biodiversity Data Centre database for the 10km grid squares W77 and W87 which encompasses the proposed development site was undertaken. No protected plant species were identified. Annex I bird species, and other protected fauna records are provided below in Table 12.7 and Table 12.8 respectively.

Table 12.7: Annex I Bird Species Results

Species Name	BoCCI Status[8]	Grid Square Recorded In
Arctic tern (Sterna paradisaea)	Amber listed	W87
Bar-tailed godwit (*Limosa lapponica*)	Red listed	W77, W87
Common kingfisher (*Alcedo atthis*)	Amber listed	W77, W87
Common tern (*Sterna hirundo*)	Amber listed	W77, W87

[6] Wyse Jackson et al. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland

[7] Marnell, et al. (2019) Ireland Red List No. 12: Terrestrial Mammals. National Parks and Wildlife Service, Department of the Culture, Heritage and the Gaeltacht, Dublin, Ireland.

[8] Gilbert et al. (2021) Birds of Conservation Concern in Ireland 4: 2020-2026

Species Name	BoCCI Status[8]	Grid Square Recorded In
Corn crake (*Crex crex*)	Red listed	W77
Dunlin (*Calidris alpina*)	Red listed	W77, W87
European golden plover (*Pluvialis apricaria*)	Red listed	W77, W87
Great northern diver (*Gavia immer*)	Amber listed	W77, W87
Greater white-fronted goose (Anser albifrons)	Amber listed	W87
Hen harrier (*Circus cyaneus*)	Amber listed	W77
Leach's storm-petrel (*Oceanodroma leucorhoa*)	Red listed	W87
Little egret (*Egretta garzetta*)	Green listed	W77, W87
Little gull (*Larus minutus*)	Amber listed	W77
Mediterranean gull (*Larus melanocephalus*)	Amber listed	W77, W87
Merlin (*Falco columbarius*)	Amber listed	W77, W87
Peregrine falcon (*Falco peregrinus*)	Green listed	W77, W87
Red-throated diver (*Gavia stellata*)	Amber listed	W77
Short-eared Owl (*Asio flammeus*)	Amber listed	W77, W87
Whooper Swan (*Cygnus cygnus*)	Amber listed	W77

Table 12.8: Protected Fauna Results

Species Name	Protection	Grid Square Recorded In
Common frog (*Rana temporaria*)	Protected under EU Habitats Directive Annex V & Wildlife Acts	W77, W87
Smooth newt (*Lissotriton vulgaris*)	Protected under Wildlife Acts	W77
Marsh fritillary (*Euphydryas aurinia*)	Protected under EU Habitats Directive Annex II & Wildlife Acts	W77
Common dolphin (*Delphinus delphis*)	Protected under EU Habitats Directive Annex IV & Wildlife Acts	W77, W87
Grey seal (*Halichoerus grypus*)	Protected under EU Habitats Directive Annex II, Annex V & Wildlife Acts	W77
Common lizard (*Zootoca vivipara*)	Protected under Wildlife Acts	W77
Brown long-eared bat (*Plecotus auritus*)	Protected under EU Habitats Directive Annex IV & Wildlife Acts	W77, W87
Daubenton's bat (*Myotis daubentonii*)	Protected under EU Habitats Directive Annex IV & Wildlife Acts	W77, W87
Eurasian badger (*Meles meles*)	Protected under Wildlife Acts	W77, W87
Eurasian pygmy shrew (*Sorex minutus*)	Protected under Wildlife Acts	W77, W87
Eurasian red squirrel (*Sciurus vulgaris*)	Protected under Wildlife Acts	W77, W87
European otter (*Lutra lutra*)	Protected under EU Habitats Directive Annex II, Annex IV & Wildlife Acts	W77, W87
Leisler's bat (*Nyctalus leisleri*)	Protected under EU Habitats Directive Annex IV & Wildlife Acts	W77, W87
Natterer's bat (*Myotis nattereri*)	Protected under EU Habitats Directive Annex IV & Wildlife Acts	W77, W87

Species Name	Protection	Grid Square Recorded In
Pine marten (*Martes martes*)	Protected under EU Habitats Directive Annex V & Wildlife Acts	W77, W87
Pipistrelle (*Pipistrellus pipistrellus sensu lato*)	Protected under EU Habitats Directive Annex IV & Wildlife Acts	W77, W87
Soprano pipistrelle (*Pipistrellus pygmaeus*)	Protected under EU Habitats Directive Annex IV & Wildlife Acts	W77, W87
West European hedgehog (*Erinaceus europaeus*)	Protected under Wildlife Acts	W77, W87
Whiskered bat (*Myotis mystacinus*)	Protected under EU Habitats Directive Annex IV & Wildlife Acts	W77, W87

National Biodiversity Data Centre also contains records for invasive species listed under part 1 of the Third Schedule of S.I. No. 477 of 2011, European Communities (Birds and Natural Habitats) Regulations 2011. These records are provided below in Table 12.9.

Table 12.9: Invasive Species Records

Species Name	Grid Square Recorded In
Canada goose (*Branta canadensis*)	W87, W77
American mink (*Mustela vison*)	W87, W77
Brown rat (*Rattus norvegicus*)	W87, W77
Common cord-grass (*Spartina anglica*)	W87, W77
Fallopia japonica hybrid	W87, W77
Fallow Deer (*Dama dama*)	W87, W77
Giant hogweed (*Heracleum mantegazzianum*)	W77
Giant knotweed (*Fallopia sachalinensis*)	W77
Giant rhubarb (*Gunnera tinctoria)*	W77
Greylag goose (*Anser anser*)	W77
Harlequin ladybird (*Harmonia axyridis*)	W87, W77
Himalayan knotweed (*Pesicaria wallichii*)	W77
Indian balsam *(Impatiens glandulifera*)	W87, W77
Japanese knotweed (*Fallopia japonica*)	W87, W77
Nuttall's waterweed (*Elodea nuttallii*)	W87
Red-eared terrapin (*Trachemys scripta*)	W77
Rhododendron ponticum	W87, W77
Ruddy duck (*Oxyura jamaicensis*)	W87, W77
Sika deer (*Cervus nippon*)	W87, W77
Three-cornered Garlic (*Allium triquetrum*)	W87, W77
Water fern (*Azolla filiculoides*)	W77

Species outlined in the desk study as previously occurring in the area were a focus of field surveys conducted if relevant. Noting the nature and scale of the proposed development with works largely within an existing active rail corridor and adjacent habitats of ecological value including Cork Harbour.

12.3.2 Field Surveys Results

12.3.2.1 Habitats

A description of the habitats located within the proposed development site is presented hereunder. Habitats were described in accordance with Fossitt (2000)[9]. An assessment of the habitats was undertaken in accordance with the NRA Guidelines (2009)[10] and CIEEM Guidelines (2018)[11]. Details relating to watercourses are provided in Table 12.11.

A habitat map of the proposed development and surrounding areas is provided in Appendix 12.3

Arable crop (BC1)

Arable crop was noted as a commonly occurring habitat adjacent to the existing rail line. This habitat typically comprises large, open fields of crop, such as rapeseed (*Brassica napus* subsp. *oleifera*), bordered by hedgerows and treelines. This habitat appeared to be heavily managed for agricultural land use.

This habitat is evaluated as Local Importance (Lower Value).

Tilled land (BC3)

Similar to arable crop tilled land is commonly occurring habitat adjacent to the existing rail line. This habitat was comprised of tilled fields which had not yet been reseeded for arable crop. This habitat appeared to be heavily managed for agricultural land use.

This habitat is evaluated as Local Importance (Lower Value).

Buildings and Artificial Surfaces (BL3)

Buildings and artificial surfaces was recorded as the most common habitat type throughout the study area. This habitat type was comprised of made ground (hardcore), buildings and structures within the study area, including small areas of landscaping such as private gardens. These landscaping features, while corresponding to Flower beds and Borders (BC4) and Amenity Grassland (GA2) at a smaller scale, were not mapped separately as they did not meet the minimum size threshold as outlined by Smith *(*2011)[12]. This habitat type also included artificial surfaces such as roads, pavement, hardstanding and the existing rail line. The existing rail line within the site includes the existing track infrastructure such as the steel rails, concrete spacers, limestone paving, retaining walls, bridges and associated equipment.

The rail line in often bordered by narrow (ca. 0.5 – 2 m wide) strips of disturbed ground and grassland which are also included in this habitat type. These areas of grassland are managed as part of the routine management of the rail line. The species recorded here contain a mixture of those recorded in Recolonising Bare Ground (ED3) and Dry Meadows and Grassy Verges (GS2) detailed below. Japanese knotweed (*Fallopia japonica*) was also recorded within this habitat type.

This habitat is evaluated as Local Importance (Lower Value).

[9] Fossit (2000) A Guide to Habitats in Ireland, The Heritage Council

[10] NRA (2009), Guidelines for Assessment of Ecological Impacts of National Roads Scheme.

[11] CIEEM (2018, updated 2019) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater Coastal, and Marine Version 1.1.

[12] Smith, G. F., (2011). Best Practice Guidance for Habitat Survey and Mapping. Heritage Council.

Figure 12.2: Buildings and Artificial Surfaces

Source: Mott MacDonald 2022

Upper Salt Marsh (CM2)

There is a small area of upper salt marsh located south of the rail corridor towards Harpers Island. This habitat borders Cork Harbour and is ca. 10 m south of the existing rail line (Chainage 800 – 900m). This habitat was not accessible for health and safety reasons and was therefore surveyed from a distance (Figure 12.2).

The upper salt marsh at this location was degraded in nature and appeared to have been modified by historic drainage works. A drainage channel and earth bank was recorded along the south and west border of this habitat, and a depression was noted within its centre. The habitat is drier to the north where it meets the rail line embankment. There are a number of small open ponds within the habitat. This habitat was largely dominated by grasses and rushes, such as red fescue (*Festuca rubra*) and creeping bent (*Agrostis stolonifera*). Common saltmarsh-grass (*Puccinellia maritima*) and sea rush (*Juncus maritimus*) were more common around the pans and along the lower section of the habitat towards the drainage channel. Other species recorded here include common scurvygrass (*Cochlearia officinalis*), sea-spurrey (*Spergularia* sp.), sea arrowgrass, (*Trigochin maritima*) and sea plantain (*Plantago maritima*).

Salt marsh habitat is noted as having links to the Annex I habitats, “Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330)’ and ‘Mediterranean salt meadows (J*uncetalia maritimi*) (1410)”. Atlantic salt marsh is a QI habitat of the Great Island Channel SAC. While this area is located outside of the SAC boundary, connectivity is present given that it is located immediately adjacent to the SAC. The saltmarsh grades to rank grassland and scrub near the

rail track. On a precautionary basis, the Upper Salt Marsh habitat is evaluated as being of **National Importance**.

Figure 12-3: Upper Salt Marsh

Source: APEM 2022

Exposed Sand Gravel or Till (ED1)

This habitat comprised an area of stockpiled limestone gravel and stone adjacent to the rail line, and areas where hardcore gravel had been laid down (Figure 12-4). This habitat was largely devoid of vegetation and bordered by scrub, bare earth, and built lands. The sparse vegetation that did occur consisted of common and widespread ruderal species.

This habitat is evaluated as Local Importance (Lower Value).

Figure 12-4: Exposed Sand Gravel or Till

Source: Mott MacDonald 2022

Spoil and Bare Ground (ED2)

Spoil and bare ground habitat was commonly recorded throughout the study area. This habitat consisted of areas that had been recently cleared. The largest of these areas was present within the study area east of Midleton Railway Station where a large area ground had been cleared for the greenway development.

Where it occurs, this habitat had sparse vegetation cover consisting of common and widespread ruderal species such as willowherbs (*Epilobium* spp.), scentless mayweed (*Tripleurospermum inodorum*), weld (*Reseda luteola*), creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), common field-speedwell (*Veronica persicaII*), dock (*Rumex* spp.), and teasel (*Dipsacus fullonum*).

This habitat is evaluated as Local Importance (Lower Value).

Recolonising Bare Ground (ED3)

Recolonising bare ground was a commonly occurring habitat throughout the study area. This habitat consisted of areas which had previously been disturbed and had begun to be recolonised by local vegetation (Figure 12.4).

Species recorded included red valerian (*Centranthus ruber*), black medick (*Medicago lupulina*), willowherbs, curly-leaved dock (*Rumex crispus*), winter heliotrope (*Petasites pyrenaicus*), herb-Robert (*Geranium robertianum*), oxeye daisy (*Leucanthemom vulgare*), horsetail (*Equisetum arvense*), creeping cinquefoil (*Potentilla reptans*), wild carrot (*Daucus carota*), ribwort plantain (*Plantago lanceolata*), common knapweed (*Centaurea nigra*), vetch (*Vicia* spp.), ragwort (*Senecio jacobea*), sow thistles (*Sonchus* spp.), teasel (*Dipsacus fullonum*), red clover (*Trifolium pratense*), St John's wort (*Hypericum sp.*), greater mullein (*Verbascum Thapsus*), dog rose (*Rosa canina*), cock's foot grass (*Dactylis glomerata*), and groundsel (*Senecio vulgaris*). In

areas bramble, willow (*Salix* spp.), and butterfly bush (*Buddleja davadii*) scrub had begun to encroach in areas of which have been left undisturbed for longer periods of time.

This habitat is valued as Local Importance (Lower Value).

Figure 12-5: Recolonising Bare Ground

Source: Mott MacDonald 2022

Exposed Calcareous Rock (ER2)

Two small lengths of exposed calcareous rock borders the rail line at Water-Rock. This habitat was present within a cut section of limestone rock which was created during the construction of the rail line (Figure 12.5). The cut exposed rock was up to 4m high in places and steep with loose rock at its base in areas.

This habitat was largely unvegetated. Species recorded on the exposed rock included oxeye daisy, scented mayweed, herb-Robert, dandelion, (*Taraxacum* spp.), kidney vetch (*Anthyllis vulneraria*), ragwort, willowherbs, viper's-bugloss (*Echium vulgare*), beaked hawk's-beard, (*Crepis vesicaria*), wood sage (*Teucrium scorodonia*), common knapweed, old man's beard (*Clematis vitalba*), great mullein (*Verbascum Thapsus*), mouse-ear hawkweed (*Pilosella officinarum*) and common cornsalad (*Valerianella locusta*).

This habitat is valued as Local Importance (Lower Value).

Figure 12-6: Exposed Calcareous Rock

Source: APEM 2022

Other Artificial Lakes and Ponds (FL8)

Two artificial lakes and ponds were recorded at Anngrove Business Park. Both ponds were man made and used as part of the surface water management of the surrounding area.

The larger of the two, west of the Business Park (Figure 12-7), covered an area of ca 0.7 ha. This functions as an attenuation pond draining the Business Park and discharging water to a drainage ditch running adjacent to the rail line. There are numerous concrete headwalls forming inflow and outflow points to the pond. The pond had been dug to a level ca. 10 m deeper than the surrounding land and had steep grass lined banks. The pond was holding shallow stagnant water at the time of survey and contained a large amounts of silt at its base. There are stands of bulrush (*Typha latifolia*) and rushes (*Juncus* spp.), established along the edges and on silt deposits.

A second smaller artificial pond was located within the business park and incorporated into the water management system and landscaping of the park. This pond had a number of concrete headwalls discharging water from the surrounding lands into it. The Tibbotstown[13] stream flowed to the south through the pond. The base of this pond consists of cobble, gravels and silt. Emergent vegetation includes bulrush, fool's-water-cress (*Apium nodiflorum*) and brooklime (*Veronica beccabunga*). Occasional green algae was also noted.

These features were valued as being of **Local Importance (Higher Value).**

[13] EPA Name: Tibbotstown. EPA Code: 19T25

Figure 12-7: Artificial Ponds

Source: APEM 2022

Drainage Ditches (FW4).

Drainage ditches were recorded throughout the study area. There was variation in the structure of the drainage ditches within the study area, ranging from heavily altered concrete lined drainage channels to watercourses with a more natural profile including small areas of riffle. All however are artificial or heavily altered watercourses and carried low levels of water. The watercourse beds were often heavily silted where they crossed under the proposed development and contained little to no instream vegetation. Many were completely dry during survey visits and hence are unsuitable for breeding amphibians (Smooth Newt and Common Frog).

Bankside vegetation recorded includes lesser celandine, opposite-leaved golden-saxifrage, (*Chrysosplenium oppositifolium*), creeping buttercup (*Ranunculus repens*), docks (*Rumex spp.*), nettles (*Urtica dioica*), hogweed, hemlock water-dropwort, fool's-water-cress, cuckooflower (*Cardamine pratense*), water mint (*Mentha aquatica*), willowherbs, bulrush, wood sage, winter heliotrope, meadowsweet (*Filipendula ulmaria*). Occasional in stream vegetation included duckweed (*Lemna minor*), and fool's-water-cress.

Given their connectivity to more sensitive ecological receptors downstream, drainage ditches are evaluated as being of **Local Importance (Higher Value)**.The actual habitat is modified and evaluated as Local Importance (Lower Value).

Improved Agricultural Grassland (GA1)

Improved agricultural grassland was one of the most common habitat types recorded throughout the study area. This habitat was typically comprised of heavily managed and fertilised

homogenous fields of perennial ryegrass (*Lolium perenne*), poorly drained fields with areas dominated by soft rush (*Juncus effusus*), and less managed grasslands used as horse pasture. This habitat was highly modified due to from regular reseeding, increased drainage, and fertiliser use.

This habitat is evaluated as Local Importance (Lower Value).

Amenity grassland (GA2)

Amenity grassland was recorded as commonly occurring throughout the study area. This habitat was centred around Glounthaune village and Midleton town as well as Anngrove Business Park. Amenity grassland was heavily managed and species poor. The species that do occur were widespread and commonly occurring.

This habitat is evaluated as Local Importance (Lower Value).

Dry Meadows and Grassy Verges (GS2)

Dry meadows and grassy verges were recorded throughout the study area and occur in areas that are infrequently cut, such as along the rail line verge and in areas previously disturbed for development but have since been left unmanaged.

Grasses dominated this habitat including species such as red fescue (*Festuca rubra*), cock's-foot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), sweet vernal-grass, perennial ryegrass (*Lolium perenne*), and crested dog's-tail (*Cynorsurus cristatus.* Other species recorded within this habitat included yarrow (*Achillea millefolium*), sun spurge, (*Euphorbia helioscopia*), wood sage, hogweed, greater periwinkle (*Vinca major*), germander speedwell (*Veronica chamaedrys*), dandelion, primrose (*Primula vulgaris*), alexanders (*Smyrnium olusatrum*), figwort (*Scrophularia nodosa*), wild angelica (*Angelica sylvestris*), lords and ladies, foxglove (*Digitalis purpurea*), dove's-foot crane's-bill (*Geranium mole*), creeping thistle, field thistle, spear thistle, early dog violet (*Viola reichenbachiana*), field poppy (*Papaver rhoeas*), cowslip (*Primula veris*), red dead-nettle (*Lamium purpureum*), cow parsley (*Anthriscus sylvestris*), creeping cinquefoil (*Potentilla reptans*), woodrush (*Luzula sylvatica*), meadow buttercup (*Ranunculus acris*), creeping buttercup, and common knapweed. In areas in close proximity to Cork Harbour more saline tolerant species such as common scurvygrass (*Cochlearia officinalis*), sea plantain and sea mayweed (*Tripleurospermum maritimum*) were also recorded within the sward.

This habitat is assessed as being of **Local Importance (Higher Value).**

Dry Calcareous and Neutral Grassland (GS1)

Dry calcareous and neutral grassland was recorded in a number of locations, most notably on the banks of the Owencurra River, and at the Ballyadam IDA site (Figure 12.7). This habitat was typically recorded in areas where topsoil had been scraped back and calcareous hardcore/hardstanding surfaces laid down, and where vegetation had begun to regenerate. Due to this it was often found in associated with recolonising bare ground.

Species recorded within this habitat included false oat grass, sweet vernal grass, wild carrot, yellow wort (*Blackstonia perfoliatai),* smooth meadow grass (*Poa pratensis*), creeping cinquefoil (*Potentilla reptans*), red clover (*Trifolium pratense*), selfheal (*Prunella vulgaris*), Timothy grass (*Phleum pratense*), ribwort plantain, cock's foot grass, bird's foot trefoil, and ragwort. Areas of scrub were noted as beginning to colonise areas of the grassland with woody species recorded including; willow, cotoneaster (*Cotoneaster spp.*), bramble, butterfly bush, and gorse.

This habitat is assessed as being of **Local Importance (Higher Value).**

Figure 12-8: Dry Calcareous and Neutral Grassland

Source: Mott MacDonald 2022

Wet Grassland (GS4)

The largest proportion of wet grassland was recorded on the southwestern bank of the Owenacurra (Figure 12-9). The sward was rank and overgrown in areas with a lower topography within the field. GS4 graded into pockets more affiliated with a marsh type habitat (GM1).

Pockets of reed canary grass (*Phalaris arundinaceae*), and dense stands of silverweed (*Potentilla anserina*) were noted. Other species recorded included Yorkshire fog, creeping bent, rushes (*Juncus spp.*), creeping buttercup, lesser celandine, meadow sweet (*Filipendula ulmaria*), meadow buttercup, cow parsley, wild Angelica (*Angelica sylvestris*), nettles, purple loosestrife (*Lythrum salicaria*), bindweed, perennial ryegrass, rosebay willowherb, bramble, broad dock, and cuckooflower. Himalayan balsam was present in multiple locations through this habitat, and in denser stands along the banks of the Owenacurra river.

Figure 12-9: Wet Grassland

Source: Mott MacDonald 2022

This habitat is assessed as being of **Local Importance (Higher Value).**

Mud shores (LS4)

Mud shores was recorded to the south of the Site at Glounthaune Station (Figure 12-10). Mud shores were not accessible during the survey and were classified from a vantage point. This habitat comprised large areas of fine sediment with lesser amount of stone and boulder. A narrow section of rock armour bordered this habitat where it meets the rail line. Sea beet (*Beta vulgaris* spp. *maritima*), sea lavender (*Limonium* sp.), sea-milkwort (*Glaux maritima*) and white stonecrop (*Sedum album*) were recorded on the rock armour. A sparse strand line of seaweeds were noted at the high tide mark.

The mud shore habitat has links to the Annex I habitat “Mudflats and sandflats not covered by sea water at low tide (1140)”. The area of mudflat identified is contiguous with NPWS Site Specific Conservation Objectives mapping for tidal mudflats and sandflats. As such, this habitat is evaluated as being of **International Importance**.

Figure 12-10: Mud Shores

Source: APEM 2022

Mixed Broadleaved Woodland (WD1)

There are several small areas of mixed broadleaved woodland scattered throughout the study area (Figure 12-11). The habitat was recorded at Ballyadam House and Water-Rock House, likely as remnants of demesne planting. A section of planted willow *Sallis* spp. over dry ground up to 10 m high is present to the north of the proposed development at Gortagousta. Mixed broadleaved woodland planted for landscaping is present north of the proposed development at Midleton Station carpark.

Species recorded within this habitat generally included canopy species such as ash, sycamore (*Acer pseudoplatanus*), beech with occasional Scot's pine (*Pinus sylvatica*). The understory species included willows, hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), elder (*Sambucus nigra*), butterfly bush, and gorse (*Ulex europaeus*). Species recorded in the field layer include wood sage, early dog violet, nettle, yellow archangel (*Lamium galeobdolon*) bracken, lord-and-ladies, ivy (*Hedera helix*), wood speedwell (*Veronica montana*), Hart's-tongue fern (*Asplenium scolopendrium*), lesser celandine, and primrose.

Mixed broadleaf woodland is assessed as being of **Local Importance (Higher Value).** This habitat is outside the potential ZOI of the project and is not discussed further.

Figure 12-11: Mixed Broadleaf Woodland

Source: APEM 2022

Mixed Broadleaved / Conifer Woodland (WD2)

A small area of mixed broadleaf / conifer woodland was recorded at Glounthaune. This habitat formed part the mature landscaping at Ashbourne House. There was no access to this area during the survey and the canopy of this habitat was surveyed from a vantage point. There are a variety of mature planted ornamental trees within this habitat. Species recorded included oaks (*Quercus* spp.), Scot's pine, sycamore, ash, horse chestnut (*Aesculus hippocastanum*) and a number of ornamental maples (*Acer* spp.), pines (*Pinus* spp.), and birches (*Betula* spp).

Mixed broadleaf / conifer woodland is assessed as being of **Local Importance (Higher Value).** This habitat is outside the potential ZOI of the project and is not discussed further.

Scattered Trees and Parkland (WD5)

This habitat is present at several locations within the study area, Ballyadam House and within mature private gardens south of the proposed development at Water-Rock. These locations were classified from a vantage point as access was not possible. At the remaining locations this habitat comprises mature trees (up to 20 m high) of similar species to those described in above in mixed broadleaf / conifer woodland over amenity grassland.

This habitat is assessed as being of **Local Importance (Higher Value).** This habitat is outside the potential ZOI of the project and is not discussed further.

Hedgerows (WL1)

Hedgerows were common and recorded throughout the study area. This habitat regularly borders the proposed development and forms field boundaries in the wider landscape. Where

hedgerows border the proposed development, they are highly maintained, and cut to approximately 2 m in height Figure 12-12). This habitat was often recorded accompanied by a short earth bank and /or drainage ditch.

Species recorded within this habitat included ash, sycamore, oak, alder, hazel, willow, brambles, gorse, hawthorn, rosebay willowherb (*Chamaenerion angustifolium*), cherry laurel (*Prunus laurocerasus*), bindweed (*Calystegia sepium*), dog rose (*Rosa canina*), old man's beard, honeysuckle (*Lonicera periclymenum*), buddleja, winter heliotrope (*Petasites pyrenaicus*), hard fern (*Blechnum spicant*), lords and ladies, cleavers (*Galium aparine*).

Hedgerow habitat is assessed as being of **Local Importance (Higher Value).**

Figure 12-12: Hedgerows

Source: APEM 2022

Treelines (WL2)

Treelines were less commonly recorded than hedgerows within the study area but were still widespread. This habitat has a similar species assemblage to the hedgerows but with a greater amount of mature trees in some cases up to 20 m high. Within the study area this habitat is regularly accompanied by hedgerows as described above.

Ash was recorded as the dominant tree forming species within this habitat. Other species frequently recorded include oak, alder, sycamore and silver birch (*Betula pendula*). Scot's pine is present occasionally as are planted ornamental treelines of aspen (*Poplulus* spp.), cherry (*Prunus* spp.) and cypress leylandii (*Cupressus* × *leylandii*).

Treeline habitat is assessed as being of **Local Importance (Higher Value).**

Wet Pedunculate Oak-Ash Woodland (WN4)

Wet pedunculate oak-ash woodland was recorded at Killacloyne. This habitat was not accessible and was classified from a vantage point. The canopy was dominated by ash with a height of up to 20 m. Alder and hawthorn were recorded as being frequent and there is occasional oak. The understory and ground layer were not visible during the survey, however, based on the surrounding topography and proximity to Cork Harbour, it is assumed that this wooded area is located on ground that is regularly flooded.

On alluvial sites this habitat can have links to the priority Annex I habitat "Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-padion, Alnion incanae, Salicion albae*) (91E0)". In addition, semi natural woodland is rare in the wider landscape. As such, on a precautionary basis, this habitat is assessed as being of **County Importance**.

Wet Willow-Alder-Ash Woodland (WN6)

Wet willow-alder-ash woodland as recorded at Killacloyne. This habitat was not accessible and was classified from a vantage point (Figure 12.12). This habitat was dominated by willows up to 6 m high over wet ground. Alder was recorded as frequently occurring. The full area was not visible during the survey and the extents were assessed based on the surrounding topography and recent satellite imagery.

As previously noted, semi natural woodland is rare in the wider landscape. As such, on a precautionary basis, this habitat is assessed as being of **County Importance**.

Figure 12-13: Wet Willow-Alder-Ash Woodland

Source: APEM 2022

Scrub (WS1)

Scrub was recorded as a commonly occurring and widespread habitat within the study area. This habitat is generally dominated either by gorse, bramble or willows up to 5 m high (Figure

12.13). A small area of planted hazel scrub is present at Carrigtwohill Train Station. Butterfly bush, blackthorn and willow occurred frequently. Other species recorded included cherry laurel, dog rose, old man's beard, honeysuckle, Japanese knotweed, Himalayan balsam, winter heliotrope, bracken, teasel, red valerian, wild angelica, montbretia (*Crocosmia x crocosmiiflora*), lords and ladies, blackthorn (*Prunus spinosa*), alder (*Alnus glutinosa*), and birch. There are also occasional individual mature trees of the same species present.

This habitat is assessed as being of **Local Importance (Higher Value).**

Figure 12-14: Scrub

Source: Mott MacDonald 2022

12.3.2.2 Rare and Protected Plant Species

As detailed previously in section 12.4.1, three rare and protected plant species were identified with potential to occur in the ZoI of the proposed development, one of which is protected. These species were not recorded during the site.

12.3.2.3 Aquatic Survey

Specialist aquatic and fisheries surveys were undertaken of waterbodies within and downstream of the proposed development footprint. A summary of the findings of the report (Appendix 12.1) are provided below in Table 12.10. The site number corresponds to those presented in Figure 12-15 and Figure 12-16.

Table 12.10: Aquatic Baseline Survey

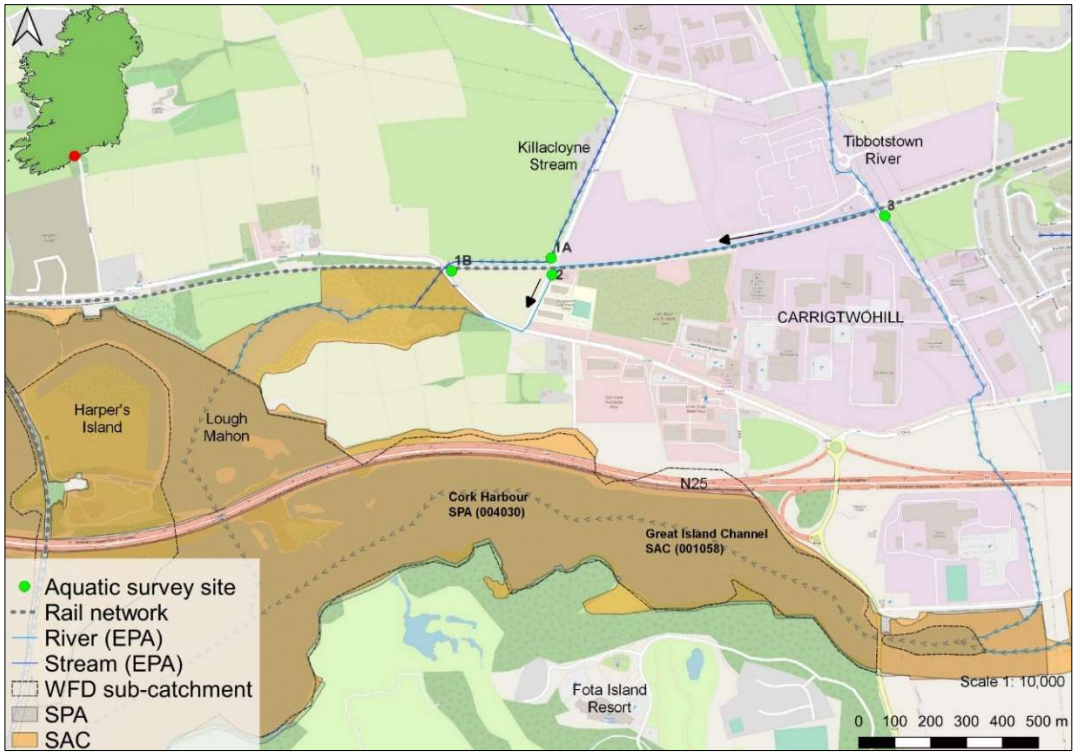
Site Number	Watercourse Name	Site Description	Overall Evaluation
1A	Killacloyne Stream	The small stream channel supported a bed of mixed coarse, medium and fine gravels with abundant cobble. The substrata were partially bedded due to siltation pressures from the farming and suffered from moderate siltation (silt plumes underfoot and surface depositions locally). The channel did not support macrophytes due to its higher energy apart from very localised fool's watercress (*Apium nodiflorum*). It was bordered by heavily improved pasture (GA1) on the north bank with heavy cattle poaching and supported a mature riparian zone along the railway embankment side comprising ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), sycamore (*Acer pseudoplatanus*) and bramble (*Rubus fruticosus agg.*). The site was considered a **low value salmonid nursery** given the very shallow nature of the channel and siltation pressures from agriculture. However, the river likely supports a **small localised brown trout population** given improved habitat in its lower reaches (channel increases in flow volume). The site adjoining the railway alignment may have some value as a **winter salmonid spawning area**, but low summer flows and its diminutive size reduce its fisheries value. The site also supported **low quality holding habitat** due to the absence of pool habitat. The higher energy of the channel precluded it from being of any value to lamprey. The small stream had some **value as a European eel nursery** but the lower reaches below the railway crossing offer greater habitat value for eel. Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling. No white-clawed crayfish were recorded present, and no otter signs were detected during site specific surveys.	Local Importance (Lower Value).
1B	Killacloyne Stream	The channel had a semi-natural profile downstream of the railway crossing with riffle and glide sequences but was largely in its natural form downstream of the local Killahore road into Carrigtwohill. The small stream supported mixed coarse, medium and fine gravels with frequent sand and localised pockets of silt. The substrata were partially bedded due to siltation pressures from farming in the upstream catchment and suffered from moderate siltation. The site did not support macrophytes due to its higher energy, but *Pellia* species liverwort was present locally on muddy banks. The site was bordered by tillage downstream of the railway crossing and by alder-dominated woodland downstream of the local road. Here its supported mature alder and elder (*Sambucus nigra*) with a heavily scrubbed understory with bramble, ivy (*Hedera helix*) and ferns. The channel was considered a **low to moderate value salmonid nursery** due to ample riffle and glide sequences that provided well oxygenated water. The stony bed with a semi-natural to natural profile provided some **moderate refugia for juvenile salmonids** (value reduced only because of the small size of channel and shallow water). It was also reduced because of siltation and nutrient enrichment pressures from agriculture. These pressures indicated it was only of **low to moderate value as a spawning site** (i.e. siltation of spawning gravels). Holding habitat was poor overall due to the limited pool habitat. The site was of too high energy to support lamprey but **likely supports European eel** given its close proximity to the sea. No otter signs were recorded in the vicinity of the stream crossing.	Local Importance (Lower Value).

Site Number	Watercourse Name	Site Description	Overall Evaluation
		Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.	
Site 2	Tibbotstown River	The river at this location was a 1.5m wide upland eroding (FW1) spate channel with water 0.1m-0.3m deep. The channel profile, despite being realigned historically, supported extensive riffle and glide sequences with very localised pool. The bed supported localised boulder, abundant cobble and mixed gravels. The substrata were partially bedded downstream of the railway but became loose and unbedded downstream with light to moderate siltation only. The channel did not support macrophytes due to its higher energy apart from very localised fool's watercress. The channel flowed along the north bank of the railway bordered by dense gorse (*Ulex europaeus*) and bramble scrub with a concrete retaining wall on the railway side and then was culverted south under the railway where it flowed in a realigned channel along the business park. Downstream of the railway the channel had extensive gabion baskets as scour protection on the business park (east bank) with a steep embankment supporting pine (*Pinus spp*.), beech (*Fagus sylvatica*), elder and sycamore on the west bank. The site was considered a low to moderate value salmonid nursery given the shallow and small nature of the river channel with limited holding habitat. As such, nursery habitat was considered of low to moderate value and the river at this location may support a **localised small brown trout population**. The river featured **low to moderate spawning habitat** downstream of the railway crossing given the presence of suitable spawning gravels with moderate siltation. **Low quality holding habitat (for brown trout only)** was present due to the paucity of deeper pool habitat. The higher energy of the channel precluded it from being of any value to lamprey. The small river had **some value as a European eel nursery** given abundant cobble habitat and close proximity to the sea. No otter signs were recorded in the vicinity of the railway crossing and suitability was low. Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.	Local Importance (Lower Value).
Site 3	Tibbotstown River	The river at this location was a 1m wide upland eroding (FW1) spate channel with water 0.05m-0.1m deep. The small heavily overgrown channel had a semi-natural profile dominated by shallow riffle. The bed was dominated by small boulder and cobble with coarse gravels, sand and silt. The substrata were heavily bedded and siltation was moderate to heavy but given the high energy depositions only blocked interstitial spaces in the substrata. The channel was moderately shaded by vegetation and did not support any macrophytes. Small patches of the moss species *Brachythecium rivulare* were present on boulders. The channel was situated between two earthen embankments with mature sycamore, elder and hawthorn (*Crataegus monoygna*) being the dominant riparian trees with abundant bramble and ivy. The site was considered a **poor value salmonid nursery** given the very shallow and small size of the river at this location. The channel bed was also heavily compacted and silted reducing the overall viability of the river as both a spawning area and nursery. It is possible that the larger lower reaches of the channel support a **small salmonid**	Local Importance (Lower Value).

Site Number	Watercourse Name	Site Description	Overall Evaluation
		population. The higher energy of the channel precluded it from being of any value to lamprey. The small river may have **some value as a European eel nursery** but would improve in the lower reaches where depths and flows provide more cover. No otter signs were recorded during the survey. Despite evident siltation pressures biological water quality was recorded as **Q4 (good status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.	
Site 4	Water Rock River	Site 4 on the Water Rock River was a lowland depositing watercourse (FW2) with a semi-natural sinuous profile with a 1m-2m wide channel upstream of the railway crossing. The channel had 1m high banks that steepened to over 15m where the channel intersected a large limestone rock face and became subterranean at a karstic feature. The river did not re-emerge downstream (south) of the railway crossing. The channel had a mixed profile of riffle and glide with localised pool upstream of the railway crossing and was shallow with water depths between 0.1m and 0.3m. The bed comprised of mixed gravels and large banks of sand and silt. The bed substrata were loose but suffered from heavy siltation. High winter flows helped reduce the silt burden. The channel also supported bars of limestone bedrock that intersected the channel. These supported the bryophyte species *Leptodictyum riparium* and *Rynchostegium riparoides*. The bed geology was mixed with sandstone gravels and limestone bedrock. The channel entered a karstic limestone cave system at the point where it became subterranean at intersection with the railway crossing. The channel supported the macrophyte species fool's watercress (*Apium nodiflorum*) and lesser water parsnip (*Berula erecta*) on depositing muddy bars with creeping bent grass (*Agrostis stolonifera*) and buttercups (*Ranunculus spp*.) in drier areas of bank. The riparian areas comprised amenity grassland scattered immature willow on the north bank**. The south bank supported an exposed bedrock rockface strewn with bryophytes from wet seepages that may support the Annex I habitat 'Petrifying springs with tufa formation (*Cratoneurion*) [7220]'.** The higher up drier areas near the railway supported non-native travellers joy (*Clematis vitalba*), cherry laurel (*Prunus laurocerasus*) with Leylandii cypress (*Cupressus x leylandii*) and sycamore. A small patch of amenity grassland on the south bank also supported a stand of invasive giant rhubarb (*Gunnera tinctoria*). The small river had some **low value as a brown trout nursery** albeit small salmonids were not observed during the site visit. The nursery habitat was considered low to moderate overall given it had ample broken riffle and glide habitat but was reduced in quality due to evident enrichment and siltation pressures. The **spawning quality was of low to moderate quality** as while mixed spawning gravels were present that could support spawning by brown trout, they were heavily silted. **Holding habitat was moderate** at best due to a paucity of deeper pools. **Suitability for European eel was low** due to its karstic nature and poor downstream connectivity with the sea. **Brook lamprey habitat was considered good with ample spawning and nursery habitat present**. No otter signs were recorded and this may because of poor downstream connectivity and likely low fisheries value.	**Local Importance (Higher Value).**

Site Number	Watercourse Name	Site Description	Overall Evaluation
		Despite evident siltation pressures biological water quality was recorded as Q4 (good status) . No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.	
Site 5	Owenacurra River	The river was 12m wide and 0.3-1m deep. The channel profile was dominated by glide habitat with localised pool. The channel was historically realigned locally both upstream and downstream of the railway crossing and this was supported by evident compaction of the bed and the straightness of the channel, albeit with good recovery. The substrata comprised a mixture of cobble and mixed gravels that were heavily bedded in the vicinity of the crossing and siltation was moderate with silt plumes visible underfoot. The site supported localised water crowfoot (*Ranunuculus sp*.) and hemlock water dropwort (*Oenanthe crocata*). The bryophyte species *Chiloscyphos polyanthos* was present but rare with occasional *Fontanalis antipyretica*. These habitats were not extensive enough to be a good representation of the Annex I habitat 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses [3260]'. However, better examples of this habitat do occur downstream of the survey location (e.g. Millbrook area). The riparian areas were very heavily scrubbed over and comprised mainly of bramble with localised areas of invasive buddleja (*Buddleja davidii*) present. Further downstream (c.50m from the bridge crossing), mature treelines of alder and willow (Salix spp.) were present. One large stand of invasive Japanese knotweed (*Fallopia japonica*) was present immediately upstream of the railway bridge on the east bank covering c.50m2. Both sides of the bridge i.e. dry gravels areas of the abutments on the east and west banks supported recent otter spraint sites. The Owenacurra River is a **sea trout river of county importance** and also **supports Atlantic salmon and European eel in addition to abundant brown trout**. The river also **supports Lampetra spp. species** (Triturus, 2019). The Owenacurra downstream of the railway crossing was considered a **good salmonid nursery** due to the presence of extensive areas of glide and cobble with a mixed gravel bed which would be considered characteristic of salmonid nursery habitat. Furthermore, the presence of beds of Ranunculus vegetation provided **important refugia for juvenile salmonids**. The holding habitat was also good locally due to the presence of deeper glide and pool. However, the best holding habitat was upstream of the bridge given deeper water depths of between 1m and 1.8m. Spawning habitat was moderate overall given the evident high levels of compaction in the vicinity of the railway crossing but nonetheless **would support spawning salmonids**. **Lamprey ammocoete habitat was recorded adjoining the eastern abutment and arch where beds of soft silt had accumulated**. This also adjoined mixed gravels that could be used for lamprey spawning. Despite historical channel alterations in the vicinity of the survey site, biological water quality was recorded as Q4 (good status). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling. The Owenacurra River at site 5 had very **high fisheries suitability for lamprey, salmonids and European eel** at the survey location in addition to supporting an otter resting area and regular marking sites (spraint areas). It also had **Q4 (good status water)**.	**County Importance**

Figure 12-15: Aquatic Sampling Locations A



Source: Triturus 2022

Figure 12-16: Aquatic Sampling Locations B

Source: Triturus 2022

12.3.2.4 Non-volant Mammals

Otter Survey

The otter survey of the Lough Mahon Estuary between Harper's Island and Killahoura south of the railway line recorded a moderate density of otter signs. Notably, an active otter holt was recorded on the intertidal zone east of Harper's Island. This holt is located approximately 115m from the proposed development (Location CONFIDENTIAL).

Of the riverine sites, otter signs were only identified on the Owenacurra River, where a single couch site and two spraint sites were recorded. The couch site appeared to be very regularly used, and was located in a historical masonry arch culvert in close proximity to the proposed development. A trail camera was deployed (under license) at the culvert which confirmed the couch site is actively used by otter.

A summary of otter signs is presented below in Table 12.11. The exact location is CONFIDENTIAL. The rail network as indicated in the figure includes the upgrade locations. The otter sign locations are also presented in Appendix 12.3 Habitat Map. The otter signs recorded were generally located south of the proposed development between Glounthaune Station, and Ch 1700, with the otter couch recorded on the Owenacurra river at approximate Ch 9850.

Table 12.11: Summary of Recorded Otter Signs

Sign ID	Location	Sign	Age	Spraint sites (no. spraints)	Notes
T001	Harper's Island (estuary)	Spraint site	Old	1(1)	Spraint on grassy embankment of lagoon
T002	Harper's Island (estuary)	Spraint site	Recent	1(1)	Spraint on grassy embankment of lagoon
T003	Harper's Island (estuary)	Spraint site	Mixed age	3(12)	Regular spraint site on east side of lagoon
T004	Killahoura (estuary)	Prints	Recent	n/a	Recent otter prints in tidal mud
T005	Killahoura (estuary)	Holt	Active	3(16)	Holt in embankment with excavated tunnel 1m above high tide mark with regular spraint areas at entrance
T006	Killahoura (estuary)	Prints	Old	1(1)	Old spraint on concrete at top of tidal embankment
T007	Killahoura (estuary)	Slide	Recent	n/a	Recent slide at edge of tidal lagoon
T008	Killahoura (estuary)	Spraint site	Recent	1(1)	Spraint site in tidal channel confluence with small drain and tidal extent of small river
T009	Owenacurra River	Spraint site	Recent	1(2)	Spraint site under arch near abutment of railway bridge on eastern bank
T010	Owenacurra River	Spraint site	Recent	1(1)	Spraint site under arch near abutment of railway bridge on western bank
T011	Owenacurra River	Couch	Active	2(6)	Otter couch with latrine areas under old masonry arch culvert

Badger Survey

A number of badger setts were identified during field surveys. These were all located in close proximity to the existing rail line. Details relating to these setts are provided below in Table 12.12. The exact locations are CONFIDENTIAL.

Table 12.12: Badger Setts

Sett Type	Location	Details	Distance from the Proposed Development
Outlier – Inactive/collapsed	CONFIDENTIAL southern rail corridor bank	Single entrance large enough for badger, however this appeared to have recently collapsed. Initial survey recorded tunnel extending south and downward sharply. No other evidence of use.	Within footprint of proposed new tracks.
Outlier – Active	CONFIDENTIAL southern rail corridor northern bank	Single large and open entrance. Guard hair present at entrance and tunnel. Present on northern bank approximately 2m above tracks. Entrance faces south and extends north. Tunnel clear and open continues straight and rises.	Within footprint of an area of cut
Main - Active	CONFIDENTIAL southern rail corridor southern bank	Present on southern bank approximately 4 m above tracks under ash tree line. Well-worn paths between entrances. Nine entrances recorded and a high level of activity recorded including old and new bedding materials, fur, recent and old spoil.	Approximately 8m from bridge structure to be removed. Located 4m from existing tracks to be modified.

12.3.2.5 Bats

Potential Roosts in Trees

A total of 11 trees with potential roost features were identified during site walkovers by APEM. Details relating to these features are outlined below in Table 12.13. An example of a roost feature in a tree is presented below in Figure 12.16Figure 12-17: Potential Roost FeatureFigure 12-17.

Table 12.13: Potential Bat Roost Features Identified in Trees

Tree Species	Potential Roost Feature	Classification of Roost Suitability	Approximate Chainage
Ash	Numerous snapped branches, upward facing rot hole at a fork in the tree approximately 5m high.	Low	130m west of start of works
Unidentified species standing deadwood	Several large open cavities, numerous snapped limbs	Low	Ch 580 approximately 11m south of tracks
Oak	Numerous rot holes, south facing rot hole approximately 10m high	Low	Ch 4425 approximately 10m north of tracks
Oak	South facing rot hole on south leaning limb approximately 5m high	Low	Ch 4770 approximately 3m north of the existing tracks
Oak	West leaning limb snapped leading to numerous south facing splits	Low	Ch 4580 approximately 6m north of the tracks
Oak	Numerous broken limbs and flaking bark	Low	Ch 4680, approximately 3m north of tracks
Ash	West facing rot hole approximately 5m in height	Low	Ch 5200, approximately 6m south of the tracks
Ash	Moderate ivy cover, numerous snapped limbs.	Low	Ch 6500 approximately 4m south of the tracks
Ash	Moderate ivy cover, with numerous broken tree limbs. Single observable rot hole on west leaning limb approximately 10m high.	Low	Ch 9570, approximately 8m south of the tracks

Figure 12-17: Potential Roost Feature

Source: Mott MacDonald 2022

Houses and Other Structures

During the initial walkover three buildings were identified as potentially containing bat roosts. These were initially assessed by APEM and reviewed during follow-up surveys by Mott MacDonald.

Red Brick Bungalow

A red brick bungalow was noted immediately adjacent to the existing track (Figure 12 17) at Chainage 430. The bungalow had a tiled, pitched roof which appeared to be generally in good condition. The building did not appear to be occupied and could not be accessed for internal inspection.

The classification of roost suitability for this feature is **Low**.

Figure 12-18: Red Brick Bungalow Adjacent to Existing Track

Source: Mott MacDonald 2022

Block and Mortar Bungalow

North of the existing track at Ch 6150 a block and mortar bungalow was recorded. This building is unoccupied and was boarded up at the time of visit Figure 12 18 preventing internal access for inspection. The building had a tiled roof with wooden soffit and fascia. Multiple potential access points were recorded with numerous raised tiles, along with rot and gaps in soffit and facia.

The building is located in a relatively sheltered area, with no lighting and with good continuity of habitat into the wider landscape. To the rear of the house scrub has encroached to the point where it is in contact with the building. Ivy growth was also noted on the side wall of the house.

An emergence survey at the bungalow was carried out on the 3rd of August 2022. The rear of the house (southern face) could not be fully accessed due to dense scrub which was growing against it. An emergence survey of the northern, eastern and western faces was carried out. No bats were observed emerging from the house during the survey. Leisler's bats, common pipistrelle bats, and soprano pipistrelle bats were observed foraging along the treelines and scrub adjacent to the structure.

Given that the rear of the house could not be included in the emergence survey, it is not possible to rule out a roost at this location. The classification of roost suitability for this house is **High**.

Figure 12-19: Block and Mortar Bungalow

Source: Mott MacDonald 2022

Derelict Prefabricated Building and Steel Shed

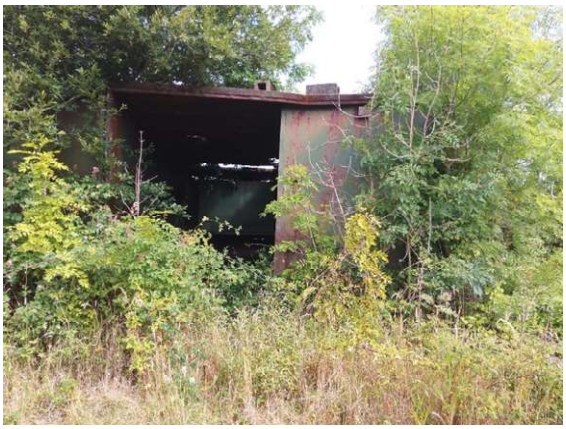
A derelict prefabricated building and steel shed type structure were recorded directly adjacent to the existing track between Ch 1300 and Ch 1350 (Figure 12.19 and Figure 12.20). The prefab building had large open holes where the doors and windows had been, and the ceiling had caved in internally resulting in high light levels (Figure 12.21). The prefab itself was inspected internally, and any voids for insulation found within the structure were inspected via endoscope (under license no. 67/2022)

Similarly, the shed structure had high light levels inside due to a large opening at the door, and numerous rust holes in the ceiling Figure 12.22). The result of this is that internal lighting levels were too high to support a roost within both of these structures.

Figure 12-20: Prefab Structure

Source: Mott Macdonald 2022

Figure 12-21: Shed Structure



Source: Mott MacDonald 2022

Figure 12-22: Roof Gap in Prefab

Source: Mott MacDonald 2022

Figure 12-23: Roof Gap in Shed

Source: Mott MacDonald 2022

Given the high light levels, and the lack of roof void suitable for roosting bats, the classification of roost suitability for the derelict prefab and shed are **negligible**.

Bridge Structures

A total of 13 existing bridge structures were encountered along the proposed development. These were constructed of either concrete beams, steel, or bricks. Of the bridge types, the bridges constructed of brick afforded the greatest potential for roost features. However, the bridges were in good condition, any gaps were superficial in nature, and the pointing of the brickwork prevented access to the bridge by bats. Examples of the bridge types are presented below in Figure 12.23, Figure 12.24, Figure 12.25 and Figure 12.26

A summary of the bridges encountered is presented below in Table 12.14

Table 12.14: Bridge Structures Encountered

Chainage	Bridge Type	Roost Potential
Ch 600	Concrete beam type. No potential roost features identified	Negligible
CH 1650	Concrete beam type. No potential roost features identified	Negligible

Chainage	Bridge Type	Roost Potential
CH 1970	Constructed of brick. A number of gaps noted in bricks, but these were superficial. The brickwork had been pointed up preventing access into the bridge by bats.	Negligible
CH 1875	Concrete beam type. No potential roost features identified	Negligible
Ch 3250	Constructed of bricks. Any gaps superficial and brickwork had been pointed up.	Negligible
CH 4200	Steel pedestrian bridge. No potential for roost features	Negligible
CH 4270	Constructed of bricks. Any gaps superficial and brickwork had been pointed up.	Negligible
CH 6150	Concrete beam type. No potential roost features identified	Negligible
CH 6470	Constructed of bricks. Bridge had been pointed up. Single hole noted however this was superficial in nature and unlikely to support roosting bats.	Negligible
CH 7170	Concrete beam type. No potential roost features identified	Negligible
CH 8300	Concrete beam type. No potential roost features identified	Negligible
Ch 9525	Concrete beam type. No potential roost features identified	Negligible
Ch 9850	Concrete beam type. No potential roost features identified	Negligible

Figure 12-24: Concrete Beam Type Bridge

Source: Mott MacDonald 2022

Figure 12-25: Steel Type Bridge

Source: Mott MacDonald 2022

Figure 12-26: Brick Type Bridge

Source: Mott MacDonald 2022

Figure 12-27: View of Brick Bridge Arch

Source: Mott MacDonald 2022

Bat Foraging Features

Linear habitat features along the proposed development likely provide commuting and foraging habitat for bat species in the wider landscape. These features, including linear strips of scrub, woodland edges, hedgerows, treelines and watercourses were identified throughout the proposed development.

12.3.2.1 Breeding Bird Survey

No suitable nesting habitat for riverbank nesting species such as kingfisher (*Alcedo atthis*) were record within the study area.

Bird species recorded within or flying over the study area include common green listed (Gilbert et al 2021) species such as robin (*Erithacus rubecula*), rook (*Corvus frugilegus*), little egret (*Egretta garzetta*), wren (*Troglodytes troglodytes*), blackbird (*Turdus merula*), song thrush (*Turdus philomelos*), great tit (*Parus major*), jackdaw (*Corvus monedula*), wood pigeon (*Columba palumbus*), dunnock (*Prunella modularis*), grey heron (*Ardea cinerea*), hooded crow (*Corvus cornix*), chiffchaff (*Phylloscopus collybita*), buzzard (*Buteo buteo*) and gold finch (*Carduelis carduelis*). Great white pelican (*Pelecanus onocrotalus*), a novel free roaming species from nearby Fota Wildlife Park, was observed in Cork Harbour by Harpers Island.

Amber listed species recorded include mallard (*Anas platyrhynchos*), greenfinch (*Carduelis chloris*), and lesser black-backed gull (*Larus fuscus*) were recorded outside of the Site at Cork Harbour. Starling was seen frequently flying over the Site. Cormorant (*Phalacrocorax carbo*) was observed basking in a tree south of the river bridge at Owenacurra River.

Red listed species recorded include oystercatcher (*Haematopus ostralegus*) recorded in the Harpers Island area outside of the Site. Snipe (*Gallinago gallinago*) was seen flying from an attenuation pond at Annsgrove Business Park

In summary potential sensitive areas for breeding birds within the site consist of linear scrub/ hedgerow along the edge of the rail corridor. These areas are used by common breeding birds.

More sensitive areas where red and amber listed birds were recorded or may potentially occur are off site, and include saltmarsh and intertidal mud habitat edge located between Glounthaune station and Chainage 850m.

River crossings in particular the Owenacurra River are likely utilised by riparian bird species including grey wagtail, kingfisher and dipper though no suitable breeding habitat was recorded within the proposed development.

Proposed temporary construction compound areas beside Owencurra River (Chainage 9800 – 9850) and Ballyadam (Chainage 6200 – 6300). Relatively undisturbed scrub and unmanaged habitats at these locations are used by common breeding birds.

12.3.2.2 Wintering Bird Survey

A total of seven red listed species, eight amber listed species, and seven green listed waterfowl species were recorded monthly during the wintering bird season (January – March 2022 inclusive).

Section 2 (Figure 12.1) recorded the highest number of species, with 16 SCI species recorded there. Sections 1, 3, 4 and 5 recording 9, 7, and 5 SCI species respectively. This corresponds to the findings outlined in the Conservation Objectives Supporting Document for Cork Harbour SPA (NPWS, 2014b) which outlines that Harpers Island is an important roost area for the SPA.

The most numerous species recorded during the wintering surveys was black-tailed godwit. While numbers recorded of the species over the survey generally varied between 6 (Section 2 Harper's Island) and 78 (Section 1 Glounthaune Estuary), a notable count of 1400 was recorded in Section 2 Harper's Island during the March counts. This count was 7 times greater than the figure of national significance for the species and exceeded the 1% international threshold of 1100.

A notable count of 543 black-headed gulls was recorded in Section 4 in January. The species was recorded in all five of the sections, albeit in lower numbers. Counts of the species were high in section 4 with peak counts each month of 420 and 330 in February and March respectively.

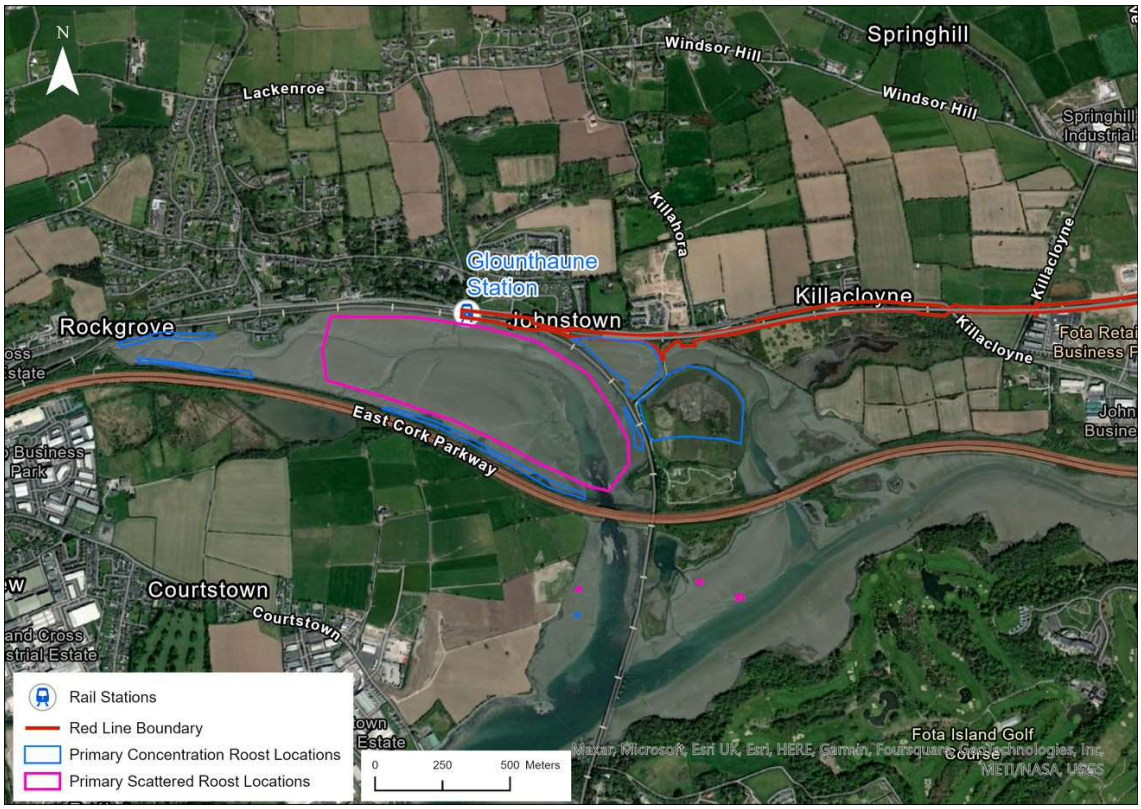
Other notable counts included the following peak counts of:

- 58 curlew recorded in Section 3
- 155 dunlin recorded in Section 1
- 3 little grebe recorded in Section 2
- 50 redshank recorded in Section 1
- 80 shelduck recorded in Section 2
- 57 teal recorded in Section 2

The largest roost concentrations were recorded at the northern end of Harper's Island (section 2). Species recorded within this roosting area included black-tailed godwit, redshank, shelduck, wigeon, and black-headed gull. Species recorded within the main section 1 roosting concentrations were primarily waders including dunlin, redshank, and black-tailed godwit. Smaller concentrations of teal and black-headed gull were recorded on the southern and western ends of the estuary, while large but scattered numbers of black-headed gull and shelduck were recorded roosting and feeding on the main estuary.

The locations of these roosting areas are presented below in Figure 12.27. Peak counts of the 16 SCI species recorded during the wintering bird surveys are provided below in Table 12.15.

Figure 12-28: Roosting Locations Wintering Birds



Source: Mott MacDonald 2022

Table 12.15: Summary of Wintering Bird Results (Intertidal and Harpers Island south of rail line)

Species	BoCCI Status	SCI of Cork Harbour SPA	SCI of Ballycotton Bay SPA	Peak Count	Figure of national significance	Peak as % of Figure of National Significance
Bar tailed godwit	Red listed	Yes	Yes	2	170	1%
Black headed gull	Amber listed	Yes	-	**543**	1000	54%
Black tailed godwit	Red listed	Yes	Yes	**1400**	200	700%
Buzzard	Green list	-	-	1	Not published	-
Common gull	Amber listed	Yes	Yes	2	500	<1%
Cormorant	Amber listed	Yes	-	6	110	5%
Curlew	Red listed	Yes	Yes	**58**	350	16%
Dunlin	Red listed	Yes	-	**155**	460	34%
Great black-backed gull	Green listed	-	-	1	Not published	-
Green shank	Green listed	-	-	**5**	20	25%
Grey heron	Green listed	Yes	-	1	25	4%
Lapwing	Red listed	Yes	Yes	78	850	9%
Lesser black backed gull	Amber listed	Yes	Yes	13	Not published	-
Little egret	Green listed	-	-	8	20	40%
Little grebe	Green listed	Yes	-	3	20	15%
Mallard	Amber listed	-	-	4	280	1%
Oystercatcher	Red listed	Yes	-	42	610	7%
Pelican	Not listed	-	-	1	Not published	-
Redshank	Red listed	Yes	-	**50**	240	21%
Shelduck	Amber listed	Yes	-	**80**	100	80%

Snipe	Green list	-	-	6	Not published	-
Teal	Amber listed	Yes	Yes	**57**	360	16%
Wigeon	Amber listed	Yes	-	59	560	11%

12.3.2.1 Invasive Species

The following species listed under the 3rd schedule were recorded during site walkovers:

- Giant rhubarb
- Japanese knotweed
- Three cornered leek
- Himalayan balsam

The location of the stands of these species relative to the proposed development is presented in the habitat map presented in Appendix 12.3.

12.4 Summary of Ecological valuation

The key ecological receptors within the Zone of Influence of the proposed development are evaluated in accordance with the evaluation criteria set out in Table 12 2 in Section 12.2.1 of this Chapter. The existing baseline condition / population stability, conservation status, rarity and legal protection of the key ecological receptors was considered as part of this evaluation. A summary of the ecological valuation and identification of Key Ecological Receptors is provided below in Table 12.16.

Table 12.16: Ecological valuation and identification of Key Ecological Receptors (KER)

Habitats/Species	Ecological Value (as per NRA guideline)	Potential to occur within the zone of influence (ZoI)	Key Ecological Receptors
Designated sites			
Natura 2000 Sites			
Great Island Channel SAC	International Importance	Yes	**Yes**
Blackwater River SAC		No	No
Cork Harbour SPA		Yes	**Yes**
Ballycotton Bay SPA		Potential for *ex situ* SCI species to occur within the ZoI.	**Yes**
Ramsar Sites			
Cork Harbour	International Importance	Yes	**Yes**
Ballycotton Bay		Potential for *ex situ* bird species to occur within the ZoI.	**Yes**
Proposed Natural Heritage Areas			
Great Island Channel	National Importance	Yes	**Yes**
Carrigshane Hill	National Importance	No – no viable source pathway connector links identified	No
Rockfarm Quarry, Little Island	National Importance	No – no viable source pathway connector links identified	No
Ballynaclashy House, North of Midleton	National Importance	No – no viable source pathway connector links identified	No
Leamlara Wood	National Importance	No – no viable source pathway connector links identified	No
Dunkettle Shore (Chainage 0m to 850m inclusive)	International Importance	Yes – through mobile wintering bird species. Forms part of Cork harbour SPA.	**Yes**
Loughs Aderry And Ballybutler	National Importance	No – no viable source pathway connector links identified	No

Habitats/Species	Ecological Value (as per NRA guideline)	Potential to occur within the zone of influence (ZoI)	Key Ecological Receptors
Douglas River Estuary	International Importance	Yes – through mobile wintering bird species. Forms part of Cork harbour SPA.	**Yes**
Glanmire Wood	National Importance	No – no viable source pathway connector links identified	No
Cuskinny Marsh	National Importance	No – no viable source pathway connector links identified	No
Rostellan Lough, Aghada Shore And Poulnabibe Inlet	National Importance	No – no viable source pathway connector links identified	No
Monkstown Creek	National Importance	No – no viable source pathway connector links identified	No
Clasharinka Pond	National Importance	No – no viable source pathway connector links identified	No
Whitegate Bay	National Importance	No – no viable source pathway connector links identified	No
Carrigacrump Caves	National Importance	No – no viable source pathway connector links identified	No
Lough Beg (Cork)	National Importance	No – no viable source pathway connector links identified	No
Ballyquirk Pond	National Importance	No – no viable source pathway connector links identified	No
Owenboy River	National Importance	No – no viable source pathway connector links identified	No
Cork Lough	National Importance	No – no viable source pathway connector links identified	No
Ballycotton, Ballynamona And Shanagarry	International Importance	Potential for *ex situ* bird species to occur within the ZoI.	**Yes**
Templebreedy National School, Crosshaven	National Importance	No – no viable source pathway connector links identified	No
Lee Valley	National Importance	No – no viable source pathway connector links identified	No
Blarney Bog	National Importance	No – no viable source pathway connector links identified	No
Fountainstown Swamp	National Importance	No – no viable source pathway connector links identified	No
Habitats and Flora			
Arable Crop (BC1)	Local Importance (Lower Value)	Yes, this habitat occurs within the ZoI of the proposed development	No
Tilled Land (BC3)	Local Importance (Lower Value)	No	No
Buildings and Artificial Surfaces (BL3)	Local Importance (Lower Value)	Yes, this habitat occurs within the footprint of the proposed development	No
Upper Salt Marsh (CM2)	International Importance	This habitat occurs immediately adjacent to the proposed development	**Yes**
Exposed Sand Gravel or Till (ED1)	Local Importance (Lower Value)	Yes, this habitat occurs within the footprint of the proposed development	No
Spoil and Bare Ground (ED2)	Local Importance (Lower Value)	Yes, this habitat occurs within the footprint of the proposed development	No
Recolonising Bare Ground (ED3)	Local Importance (Lower Value)	Yes, this habitat occurs within the footprint of the proposed development	No
Exposed Calcareous Rock (ER2)	Local Importance (Lower Value)	Yes	No

Habitats/Species	Ecological Value (as per NRA guideline)	Potential to occur within the zone of influence (ZoI)	Key Ecological Receptors
Other Artificial Lakes and Ponds (FL8)	Local Importance (Higher Value)	Yes – connectivity to this habitat is present	**Yes**
Drainage Ditches (FW4)	Local Importance (Higher Value)	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
Improved Agricultural Grassland (GA1)	Local Importance (Lower Value)	Yes, this habitat occurs within the ZoI of the proposed development	No
Amenity Grassland (GA2)	Local Importance (Lower Value)	Yes, this habitat occurs within the ZoI of the proposed development	No
Dry Meadows and Grassy Verges (GS2)	Local Importance (Higher Value)	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
Dry Calcareous and Neutral Grassland (GS1)	Local Importance (Higher Value)	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
Wet Grassland (GS4)	Local Importance (Higher Value)	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
Mud Shores (LS4)	International Importance	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
Mixed Broadleaf Woodland (WD1)	Local Importance (Higher Value)	No	No
Mixed Broadleaved/Conifer Woodland (WD2)	Local Importance (Higher Value)	No	No
Scattered Trees and Parkland (WD5)	Local Importance (Higher Value)	No	No
Hedgerows (WL1)	Local Importance (Higher Value)	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
Treelines (WL2)	Local Importance (Higher Value)	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
Wet Pedunculate Oak-Ash Woodland (WN4)	County Importance	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
Wet Willow-Alder-Ash Woodland (WN6)	County Importance	No	No
Scrub (WS1)	Local Importance (Higher Value)	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
Owenacurra River	County Importance	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
Water Rock River	Local Importance (Higher Value)	Yes, this habitat occurs within the ZoI of the proposed development	**Yes**
All Other Watercourses	Local Importance (Lower Value)	Yes, this habitat occurs within the ZoI of the proposed development	**Yes** – due to connectivity with other sensitive receptors
Little robin	Local Importance (Higher Value)	Yes –Although not recorded, this species has habitat associations which occur within the footprint of the proposed development (railway lines).	Yes
Round leaved cranes'-bill	Local Importance (Higher Value)	Yes – Although not recorded, this species has habitat associations which occur within the footprint of the works (railway ballast, hedgerows, waste ground).	Yes
Wood small - reed	County importance	Yes – this species has associations with habitats which occur within the footprint of the works (railway banks).	**Yes**
Fauna			

Habitats/Species	Ecological Value (as per NRA guideline)	Potential to occur within the zone of influence (ZoI)	Key Ecological Receptors
Badger Setts	Local Importance (Higher Value)	Yes, these features occur within the ZoI of the proposed development	**Yes**
Otter holts and couches	County importance	Yes, these features occur within the ZoI of the proposed development	**Yes**
Amphibian breeding habitat	Local Importance (Higher Value)	Yes, these features occur within the ZoI of the proposed development	**Yes**
Bat species roosting features	Local Importance (Higher Value)	Yes, these features occur within the ZoI of the proposed development	**Yes**
Wintering birds	International Importance (south of chainage 0 – 750 only) Otherwise, Local Importance (lower value) – rest of scheme.	Yes, wintering bird species and supporting habitat for same occur within the ZoI of the proposed development	**Yes**
Breeding birds	Local Importance (Higher Value)	Yes. Suitable habitat for breeding birds occurs within the ZoI of the proposed development	**Yes**

12.5 Assessment of Effects

12.5.1 Do-Nothing

In the Do-Nothing scenario, the existing works area will remain as at present. There would be no effect on biodiversity.

12.5.2 Likely Significant Impacts Identified: Construction Phase

The following outlines potential impacts identified associated with the works:

- **Direct Loss of Habitat:** There is potential for a permanent loss of habitat associated with the construction phase of the proposed development.
- **Surface water run-off:** There is potential for impacts to surface water caused by the construction phase of the proposed development.
- **Dust:** Breaking out of existing hardstanding has the potential to cause dust. The proposed construction works are likely to result in the temporary generation of dust. Chapter 8 outlines the assessment of dust effects associated with the construction phase of the proposed development. This assessment incorporates earthworks, construction and track out from site areas.
- **Noise**: There is potential for a temporary increase in noise during the construction phase of the proposed development.
- **Visual Disturbance**: There is potential for a temporary increase in personnel and machinery presence during construction along the coastal area of the proposed development which may disturb coastal species.
- **Lighting**: Temporary working will be required to facilitate night working during the construction phase of the proposed development. This has potential to cause locally increased light levels.

The potential for these to cause significant effects to KERs is outlined hereunder.

12.5.2.1 Internationally Designated Sites

Designated sites with potential for impact were identified as Key Ecological Receptors.

Mott MacDonald prepared a screening for Appropriate Assessment and Natura Impact Statement report (which accompanies this application) which investigated the potential for the proposed development to have significant effects on European Site(s) either alone or in combination with other plans or projects. The screening report identified the potential for significant effects on the Natura 2000 Network arising from the proposed development in the absence of mitigation.

No direct habitat loss is likely to QI habitat within European site boundaries.

Impacts to relevant European sites identified are outlined hereunder in Table 12.17:

Table 12.17: Potential Construction Phase Impacts to European Sites

European site	Construction-Phase Impacts
Great Island Channel SAC	Potential for degradation and loss of Mudflats and sandflats caused by pollution of watercourses and direct impact to the mudflat habitat
	Potential for degradation of Atlantic salt marsh due to invasive species spread
Cork Harbour SPA	Degradation of wetland habitat within the SPA boundary caused by pollution
	Potential for noise and visual disturbance to SCI populations of within ZoI.
	Degradation of supporting habitat caused by invasive species spread
Ballycotton Bay SPA	Potential for impact to *ex situ* supporting habitat of SCI species
	Noise and visual disturbance impacts to SCI populations within ZoI
	Degradation of supporting habitat for SCIs caused by invasive species spread

In summary potential **permanent significant adverse effects** are identified in the absence of mitigation.

12.5.2.2 Proposed Natural Heritage Areas

The following proposed Natural Heritage Areas were identified as KERs.

- Great Island Channel
- Dunkettle Shore
- Douglas River Estuary.

These pNHA sites are contiguous with Cork Harbour SPA. Great Island Channel pNHA also overlaps with Great Island Channel SAC.

Potential for impacts to these sites are as outlined in previously in relation to European Sites (Section 12.5.2.1). Additional information in relation to degradation of habitats and impacts on wintering birds associated with these sites is outlined below. In summary potential **permanent significant adverse effects** are identified, in the absence of mitigation.

12.5.2.3 Habitats

The following habitats were identified as Key Ecological Receptors within, or in proximity to the proposed works:

- Upper salt marsh
- Other artificial lakes and ponds

- Drainage ditches (downstream connected habitats only)
- Wet grassland
- Mud shores
- Hedgerows
- Treelines
- Wet willow alder ash woodland
- Scrub
- Owenacurra river
- Water rock river

Table 12.18 below outlines the extent of direct impacts associated with the works based on a worst case scenario, at a local scale.

Table 12.18:Impact on Habitat KERs

Habitat	Area Within the Project Boundary	Magnitude of Impact in the Absence of Mitigation
Upper salt marsh (International Importance)	0.05ha	Permanent significant negative effect
Mud Shores (International Importance)	None	Temporary moderate negative effect (due to indirect effects)
Drainage ditches (Local Importance (Higher Value))	1.8km	Permanent moderate negative effect
Dry Calcareous and Neutral Grassland (Local Importance (Higher Value))	0.12ha	Temporary moderate negative effect
Dry meadows and grassy verges (GS2)	0.22ha	Temporary moderate negative effect
Wet grassland (Local Importance (Higher Value))	0.05ha	Temporary slight negative effect
Hedgerows (Local Importance (Higher Value)	7km	Permanent significant negative effect
Treelines (Local Importance (Higher Value)	0.5km	Permanent moderate negative effect
Wet Pedunculate Oak-Ash Woodland (County Importance)	0.007ha	Permanent slight negative impact
Wet willow alder woodland (County Importance)	None	No impact predicted
Scrub (Local Importance (Higher Value))	3.2ha	Permanent significant negative effect

No permanent impacts re likely to arise to mudflat or saltmarsh habitat. However, works areas will be immediately adjacent. In the absence of mitigation (monitoring, habitat delineation and EcOW presence) there is potential for temporary works areas to extend to the edge of upper salt marsh habitat (area south of chainage 825 – 875m) which, as outlined above has potential for a worst case **permanent significant negative effect** if works damage this habitat, for example through infill adjacent to works area.

In addition, given the proximity, and connectivity to the habitat, there is potential for impacts via surface-water emissions into mudflat habitat in the absence of mitigation. This has potential to cause impacts to invertebrate communities within the mudflat habitat. As outlined above, this would constitute a **temporary moderate negative** effect at a local scale on mudflat habitat.

Culvert lengthening will be required on the Killacloyne River (local importance (lower value) in two locations. In one location the culvert will be lengthened by 4m (2m upstream and 2m downstream), in the second location the culvert will be lengthened by 1m (1m to the north). There is potential, therefore for **a permanent slight negative effect** at these locations associated with minor habitat loss due to in river works, based on nature and scale of works and aquatic ecology evaluation.

Impacts will be required to linear woodland (hedgerows/ treelines) either side of the existing track. A worst-case scenario is presented in Table 12.20, however this impact will be much reduced, and mitigation is outlined to minimise existing woody vegetation loss.

Impacts to semi natural grasslands are mainly associated with temporary construction compounds and these areas will be reinstated post works.

Works will be required at Owenacurra River Bridge to widen the deck of the bridge on the existing piers to allow for a double track. The widening deck consists of precast prestressed concrete beams with an in-situ infill concrete deck which will be stitched to the existing deck.

The bank seat (base of the bridge) widening will be supported on continuous flight auger piles. The two existing piers in the river channel were built to accommodate future widening of the bridge deck and are sufficiently wide and therefore no permanent instream works/ infrastructure are proposed. The existing pier capping beams will be widened to accommodate the proposed deck widening. The existing north walkway will be removed and reinstated on the widened deck. The existing reinforced concrete northern wingwalls will be demolished and rebuilt to accommodate the extension. Scaffolding will be required within the river during the works, this is the only instream work required. This has potential to result in a release of sediment, and localised impacts to the river bed. There is potential therefore, for a **temporary moderate impact** to the Owenacurra River.

12.5.2.1 Aquatic Ecology/ Fisheries

There is potential for direct impact to County Importance fisheries habitat in the case of the Owenacurra River to facilitate the installation of the scaffolding. This also has potential to cause sediment to be released due to in river disturbance, causing impacts downstream of the works area. This has potential to result in a **temporary (construction phase) moderate negative impact** to aquatic fisheries downstream.

The requirement for culvert lengthening on the Killacloyne River has the potential for direct impact and loss of aquatic fisheries habitat in the footprint of the works. This also has potential to cause surface water emissions to be released causing impacts downstream of the works area through the physical installation of the culvert. This has potential to result in a **permanent slight negative impact** to aquatic fisheries.

Given the nature and location of the works there is potential for surface water emissions to be released into all watercourses which are crossed by the proposed development due to site clearance and potential associated run-off. This has potential to result in a **temporary moderate negative impact** to sensitive aquatic fisheries receptors downstream, of the proposed development.

12.5.2.2 Badger

Three badger setts were identified during the site walkovers, two of which were identified as being active setts. Given the proximity of these setts to the proposed development (all on vegetated track sides) there is a high potential for direct impacts to these setts and the badgers therein.

In addition, there is potential for additional direct impacts and disturbance effects should additional badger setts become established within the ZoI in the time period following the survey and prior to construction.

In the absence of mitigation, these impacts are assessed as **permanent significant negative effect** at a local scale.

12.5.2.3 Otter

One otter holt was identified within the ZoI (noise/ visual disturbance) of the proposed development. The holt is located approximately 115m south of the existing track. The ZoI of the works intersects with the proposed development between Ch 800 and Ch 925. The works in this section require two sections of fill, and a small strip of cut to facilitate the addition of track at this section.

In addition, a couch was recorded approximately 30m north of the development along the Owenacurra river. This was not a breeding site for otter. The couch will be subject to noise effects associated with the works to facilitate additional tracks at the crossing.

There will be no direct impacts to any holts, or couches, however disturbance effects may occur given the proximity of these features to the proposed development. In addition, otters utilise the coastal areas adjacent to the proposed development, and the freshwater features for foraging and commuting habitat.

The impacts are therefore assessed as **temporary moderate negative effect** at a local scale.

12.5.2.4 Bats

The site walkovers identified 11 trees, and two buildings with bat roost features. There is potential for direct impact to 7.5km of the identified linear hedgerow/ scrub and trees, which are located in close proximity to the existing rail line. The two identified houses (red brick building, and block and mortar bungalow) with roost potential will not be directly impacted by the proposed development and will be retained.

Additionally, loss of treeline, hedgerow, and scrub habitat has the potential to result in loss and/or degradation of foraging habitat for bat species in the wider landscape. The loss of trees with potential roost features therein, and foraging habitat, has the potential to result in a **permanent slight negative effect** at a local scale due to the potential loss of linear woodland type forage habitat.

12.5.2.5 Wintering Birds

Wetland birds have been documented to tolerate noise levels at or below 70dB(A) (Institute of Estuarine & Coastal Studies, University of Hull, 2009). Noise modelling for the proposed development has been carried out and is detailed in Chapter 16 of the EIAR. The key findings in relation to noise and vibration during the construction phase, is the track installation work, with a maximum combined sound power level of 107.6 dBA at works areas, in the absence of mitigation. The distance at which the sound level falls below 65dB (potential disturbance level to birds) is determined as 54m. These buffers are estimated maximum extent and precautionary. It does not account for further noise reductions likely due to existing trackside trees/ woody vegetation.

The 65dB noise levels only includes a very small portion of the edge of the SPA and will further reduce before it reaches the main mudflat areas and the northern edge of Harpers Island (important roost site for SCI birds). Noise will rapidly reduce as it moves away from the shoreline (SPA edge) and will be < 50dB at 300m from works areas.

Based on the desk information and bird surveys conducted in 2022 the key area for wintering south of the existing rail track between Glounthaune station and chainage 850m. This area includes areas of extensive mudflats used by waterbirds, with significant proportions of the overall SCI wintering populations of Cork Harbour SPA

The proposed works will result in construction phase noise disturbance to approximately 2.3Ha to wintering bird habitat (mudflat habitat).

Additionally, presence of machinery and lighting required during construction phase will result in visual disturbance within 400m of the proposed development where existing screening (trees) does not exist. This has potential to result in a worst-case scenario measurable temporary increase in disturbance effects from 39Ha of foraging and roosting habitat for wintering birds.

Given that significant roosting and core foraging areas were identified within this ZoI, there is potential therefore for a **short term imperceptible effect** at a local scale due to construction phase disturbance (visual and noise) noting a maximum two week construction phase, works outside winter season (when birds are more abundant) and works area within an existing noise disturbed zone i.e. existing active train line.

12.5.2.6 Breeding birds

Vegetation clearance has potential to result in a loss of nesting habitat for these breeding bird species in the local area. In addition, should clearance be carried out during the nesting season (1st March-31st August) there is potential for direct impact to nesting birds within scrub, treeline, and hedgerow habitats within the study area. The disturbance of these species during the construction phase has potential to result in temporary movement out of the ZoI and is assessed to be a temporary **moderate negative effect** at local scale.

The loss of potential nesting habitat (track side hedgerows and scrub) has potential to result in a **permanent slight negative effect** on local bird populations.

12.5.2.7 Amphibians

There is potential for a permanent loss of habitat for amphibians in the footprint of the works due to loss of drainage ditch habitat though noting most drainage ditches are ephemeral water bodies (dry out) and hence relatively unsuitable as breeding sites for amphibians. As such, there is potential for a **permanent slight negative effect** on local population of amphibians, in the absence of mitigation.

12.5.3 Likely Significant Effects Identified: Operation and Maintenance Phase

The following outlines potential impacts identified associated with the works:

- **Noise**: There is likely to be a slight increase in operational noise levels surrounding the proposed development.
- **Lighting**: Additional permanent lighting will be required along localised sections of the scheme. Details in relation to this are outlined in the Description of the Development Chapter 6.
- **Disturbance**: Maintenance works have potential to result in additional disturbance should the works take place during the wintering season
- **Invasive Species Spread**: Maintenance works have potential to result in additional spread of invasive species

12.5.3.1 Designated Sites

The potential for impacts to designated sites during operational phase as identified in the AA screening and NIS are outlined below in Table 12.19.

Table 12.19: Potential Impacts to European Sites

European site	Operation-Phase Impacts
Great Island Channel SAC	Potential for additional degradation of QI habitat caused by invasive species spread.
Cork Harbour SPA	Potential for additional degradation of SCI supporting habitat caused by invasive species spread during maintenance.
	Potential for disturbance to SCI species caused by maintenance works if conducted during the wintering season.
Ballycotton Bay SPA	Potential for additional degradation of Sci supporting habitat caused by invasive species spread.
	Potential for disturbance to SCI species caused by maintenance works if conducted during the wintering season.

12.5.3.2 Habitats

The operational phase will result in increased frequency of train operations. Maintenance works may be required on occasion along the edges of the railway embankment. There is also potential for continued spread of invasive species associated with these works.

This has potential to result in **permanent moderate impacts** to habitats fringing the railway tracks such as scrub, saltmarsh, and wet pedunculate oak-ash woodland.

12.5.3.3 Watercourses

The potential for impact to watercourses quality during the operational phase is outlined in Chapter 11.

No additional impacts are identified associated with the operation and maintenance phase of the proposed development.

12.5.3.4 Aquatic Ecology/ Fisheries

Potential for temporary pollutant runoff and temporary localised disturbance to fishery habitat in the Owenacurra River may arise. As outlined in section 12.6.3.3 the potential for likely significant effects associated with water quality are outlined in Chapter 11.

No additional impacts are identified associated with the operation and maintenance phase of the proposed development.

12.5.3.5 Badger

The operational phase will result in increased frequency of train operations. No additional impacts to badgers are identified as badger populations are already established and adapted to train traffic.

12.5.3.6 Otter

The operational phase will result in increased frequency of train operations. No additional impacts to otters are identified as they use areas outside the rail corridor which will continue to allow otter passage and connectivity to suitable habitats e.g., at river crossings and coastal areas.

12.5.3.7 Bats

Additional lighting will be provided at Water Rock level crossing. Walkway lighting will be provided in the new sidings in Midleton. The lighting will be uni-directional and designed to avoid light splay. Existing lighting will be maintained at the Water Rock level crossing and any additional lighting will be similar to existing lighting. In line with Railway Safety Commission Guidance 'lighting should not cause glare to either road users or train drivers, interfere with the visibility of railway signals nor cause avoidable annoyance to local householders'.

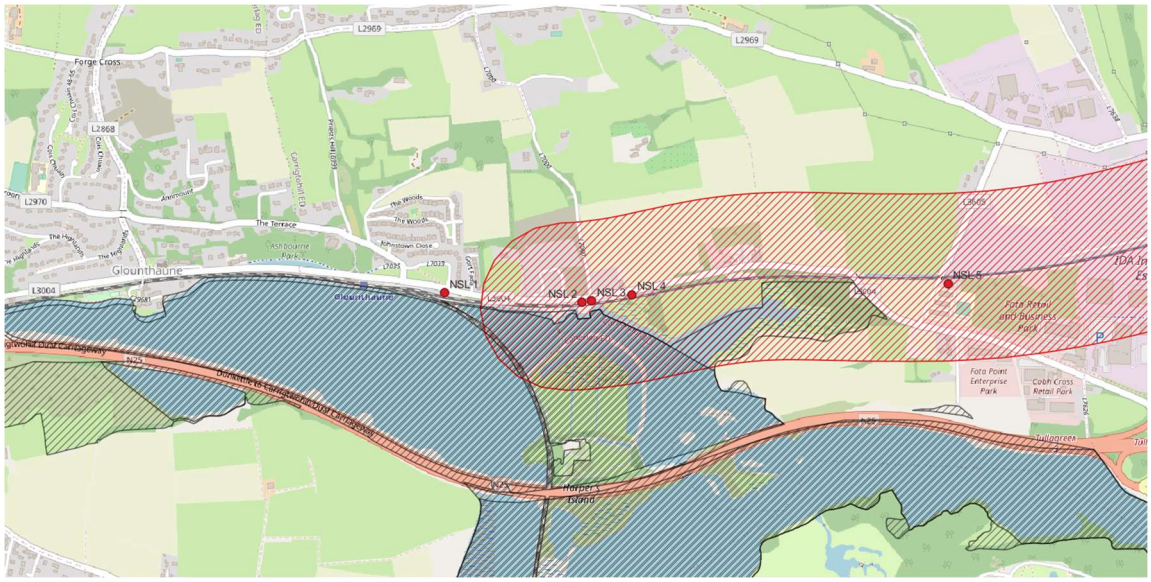
Increased lighting can cause disturbance effects to foraging bats that can affect their foraging behaviour. British Conservation Trust (BCT 2018) notes in their guidance note on impacts of artificial lighting on bats, that even relatively light tolerant bat species such as common pipistrelle have been recorded avoiding areas that are well lit.

Localised increased lighting has the potential to cause a localised **permanent imperceptible effect** on local bat populations which may be foraging in this area.

12.5.3.8 Wintering Birds

The operational phase will result in increased frequency of train operations. This has potential to result in a localised increase in noise levels of between 3 and 10dBA within 300m of the rail line. Some of these locations include areas within Cork Harbour SPA, refer to Figure 12.28.

Figure 12-29: Operational Noise increase (between 3 and <10dBA) Zone



Source: Mott MacDonald 2022. Note: Black hatch = Cork Harbour SPA

Wintering birds in the vicinity of the existing tracks are already subject to regular noise and visual disturbance due to the operation of the railway. Given the habituation exhibited by wintering birds in the area, this is not likely to result in a significant effect on wintering birds. Water birds regularly adapt to non-impulsive predictable noise, similar to train noise, even immediately

adjacent to significant noise sources e.g., roads and rail running adjacent to wintering waterfowl sites in Dublin Bay and elsewhere in Cork Harbour.

In summary operational noise and visual disturbance changes are likely to have imperceptible effects on wintering birds.

Maintenance works have the potential to result in disturbance effects to SCI species. In addition, continued accidental spread has the potential to result in the degradation of supporting habitats. This has the potential to result in **permanent moderate impacts.**

12.5.3.1 Breeding birds

The operational phase will result in increased frequency of train operations. No additional impacts to breeding birds are identified associated with the frequency of trains. Maintenance of woody vegetation adjacent to the train lines has potential to result in direct impacts to breeding birds should these works be carried out during the breeding bird season. This has potential to result in a **short term slight impact** where localised woody vegetation management is required.

12.5.4 Decommissioning

The activities associated with the decommissioning phase will be similar to those associated with the construction phase. Therefore, provided that appropriate mitigation is used, the impacts of the decommissioning phase should be, as a worst-case scenario, similar to those at construction phase.

12.6 Cumulative Effects

An assessment of projects with the potential for cumulative impacts in association with the proposed development was also undertaken. Details relating to this assessment are provided below in Table 12.20.

Table 12.20: Cumulative Effects Assessment

Development	Reference (planning or other)	Location	Summary of Details	Potential for Cumulative Effects
Local Authority Own Development – Part 8 (Cork County Council)				
Burys Bridge, Kilcoolishal to Carrigtwohill via Glounthaune Pedestrian and Cycle scheme.	ABP confirmed associated CPO (Ref. CH04.310856) on 04/08/2021	Burys Bridge, Kilcoolishal to Carrigtwohill	From the planning drawings, it is noted that a new bridge is proposed at eastern edge of Carrigtwohill. The Scheme involves the construction of a dedicated pedestrian and cycle route on the northern side of the L3004 (the former N25) road and includes the following: ● A general cross section of 3m wide shared pedestrian and cycle path with a 1m landscaped separation between the path and the public road where possible; ● Formalised parking and controlled (i.e. traffic signals) pedestrian crossings; ● New footpaths, ducting and LED public lighting Approved Part 8: 2020	The scheme is located immediately adjacent to the proposed development extending out further to the west, and stopping at Carrigtwohill. The CPO for the project was confirmed in August 2021. Given the location and potential timing of these works (i.e. construction phase may run concurrently with that of the proposed development). Given the location and timing of the works, **there is potential for cumulative impacts due to noise/ visual disturbance of wintering bird species.**
Carrigtwohill to Midleton Inter-Urban Cycleway -		Carrigtwohill to Midleton	The construction of a dedicated pedestrian and cycle route from the western side of the L3616-0 west of Carrigtwohill to the south of L3617-0 the east of Carrigtwohill. Dedicated pedestrian and cycle links will be provided from this route to the Carrigtwohill Train Station, the planned Carrigtwohill School's Campus (planning reference 19/5707) and along the L3617-0. The proposed development includes the following: ● A general cross section of 4m wide shared pedestrian and cycle path with public lighting and landscaping on both sides; ● 2 no. pedestrian/ cyclist bridges including one over the Cork to Midleton railway line; ● 1 no. railway underpass (at existing underpass structure) ● 1 no. road underpass of the L3617-0; ● At grade pedestrian/ cyclist crossings of existing roads (L3616-0, L3603-0, L3606-37, L7641-0 and	The project is located immediately adjacent to the proposed development. Given the timing of the application, there is potential for the works to be carried out concurrently to the proposed development. Given the location of the Carrigtwohill to Middleton Inter-urban cycle scheme in relation to the nearest sensitive receptors, no potential for cumulative effects associated with the proposed development have been identified.

Development	Reference (planning or other)	Location	Summary of Details	Potential for Cumulative Effects
			L3617-0) The scope of the scheme includes a new cycle and footbridge over the existing rail line ● Traffic calming measures on existing roads (L3616-0, L3603-0, L3606-37, L7641-0 and L3617-0). ● Live Part 8 process: consultation closed January 2022.	
Ballinacurra to Midleton pedestrian and cycle route		Ballinacurra to Midleton Train Station	The construction of a dedicated pedestrian and cycle route from Ballinacurra to Midleton Train Station and includes the following: ● A mixture of segregated cycle facilities, shared use pedestrian and cycle paths and greenway. ● A one-way system for traffic from the south of the Bailick Road to Charlestown Wharf. · A traffic light shuttle system at the N25 underbridge on the Bailick Road. ● Works are proposed to Protected Structure Ref number 00517 on Bailick Road. ● An underbridge under the existing Irish Rail railway line. ● New footpaths, Controlled Crossings, Bus Stop The Part 8 planning application was approved in 2020	The project is located in close proximity to the proposed development, on the eastern end of the site. The Part 8 for the scheme was approved in 2020 and documentation supporting the project indicates it is anticipated to take 5 years for the installation of the scheme. As such, there is potential for works to take place concurrently with the proposed development. Given the location and timing of the works, **there is potential for cumulative impacts due to noise/ visual disturbance of wintering bird species.**
Dunkettle Interchange Improvement Motorway Scheme	ABP - MA0011 and HA0039	Cork City	The scheme relates to the proposed provision of an improved interchange at the location of the existing Dunkettle Interchange at the intersection of the N8, the N25 and the N40 in the townland of Dunkettle, Co. Cork. The scheme comprises a series of direct road links between the above existing elements of road infrastructure and also provides links to the R623	The scheme is located approximately 3km to the west of the proposed development. Given the location of the Proposed Development relative to the Dunkettle scheme, and the implementation of mitigation measures outlined in associated environmental reporting no potential for cumulative effects is identified.

Development	Reference (planning or other)	Location	Summary of Details	Potential for Cumulative Effects
			Regional Road in Little Island and Bury's Bridge in Dunkettle. In particular, the proposed development includes direct road links for northbound traffic exiting the Jack Lynch Tunnel to access the N25 in the East and for southbound traffic on the N8 to access the Jack Lynch Tunnel southbound and vice versa. The scheme also includes a direct link for N8 traffic heading east towards the existing Dunkettle Interchange to gain access onto the M8 Northbound or directly under the existing N8 to access Bury's Bridge. Other links are also provided. The scheme is currently under construction.	
Ballyadam Proposed new 110kV substation and associated works	ABP - VC04.309585	Ballyadam, former Amgen site	The Electricity Supply Board (ESB) proposes to construct a new 110 kV substation within the IDA owned Ballyadam site.	Consultation has been commenced with An Bord Pleanala but at the time of writing has not been completed. Given that the project has not yet been defined at the time of writing, the extent of any potential impacts is unclear. Following the submission of the application, the project will be subject to environmental assessment in its own right. However, given the location of the proposed new substation, no potential for cumulative effects is anticipated.
Water Rock Urban Expansion Area Infrastructure Works	Local Authority Own Development – Part 8 Approved with Modifications	Water-Rock (townland), west of Midleton	Various infrastructural works and services – • Traffic Management Measures for Water Rock Road (L3618) – Erection of bollards within the existing Water Rock public road (L3618) each side of the railway line to close the level crossing to vehicular traffic. Railway level crossing to remain operational and access across the level crossing will be maintained for pedestrians and cyclists; • Bridge over Railway and Extension to Services Corridor Link Road – New bridge over the Cork to Midleton railway line connecting the Services Corridor Link Road to lands to the south of the railway line and new serviced road corridor with footpaths	The scheme bisects the proposed development on the eastern side, running north to south. Given the nature, scale and location of these works relative to the proposed development, no potential for cumulative effects is anticipated.

Development	Reference (planning or other)	Location	Summary of Details	Potential for Cumulative Effects
			and cycle tracks to access the proposed railway stop and bridge and ancillary works • Railway Stop – New railway stop along the Cork to Midleton railway line consisting of a platform and shelter, drop-off area, cycle parking, disabled parking and access, ticket machines and ancillary works • Approved Part 8: March 2019	
PCI & Strategic Infrastructure Development and Strategic Housing Development Applications: Application made directly to ABP				
North Midleton Wastewater pumping station	Future Irish Water application to Cork County Council	Water-Rock and various townlands	Proposed construction of a new wastewater PS and associated network infrastructure (rising mains and gravity sewers) to transfer loads from Midleton WWTP to Carrigtohill WWTP via Waterrock PS. The connection to Waterock PS will require a trenchless sewer connection under the Owenacurra River and requires two crossing beneath the Cork to Midleton rail line, one via an existing sleeve under the rail line, and a second crossing via a new sleeve (townland of Carrigtohill).	Given that the project has not yet been fully defined at the time of writing, the extent of any potential impacts is unclear. Following the submission of the application, the project will be subject to environmental assessment in its own right. However, given the location relative to European sites and the proposed development, no potential for cumulative effects is anticipated.
South Midleton Wastewater Network Diversion Project	Future Irish Water application to Cork County Council	Townparks	This project seeks to transfer further loads to Carrigtohill WWTP via a wastewater pumping station located east of Ballick Road within the southern half of Midleton, via a rising main to Midleton North Pumping Station to cater for loads for future developments in Midleton town centre and wider area.	Given that the project has not yet been fully defined at the time of writing, the extent of any potential impacts is unclear. Following the submission of the application, the project will be subject to environmental assessment in its own right. However, given the location relative to European sites and the proposed development, no potential for cumulative effects is anticipated.
Celtic Interconnector	310798	Townlands of Ballynanelagh, Ballyadam and other various townlands, County Cork	EirGrid - proposed development of that portion of an electricity transmission interconnector (Celtic Interconnector) to be constructed onshore in Ireland to the mean high-water mark, including a connection to the Irish National Grid, an electricity converter station and all associated and ancillary works. The project was granted May 2022	The Celtic Interconnector project runs on-shore from Claycastle in Youghal and terminates at the Ballyadam site, which is located immediately south of the proposed development. The project is expected to be completed in 2026. Given the location of this development, the nature of the impacts described (particularly in relation to the western extent of the Celtic Interconnector), and the mitigation measures to be employed, no potential for cumulative effects is identified.

Development	Reference (planning or other)	Location	Summary of Details	Potential for Cumulative Effects
Harpers Creek	ABP-301197-18	Harpers Creek	O'Mahony Developments - 174 No residential units (201 No houses and 88 No. apartments); 35 place creche & doctor's surgery. Granted - 29/05/2018	The development is currently under construction with phase three due to be released imminently. Given the stage the development is at, and the location of the scheme relative to the proposed development no potential for cumulative effects is identified.
Ballynaroon Housing development	ABP Ref. 312658	Ballynaroon, Glounthaune, Co. Cork.	Ruden Homes Ltd (Agent: Brian McCutcheon: McCutcheon Halley Planning Consultants). Demolition of an existing buildings, construction of 112 no. residential units (72 no. houses, 40 no. apartments). Lodged with ABP: 07/02/2022	The Ballynaroon housing development is located north of the proposed development. Given the nature and location of the housing development works, no potential for cumulative effects is identified.
BAM Property Limited - housing development	311855 – ABP SHD Pre-App Consultation	Castlelake, Terry's land and Carrigtohill (townlands).	BAM Property Limited - 706No residential units (239No houses, 467 No apartments, creche and associated site works. Signed 28/02/2022	The housing development is located immediately south of the proposed development. Impacts were identified through insignificant low-level disturbance effects to grey heron, and surface water emissions. Mitigation measures were prescribed to ameliorate surface water impacts. Given these measures, and the development location, no potential for cumulative effects is identified.
Section 34 Planning Applications lodged with Cork County Council				
Bluescape Development	17/5699	Bluescape Development	Bluescape Ltd, 31 No 2-storey houses - 21/05/2018 - Granted on appeal by ABP (Ref. ABP-300128-17)	The Bluescape development is located approximately 1km to the north west of the proposed development. Given the location and nature of the Bluescape Development. No potential for in combination effects is identified.
Church Road Development, Murnane & O'Shea Ltd	174498	Church Road, Carrigtohill, Co. Cork	Residential development of 25 no. residential units and all ancillary site development works. The proposed development consists of 20 no. 3 bed semi-detached dwellings, 4 no. 2 bed semi-detached dwellings and 1 no. 3 bedroom detached dwelling. Granted 03/03/2017	The location of this development is approximately 500m from the Proposed Development. The houses associated with the development have already finished construction Given the location of this development, and that the works associated with this scheme have been completed, no potential for cumulative effects is identified.
Bluescape Ltd.	175315	Cluain Cairn, Station Road, Carrigtohill, Co. Cork	Construction of 19 no. 2 storey dwelling houses and all ancillary site development works. The proposed development consists of 7 no. 2 bed townhouses, 10 no. 3 bed townhouses, and 2 no 3 bed semi-detached	The location of this development is approximately 300m from the proposed development. The houses associated with the development have already finished construction

Development	Reference (planning or other)	Location	Summary of Details	Potential for Cumulative Effects
			dwellings. Ancillary site development work. Granted 26/05/2017	Given the location of this development, and that the works associated with this scheme have been completed, no potential for cumulative effects is identified.
Cork Co-operative Marts Ltd	175516	Market Green, Knockgriffin, Midleton	Construction of a residential development of 42 no. residential units and a community room. The proposed development consists of the demolition of the existing Educate Together School and ancillary structures located on the eastern portion of the site, extinguishing the existing vehicular access to the north. New vehicular & pedestrian access to the west of the site onto Knockgriffin Rd; Granted 27/10/2017	The location of this development is approximately 300m from the proposed development. The development has already finished construction phase. Given the location of this development, and that the works associated with this scheme have been completed, no potential for cumulative effects is identified.
Stryker Ireland Ltd	185546		Extension to Manufacturing facility: 6,235m2, Will be carried out on a phased basis – Phase 1 has been implemented, Phase 2 remains to be implemented. Granted 08/08/2018	This development is located immediately adjacent to the proposed development. Given the location of the site, and the nature of the works. No potential for cumulative effects is identified.
Castle Rock Homes (Midleton) Ltd	186553	Midleton	Construction of 26 no. dwelling houses consisting of 8 no. 5 bedroom detached dwelling houses and 18 no. 3 bedroom semi –detached dwelling houses and all ancillary site works.	The location of this development is approximately 500m from the proposed development. The construction phase of this housing development has commenced with two phases complete as of 2020. Given the location of this development, and the stage of development, no potential for cumulative effects is identified.
Park Hill View Estates Ltd,	187236	Broomfield West, Midleton. NE of existing Carrigtwohill station	Demolition of existing sheds and construction of 41 no. residential units. The proposed development includes the demolition of existing sheds (2 no. agricultural sheds) and the construction of 2 and 3 storey detached and semi-detached houses and the provision of landscaping, car parking and all assoc. infrastructural and site development works, including widening of L-7630 Broomfield Road and provision of pedestrian footpath. Granted - 20/08/2019	This housing development is located approximately 800m from the proposed development. Given the location of the housing development relative to the proposed development, no potential for cumulative effects is identified.
Castle Rock Homes (Midleton) Ltd	187321	Midleton	The construction of 13 no. dwelling houses consisting of 12 no. 3 bedroom semi-detached dwelling houses and 1 no. 3 bedroom detached dormer dwelling house and all ancillary site works. Granted 12/02/2019	The location of this development is approximately 500m from the proposed development. The construction phase of this housing development has commenced with two phases complete as of 2020.

Development	Reference (planning or other)	Location	Summary of Details	Potential for Cumulative Effects
				Given the location of this development, and the stage of development, no potential for cumulative effects is identified.
Murnane & O'Shea Ltd	194124	Carrigane Rd. Carrigtohill (townland), Carrigtwohill	The construction of 94 no. dwelling houses and all ancillary site works. The proposed residential development represents a change of house type from that permitted under Cork County Council planning reference 06/10171 [as amended under planning ref. 14/4654]. Granted 13/01/2020	The location of this development is approximately 200m south of the proposed development. Given the location of the housing development relative to the proposed development, no potential for cumulative effects is identified.
Ancelstierre Investments Ltd,	194216	Avoncore Mill Rd, Broomfield West, Midleton	Construction of 40 no. dwelling houses consisting of 2 no. 2 bedroom townhouses, 28 no. 3 bedroom townhouses, 8 no. 3 bedroom semi-detached dwelling houses and 2 no. 4 bedroom semi detached dwelling houses and all ancillary site works. Granted 02/08/2019	The location of this development is approximately 200m from the proposed development. The development is located on the banks of the Owencurra river which is also crossed by the proposed development Potential impacts associated with the scheme included release of surface water emissions, spread of invasive species, noise impacts. Mitigation measures relating to the protection of groundwater and watercourses, management of invasive species, and noise reduction are prescribed as part of the development. Given the mitigation measures as outlined, the location of the development relative to the proposed development, no potential for cumulative effects is identified.
Smithkline Beecham (Cork) Ltd	204090	IDA Business & Technology Park, Killacloyne, Carrogtohill	The development will consist of (1) a single storey laboratory building to include plant and equipment area, office area, meeting rooms, canteen and kitchen, staff toilets, laboratories, IT room, electrical switch rooms and store rooms. The main laboratory bdg is 6.1m high, 44.5m long and 21.5m wide; incl. 19No new car pkg spaces. Granted 23/04/2020	This development is located immediately adjacent to the proposed development. Low level, short term, disturbance impacts to wintering curlew were identified associated with the development of the laboratory. The development of the site is currently under construction. Given the timing of these works (i.e. will be completed ahead of the proposed development) no potential for cumulative effects is identified.
The Cork Education and Training Board - Post Primary School accommodation:	204810	Fota Retail & Business Park, Killacloyne, Carrigtwohill.	Installation of 8no prefab unites and associated surfacing and drainage – temporary permission for a period of no longer than 5 yrs. Granted 03/07/2020	This development is located immediately adjacent to the proposed development. The planning documentation identified three phases of accommodation needs for the accommodation ranging from ending in 2022.

Development	Reference (planning or other)	Location	Summary of Details	Potential for Cumulative Effects
				Given that the nature, scale and timing of the works, no potential for cumulative effects is identified.
Midleton Association Football Club Ltd	214154	Immediate south of Midleton Station	The construction of a full size all weather playing surface on pitch number two, floodlighting, surrounding fencing, ball catching nets and all associated site development works on the club grounds. Granted 22/03/2021	This development is located 300m south of the proposed development. Given the nature, scale and location of the development relative to the proposed development, no potential for cumulative effects is identified.
Murnane & O'Shea Ltd	214267	Carrigane Rd. Carrigtohill (townland), Carrigtwohill	The construction of 10 no. 4 bed semi-detached dwelling houses and all ancillary site development works. The proposed development is a change of plan from that previously permitted under Cork County Council planning application reference 19/4124. Granted 01/04/2021	The location of this development is approximately 200m south of the proposed development. Ecological review was provided for this development which noted that due to the location of the development, no potential for significant impacts was identified. Given these factors, along with the location of the housing development relative to the proposed development, no potential for cumulative effects is identified.
Barlow Properties Ltd	215072	Ashbourne House, Johnstown, Glounthaune	94no. residential units (comprising 5no. 4-bed detached dwelling houses, 3no. 3-bed detached dwelling houses, 9no. 3-bed apartments, 4no. 3-bed duplex apartments, 65no. 2-bed apartments and 8no. 1-bed apartments in 8no blocks ranging in height from 2-4storey.	This development is located immediately north west of the proposed development. Conditional permission was granted for this development in May 2022, which has since been appealed. A screening for Appropriate Assessment has been submitted as part of this application. The report notes that the site is screened by mature trees and infrastructure such that any disturbance or displacement is extremely unlikely. Given these factors, no potential for cumulative effects is identified.
Murnane & O'Shea Ltd	215150	Carrigtohill (townland), Carrigtwohill	The construction of 67 no. dwelling houses and all ancillary site works. The proposed development consists of the construction of 34 no. 4 bedroom dwellings, 30 no. 3 bedroom dwellings and 3no. 2 bedroom dwellings. Access to the proposed development via estate entrance (2nd phase of 'Elmbury' development); Granted 08/12/2021	This development is located approximately 250m to the south of the proposed development. Given the location of this development in the context of the wider landscape, no potential for cumulative effects is identified.
Park Hill View Estates Ltd,	215664	at Broomfield West, Midleton, Co. Cork	A temporary waste water treatment system to serve the permitted housing consent 18/7236 (a consent for 41 houses), including ancillary links, connections to	This temporary waste water treatment system is located north of the proposed development. Given the nature and location of this development, no potential for cumulative effects is identified.

Development	Reference (planning or other)	Location	Summary of Details	Potential for Cumulative Effects
			the public foul system, local servicing and access off the. Granted 16/09/2021	
Compass Homes Ltd	216240	Station Road, Carrigtwohill, Carrigtwohill (townland), Co. Cork	Construction of 38 houses and a café; ABP decision due: 20/06/2022	This development is located approximately 500m to the south of the proposed development. Given the location of this development in the context of the wider landscape, no potential for cumulative effects is identified.
Vella Homes Ltd	216874	Junction of Mill Rd & Northern Relief Rd, Broomfield West, Midleton.	The construction of a mixed-use residential development with café/community space and all ancillary site works. The proposed development provides for the construction of 57 no. residential units comprising 4 no. 3 bedroom two storey townhouses and 53 no apartment/ duplex units; Close proximity to stn - NW side on opposite side of bridge. CEMP indicates a potential construction start of April 2023 (site set up) and August 2023 (construction of units). Decision Due: 26/04/2022	This development is located approximately 180m north of the proposed development. Potential impacts were identified for the project in relation to surface water runoff, and cumulative impacts. Mitigation for these impacts has been identified to ameliorate these effects. As such, no potential for cumulative effects is identified.
Connaught Trust Limited	217130	Ballyadam and Carrigtohill (townland), Carrigtwohill.	63No Residential units (47No houses and 16No duplex apartment units); vehicular entrance from upgraded site entrance from the Bog Road.	This development is located immediately south of the proposed development. Given the location of the development and the nature of the site, no potential for cumulative effects is identified.
EMR Projects Ltd	217264	Knockgriffin and Water Rock, Midleton	284No Residential units on 6.7Ha site; ; 7,525sqm is non-residential (childcare facility; retail unit; café unit; medical clinic; office units and associated ancillary accommodation). FI requested 07/02/2022	This development is located immediately north of the proposed development. Given the location of the development and the nature of the site, no potential for cumulative effects is identified.
IDA Ireland	217374	Carrigane Rd, Ballyadam, Carrigtwohill	New site access, local road improvement works and site development works comprising; new vehicular site entrance from L-7642 (Hedgy Boreen) including approx. 34m of internal stub road; road improvement works to approx. 140m of the northern end of the L-7642 to widen approx. 80m of carriageway and provide a grass verge and new setback boundary to the north and south of proposed entrance; improvement of sightlines along L-3617. Granted 18/02/2022	This development is located immediately south of the proposed development. Given the nature and location of the works relative to European sites, no potential for cumulative effects is identified.

Development	Reference (planning or other)	Location	Summary of Details	Potential for Cumulative Effects
Cruachan Investment Limited Partnership	217424		Construction of 13 no. warehouse/light industrial units in 3 no. buildings with ancillary two storey offices internally and associated site works (part of previous permitted development under planning reg no. 06/6741 and extension of permission Reg No. 1	This development is located approximately 200m south of the proposed development. A request for further information has been made by the planning authority due to potential for loss of and damage of QI habitats, impact to supporting habitat for QI and SCI species, and risk of disturbance to SCI species. Following the submission of the required information, the project will be subject to the provisions of the Directive, i.e. environmental assessment in its own right. However given the uncertainty surrounding the potential for impacts, there is **potential identified for cumulative effects**.

12.7 Mitigation and Monitoring Measures

12.7.1 Construction Phase Mitigation Measures

Mitigation measures were designed having regard to the Mitigation Hierarchy. This is a sequential order of mitigation actions whereby the preference for mitigation measures are as outlined below:

- Avoidance: Steps to avoid harm to biodiversity.
- Minimisation: Where adverse impacts cannot be avoided, action is taken to minimise these impacts.
- Compensation: Only considered after all possibilities for avoidance and minimisation of impacts have been implemented.

Care has been taken throughout the design process to avoid impacts to sensitive ecological receptors. Additional mitigation measures to ameliorate the impacts as described in this chapter are outlined hereunder. These are incorporated into the CEMP for the proposed development as provided in Appendix 6.1 of this EIAR.

12.7.1.1 Ecological Clerk of Works (EcOW)

An ECoW will be employed by the Contractor to oversee implementation of mitigation. This will include monitoring and auditing the works and contractor programmes and works method statements, to ensure mitigation is correctly implemented. The Contractor's ECoW will also ensure any disturbance licenses are arranged based on relevant details outlined in this EIAR and any significant findings of further confirmatory pre-construction surveys outlined above. The Contractor's ECoW will advise on mitigation measures implementation including the scheduling of works and will be included in regular liaison meetings between project teams to ensure that plans are co-ordinated and impacts are minimised. An independent Environmental Clerk of Works (EnCoW) will be employed on behalf of the Employers Representative team, who will review and comment on the monitoring and compliance reports generated by the Contractor's ECoW.

Key sensitive habitats, where works areas are adjacent, including saltmarsh and tidal mud will be monitored by the site EcoW on a full-time basis to ensure impacts to these sensitive adjacent habitats are avoided. The EcOW will also ensure works areas are minimised in relation to so impacts to woody vegetation (hedgerow/ scrub) are minimised as far as possible and disturbance risks to badger setts are avoided if possible. Pre construction confirmatory surveys will be conducted by the EcOW to demarcate protected mammal breeding sites and confirm disturbance license requirements. Prior to enabling and construction works the site EcoW will review and confirm proposed access routes, demarcate sensitive habitats and confirm works areas in these locations.

12.7.1.2 Mitigation to Prevent Spread of Invasive Species

It is an offence under Regulation 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) to plant, disperse, allow, or cause to disperse, spread or otherwise cause to grow any plant species specified in the Third Schedule of the Regulations.

Japanese knotweed, three cornered leek, Spanish bluebell, and Himalayan balsam (all listed under the above legislation) have been recorded within the footprint of the proposed development.

General

It is noted that Japanese Knotweed is being actively treated along most of the proposed work's area currently (2022). Prior to works commencing a full preconstruction confirmatory invasive species[14] survey will be carried out. The confirmatory survey will be carried out within the works areas, including compound locations, and along proposed access routes to identify the presence of all invasive species within and adjacent to works areas.

The invasive species confirmatory survey will be carried out during the appropriate growing season (May – October). The findings of this confirmatory survey will be incorporated into an updated Invasive Species Management Plan by the Contractor's ECoW.

Any stands of invasive species recorded within the proposed development boundary, including within compounds and along access tracks, will be clearly marked out as restricted areas. This exclusion zone will incorporate a buffer surrounding stands of Japanese knotweed such that below ground growth is accounted for (7m in diameter and 3m depth and inclusive of both treated and untreated material at a worst-case scenario). No works will be carried out within the exclusion zones unless approved by the Contractor's ECoW.

'Biosecure zone' signage will be erected at each potentially contaminated site. This is to alert staff that invasive species have been recorded and to avoid accidental entering or interfering with these sites. Likewise, any stockpiles of soil that are or could be contaminated with any of the aforementioned invasive species will be clearly marked. Marked haulage routes protected by root barrier membranes will be established within the proposed development footprint to allow transport to bunds.

Designated and clearly marked cleaning stations will be strategically placed within the work site for use by staff, vehicles, and machinery. Where it is necessary to work in contaminated areas, every effort will be made not to use vehicles with caterpillar tracks.

The Contractor's ECoW will carry out a toolbox talk for all construction personnel which will provide information on how to identify and manage invasive species. The toolbox talk will take place prior to works commencing in any areas where Invasive Species have been recorded.

All vehicles and equipment that have been used in these control operations will be steam-cleaned in a designated wash-down area each time they leave the contaminated area, and once work in that area has been completed. This also includes footwear, personal protective equipment (PPE), tools, and other light equipment. This is essential to remove soil that may contain plant fragments (vector material), which otherwise could be transported along the proposed development as works are being undertaken. Any water required for this will be brought to site in a bowser.

Vehicles leaving contaminated area(s) will either be confined to marked haulage routes protected by root barrier membranes or be steam cleaned as outlined above before leaving the area. Only vehicles that are deemed to be Biosecure (i.e. sealed so that no soil can escape) will be used to transport contaminated soil and all must be thoroughly steam cleaned in the designated wash-down area before exiting the designated area.

Chemical Control

Three cornered leek, Spanish bluebell and Himalayan balsam can all be controlled effectively using herbicide application. Applications will take place in Spring. Follow up monitoring of

[14] Species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) regulations 2011 (as Amended)

treatment sites will be undertaken annually, to ensure that regrowth of new plants does not take place.

The stands of Japanese knotweed identified within the proposed development footprint have been subject to a chemical treatment regime. In order to control established stands of Japanese knotweed, repeated treatments over successive years is necessary.

TII (2020) outline that a site may be considered remediated after two consecutive growing seasons with no sign of regrowth from all of the previously identified stands. It is of note, however, there is always the possibility of further regrowth occurring, this happens most commonly through the reactivation of dormant rhizomes due to disturbance of soils but may also occur through re-infestation of the site from off-site. Monitoring and potentially treatment will be carried out on an annual ongoing basis by Irish Rail.

Treatment of established stands of knotweed will be continued in order to prevent the spread of existing stands within the proposed development footprint.

Physical Control

Pulling and digging of Himalayan balsam plants (before seed is mature), three cornered leek, and Spanish bluebell has been found to be an effective methodology to control and remove stands. This treatment will only be carried out under supervision of the EcoW or by an appropriately experienced knotweed contractor. All waste material associated with these stands will be treated in accordance with legislative requirements on disposal.

Physical control methods (cutting, digging, excavating etc) of Japanese knotweed will be avoided wherever possible as interference with stands may result in a resurgence of growth in dormant stands, and increase potential for spread of vector material should biosecurity measures not be adhered to.

Where excavation of Japanese knotweed material is required, it may be subject to burial at a suitable location agreed with the site EcOW, as follows:

- Stands of Japanese knotweed identified for removal will be treated with a non-persistent herbicide prior to excavation.
- Material with potential to contain Japanese knotweed, or vector material, will only be excavated under strict supervision and placed within a vehicle for transportation.
- Only vehicles that are deemed to be Biosecure (i.e. sealed so that no soil can escape) will be used to transport contaminated soil and all must be thoroughly steam cleaned in the designated wash-down area before exiting the contaminated area.
- Burial of material may be undertaken as follows:
  - Where deep burial of a minimum depth of 5m is feasible, the waste will be covered with a proprietary root barrier membrane. Any joins in the membrane will be overlapped and secured. No material will be placed over the membrane until it has been inspected by the EcoW. A layer of pea gravel will be placed on top of the barrier membrane to reduce the potential for perforation of the barrier membrane. The waste will then be infilled with a minimum 5m depth of uncontaminated soil.
  - Where a burial of 5m is not feasible, the waste will be completely encapsulated in a proprietary root barrier membrane cell. The lower surface of membrane will be covered in a layer of pea gravel to reduce the potential for perforation of the barrier membrane. Any joins in the barrier membranes will be overlapped and suitably sealed. The upper surface of the cell will be covered in a layer of pea gravel and buried to a minimum depth of 2m. No material will be placed over the membrane (both internally and over the upper surface until it has been inspected by the EcoW.

- Where burial is not feasible due to site constraints, the material may be transported off-site (under license). It is a requirement to dispose of this material in a fully licenced wasted facility, capable of accepting such contaminated material. This disposal requirement applies to all Japanese knotweed contaminated material including untreated and treated plant material.

Monitoring

As outlined previously, a single herbicide treatment is unlikely to control an established stand of Japanese knotweed. Any re-growth of treated Japanese knotweed will be accurately mapped.

Monitoring will be conducted post treatment to determine the level of control success that the treatments of all species have achieved. All stands identified within the proposed development, and any areas where burial or storage has taken place will be monitored. This will continue at a minimum until such time that after two consecutive growing seasons there is no sign of regrowth from all the previously identified stands within the proposed development site.

Following control of large areas Japanese knotweed, a subsequent disturbance of the soil may give rise to revitalised rhizome growth. To avoid this, bare soil will be mulched (covered with a natural or synthetic barrier, such as wood chip, straw, geo-textile, or other appropriate material) and planted at the earliest opportunity with appropriate native replacement vegetation to stabilize the soil and deter subsequent re-invasion.

12.7.1.3 Compensation and Retention of Habitats

Table 12.21 below summarises the potential for retention of key habitat features, such as scrub and hedgerow, and replanting of woody vegetation species to mitigate for the loss of scrub, hedgerow and treeline.

As outlined under Section 12.7.1 the ECoW will monitor works and demarcate areas to ensure that the requirements for site clearance are kept to a minimum. The EcoW will ensure impacts to habitats are avoided in particular avoidance of permanent impacts to habitats of international (coastal areas) / county (Owenacurra River) value.

Table 12.21: Mitigation for Habitat KER Loss

Habitat	Estimate of Area Which May Be Lost	Mitigation
Upper Salt Marsh (CM2)	A total area of 0.05ha is located within the Red Line Boundary. No permanent works are necessary within the saltmarsh.	Given the value of this habitat it will be entirely retained. No works will be permitted within the habitat, and it will be fenced off prior to works commencing.
Drainage Ditches	1.8km. This is the maximum extent that may possibly be impacted. Impacts will be reduced further to minimum requirements	New drainage ditches will be required on the outer extent of works area. These will develop naturally post works with typical common species present in existing drains.
Dry Meadows and Grassy Verges (GS2)	A total area of 0.22ha of Dry Meadows and Grassy Verges habitat is within the Red Line Boundary. The majority of this is located at the western construction compound at the Owenacurra river. A small area will require permanent removal along the edge of the existing track (approximately 80m)	Any areas cleared where permanent works are not incorporated (i.e., at construction compounds and temporary works areas) will be reinstated.
Dry Calcareous and Neutral Grassland (GS1)	A total area of 0.12ha of Dry Calcareous and Neutral Grassland	Any areas cleared will be reinstated

Habitat	Estimate of Area Which May Be Lost	Mitigation
	habitat is within the Red Line Boundary. No permanent works are necessary within this habitat.	
Wet Grassland (GS4)	A total area of 0.05ha of Dry Meadows and Grassy Verges habitat is within the Red Line Boundary. This is on the edges of the proposed development and outside of any permanent works.	Any areas cleared outside of the permanent works will be reinstated.
Scrub (WS1)	A total of 3.2ha of scrub is within the red line boundary. This incorporates areas for both permanent and temporary works.	The Ecow will seek to minimise habitat loss and minimise works areas. Any areas cleared where permanent works are not incorporated (i.e., at construction compounds and temporary works areas) will be fully reinstated.
Hedgerows (WL1)	A total length of 7km of hedgerow fall within the red line boundary. This incorporates areas for both permanent and temporary works.	The Ecow will seek to minimise habitat loss and minimise works areas. Any areas cleared where permanent works are not incorporated (i.e., at construction compounds and temporary works areas) will be fully reinstated.
Treelines (WL2)	A total length of 0.5km of hedgerow fall within the red line boundary. This incorporates areas for both permanent and temporary works.	The Ecow will seek to minimise habitat loss and minimise works areas. Any areas cleared where permanent works are not incorporated (i.e., at construction compounds and temporary works areas) will be fully reinstated.

Reinstatement

Unless otherwise agreed with the Employer's Representative, the Contractor will re-instate hedgerows, treelines, and scrub to a species-rich condition (i.e. five woody species per 30 m), comprising only native species suited to the locality.

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 ECoW. Plant species of native provenance will be used in all replanting of semi natural habitats.

The Contractor will commit to a five year after-care plan for hedging, grassland, and agricultural reinstatement, or as otherwise agreed with the local authority.

The Contractor's agronomist will inspect, photograph and report in writing to the Employer's Representative on the establishment-phase of all vegetation.

The Contractor's agronomist will review, and advise on any corrective measures required to ensure good condition, immediately after reinstatement, and at least twice yearly thereafter for a five year period.

12.7.1.4 Mitigation Against Impact to Rare and Protected Plant Species

As outlined previously, historical records of little robin, round leaved crane's bill and wood small reed were identified during the desktop study. These species were not recorded during site walkovers and are considered unlikely to occur. However, given their habitat associations, the following mitigation measures will be incorporated at a minimum:

Prior to works commencing a confirmatory survey for the species within suitable habitat, where direct impacts will arise, will be carried out by an experienced botanist during the appropriate flowering season.

The botanist, to be appointed by the Contractor, will coordinate with the Contractors ECoW and, report findings to the ENCoW within the Client's Representative Team. The botanist will be contracted for a period lasting at least one year following the cessation of potentially damaging construction works at the plant location(s).

In the event where one or more plants are identified at risk of impact, an assessment of risk of impact will be carried out by the appointed botanist, in consultation with NPWS where relevant. The assessment will be specific to the species which identify any additional measures required to protect the species by either avoiding and protecting the plant species in situ, or (only as a last resort) through the translocation of the plant species to new receptor locations nearby, under licence from the NPWS where appropriate. Any additional measures as outlined under the terms of the license will also be included.

12.7.1.5 Mitigation Against Impact to Breeding Birds

Woody vegetation clearance will take place outside the main bird breeding season (March – August inclusive). Where tree clearance is proposed during the bird breeding season an experienced ecologist will conduct a pre-construction confirmatory survey to confirm no bird breeding sites will be disturbed. This will be monitored by the site EcOW to ensure birds are not disturbed and the area of woody vegetation clearance is minimised.

Habitat reinstatement (Section 12.7.1.3) will ensure where possible replanting of suitable woody vegetation breeding habitat for birds post works.

12.7.1.6 Mitigation Against Impact to Amphibians

A pre-construction confirmatory survey for frog will be undertaken prior to works commencing during the breeding season (February and March) at potential suitable breeding habitat (ditches, drains, and standing water impacted).

Suitable habitat (drainage ditches) have been identified at the following approximate chainages:

- Ch1325
- Between Ch1650 and Ch 2900
- Between Ch 3500 and Ch 3750
- Ch 4400
- Ch 5300
- Between Ch 5450 and Ch 5900

When surveying for the species biosecurity measures will be followed to ensure that there is no incidental spread of vector borne diseases between waterbodies. This includes the cleaning, disinfection and drying of all equipment and will have regard to guidelines from IFI.

Should frog be recorded, translocation of the species to areas outside of the proposed development footprint will be undertaken, in consultation with the NPWS. Any translocation of these species will be under license by the NPWS.

Any spawn or adult frogs recorded will be captured and removed from affected habitat by hand net and translocated to the nearest area of available suitable habitat that will not be impacted.

12.7.1.7 Mitigation for the Protection of Mammals

Mitigation for the Protection of Otter

The Contractor will ensure an initial confirmatory otter survey is undertaken in advance of the commencement of any works within 150m of the works areas as per Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes. This will allow for the identification of any additional holts which have been established prior to commencement of works and the confirmation of the activity status of the identified holt.

The confirmatory pre-construction survey will be conducted no more than 10-12 months prior to construction commencing.

The existing holt is located approximately 115m from the existing track. This is within the ZoI of noise effects associated with the proposed development. Should the holt be confirmed to be active during preconstruction confirmatory surveys, prior to works commencing between Ch 800 and Ch 925 sound reducing hoarding will be placed adjacent to works areas on the southern boundary of the site. This will reduce further the noise impacts associated with the construction phase of the works.

In addition, 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.
- Machines in intermittent use will be shut down during periods where they are not required.

Should any additional holts be identified within 150m of the proposed development the following will, at a minimum, be employed, unless otherwise agreed with the NPWS:

- No works will be undertaken within 150m of holts where breeding females or cubs are present. Presence of breeding females will be assumed until confirmed otherwise.
- Works within 150m of such a holt can only take place following consultation and in agreement with the NPWS
- No wheeled or tracked vehicles of any kind will be used within 20m of active but non breeding holts
- No light work such as digging by hand or scrub will take place within 15m of such holts except under license from NPWS
- The identified exclusion zones will be fenced and clearly marked on site prior to any invasive works.
- All contractors on site will be made fully aware or the procedures in relation to the holts by the EcoW

Mitigation for the Protection of Badger

Prior to any works commencing a preconstruction confirmatory badger survey will be carried out. Surveys will be conducted having regard to *Surveying Badgers* (Harris et al.1989) and record signs of badgers including tracks, hair, latrines and setts. The extent of the confirmatory survey area will be defined with regard to Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (NRA, 2006) as 150m beyond all works areas within suitable habitat.

Prior to works commencing, sett activity at all identified setts (including sett identified as inactive during initial walkovers) within 150m will be confirmed. This may be confirmed through the use of camera monitoring, setting of footprint traps, soft blocking of the sett entrance or similar. Any risk of disturbance to badger will be subject to disturbance license requirements.

A description of the setts i.e. main sett, annex sett, or outlier sett will be provided by the EcoW along with the level of activity at the sett. This will allow for an understanding of the importance of the setts in the wider context of the local population.

As per the Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (NRA, 2006), where setts have been confirmed, no heavy machinery will be used within 30m of badger setts (unless carried out under licence from the NPWS). Lighter machinery (generally wheeled vehicles) will not be used within 20m of a sett entrance; light work, such as digging by hand or scrub clearance will not take place within 10m of sett entrances.

Unless otherwise agreed, and under license from the NPWS, during the breeding season (December to June inclusive), none of the above works will be undertaken within 50m of active setts nor blasting or pile driving within 150m of active setts. An assumption that the sett is active will apply unless proven otherwise during the course of investigation.

The three setts already identified are located in close proximity to the proposed works areas, with two requiring removals, and the third potentially directly impacted by works depending on the direction of underground chambers.

Sett Evacuation and Destruction

Any exclusion and/or destruction of setts will be undertaken in consultation with, and under license by the NPWS.

Prior to works commencing all three of the setts, and any additional setts identified during pre-construction confirmatory surveys will be clearly marked and the extent of bounds of exclusion zones clearly marked by fencing and signage. The location and restrictions surrounding these setts will be clearly communicated to personnel on site.

No exclusion or destruction procedures will take place during the badger breeding season due to risk of young being trapped within the sett. The status of active setts will need to be confirmed prior to any disturbance works. It is normal practice to impose seasonal constraints e.g. that breeding setts are not interfered with or disturbed during the badger breeding season (December to June inclusive).

Inactive Setts

All entrances will be lightly blocked with vegetation and soil. The sett will be left undisturbed for approximately five says. If all entrances remain undisturbed for the time period the sett will be destroyed immediately using a mechanical digger, under the supervision of the licensee.

Should there be a delay all entrances will be hard blocked. Immediately prior to destruction the licensee will inspect the sett to ensure there are no signs of activity. The sett may then be destroyed as outlined above.

Active Sett

Sett exclusions of active setts will include setts within the footprint of the works, but also setts where the proximity of the feature is such that there is potential for impact to outer chambers. The potential breeding sett identified in Table 12.13 will not be directly impacted but will need to be temporarily closed during construction.

All entrances will have one-way gates installed to allow badgers to exit but not to return. The gates will be tied open for three days prior to the exclusion procedure taking place. During the exclusion procedure, gates will be left installed, with regular inspections, over a period of a minimum of 21 days before the sett is deemed to be inactive.

Inspections will include areas between sett entrances to identify any areas where badgers may have attempted to dig around the gates or created new entrances and tunnels into the sett. Provided the gates are effective, and no activity is observed for 21 days, the sett may be considered inactive.

In the case of setts identified within the footprint of the works, destruction of the sett will be required. Once the sett is considered inactive destruction may take place.

Sett Destruction

Destruction of setts will be avoided wherever possible. The potential breeding sett identified in Table 12.13 will not be directly impacted but will need to be temporarily closed during construction

Destruction of inactive and evacuated setts may only be conducted under license from NPWS and supervision of qualified and experienced personnel. Preparation must be made, and equipment on hand, to deal with any badgers which may be trapped within the sett, or injured during destruction.

Destruction may be undertaken with a tracked digger, over the time period of no more than one day. The digger will commence at approximately 25m from the outer sett entrances and work towards the centre of the sett cutting small 0.5m sections in a trench to a depth of 2m. Any tunnels which are exposed may be checked for recent badger activity. The sett will be destroyed from several directions until only the centre core remains. Once it is ensured that no badgers are present, the core may be removed and the area backfilled and made safe.

Artificial Setts

As the two setts identified for destruction are noted as being outliers (one active and one inactive in 2022), there are alternative natural setts present in the wider area to accommodate any displaced badgers. Should setts be identified for destruction where no suitable natural setts are present, i.e. a breeding sett, an artificial sett will be constructed to replace the sett.

Any artificial sett will be constructed months in advance of the closure of the breeding sett. Closure and destruction of the existing sett will not take place until it is ensured that the affected badgers are utilising the artificial sett.

The sett will be constructed as close as possible to the existing sett, outside of the development footprint at a location that avoids significant residual impacts to habitats of ecological value.

The artificial sett will be located in well drained soils, landscaped, and planted, such that the sett is well covered, to ensure lack of disturbance.

12.7.1.8 Mitigation for the Protection of Bats

The Design and Construction of bat mitigation measures will be site specific, and comply with licensing requirements, having regard for relevant guidance including the NRA's "Guidelines for

the Treatment of Bats During the Construction of National Road Schemes"[15], and the NPWS Bat Mitigation Guidelines for Ireland[16].

The following measures will, at a minimum, be undertaken:

- Trees with suitability for roosting bats will not be felled in advance of surveying for bats, unless in agreement with the ECoW, and NPWS as relevant. This includes trees identified during baseline walkover surveys, and any additional trees with roosting features that may develop prior to works commencing.
- Prior to felling of any trees, an initial bat survey of trees to be felled will be undertaken, by a licensed qualified specialist, to assess the suitability of the tree to contain bat roosts as per Bat Surveys for Professional Ecologists: Good Practice Guidelines.
- Trees identified with potential roost features will be thoroughly examined, under licence from the NPWS, to ascertain the presence or absence of roosting bats. This will be conducted by an experienced bat expert. The trees will be examined for the presence or absence of bats / bat roosts immediately prior to felling. NPWS (2022)[17] guidance notes that emergence/re-entry surveys of trees are limited in terms of effectiveness. As such, inspections via endoscope will be carried out, including of features at height.
- Where felling does not occur within one day of the examination, the trees will be re-assessed.
- Where evidence of a roost, or roosting bats has been determined, a license for destruction of a roost and/or exclusion of bats will be required from the NPWS. The procedures for the exclusion of bats and destruction of roost as detailed in the license document will be obeyed, at all times, by the Contractor.
- Where bat exclusions are required, they will be undertaken in accordance with the requirements of the bat specialist, and any conditions under license. They will not be carried out during the breeding season, between the months of June to August inclusive, or during hibernation in the months of November to March inclusive, unless under license from the NPWS. Where the felling of trees found to be suitable as bat roosts cannot be avoided, appropriate mitigation will be agreed with the NPWS and put in place at least one month in advance of any felling or disturbance.
- If any bat roost sites are removed by the Works, appropriate replacement bat roost sites will be provided following consultation with the NPWS, and in consultation with the local authority.
- The Design and Construction of bat mitigation measures will be site specific, and comply with the requirements of the bat specialist, the Standards, the TII's "Guidelines for the Treatment of Bats During the Construction of National Road Schemes", the National Parks and Wildlife Services Bat Mitigation Guidelines for Ireland, the National Parks and Wildlife Service Circular 2/07 Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997.

12.7.1.9 Mitigation for the Protection of Wintering Birds

Prior to the commencement of the works, a sound reducing hoarding will be placed along works area from Ch 340 to 850. Sound hoarding will reduce the noise impacts associated with the construction phase of the works. It will also reduce visibility of workers.

The barrier material will have a mass per unit area exceeding 7kg/m2 in accordance with the recommendations of BS 5228 Part 1:2009+A1:2014 Part B.4.

[15] https://www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Treatment-of-Bats-during-the-Construction-of-National-Road-Schemes.pdf

[16] Kelleher, Conor & Marnell, Ferdia. (2006). Bat Mitigation Guidelines for Ireland.

[17] Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland

Any temporary lighting used to facilitate the works will be cowled and angled away from the SPA and watercourses.

The ECoW will undertake monitoring of the barrier to ensure installed correctly and identify any defects for the contractor to remedy.

All plant used during the construction phase will be the quietest of its type practical for achieving the works, as demonstrated in writing by the Contractor to the local authority, with reference to other noisier models.

All plant will be operated and maintained in accordance with the manufacturer's recommendations including the use and maintenance of the specific noise reduction measures in the next bullet.

The following may be incorporated to reduce the impact further:

- The use of mufflers on pneumatic tools
- Effective exhaust silencers

  Sound reducing enclosures
- Machines in intermittent use will be shut down during periods where they are not required.

12.7.1.10 Mitigation for the Protection of Breeding Birds

Minimisation of habitat and reinstatement of areas of habitat which may be used by breeding birds (i.e. scrub, hedgerows, and grassland habitats) is outlined previously in Section 12.7.1.5.

As outlined in the description of the development the clearance of all vegetation (except for improved grassland, recognising bare ground, or other vegetation with no nesting potential as determined by the ECoW), will be planned to take place outside of the breeding season for birds where possible, or as determined by risk of disturbance to a nest site.

Should clearance within the breeding season be required, a suitably qualified ecologist / EcOW will conduct pre-construction confirmatory surveys to assess risk of disturbance to nesting birds to inform vegetation clearance activity. In the event where pre-construction surveys confirm or presume nesting birds are present, an exclusion zone will be established around the nesting bird (to include the risk of abandonment due to indirect disturbance), and no vegetation clearance may proceed until young are presumed to have fledged, or nesting has failed. Repeat surveys will be required if vegetation has not been cleared within 72hours of the initial survey. This will prevent direct impact to nesting birds within the footprint of the works.

Pre-construction confirmatory surveys will be carried out for kingfisher and other riparian breeding bird species at river crossings. These will incorporate a survey area of approximately 100m upstream and downstream of the works at all river crossings.

Features likely to be of note to kingfisher and other breeding riparian bird species will be recorded and watches of suitable nest areas undertaken. If actual nest sites (i.e. confirmed or presumed) are present at or within close proximity to works areas at water crossings, the NPWS will be consulted regarding the potential requirement to stop works. The loss of any potentially suitable nesting sites will be compensated through the addition of artificial nesting sites or suitable nest features within the reinstated riverbank. The provision of any new nesting sites (if required) for kingfisher or other riparian bird species will be undertaken in line with NPWS and IFI consultation.

12.7.1.11 Mitigation for the Protection of Watercourses

Mitigation for the protection of water quality in watercourses has been outlined previously in Chapter 11. Additional mitigation for the protection of aquatic species is outlined hereunder.

General

Works will be carried out in accordance with the guidelines set out by IFI in 'Guidelines on Protecting Fisheries During Construction Works in and Adjacent to Waters' (IFI, 2016).

The IFI biosecurity protocol for works will be complied with for all instream works.

The open season (July-September) restriction for instream works will apply for all instream works.

Works method statements will be agreed with IFI for all instream works at watercourse crossings prior to works commencing. These method statements will be site and river specific.

The works method statement will include details on the works to take place, along with clear instructions relating to placement and monitoring of aquatic mitigation measures.

Works will not continue during adverse weather events, including during Met Eireann (Red, Orange, Yellow) warnings, and periods of high flow. High temperature will also be considered during instream works as this has the potential to cause increased stress on aquatic species.

Instream Works

Small scale limited instream works will be required to facilitate certain works. In the case of the Owenacurra River, the instream works will be restricted to the installation of scaffolding to support the addition of capping breams to the existing piers.

All instream works, including silt control measures, biosecurity measures, and fish salvage operations will be monitored by an appropriately experienced ECoW.

These instream works will be carried out between July and September, which is outside of the salmonid spawning season.

Instream works will take place within an isolated works area. Any isolated area will be kept to the minimum size required to facilitate the works. Works will take place span by span to ensure that there is no loss of flow during the works.

The riverbed will be isolated using either an aquadam, or sandbags, dependant on the water levels present when the works take place. Any sandbags used will be filled with clean, sediment free material to ensure that there is no downstream mobilisation of silt.

Prior to drying out of the works area, de-fishing will be undertaken under license. This will include for the translocation of fish out of the works footprint, should they be found within the isolated works area. The base of the realigned concrete channel will be lined with a layer of closely packed natural rock slabs. The rock slabs will be of approximate dimension 600mm(l) x 600mm(w) x 200mm(d).

Any pump used to dewater the works area will be fitted with a screen to prevent aquatic species from being sucked into the pump.

No dewatering will take place directly into the river itself. Any water pumped out of the works area will be treated to prevent downstream mobilisation of pollutants and sediment. Water will be discharged back to the river in such a way that scour is prevented.

12.8 Operational Phase Mitigation

12.8.1 Mitigation for the Protection of Bats

For the operational phase it is confirmed here that unless incompatible with asset security / operational requirements the detailed design of outdoor lighting will incorporate in full design recommendations from Bat Conservation Trust as follows:

- LED lights only will be used where practicable, and no Ultra Violet (UV) elements will be incorporated;
- Lighting with peak wavelengths of 550nm; and
- Lighting to avoid blue colour, and ideally to be warm white (<2700 Kelvin)

The lighting proposals will be reviewed at detailed design stage with the input of an experienced bat ecologist to ensure lighting levels are minimised for the site and excessive light spill to vegetated features is avoided.

Any removal of trees with potential bat roost features will be subject to mitigation as outlined in section 12.7.1.8.

12.8.2 Mitigation for the Protection of Mammals

Prior to maintenance works relating to the clearance of vegetation, follow up confirmatory surveys will be undertaken to ascertain the status of the badger setts, and any otter breeding and resting places within the ZoI of the clearance works.

Should badger setts, or otter holts and couches be confirmed, mitigation as outlined in section 12.8.2 will be employed.

12.8.3 Mitigation for the Protection of Breeding birds

Woody vegetation clearance required as part of maintenance operations will take place outside the main bird breeding season (March – August inclusive). Where tree clearance is proposed during the bird breeding season an experienced ecologist will conduct a pre-construction confirmatory survey to confirm no bird breeding sites will be disturbed. This will be monitored by an EcOW.

12.8.4 Mitigation for the Protection of Wintering birds

No trackside maintenance, or vegetation clearance will take place between Ch 0-800 during the wintering season for birds.

12.9 Residual Effects

The assessment which is provided in the NIS for the proposed development outlines that the mitigation measures detailed will ensure no adverse effects on the integrity of any European sites in light of the site's conservation objectives. In EIA terms, there are no significant effects on European sites.

Based on the assessment of the proposed development alone and in combination with other projects and plans, including the implementation of mitigation measures, it can be concluded that no adverse effects on the integrity of any European sites will arise, in view of any site's conservation objectives.

The Residual Impacts of the proposed development on the KERs as previously identified are outlined below in Table 12.22.

Table 12.22: Residual Impacts to Key Ecological Receptors (KER)

Habitats/Species	Ecological Value (as per NRA guideline)	Potential for Effect in the Absence of Mitigation	Potential for Residual Effect
European Sites			
Great Island Channel SAC	International Importance	Permanent significant adverse effects	Imperceptible
Cork Harbour SPA			
Ballycotton Bay SPA			
Cork Harbour Ramsar Site	International Importance	Permanent significant adverse effects	Imperceptible
Ballycotton Bay Ramsar Site	International Importance	Permanent significant adverse effects	Imperceptible
Proposed Natural Heritage Areas			
Great Island Channel pNHA	International Importance (also European Sites)	Permanent significant adverse effects	Imperceptible
Dunkettle Shore pNHA			
Douglas River Estuary pNHA			
Ballycotton, Ballynamona And Shanagarry pNHA		Permanent significant adverse effects	Imperceptible
Habitats and Sensitive Species			
Upper Salt Marsh (CM2)	National Importance	Permanent Significant Negative	Imperceptible
Drainage Ditches (FW4)	Local Importance (Higher Value)	Permanent Moderate Negative	Permanent Slight Negative
Wet Grassland (GS4)	Local Importance (Higher Value)	Temporary slight negative effect	Imperceptible
Mud Shores (LS4)	International Importance	Temporary Moderate Negative	Negligible impact
Hedgerows (WL1)	Local Importance (Higher Value)	Permanent Significant Negative	Permanent Slight Negative
Treelines (WL2)	Local Importance (Higher Value)	Permanent Moderate Negative	Permanent Slight Negative
Wet Pedunculate Oak-Ash Woodland (WN4)	County Importance	Permanent Slight Negative	Permanent Slight Negative
Scrub (WS1)	Local Importance (Higher Value)	Permanent significant Negative	Permanent moderate Negative
Dry Calcareous and Neutral Grassland	Local Importance (Higher Value)	Temporary moderate negative effect	Imperceptible
Dry meadows and grassy verges (GS2)	Local Importance (Higher Value)	Permanent moderate negative	Permanent slight negative
Owenaccura River	County Importance	Temporary Moderate Negative	Imperceptible
All Other Watercourses	Local Importance (Lower Value)	Permanent Moderate Negative	Imperceptible
Aquatic fisheries	County Importance	Temporary Moderate Negative	Imperceptible

Habitats/Species	Ecological Value (as per NRA guideline)	Potential for Effect in the Absence of Mitigation	Potential for Residual Effect
Badger Setts	Local Importance (Higher Value)	Permanent significant negative effect	Permanent slight negative effect
Otter holts and couches	County importance	Temporary moderate negative	Imperceptible
Amphibian breeding habitat	Local Importance (Higher Value)	Permanent slight negative effect	Permanent slight negative effect
Bat species roosting features	Local Importance (Higher Value)	Permanent slight negative effect	Imperceptible
Wintering birds	International Importance	Short term significant negative effect	Imperceptible
Breeding birds	Local Importance (Higher Value)	Permanent significant negative	Imperceptible

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13 Landscape and Visual

13.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application (also referred to herein as "the proposed Project") by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act'). An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed project (comprising inter alia railway works), including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors. This Landscape and Visual Impact Assessment (LVIA) describes the landscape context of the proposed development, as described in Chapter 6, 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 (LIA) relates to assessing effects of the proposed development on the landscape as a resource in its own right and is concerned with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

Visual Impact Assessment (VIA) relates to assessing effects of a development on specific views and on the general visual amenity experienced by people. This deals with how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements. Visual impacts may occur from; visual obstruction (blocking of a view, be it full, partial or intermittent) or; visual intrusion (interruption of a view without blocking).

13.2 Methodology and Limitations

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 and having regard to the Environmental Protection Agency (EPA), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2022. As per the EPA Draft Advice Notes (2015), *when more specific definitions exist within a specialised factor or topic, e.g. biodiversity, these should be used in preference to these generalised definitions* and as such the GLVIA have been used in this assessment.

Production of this Landscape and Visual Impact Assessment 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; and
- Assessment of the significance of the visual impact of the proposed development as a function of visual receptor sensitivity weighed against the magnitude of the visual impact. This aspect of the assessment is supported by photomontages prepared in respect of the selected viewpoints.
- Incorporation of mitigation measures to reduce potential impacts and estimation of residual impacts once mitigation has become established.

13.2.1 Landscape Impact Assessment Criteria

When assessing the potential impacts on the landscape resulting from the proposed development, the following criteria are considered:

- Landscape character, value and sensitivity;
- Magnitude of likely impacts; and
- Significance of landscape effects.

13.2.1.1 Landscape Sensitivity

The sensitivity of the landscape to change is the degree to which a particular landscape receptor [Landscape Character Area (LCA) or feature] 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 13.1: Landscape Value and Sensitivity.

Table 13-1: Landscape Value and Sensitivity

Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an international or national level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level (Area of Outstanding Natural Beauty), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes, which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use.
Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include, enhancement, repair and restoration.
Negligible	Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

13.2.1.2 Landscape Impact Magnitude

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 application site boundary that may have an effect on the landscape character of the area (Table 13-2: Magnitude of Landscape Impacts refers).

Table 13-2: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.

13.2.1.3 Landscape Impact Significance

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the following matrix set out in Table 13-3: Impact Significance Matrix, which aligns with the GLVIA guidelines (2013).

Table 13-3: 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: Judgements deemed 'substantial' and above are considered to be 'significant impacts' in EIA terms - EPA Guidelines (2022).

13.2.2 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.

13.2.2.1 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 13-6: Analysis of Visual Receptor Sensitivity at Viewshed Reference Points: Magnitude of Visual ImpactTable 13-4: Magnitude of Visual Impact 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; and*
   - *Travellers on road rail or other transport routes where such travel involves recognised scenic routes and awareness of views is likely to be heightened*".

Visual receptors that are less susceptible to changes in views and visual amenity include;

   - "*People engaged in outdoor sport or recreation, which does not involve or depend upon appreciation of views of the landscape; and*
   - *People at their place of work whose attention may be focussed on their work or activity, not their surroundings and where the setting is not important to the quality of working life*".
2. Recognised scenic value of the view (County Development Plan designations, guidebooks, touring maps, postcards etc). These represent a consensus in terms of which scenic views and routes within an area are strongly valued by the population because in the case of County Developments Plans, for example, a public consultation process is required;
3. Views from within highly sensitive landscape areas. Again, highly sensitive landscape designations are usually part of a county's Landscape Character Assessment, which is then incorporated within the County Development Plan and is therefore subject to the public consultation process. Viewers within such areas are likely to be highly attuned to the landscape around them;
4. Primary views from dwellings. A proposed development might be seen from anywhere within a particular residential property with varying degrees of sensitivity. Therefore, this category is reserved for those instances in which the design of dwellings or housing estates, has been influenced by the desire to take in a particular view. This might involve the use of a slope or the specific orientation of a house and/or its internal social rooms and exterior spaces;
5. Intensity of use, popularity. This relates to the number of viewers likely to experience a view on a regular basis and whether this is significant at county or regional scale;
6. Connection with the landscape. This considers whether or not receptors are likely to be highly attuned to views of the landscape i.e. commuters hurriedly driving on busy national route versus hill walkers directly engaged with the landscape enjoying changing sequential views over it;

7. Provision of elevated panoramic views. This relates to the extent of the view on offer and the tendency for receptors to become more attuned to the surrounding landscape at locations that afford broad vistas;
8. Sense of remoteness and/or tranquillity. Receptors taking in a remote and tranquil scene, which is likely to be fairly static, are likely to be more receptive to changes in the view than those taking in the view of a busy street scene, for example;
9. Degree of perceived naturalness. Where a view is valued for the sense of naturalness of the surrounding landscape it is likely to be highly sensitive to visual intrusion by distinctly manmade features;
10. Presence of striking or noteworthy features. A view might be strongly valued because it contains a distinctive and memorable landscape feature such as a promontory headland, lough or castle;
11. Historical, cultural and / or spiritual significance. Such attributes may be evident or sensed by receptors at certain viewing locations, which may attract visitors for the purposes of contemplation or reflection heightening the sense of their surroundings;
12. Rarity or uniqueness of the view. This might include the noteworthy representativeness of a certain landscape type and considers whether the receptor could take in similar views anywhere in the broader region or the country;
13. Integrity of the landscape character. This looks at the condition and intactness of the landscape in view and whether the landscape pattern is a regular one of few strongly related components or an irregular one containing a variety of disparate components;
14. Sense of place. This considers whether there is special sense of wholeness and harmony at the viewing location; and
15. Sense of awe. This considers whether the view inspires an overwhelming sense of scale or the power of nature.

Those locations which are deemed to satisfy many of the above criteria are likely to be of higher sensitivity. (No relative importance is inferred by the order of listing in Table 13-6. Overall sensitivity may be a result of a number of these factors or, alternatively, a strong association with one or two in particular.

13.2.2.2 Visual Impact Magnitude

The magnitude of visual effects is determined on the basis of two factors; the visual presence (relative visual dominance) of the proposal and its effect on visual amenity. The magnitude of visual impacts is classified in Table 13-4: Magnitude of Visual Impact.

Table 13-4: Magnitude of Visual Impact

Magnitude of Impact	Description
Very High	The proposal 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 proposal 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 proposal 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

Magnitude of Impact	Description
Low	The proposal intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene
Negligible	The proposal would be barely discernible within the available vista and/or it would not influence the visual amenity of the scene

13.2.2.3 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 13-3: Impact Significance Matrix refers).

13.2.3 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.

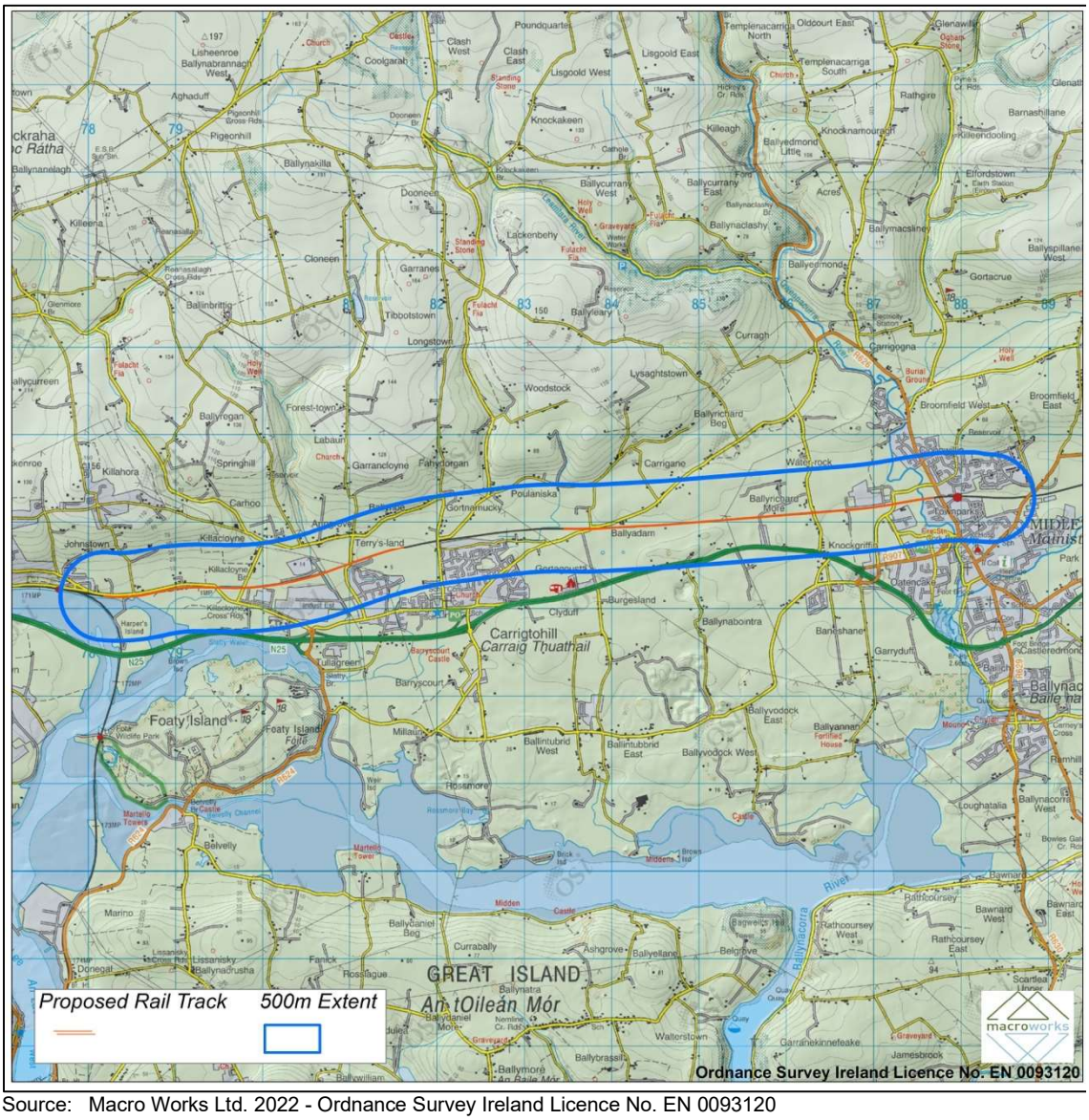
Landscape and Visual effects are also categorised according to their duration:

- 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.

13.2.4 Extent of Study Area

According to Guidelines for Landscape and Visual Impact Assessment 2013 (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 from Glounthaune to Midleton are likely to be difficult to discern beyond approximately 500m and are not likely to give rise to significant landscape or visual impacts beyond this distance. In terms of the landscape, the proposed development is essentially an upgrade of the rail infrastructure within an existing transport corridor and, in terms of visual considerations, is only likely to involve new visual intrusions rather than new visual obstructions. This study area will focus the assessment within the area where impacts may actually occur. For these reasons a 500m radius study area was selected (Figure 13.1).

Figure 13.1: Study Area



Source: Macro Works Ltd. 2022 - Ordnance Survey Ireland Licence No. EN 0093120

13.2.5 Data Sources

Data to inform the assessment was extracted from the following data sources:

- Cork County Development Plan 2022-2028;
- National Parks and Wildlife Service;
- The Heritage Council – HeritageMaps.ie;
- Ordnance Survey maps;
- Coillte Recreation;
- Discover Ireland – DiscoverIreland.ie;
- Sport Ireland Trails; and
- Google Maps.

13.2.6 Desk Study/Field Study

The desk study element of data collection involved review of project documents (including the project description as detailed in Chapter 6 of this EIAR) and Geographical Information System files for the proposed development. These 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 CDPs, in the interests of thoroughness. The National Inventory of Architectural Inventory's datasets were also reviewed in relation to the landscape and visual desk study.

Fieldwork was undertaken along the railway line and at adjacent public roads on 3 May 2022 by Rory Curtis as part of the preparation of this assessment. This involved reviewing and recording aspects of landscape character as well as the capture of high-resolution photography in clear viewing conditions, at selected viewpoint locations, for later use in photomontage preparation.

13.3 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.

At a macro level, the study area is located to the east of Cork city, between the settlements of Glounthaune and Midleton. The area to the north is hilly and the area to the south is low-lying, descending to the water bodies between the River Lee and the Owenacurra River. It is noted that the receiving environment undergoes continual change, in particular with reference to proposed housing developments, as per Table 2.2 in Chapter 2 of this EIAR.

13.3.1.1 Landform and Drainage

The study area has a gently undulating topography that is slightly more elevated to the north and northwest of the settlement of Carrigtwohill. Watercourses generally drain in a southerly direction. The most notable watercourse is the Owennacurra River which flows through the settlement of Midleton located at the eastern end of the study area.

13.3.1.2 Vegetation and Land Use

A large proportion of the study area is occupied by urban areas at Carrigtwohill and Midleton and their adjoining urban fringe environments which encompass various industrial and retail premises including the; Fota Point Enterprise Park, Fota Retail and Business Park, Cobh Cross Retail Park, IDA Industrial Estate and Market Green Retail Park. Outside the settlements, the predominant land use is intensive agriculture. Field patterns are generally composed of small to medium sized fields demarcated by mature hedgerows. There are wetlands between the mouth of the River Killacloyne and Harper's Island. There is also a strip of riparian vegetation associated with the Owennacurra River.

13.3.1.3 Centres of Population and Houses

The greatest population density is in the settlements of Carrigtwohill and Midleton but there are also one-off houses throughout the study area dotted along the local roads. It is also of note that there are planning applications in the vicinity of the proposed development, as detailed in Table 2.2 of Chapter 2.

13.3.1.4 Transport Routes

The existing Iarnród Éireann Cork to Midleton single track railway is the most significant transport route within the study area. A short section of the N25 national primary road passes through the eastern portion of the study area, to the west of Midleton. The R626 regional road passes through the centre of Midleton in a north-south orientation.

13.3.1.5 Tourism, Heritage and Public Amenities

Harper's Island is located in the western end of the study area and is publicly accessible via a track from the L3004 local road. No other notable landscape related tourism, heritage and public amenities were identified within the study area.

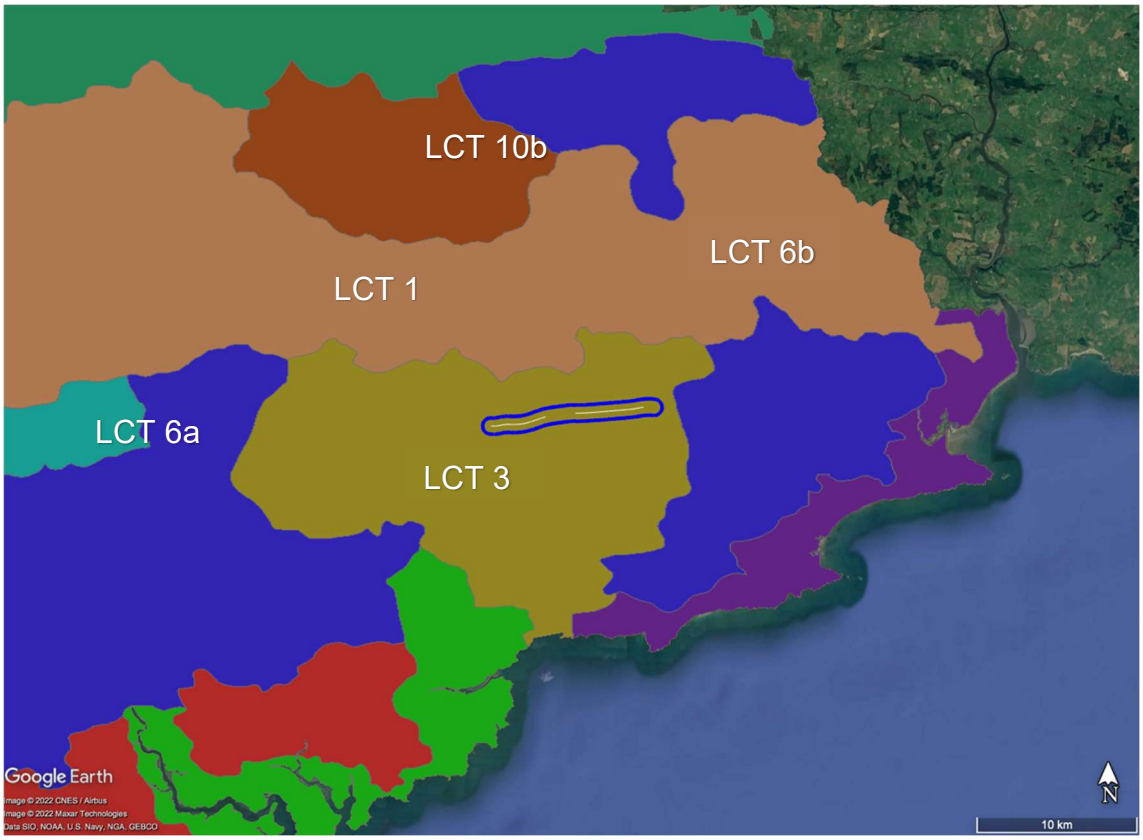
13.3.1.6 Landscape Policy Context and Designations - Cork County Development Plan 2022-2028

Landscape Character Types

A landscape character assessment was undertaken as part of the Cork County Draft Landscape Strategy (2007) which has been incorporated within the Cork County Development Plan 2022-2028 and it divides the county into 16 No. Landscape Character Types (LCTs). The application site is situated within LCT1 'City Harbour and Estuary' (see Figure 13.2, below) and is identified as having: 'very high' Landscape Value; 'very high' Landscape Sensitivity, and as having Landscape Importance at a 'national' level. Within the Cork County Draft Landscape Strategy (2007), the Sensitivity of a LCT is derived from a combination of the Landscape Character Sensitivity and Visual Sensitivity[1]. Landscapes ranked as having 'very high' Landscape Sensitivity are described as being 'extra vulnerable landscapes (e.g. seascape area with national importance) which are likely to be fragile and susceptible to change.'

[1] Whilst influenced by the value and sensitivity judgements for particular Landscape Character Type or Areas in the Cork County Draft Landscape Strategy, 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.

Figure 13.2: Showing location of study area (blue outline) in relation to Landscape Character Types



Source: Google Earth import of data from Cork County Development Plan 2022

Within the Cork Draft Landscape Strategy (2007), the landscape of this LCT is described as comprising of:

'a mix of rural and intensely urban areas, combined with a large expansive harbour. To the south of the city, the western side of the harbour supports major industrial development, while on higher ground telecommunication masts or water storage towers punctuate the skyline. The harbour includes large islands, which, along with much of the harbour shore, comprises landscape of fertile farmland which slopes gently to the sea… The rural areas around much of the greater harbour area are now characterised by a prevalence of infrastructure such as roads, bridges and electricity power lines and some urban sprawl.'

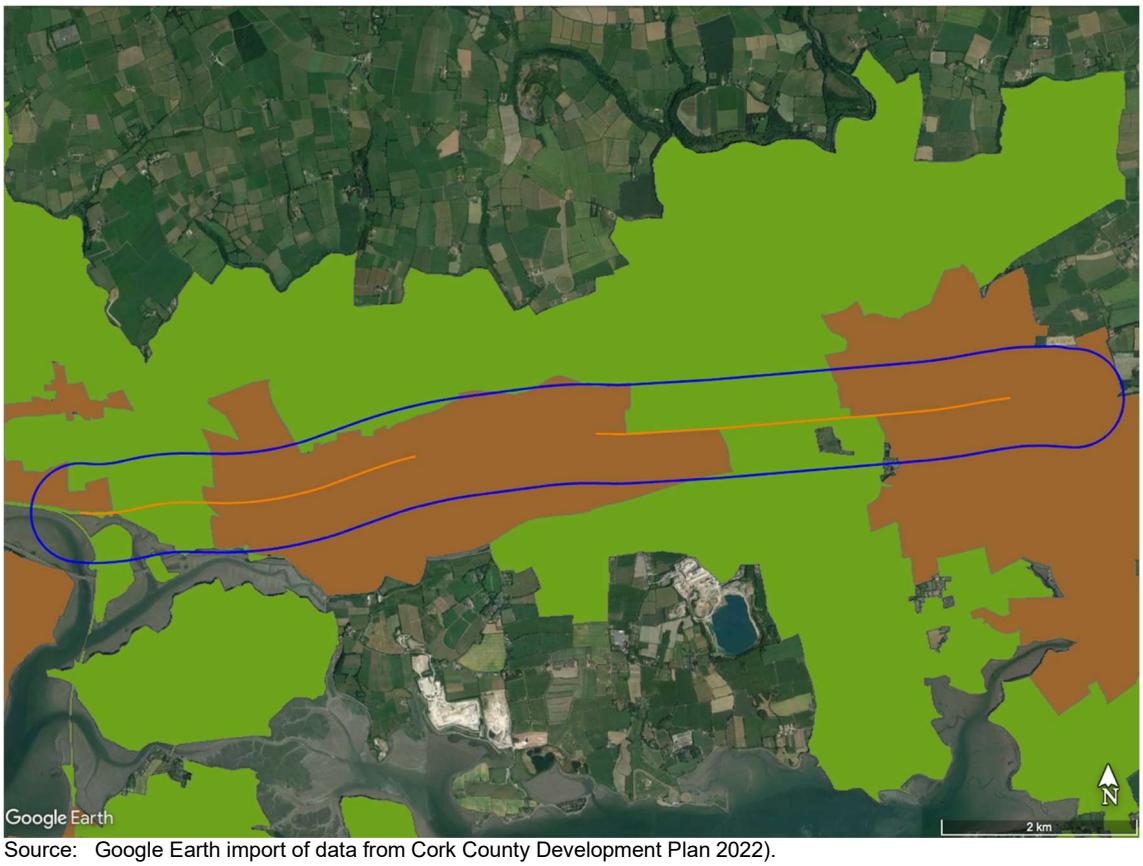
A number of general recommendations are outlined in the Strategy regarding this LCT, of which the following is of relevance to the development in question:

'Promote sustainable growth in the existing main settlements of Cobh, Passage West, Carrigtwohill, and Midleton by encouraging new development, which respects the existing character of these settlements in terms of both scale and design.'

13.3.1.7 Prominent and Strategic Metropolitan Greenbelt Area

Although portions of the study area occur within an area designated by Cork County Council as a Prominent and Strategic Metropolitan Greenbelt Area, the majority of this area is classified as Built Up Areas as indicated in Figure 13.3.

Figure 13.3: Showing location of proposed railway track (orange lines) and study area (blue outline) in relation to the Prominent and Strategic Metropolitan Greenbelt Area (green areas) and Built Up Areas (brown areas)



Source: Google Earth import of data from Cork County Development Plan 2022).

Landscape Objectives

The Cork CDP lists a number of objectives in relation to landscape in Chapter 14.

'Objective GI 14-9: Landscape' states the objective to:

'a) Protect the visual and scenic amenities of County Cork's built and natural environment.

b) Landscape issues will be an important factor in all land-use proposals, ensuring that a proactive view of development is undertaken while maintaining respect for the environment and heritage, generally in line with the principle of sustainability.

c) Ensure that new development meets high standards of siting and design.

d) Protect skylines and ridgelines from development.

e) Discourage proposals necessitating the removal of extensive amounts of trees, hedgerows and historic walls or other distinctive boundary treatments.'

'Objective GI 14-10: Draft Landscape Strategy' states the objective to:

'Ensure that the management of development throughout the County will have regard for the value of the landscape, its character, distinctiveness and sensitivity as recognised in the Cork County Draft Landscape Strategy and its recommendations, in order to minimize the visual and environmental impact of development, particularly in areas designated as High Value Landscapes where higher development standards (layout, design, landscaping, materials used) will be required.'

'Objective GI 14-11: Draft Landscape Strategy Land Use Plans and Policy Guidance' states the objective to:

'Have regard to the Draft Cork County Landscape Strategy (2007) in the preparation of plans and other policy guidance being prepared during the lifetime of the Plan…Whilst advocating the protection of such scenic resources the Plan also recognises the fact that all landscapes are living and changing, and therefore in principle it is not proposed that this should give rise to the prohibition of development along these routes, but development, where permitted, should not hinder or obstruct these views and prospects and should be designed and located to minimise their impact. This principle will encourage appropriate landscaping and screen planting of developments along scenic routes.'

'GI 14-16: Prominent and Strategic Metropolitan Greenbelt Areas requiring Special Protection' states the objective to:

'Protect those prominent open hilltops, valley sides and ridges that define the character of the Metropolitan Cork Greenbelt and those areas which form strategic, largely undeveloped gaps between the main Greenbelt settlements. These areas are labelled MGB1 in the Metropolitan Greenbelt map (Figure 14.3) and it is an objective to preserve them from development.'

13.3.1.8 Ecological Designations

The following ecological designations occur in the vicinity of Haper's Island within the south-western-most extents of the study area:

- Great Island Channel Special Area of Conservation (SAC);
- Great Island Channel proposed Natural heritage Area (pNHA); and
- Cork Harbour Special Protection Area (SPA).

13.3.1.9 Visual Context

The visual assessment focused on the proximity of the proposed development to specific receptors. There is the potential for visual impacts at scenic designations, residential dwellings and along public roads, with scenic designations carrying a greater potential for negative adverse impacts.

Views of recognised scenic value are primarily indicated within County Development Plans in the context of scenic views/routes designations, but they might also be indicated on touring maps, guidebooks, road side rest stops or on post cards that represent the area.

13.3.1.10 Visual Policy Context and Designations - Cork County Development Plan 2022

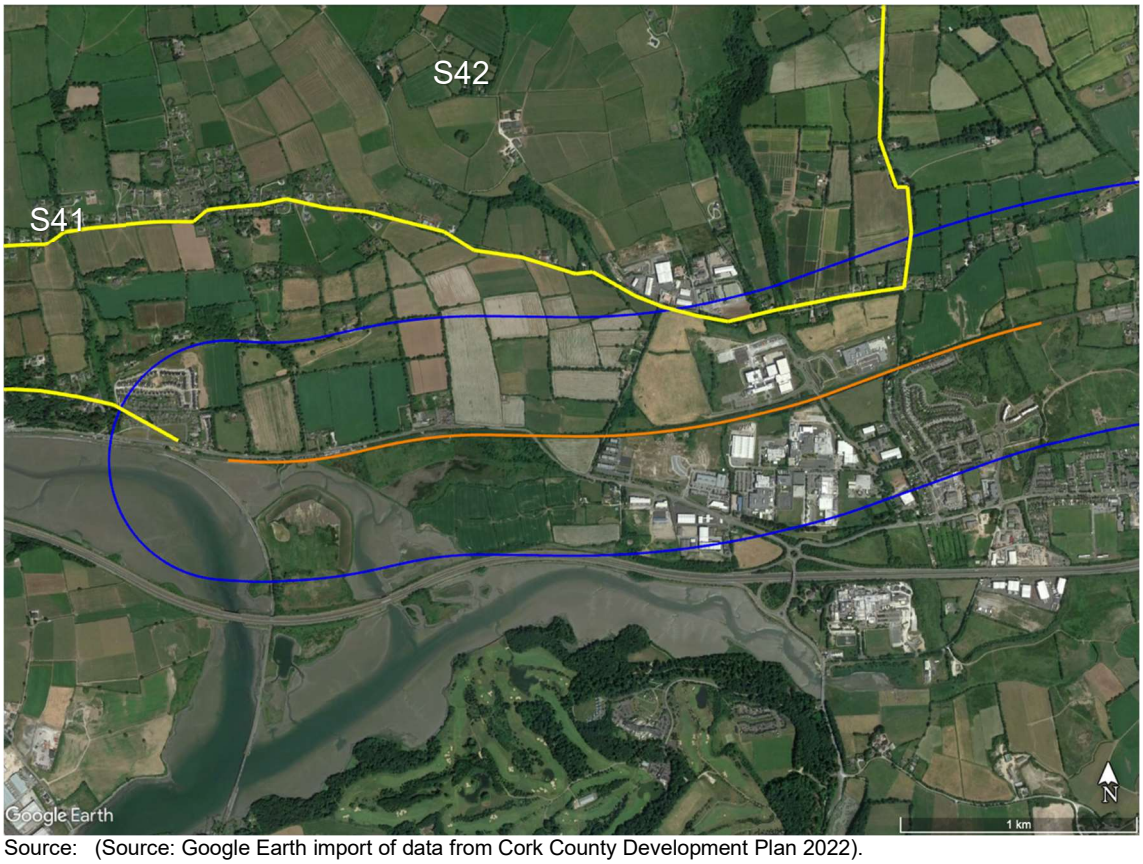
A map showing the location of each scenic route referred to in the Cork County Development Plan is shown on the County Development Plan Map Browser accessible through www.corkcoco.ie. Indicated on Figure 13.4 are those that occur within the study area:

'S41 - Road from Dunkettle to Glanmire and eastwards to Caherlag and Glounthane'; and

'S42 - Road at Cashnagarriffe,N.W.Carrigtwohill and Westwards to Caherlag.'

Both of these scenic routes were investigated and it was identified that there is no inter-visibility between these two scenic routes and the proposed twin track layout.

Figure 13.4: Showing location of proposed development (orange lines) and study area (blue outline) in relation to Scenic Routes (yellow lines)



Source: (Source: Google Earth import of data from Cork County Development Plan 2022).

Visual Objectives

Chapter 14 in the Cork CDP lists the following objectives in relation to visual matters:

'County Development Plan Objective GI 14-12: General Views and Prospects:

Preserve the character of all important views and prospects, particularly sea views, river or lake views, views of unspoilt mountains, upland or coastal landscapes, views of historical or cultural significance (including buildings and townscapes) and views of natural beauty as recognized in the Draft Landscape Strategy.

County Development Plan Objective GI 14-13: Scenic Routes:

Protect the character of those views and prospects obtainable from scenic routes and in particular stretches of scenic routes that have very special views and prospects identified in this Plan. The scenic routes identified in this Plan are shown on the scenic amenity maps in the CDP Map Browser and are listed in Volume 2 Heritage and Amenity Chapter 5 Scenic Routes of this Plan.

County Development Plan Objective GI 14-14: Development on Scenic Routes:

a) *Require those seeking to carry out development in the environs of a scenic route and/or an area with important views and prospects, to demonstrate that there will be no adverse obstruction or degradation of the views towards and from vulnerable landscape features. In such areas, the*

appropriateness of the design, site layout, and landscaping of the proposed development must be demonstrated along with mitigation measures to prevent significant alterations to the appearance or character of the area.

b) Encourage appropriate landscaping and screen planting of developments along scenic routes (See Chapter 16 Built and Cultural Heritage).

County Development Plan Objective GI 14-15: Development on the Approaches to Towns and Villages:

Ensure that the approach roads to towns and villages are protected from inappropriate development, which would detract from the setting and historic character of these settlements.'

13.3.1.11 Representative Viewpoints selected for Visual Impact Assessment

Viewshed Reference Points (VRPs) are the locations used to study the visual impacts of the proposed development in detail. It is not warranted to include each and every location that provides a view of a development as this would result in an unwieldy report and make it extremely difficult to draw out the key impacts arising from the proposed development. Instead, the selected viewpoints are intended to reflect a range of different receptor types, distances and angles. The visual impact of a proposed development is assessed by Macro Works using up to six categories of receptor type as listed below:

- Key views (from features of national or international importance);
- Designated scenic routes and views;
- Local community views;
- Centres of population;
- Major routes; and
- Amenity and heritage features.

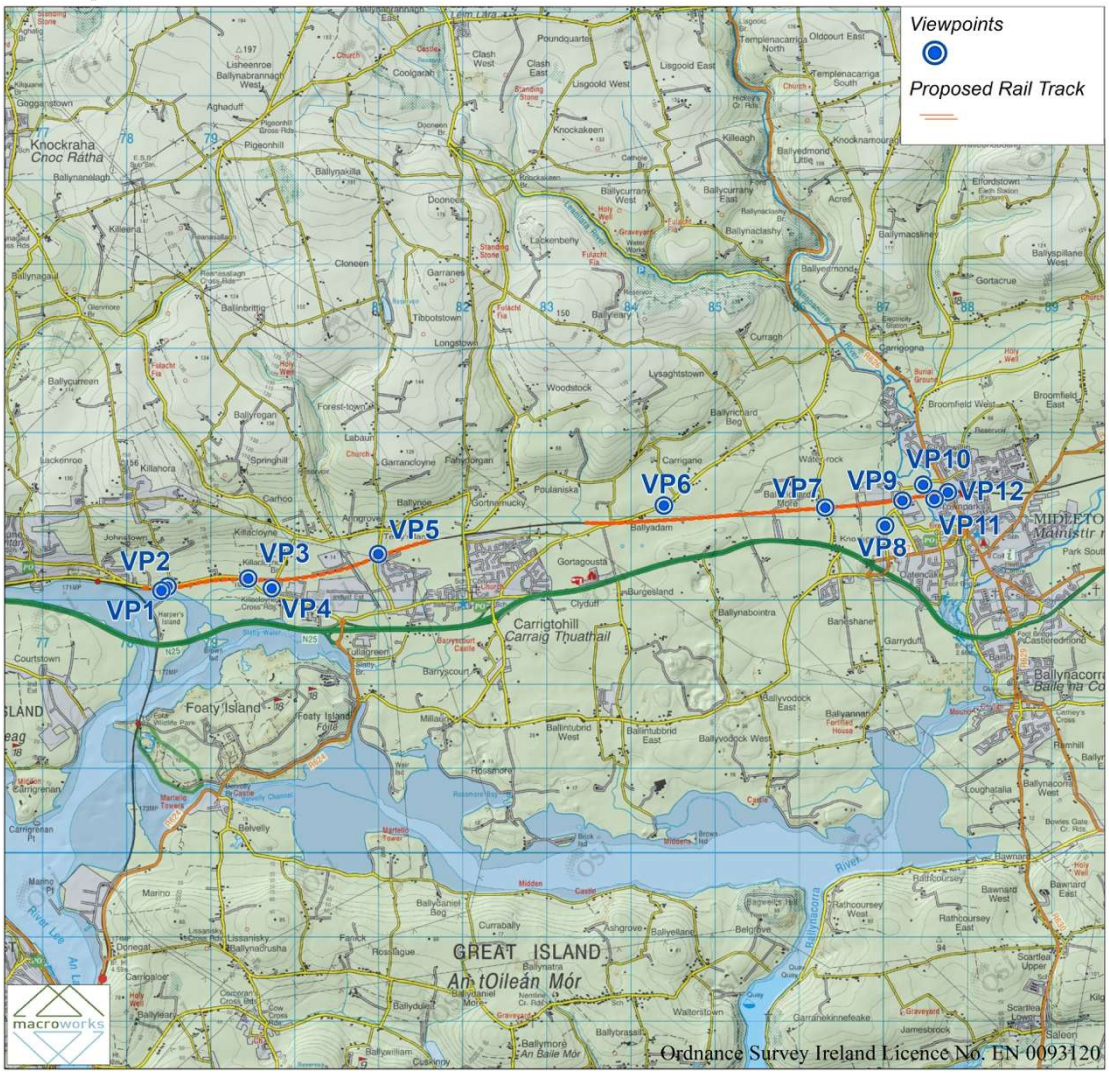
VRPs might be relevant to more than one category and this makes them even more valid for inclusion in the assessment. The receptors intended to be represented by a particular VRP are listed at the beginning of each viewpoint appraisal.

The VRPs selected in this instance are set out in Table 13-5, and indicated on Figure 13.5 below.

Table 13-5: Outline Description of Selected Viewshed Reference Points (VRPs)

VRP No.	Location	Direction of View
VP1 (a&b)	Track, Johnstown	Northwest and Northeast
VP2	L3004 local road, Killahora	South
VP3	L3004 local road, Killacloyne	East
VP4	L3605 local road, Killacloyne	Northwest
VP5	L3616 local road, Anngrove	Southwest
VP6	L3617 local road, Ballyadam	Southwest
VP7 (a&b)	L3618 local road, Water-Rock	East and West
VP8	Midleton Northern Relief Road, Knockgriffin (Barrymore)	North
VP9	Midleton Northern Relief Road, Knockgriffin (Imokilly)	West
VP10	Midleton Northern Relief Road, Broomfield West	Southeast
VP11	Millbrook Drive, Townparks	Northwest
VP12	R626 regional road, Townparks	West

Figure 13.5: VP Locations



Source: (Macro Works Ltd. 2022 - Ordnance Survey Ireland Licence No. EN 0093120)

13.4 Likely Significant Impacts of the Proposed Development

Potential landscape and visual impacts were considered for both the construction phase and the operational phase. The first aspect of determining the significance of landscape impacts is establishing the sensitivity of the receiving landscape. Similarly, the first aspect of determining the significance of visual impacts is establishing the sensitivity of each of the selected viewshed reference points.

13.4.1 Landscape Sensitivity

In accordance with Guidelines for Landscape and Visual Impact Assessment 2013 (GLVIA) (2013) (p71), sensitivity is a function of the susceptibility of the landscape to the type of change proposed and the value placed on that landscape. Landscape value and sensitivity are considered in relation to a number of factors highlighted in the GLVIA (2013), which are set out below, and discussed relative to the proposed development and wider study area. Landscape

Character Value and Sensitivity are now assessed using the methodology described in Section 13.2.2.

13.4.1.1 Landscape Quality (condition)

Landscape quality relates to the physical state of the landscape and its individual elements. The landscape of the study area varies in terms of condition and quality. More rural aspects of the study area have a degree of integrity and productive agricultural value, but these areas are contrasted by the built-up areas that comprise a large proportion of the study area. This is a dynamic and evolving landscape where large industrial-scale developments are occurring adjacent to the towns of Carrigtwohill and Midleton.

The site of the proposed development and its immediate surroundings have an established character which is influenced by the existing railway corridor.

The rural locations are of relatively high integrity with clear transitions between land uses, but there are some fallow and underutilised areas. Although where the nature of rural production may vary periodically in these areas, the principal landscape patterns remain largely unaltered. The mature tree lines about the rural portions of the study area also give the impression that it is a stable and established landscape; however, these areas occur within close proximity to urban settlements, major transport infrastructure and industrial areas.

13.4.1.2 Scenic Quality

The presence of the designated Scenic Routes indicates a level of recognised scenic value in certain areas. Scenic Route S41 relates to waterside views in the western portion of the study area. There is also scenic value associated with the more elevated areas to the north of the study area, where long-distance views are afforded from Scenic Route S42. Although there is a ‘pleasant’ pastoral aesthetic in the agricultural portions of the study area, this offers a lesser degree of scenic quality. This is reflected in the fact that there are no designated views in these locations. Views may be relatively open at some locations in the study area, but given the generally low elevation, they tend not to be extensive. Equally, the built-up areas of the study area offer little in the way of scenic value.

13.4.1.3 Rarity and Representativeness

Although the Cork County Draft Landscape Strategy (2007) considers the broader landscape in which the study area occurs to be of importance at a ‘National’ level, it is not considered that the landscape within the study area is rare or distinctive.

13.4.1.4 Conservation Interests

There are three largely overlapping ecological designations in the vicinity of Haper’s Island in the southwestern portion of the study area. These areas are accessible to the public, and they contribute strongly to the naturalistic value and character of that portion of the study area.

13.4.1.5 Recreation Value

Outdoor public recreational opportunities are limited to Harper’s Island and walking or cycling on the public road network.

13.4.1.6 Perceptual Aspects and Associations

A degree of rural tranquillity occurs in some of the agricultural parts of the study area. However, this is principally a working rural hinterland setting, located in the Cork commuter belt, approximately 10km from the centre of Cork city. The study area is relatively densely populated and contains vital transport infrastructure as well as hosting industrial and commercial facilities.

13.4.1.7 Landscape Sensitivity Judgement

On the basis of the factors outlined above, it is considered that this is a diverse and productive rural hinterland setting, with a degree of integrity in certain parts, which contributes to the rural subsistence and amenity of the surrounding rural hinterland population. Notwithstanding the susceptible scenic or naturalistic values associated with Harper's Island, overall, this is a landscape with robust, productive landscape values in the agricultural areas, contrasted by the commercial, residential and industrial zones in the more built-up areas. On balance, for these reasons, landscape sensitivity is deemed to be **Medium-low**.

13.4.2 Sensitivity of Visual Selected Receptors

Table 13-6 uses the criteria set out in Section 13.2.2.1 to determine sensitivity at each of the viewshed reference points selected to represent visual receptors.

Table 13.6: **Analysis of Visual Receptor Sensitivity at Viewshed Reference Points**

Scale of value for each criterion

Strong association	Moderate association	Mild association	Negligible association

Values associated with the view	**VP 1**	**VP 2**	**VP 3**	**VP 4**	**VP 5**	**VP 6**	**VP 7**	**VP 8**	**VP 9**	**VP 10**	**VP 11**	**VP 12**
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	**ML**	**ML**	**ML**	**ML**	**ML**	**ML**	**L**	**ML**	**L**	**ML**	**ML**	**L**

N = Negligible; L = low sensitivity; ML = medium-low sensitivity M = medium sensitivity; HM = High-medium sensitivity; H = high sensitivity; VH = very high sensitivity

13.4.3 Landscape Impacts - Construction Phase

13.4.3.1 Magnitude of Landscape Impacts - Construction Phase

All of the construction compounds occur within brownfield sites. Three are set back from the road network, with only one (opposite the Elm Tree public house on the L3004 local road) immediately adjacent to the public road network. In this instance, the existing roadside hedgerow will be retained to help screen construction-related activity within this construction compound.

There will also be temporary effects on the landscape character in the construction compounds and the immediate surrounding areas. Some impacts will occur due to the intensity of construction activities which will involve more frequent movement of heavy vehicles both within and to and from the construction compounds. There will be site welfare facilities, lighting and vehicle parking, as well as areas of the site dedicated to the storage of construction materials. These are all typical construction phase activities for a facility of this scale. Still, they will represent a noticeable increase in the baseline activity levels experienced within and immediately around these construction compounds.

The construction activities directly related to the construction of the proposed new rail infrastructure will occur almost exclusively within the existing rail corridor. There are existing frequent train movements along the existing tracks, but the construction activities will be much slower. Therefore, although it will be unusual, it will be less likely to draw attention. The construction of the railway tracks will occur at a very similar elevation to the existing railway track level and will only marginally increase the lateral extents of the existing ballast; thus, the physical impact on the landscape will be inconsequential. There will be localised instances where vegetation removal will be required along the route and where the terrain will need to be re-profiled to accommodate the new infrastructure (most notably west of Level Crossing XY009).

The laying of the new tracks will be transitory as progress is made along the route of the proposed twin tracks. Construction work related to the bridge over the Owennacurra River (river crossing - UBY11) will occur immediately adjacent to a construction compound and, due to the complex nature of bridge construction, may take more time to complete. Construction phase works will also involve the demolition of an old masonry bridge OBY8.

On the basis of the factors discussed above, it is considered that the magnitude of landscape impacts during the construction phase is **Medium-low**.

13.4.3.2 Significance of Landscape Impacts - Construction Phase

The significance of landscape impacts is a function of landscape sensitivity weighed against the magnitude of the landscape impact. This is derived from the significance matrix (Table 13-3) used in combination with professional judgement. It was established in Section 13.4.1 that the landscape sensitivity is Medium-low. It was determined in Section 13.4.1 that the highest magnitude of construction phase landscape impacts is Medium-low. As a result of this combination, the overall significance of construction phase landscape impact is **Moderate-slight** in the immediate vicinity of the construction compounds and Slight or Imperceptible in the vicinity of all other proposed development elements. Construction phase landscape impacts will be of a **Negative** quality and are anticipated to be **Short Term** in duration, mainly limited to the vicinity of the construction compounds.

13.4.4 Landscape Impacts - Operational Phase and Maintenace

Following the completion of the construction phase, the main landscape effects remaining to be considered at the operational phase relate to permanent changes in landscape character relating to the introduction of new above-ground elements or permanent removal of vegetation.

13.4.4.1 Magnitude of Landscape Impacts - Operational Phase

The proposed project will be a twin-track railway line within the existing railway corridor between Glounthaune and Midleton. The proposed development will result in the loss of some mature vegetation along the route and some permanent alterations to the physical landscape; however, they will be highly localised and will occur immediately adjoining the existing railway infrastructure, where incremental upgrades along the route would not be unexpected. In general, the new twin-track layout will be most noticeable from the level crossings in the study area, but at these locations, there will be an unmistakable sense of a thematic connection to the existing single-track railway.

From a macro perspective of the overall landscape impacts, the wider landscape is also already characterised by the existing railway infrastructure; thus, operational phase impacts will not markedly alter the existing landscape character.

On the basis of the factors discussed above, it is considered that the operational phase magnitude of landscape impact is **Negligible** within the immediate vicinity of the proposed development.

13.4.4.2 Significance of Landscape Impacts - Operational Phase

The significance of landscape impacts is a function of landscape sensitivity weighed against the magnitude of the landscape impact. This is derived from the significance matrix (Table 13-3) used in combination with professional judgement. It was established in Section 13.4.1 that the Landscape Sensitivity is Medium-low. It was determined in Section 13.4.4.1 that the Magnitude of Operational Phase Landscape Impacts is Negligible. As a result of this combination the overall Significance of Operational Phase Landscape Impact is **Imperceptible**. Operational phase landscape impacts will be **Neutral** in terms of quality and **Permanent** in duration.

13.4.5 Visual Impacts - Construction Phase

It is not considered beneficial to assess construction phase visual impacts from specific receptor locations (viewpoints) using photomontages, which is instead reserved for the operational phase of the proposed development. This approach is partly on the basis that construction phase visual effects are constantly changing in nature, intensity and location. Furthermore, many potential construction-related visual effects (such as dust, lighting and heavy vehicle movements, etc.) are also not easily depicted or readily experienced through the use of static photomontages.

13.4.6 Visual Impacts - Operational Phase

The assessment of visual impacts at each of the selected viewpoints is aided by photomontages of the proposed development. Photomontages are a ‘photo-real’ depiction of the scheme within the view utilising a rendered three-dimensional model of the development, which has been geo-referenced to allow accurate placement and scale. For each viewpoint, the following images have been produced and are included in Volume 4:

- Existing view; and
- Montage view and/or, where appropriate, an outline view (yellow outline showing the extent of the above ground elements of the proposed development overlaid on the photography).

13.4.6.1 Magnitude and Significance of Visual Impacts - Operational Phase

VP No.	Title and description of existing view	Receptor Sensitivity	Description and Magnitude of Visual impact	Residual Significance / Quality / Duration of Visual Impact
VP1	**Track, Johnstown** This viewpoint is located on an abutment to a bridge (OBY1A) that spans the railway line, which allows pedestrians to access Harper's Island. From this slightly elevated location, broad views are afforded to the south (in the opposite direction to the proposed development) toward Harper's Island and the water body surrounding it; however, the view to the north is enclosed due to the parapet of the bridge and foreground vegetation. Through gaps in the intervening vegetation, a retaining wall for the bridge and a residential housing development is visible.	**ML**	The proposed development will not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is **Negligible**.	**Imperceptible**
VP2	**L3004 local road, Killahora** This is a complex view from the footpath adjoining the busy L3004 local road. The foreground is composed of a private garden which adjoins the existing single-track railway line. The footbridge to Harper's Island (OBY1A) foreshortens the view to the southwest, but a channelled view over Salty Water to Harper's Island is afforded, and a low distant ridge is identifiable in the background.	**ML**	The existing single-track railway line will be removed. The ballast beneath the existing single track in the foreground of the view will be widened. A new twin-track railway will be placed onto the new ballast, but the change is unlikely to be noticed by a casual observer due to the high degree of intervening structures which both partially screens the proposed development and also helps it to be visually absorbed. The visual change will not detract from the visual amenity of the scene. For these reasons, the magnitude of impact is deemed to be **Negligible**.	**Imperceptible**
VP3	**L3004 local road, Killacloyne** This is a glimpse view to the east above the parapet of the bridge over the existing railway track. The middle ground contains two agricultural fields separated by the existing railway track, which is flanked by mature vegetation. An overgrown hedgerow/treeline in the background foreshortens the view.	**ML**	The existing single-track railway line will be removed. The ballast beneath the existing single track in the view will be widened. A new twin-track railway will be placed onto the new ballast. Any visible portions of the proposed development will occur where there is already railway infrastructure and will be extremely similar in nature to the existing railway infrastructure; thus, the visual change is unlikely to be noticed by a casual observer and will not detract from	**Imperceptible**

VP No.	Title and description of existing view	Receptor Sensitivity	Description and Magnitude of Visual impact	Residual Significance / Quality / Duration of Visual Impact
			the visual amenity of the scene. For these reasons, the magnitude of impact is deemed to be **Negligible**.	
VP4	**L3605 local road, Killacloyne** A view to the northwest is afforded because the roadside hedgerow has been maintained at a lower height in this area. A large arable field occupies the foreground. A low farmed and settled ridge in the middle ground creates a backcloth and generates a sense of enclosure.	**ML**	The proposed development will not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is **Negligible**.	**Imperceptible**
VP5	**L3616 local road, Anngrove** This is an enclosed view from the newly constructed pedestrian/cycle track, which links the L3616 local road to the IDA Industrial Estate. The new access includes new pavement and lighting columns contained within black paladin fencing. The existing railway track is located immediately to the south of this access track but is fully screened by gorse bushes.	**ML**	The proposed development will not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is **Negligible**.	**Imperceptible**
VP6	**L3617 local road, Ballyadam** This is a broad and slightly elevated view from a locally elevated section of the L3617 local road. A low stone wall runs along the boundary between the road and the large agricultural field in the foreground, which slopes gently away from the viewpoint towards the existing railway track. A historic stone bridge (Ballyadam House Overbridge – OBY8) is identifiable, spanning the railway track directly to the southwest. Beyond the railway track to the south, the landform begins to rise again where the land use appears to be extractive in	**ML**	The stone bridge (Ballyadam House Overbridge – OBY8) will be removed, but this is unlikely to be noticed by a casual observer. If noticed, the loss of the attractive stone bridge is likely to be considered a minor loss to the amenity of the scene especially in the manor is ties in with the view of the surrounding stone walls in terms of tone, texture and historic context. The remaining portions of the proposed development will not be visible from this location due to a high degree of intervening screening. Overall, the magnitude of visual impact is Low-**negligible**.	**Slight-imperceptible. Negative and Permanent**

VP No.	Title and description of existing view	Receptor Sensitivity	Description and Magnitude of Visual impact	Residual Significance / Quality / Duration of Visual Impact
	nature. To the southwest, long-distance views are afforded over an undulating rural hinterland landscape which includes degraded lands, high voltage overhead line towers, large buildings and road signage.			
VP7	**L3618 local road, Water-Rock** Views to the east and west from this viewpoint are heavily channelled along the centre of the railway corridor, where the track, ballast and associated structures characterise the view from the foreground to the background.	**L**	There will be a widening of this existing railway corridor and level crossing (Water Rock CCTV XY009 Ch.8600). Existing structures will need to be repositioned, and the existing cuttings in this area will be regraded to accommodate the proposed twin-track arrangement. The cuttings will be allowed to regenerate naturally and will be maintained in accordance with standard Irish Rail protocol. Any visible positions of the proposed development will occur where there is already railway infrastructure and will be very similar in nature to the existing railway infrastructure. Due to the close proximity of the viewpoint to the proposed development, the changes will be readily noticeable, but there will be only a minimal reduction to the visual amenity afforded at this location. For these reasons, the magnitude of impact is deemed to be **Low**.	**Slight-imperceptible. Negative and Permanent**
VP8	**Midleton Northern Relief Road, Knockgriffin (Barrymore)** This is a broad and slightly elevated view from the embankment of the Midleton Northern Relief Road. The grassy roadside verge slopes own to a timber post-and-rail fence and an intermittent, low-trimmed hedge. An expansive arable field stretch across the middle ground. Railside vegetation bounds the northern edge of this field, amongst which a level crossing (Ford CCTV XY010) is identifiable. Immediately beyond the railway track is a large building in the Northern Point Business Park. In the background, a farmed and forested ridge rises gently to form a distant backcloth.	**ML**	The level crossing (Ford CCTV XY010 Ch.9000) is to be closed, and all associated infrastructure will be removed. It may also be possible to identify where vegetation removal has occurred, but these visual change s are unlikely to be noticed by a casual observer. The visual changes will not detract from the visual amenity of the scene. The remaining portions of the proposed development will not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is **Negligible**.	**Imperceptible**

VP No.	Title and description of existing view	Receptor Sensitivity	Description and Magnitude of Visual impact	Residual Significance / Quality / Duration of Visual Impact
VP9	**Midleton Northern Relief Road, Knockgriffin (Imokilly)** This is an elevated view from a bridge over the existing railway line, which is bounded by lineside vegetation, predominantly Gorse. As the railway line takes a westerly route into the background, it is adjoined to the north by the Northern Point Business Park, and to the south, by a yard and an arable field. In the background, it is possible to see a level crossing (Ford CCTV XY010 Ch.9000).	**L**	In the foreground, there will be localised modifications to the profile of the existing embankment on the northern side of the line, which will require the removal of some of the Gorse vegetation, revealing existing palisade fencing in the process. There will be some noticeable vegetation removal, mainly as the existing fence to the south of the track will be repositioned slightly further to the south to accommodate a reinforcement of the existing embankment and cuttings. The existing single-track railway line will be removed. The ballast beneath the existing single track in the view will be widened. A new twin-track railway will be placed onto the new ballast. In the background, the level crossing (Ford CCTV XY010 Ch.9000) is to be closed, and all associated infrastructure will be removed, but the visual change is unlikely to be noticed by a casual observer. Any visible portions of the proposed development will occur where there is already railway infrastructure and will be extremely similar in nature to the existing railway infrastructure. Thus, although some of the visual changes are likely to be noticeable, they will not detract from the visual amenity of the scene. For these reasons, the magnitude of impact is deemed to be **Low**.	**Slight-imperceptible. Negative and Permanent**
VP10	**Midleton Northern Relief Road, Broomfield West** This viewpoint is on a road bridge over the Owennacurra River, which can be glimpsed amongst the riparian vegetation in the foreground to the southeast. To the south is a scrubby field. In the middle ground, an existing bridge over the river can be identified. Intermittent views of the upper portions of some of the buildings near Midleton can be seen in the background.	**ML**	The widening of the existing bridge (UBY11) to the southeast will be visible, but this visual change is unlikely to be noticed by a casual observer. The visual change will not detract from the visual amenity of the scene. The remaining portions of the proposed development will not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is **Negligible**.	**Imperceptible**
VP11	**Millbrook Drive, Townparks** This is a largely enclosed view from within a green amenity area within a residential housing estate. Above the panel fence to the	**ML**	The new handrails of the widened Owenacurra River Bridge (UBY11) will be visible to the northwest above the panel fence, but this visual change is unlikely to be noticed by a casual observer. The visual change will not detract from the visual amenity of the scene.	**Imperceptible**

VP No.	Title and description of existing view	Receptor Sensitivity	Description and Magnitude of Visual impact	Residual Significance / Quality / Duration of Visual Impact
	left of a two-storey house, the handrail of an existing railway bridge over the Owennacurra River (UBY11) is identifiable. The view is channelled towards the upper portion of a distant farmed ridge in the background.		The remaining portions of the proposed development will not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is **Negligible**.	
VP12	**R626 regional road, Townparks** This is an enclosed view in close proximity to the existing twin-track railway infrastructure at the level crossing (Mill Road R626 CCTV XY012) on the R626 regional road to the west Midleton station. The pavement of this road passes through the foreground and is adjoined by a variety of fencing, barriers, lighting columns and road signals. The view is channelled towards Owenacurra River Bridge (UBY11) and a bridge (OBY9B) over the railway track in the background.	**L**	In the background of the view, the existing Owenacurra River Bridge (UBY11) will be widened, and the existing twin track layout will be adjusted upon approach to the same, but this visual change is unlikely to be noticed by a casual observer. The visual change will not detract from the visual amenity of the scene. The remaining portions of the proposed development will not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is **Negligible**.	**Imperceptible**

13.5 Mitigation and Monitoring Measures

There are no specific landscape or visual mitigation measures proposed during the construction or operational phases.

13.6 Cumulative Impacts

Given the low level of construction effects for the proposed development, it is considered that any cumulative effects would be **Imperceptible**. As the proposed development will have **Imperceptible** operational effects in terms of landscape and visual effects, there is no potential for significant cumulative effects with other developments.

13.7 Residual Impacts

As there are no mitigation measures proposed in relation to landscape and visual impacts, residual impacts are as described in the assessment.

13.8 Summary

The overall significance of construction phase landscape impact is **Moderate-slight** in the immediate vicinity of the construction compounds, and these impacts are anticipated to be **Short Term** in duration. The overall operational phase landscape impact will be **Permanent** in duration, but the significance is deemed to be **Imperceptible**. Therefore significant landscape impacts are not anticipated during the construction or operational phases.

The significance of visual impact was assessed at 12 no. selected viewpoints operational phase. Even without any specific mitigation measures, impacts were **Slight-imperceptible** and **Permanent** at three viewpoints (VP6, VP7 and VP9) and **Imperceptible** at the remaining nine viewpoints; thus, the visual impact of the proposed development is not deemed to be significant.

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14 Archaeology, Architectural and Cultural Heritage

14.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors. This chapter of the EIAR, prepared by Rubicon Heritage Services Ltd., and Southgate Associates, details the likely significant effects on archaeological, architectural and cultural heritage arising from the proposed development.

It is noted that section 115(6) of the Dublin Transport Authority Act 2008 made a number of amendments to the Transport (Railway Infrastructure) Act 2001 including inter alia substituting a new section 38 of the 2001 Act as follows: "38.— (1) Each of the following shall be exempted development for the purposes of the Act of 2000: (a) development consisting of the carrying out of railway works, including the use of the railway works or any part thereof for the purposes of the operation of a railway, authorised by the Board and specified in a railway order or of any incidental or temporary works connected with such development; (b) development consisting of the carrying out of railway works for the maintenance, improvement or repair of a railway that has been built pursuant to a railway order. (2) Part IV of the Act of 2000 does not apply and is deemed never to have applied to developments specified in subsection (1).".

Part IV of the Planning and Development Act 2000 (as amended) – which refers to Part IV, Architectural Heritage, Chapter I (Protected Structures, sections 51-80); Chapter II (Architectural Conservation Areas and Areas of Special Planning Control, sections 81-92) of the Planning and Development Act 2000 (as amended) – is disapplied to developments comprising railway works (in a Railway Order) in the circumstances set out in section 38(1) by section 38(2) of the 2001 Act.

This study aims to assess the baseline archaeology, architectural and cultural heritage environment, to evaluate the likely significant impacts that the proposed development, as described in Chapter 6, will have on this environment, and to provide mitigation measures to ameliorate these impacts in accordance with the policies of the Department of Housing, Local Government and Heritage (DHLGH), Cork County Council, the National Monuments Acts 1930-2004, and best practice guidelines.

14.1.1 Study Area

The study area has been defined in respect of two factors:

- The ability of sites/information sources to provide information pertaining to the archaeological potential of the proposed development site, and
- The potential physical impact, as well as impact on setting, that the proposed scheme may have on sites of cultural heritage significance.

Taking these factors into account the study area has been defined as follows:

Table 14-1: Dimensions of the study area

Subject	Study Area
National Monuments and Recorded archaeological monuments (RMPs)	Within 50 m of the proposed development
Protected Structures and / or their curtilage	Within 50 m of the proposed development
Architectural Conservation Areas (ACAS)	Within 50 m of the proposed development
Structures recorded in the NIAH	Within 50 m of the proposed development
Unregistered features of cultural heritage	Along any route option for the proposed development
Townland boundaries	Traversed by the proposed development
Areas of archaeological potential	Along any route option for the proposed development
Previous Excavations	Within any townland traversed by the proposed development
Topographical files	Within any townland traversed by the proposed development

14.2 Methodology

This section presents the methodology used in assessing the baseline cultural heritage environment. The scope and methodology for the baseline assessment has been devised in consideration of the following guidelines:

- Environmental Protection Agency (2002) 'Guidelines on the information to be contained in Environmental Impact Statements'
- Environmental Protection Agency (2003) 'Advice notes on current practice (in the preparation of Environmental Impact Statements)'
- Environmental Protection Agency (2022) 'Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)'
- Department of Arts, Heritage, Gaeltacht and the Islands (DAHGI) (1999) 'Frameworks and Principles for the Protection of the Archaeological Heritage'
- Department of the Environment, Heritage and Local Government (2004) 'Architectural Heritage Guidelines'
- National Roads Authority (2005) 'Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes'
- National Roads Authority (2005) 'Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes'

14.2.1 Desktop study methodology

This assessment of the archaeological, architectural and cultural heritage of the proposed development area is based on a desktop study of a number of documentary and cartographic sources. The desktop study was further augmented by an examination of aerial photography

as well as a field survey. The main sources consulted in completing the desktop study are listed here.

- Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for County Cork
- Record of Protected Structures
- Various editions of the Ordnance Survey of Ireland maps
- Archaeological Inventory for County Cork – Volume 1 (Power *et al*. 1992)
- National Inventory of Architectural Heritage
- Excavation Bulletins Database (www.excavations.ie)
- Cork County Development Plan (2022-2028)
- Various published sources for local history
- Ordnance Survey Name books and Letters
- Excavations Bulletin
- Aerial Photographs
- Cartographic Sources
- Cork Digital Archive
- Newspapers
- Consultation

14.2.2 Field Inspection Methodology

A field inspection of the proposed development site was undertaken by Rubicon Heritage Services Ltd on 12 April 2022 by Jonathan Millar and Tenaya Jorgensen. In relation to architectural heritage, a site inspection was carried out by buildings archaeologist, Flor Hurley on 27 April and 29 April 2022; conservation engineer, David Keane of Southgate Associates on 3 May 2022 and Chris Southgate, conservation engineer, carried out the site inspection at Midleton Station on 28 April 2022 and Glounthaune Station on 20 May 2022.

The primary purpose of a field inspection is to assess local topography in order to identify any potential low-visibility archaeological and/or historical sites that are not currently recorded and which may be impacted upon negatively by the proposed development. It is also the purpose of the field inspection to survey any known monuments or sites and to consider the relationship between them and the surrounding landscape, all of which need to be considered during the assessment process.

The methodology used during the field inspection involved recording the present land use as well as the existing topography for the entire area comprising the proposed development. A photographic record and written description were compiled for any known and / or potential sites of archaeological, architectural and / or cultural significance. In addition, a Global Positioning System (GPS) waypoint was taken for each identified site of said significance.

In relation to architecture, structures listed on the NIAH and the RPS which were immediately adjacent to or spanning the railway line were then assessed by a conservation engineer to determine their condition.

14.2.3 Methodology used for assessing baseline value of sites

In order to categorise the baseline environment in a systemised manner, ‘baseline values’ have been assigned to each identified site of cultural heritage significance and / or potential

within the study area. The baseline value of a site is determined with reference to the 'importance' and 'sensitivity' of the site.

In accordance with TII Guidelines, (NRA 2005) the importance of a site is determined based on the following criteria: legal status, condition, historical associations, amenity value, ritual value, specimen value, group value and rarity. The sensitivity of a site is determined based on its susceptibility to physical impact, as well as susceptibility to impact on setting.

It should be noted that the National Monuments Act 1930-2004 does not differentiate between recorded archaeological sites on the basis of relative importance or sensitivity. In addition, the Planning and Development Act 2000 (as amended) does not differentiate between Protected Structures or Areas of Architectural Conservation on the basis of relative importance or sensitivity either. Consequently, professional judgement has been exercised to rate these features based on their perceived importance and sensitivity in relation to physical impacts and impacts on setting.

Taking the above factors into consideration, the criteria that have been defined are provided in Table 14.2 below.

Table 14-2 Baseline values of sites

Subject	Baseline Value
● Recorded Archaeological Monuments ● Protected Structures ● Architectural Conservation Areas (ACAs) ● Shipwrecks known to be more than 100 years old or whose date is uncertain	Very High
● Sites listed in the NIAH that are not Protected Structures ● Shipwrecks that are known to be less than 100 years old. ● Unregistered built heritage sites that comprise extant remains which are in good condition and/or which are regarded as constituting significant cultural heritage features ● Unrecorded features of archaeological potential	High
● Unregistered built heritage sites that comprise extant remains which are in poor condition ● Unregistered cultural heritage sites (not including built heritage sites) that comprise extant remains ● Townland boundaries that comprise extant remains ● Marshy/wetland areas	Medium/High
● Unregistered cultural heritage sites for which there are no extant remains but where there is potential for associated subsurface evidence ● Townland boundaries for which there are no extant remains	Medium/Low
● Unregistered cultural heritage sites for which there are no extant remains and where there is little or no potential for associated subsurface evidence	Low

Note: 'All other areas' collectively refers to the areas within the proposed development site that do not contain or comprise features of cultural heritage significance.

14.2.3.1 Types of impact

The following table lists the type of impacts that a proposed development may have on the cultural heritage resource:

Table 14-3 Types of Impact

Types of Impact	Definition
Direct	Direct impacts arise where an archaeological, architectural and/or cultural heritage feature or site is physically located within the footprint of the proposed development, or its associated physical impact zone, whereby the removal of part, or all of the feature or site is thus required.

Types of Impact	Definition
Indirect	Indirect impacts arise when an archaeological, architectural or cultural heritage feature is not located within the footprint of the proposed development, or its associated physical impact zone, and thus is not impacted directly. Such an impact could include impact on setting or impact on the zone of archaeological potential of site whereby the actual site itself is not physically affected.
Cumulative	The addition of many impacts to create a large, significant impact.
Undeterminable	Whereby the full consequence that the proposed development may have on the cultural heritage resource is not known
Residual	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.

14.2.3.2 Assessing physical impacts

The methodology used to assess the magnitude of potential pre-mitigation impacts, as well as residual impacts, of the proposed development on the baseline environment is presented in Table 14.4 below

Table 14-4: Criteria used for rating magnitude of impacts

Impact Magnitude	Criteria
Severe	● Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise where an archaeology site is completely and irreversibly destroyed. ● An impact that obliterates the architectural heritage of a structure or feature of national or international importance. These effects arise where an architectural structure or feature is completely and irreversibly destroyed by the proposed development. Mitigation is unlikely to remove adverse effects.
Major	● An impact which, by its magnitude, duration or intensity, alters an important aspect of the environment. An impact like this would be where part of a site would be permanently impacted upon, leading to a loss of character, integrity and data about an archaeological feature/site. ● An impact that by its magnitude, duration or intensity alters the character and/or the setting of the architectural heritage. These effects arise where an aspect or aspects of the architectural heritage is/are permanently impacted upon leading to a loss of character and integrity in the architectural structure or feature. Appropriate mitigate is likely to reduce the impact ● A beneficial or positive effect that permanently enhances or restores the character and/or setting of a feature of archaeological or cultural heritage significance in a clearly noticeable manner.
Moderate	● A medium impact arises where a change to a site/monument is proposed which though noticeable, is not such that the archaeological integrity of the site is compromised, and which is reversible. This arises where an archaeological feature can be incorporated into a modern-day development without damage and that all procedures used to facilitate this are reversible. ● A medium impact to a site/monument may also arise when a site is fully or partly excavated under license and all recovered data is preserved by record. ● An impact that results in a change to the architectural heritage which, although noticeable is not such that alters the integrity of the heritage. The change is likely to be consistent with existing and emerging trends. Impacts are probably reversible and may be of relatively short duration. Appropriate mitigation is very likely to reduce the impact. ● A beneficial or positive effect that results in partial or temporary enhancement of the character and/or setting of a feature of archaeological or cultural heritage significance in a clearly noticeable manner.
Minor	● An impact which causes changes in the character of the environment, such as visual impact, which are not high or very high and do not directly impact or affect an archaeological feature or monument.

Impact Magnitude	Criteria
	● An impact that causes some minor change in the character of architectural heritage of local or regional importance without affecting its integrity or sensitivities. Although noticeable, the effects do not directly impact on the architectural structure or feature. Impacts are reversible and of relatively short duration. Appropriate mitigation will reduce the impact. ● A beneficial or positive effect that causes some minor or temporary enhancement of the character of an architectural heritage significance which, although positive, is unlikely to be readily noticeable.
Negligible	● An impact on archaeological features or monument capable of measurement but without noticeable consequences. ● An impact on architectural heritage of local importance that is capable of measure merit but without noticeable consequences. ● A beneficial or positive effect on architectural heritage of local importance that is capable of measurement but without noticeable consequences.

14.2.3.3 Assessing impacts on setting

The definition of setting follows the guidance set by English Heritage as they have developed a range of comprehensive guidance on this subject specific to heritage assets (English Heritage 2005; 2008). Hence setting is not simply the visual envelope of the asset in question. Rather, it is those parts of the asset's surroundings that are relevant to the significance of the asset and the appreciation thereof, and in which a heritage asset is experienced.

In most instances setting will relate to the historical value of the asset, where an appreciable relationship between the asset and an element of its surroundings helps the visitor understand and appreciate the asset. This may be in terms of a physical relationship, such as between a castle and the natural rise that it occupies, or a more distant visual relationship, such as a designed vista or the view from, for example, one ringfort to another. The former is referred to as immediate setting and the latter as landscape setting. Many assets will only have an immediate setting. Some assets will have aesthetic value that relates to the surrounding landscape, such as in the case of a designed view incorporating a distant hill, or that relates to the contribution the asset makes to the local landscape, for example a church spire providing a focal point in a view down a valley.

English Heritage has provided a list of factors to be considered when assessing impacts upon setting. These are broad factors and have been taken into consideration when assessing magnitude of impact and sensitivity. They are summarised in Table 14.5.

Table 14-5 Factors to be considered when assessing impacts upon setting (after English Heritage 2005)

Factor	Discussion
Visual dominance	Where an historic feature (such as a hilltop monument or fortification, a church spire, or a plantation belonging to a designed landscape) is the most visually dominant feature in the surrounding landscape, adjacent construction of the proposed development may be inappropriate.
Scale	The extent of a proposed development and the number, density and disposition of its associated elements will also contribute to its visual impact.
Intervisibility	Certain archaeological or historic landscape features were intended to be seen from other historic sites. Construction of a proposed development should respect this intervisibility.
Vistas and sight-lines	Designed landscapes invariably involve key vistas, prospects, panoramas and sight-lines, or the use of topography to add drama. Location of a proposed development within key views, which may often extend beyond any designated area, should be avoided.
Movement, sound or light impacts	The movement associated with a proposed development may be a significant issue in certain historic settings. Adequate distance should always be provided between important

Factor	Discussion
	historic sites and proposed developments to avoid the site being overshadowed or affected by noise.
Unaltered settings	The setting of some historic sites may be little changed from the period when the site was first constructed, used or abandoned. Largely unaltered settings for certain types of sites, particularly more ancient sites, may be rare survivals and especially vulnerable to modern intrusions such as wind turbines. This may be a particular issue in certain upland areas.

The following are guides to the assessment of magnitude of impact on setting:

- *Obstruction of or distraction from key views*. Some assets have been sited or designed with specific views in mind, such as the view from a country house with designed vistas. The obstruction or cluttering of such views would reduce the extent to which the asset could be understood and appreciated by the visitor. Developments outside key views may distract from them and make them difficult to appreciate on account of their prominence and movement. In such instances the magnitude is likely to be greatest where views have a particular focus or a strong aesthetic character. Sympathetic development may improve key views by removing features that obstruct or distract from key views and hence preserve or enhance the importance of the asset.
- *Changes in prominence*. Some assets are deliberately placed in prominent locations in order to be prominent in the surrounding landscape, for example prehistoric cairns are often placed to be silhouetted against the sky and churches in some areas are deliberately placed on ridges in order to be highly visible. Developments can reduce such prominence and therefore reduce the extent to which such sites can be appreciated or the contribution that they make to the local landscape. Similarly, sympathetic development can enhance the setting of such sites by, for example, removing modern forestry that would otherwise compromise the setting of a cairn that had been placed on a skyline.
- *Changes in landscape character*. A particular landuse regime may be essential to the appreciation of an asset's function, for instance the fields surrounding an Improvement period farmstead are inextricably linked to its appreciation. Changes in land use can leave the asset isolated and reduce its value. In some instances, assets will have aesthetic value or a sense of place that is tied to the surrounding landscape character. Conversely, sympathetic development may restore or preserve the relevant landuse and hence preserve or enhance the relevant value of the asset.
- *Duration of impact*. Impacts that are long term or permanent are generally of greater magnitude than those that are short term.

Readily reversible impacts are generally of lesser magnitude than those that cannot be reversed. Impacts upon the defined setting will be of greater magnitude than those that affect unrelated elements of the asset's surroundings or incidental views to or from an asset that are unrelated to the appreciation of its value. The magnitude of impacts can be rated from Negligible to Major using a similar scale to that for physical impacts.

14.2.3.4 Methodology used for assessing significance level of impacts

The significance level of a construction or operation impact on a feature is assessed by combining the magnitude of the impact and baseline value of the feature. The matrix in Table 14.6 provides a guide to decision-making, but it is not a substitute for professional judgement and interpretation, particularly where the baseline value or impact magnitude levels are not clear or are borderline between categories. The permanence of the effects are also taken into account, with irreversible effects being more significant while temporary or reversible changes are likely to be less significant.

Table 14-6 Criteria for assessing significance level of impacts

Magnitude of Impact	Baseline Value				
	Very High	High	Medium / High	Medium / Low	Low
Severe	Very significant	Very significant	Significant	Moderate	Slight
Major	Significant	Significant	Moderate	Slight	Slight
Moderate	Moderate	Moderate	Slight	Slight	Negligible
Minor	Moderate	Slight	Slight	Negligible	Negligible
Negligible	Slight	Slight	Negligible	Negligible	Negligible

14.2.3.5 Limitations of this EIAR

There were no significant limitations or restrictions encountered during the compilation of this EIAR. All third-party reports, data and mapping are assumed to be correct for the purposes of this EIAR.

14.3 Receiving Environment

14.3.1 Topography, Route and Locational Detail

The Glounthaune - Midleton Twin Track project covers the area of the network from Cobh Junction to Midleton Station turn back sidings, a total distance of approximately 10km. Table 14-7 below outlines the nature of the receiving environment for the proposed developments within this area.

Table 14-7 Overview of the scheme landscape

Proposed Development	Descriptor (and Townland)	Receiving Environment
Twin tracking of the single track sections between Glounthaune and Midleton;	Between Glounthaune Railway Station (Johnstown) and Midleton Railway Station (Townparks)	• Existing single track
Reconfiguration of the operational track layouts	Between Glounthaune Railway Station (Johnstown) and Midleton Railway Station (Townparks)	• Existing single and twin track • Bordering Glounthaune Estuary / Salty Water Complex
Modification of existing bridges and level crossings to facilitate the twin tracking;	Bridge OBY8 (Ballyadam) Owenacurra Bridge (Knockgriffin) Level Crossing (Water Rock) Level Crossing (Water Rock/Knockgriffin)	• Existing single and twin track
Provision of sidings/turn back facility at Midleton	East of Midleton Railway Station (Townparks and Broomfield East)	• Townparks: Existing railways station and twin track • Broomfield East: Mixture of levelled ground, paved cycle track, and undeveloped and overgrown land along northern section.
Provision of new cable containment routes from Glounthaune to Midleton to facilitate the signalling upgrades and alterations	Between Glounthane Railway Station (Johnstown) and Midleton Railway Station (Townparks))	• Existing single and twin track
Associated signalling upgrades and alterations	Between Glounthane Railway Station (Johnstown) and	• Existing single and twin track

Proposed Development	Descriptor (and Townland)	Receiving Environment
	Midleton Railway Station (Townparks)	
All associated works (drainage, retaining walls, boundary treatments, etc.)	Between Glounthane Railway Station (Johnstown) and Midleton Railway Station (Townparks)	• Existing single and twin track • Bordering Glounthaune Estuary / Salty Water Complex
The provision of five temporary adjacent construction compounds in the townlands of Killahora, Killacloyne, Ballyadam Townparks and Knockgriffin	Killahora; immediately south of existing line Killacloyne; immediately south of existing line Ballyadam; immediately south of existing line Knockgriffin; immediately north of existing line Townnparks; immediately north of existing line	• Killahora; existing railway embankment • Killacloyne; brownfield site • Ballyadam; brownfield site • Knockgriffin; greenfield site located immediately adjacent and to west of the Owenacurra River • Townparks; mixed brownfield and greenfield site located immediately adjacent and to east of the Owenacurra River

14.3.2 Archaeological and historical context

14.3.2.1 Prehistoric period

There is abundant evidence for prehistoric settlement in County Cork, and this is evident in the study area. There are eight shell middens identified within Carrigtwohill parish that have been dated from the later part of the Mesolithic Stone Age (7000-4000 BC) to the medieval period. There are also a number of *fulachtaí fiadh*, or burnt mounds, associated with the townlands included in the study area, which often date to the Bronze Age (1500-500 BC).

Archaeological excavations at Ballyadam (CO076-120----; CO076-123----; Licence No 06E0612) identified a number of examples that were radiocarbon dates to the Bronze Age. Fulachtaí fia survive as low mounds, usually horse-shoe shaped, of charcoal-enriched soil packed with fragments of heat-shattered stones (termed ‘burnt mound’); when levelled, they are often noticeable as black spreads in ploughed fields. They were usually situated close to a water source, like a stream, or in wet marshy areas. It is generally accepted that they were probably used as cooking places (Ó Drisceóil 1988). Water was boiled in a regular pit (lined with wooden planks or stone slabs to form a trough) by the addition of hot stones from a fire close by. O’Kelly (1954, 105–55) showed by experiment that the large quantities of water can be boiled in this way in about twenty minutes. He also demonstrated that meat, wrapped in straw and immersed in the boiling water, cooked at a rate of twenty minutes per pound weight. When the cooking was over the remnants of heat-shattered stones in the trough were discarded to one side. Eventually, after many episodes of use, these would form a mound curving round three sides of the trough, hence the horse-shape mound (Power et al. 1997, 75). It is not certain whether fulachtaí fia were elements temporary hunting camps or of permanent settlements. The majority of radiocarbon dates place these monuments in the Bronze Age (Brindley and Lanting 1990, 55–6). They are the most numerous prehistoric sites in Ireland, with over 4,500 known examples, some 2,000 of these in County Cork (Power 1990, 13–17).

A review of the use of the term ‘fulacht’ in early Irish literature and of references to ‘activities that may have taken place at such sites’, suggest associations with ‘the cooking and eating of food, washing and bathing, music and sex’ (Ó Drisceóil 1990, 157– 64). The word ‘fulacht’ means a pit used for cooking. The second element can be interpreted as either ‘fiadh’ meaning ‘of the deer’ or ‘of the wild’ or ‘fian’ meaning ‘of a roving band of hunters or warriors’ or ‘of Fianna or Fionn Mac Cumhail’ (Ó Drisceóil 1988, 671–80).

Further examples of known extant fulachtaí fia in the landscape immediately surrounding the proposed project have been identified at Park South (CO076-138----; CO076-134----), in the townland of Johnstown (CO075-011----), and in Carrigtohill townland (CO076-124). In the townland of Oatencake which forms part of the town of Midleton, a single Pit Burial, also typically associated with the Bronze Age was identified in 1986 situated c. 150m north of highest tidal reaches of Ballynacorra River. A Cordoned Urn was found during drainage works; although the grave was destroyed before investigation could take place.

It is noteworthy that the investigations at Ballyadam also uncovered a number of features that were radiocarbon dated to the Later Iron Age.

14.3.2.2 Medieval period (AD 400–1540)

The early medieval documentary sources indicate a complex secular social system based on clientship during this period. Landowning commoners such as ócaire and bóaire were obligated to wealthy landowners (mruigfer), lords (flaith) and the king of a region with commoners (betaghs) bonded freemen (fuidirs) and slaves (cumal) lower down the scale but still required to pay tributes. The social system was dependant on clientelism with rents and what amounted to taxes being paid with labour, food and other commodities to the upper echelons and also to the church (Kelly 2000, 447). By the twelfth century the distinction between ócaire and bóaire diminished suggesting a change in the social order (Kelly 2000, 428). The betagh class came to refer to a servile tenant (Kelly 2000, 428). Many of these wealthy landowners and landowning commoners inhabited ringforts

Ringforts are undoubtedly the most widespread and characteristic archaeological field monument in the Irish countryside. There are several known ringforts and enclosures within 1km of the constraints study area. They are usually known by the names ráth or lios, forming some of the most common placename elements in the countryside. The ringfort is basically a circular or roughly circular area enclosed by an earthen bank formed of material thrown up from concentric fosse (ditch) on its outside. Generally, the diameter of the enclosure is between 25 m and 50 m. A single bank and fosse (univallate) is the most usual form; double rings (bivallate) or triple rings (trivallate) are rarer. The number of rings of defence are thought to reflect on the status of the site, rather than the strengthening of its defences. These sites have endured centuries of erosion, reuse and sometimes deliberate destruction and it is not always possible to distinguish original features; the overgrown nature of many sites compound the problem of field recording. However, entrances may be detected where a clear break in the bank is in line with an uncut causeway over the fosse (Power 1992, 131).

Archaeological excavation has shown that the majority of ringforts were enclosed farmsteads, built in the early medieval period. Though not forts in the military sense, the earthworks acted as a defence against natural predators like wolves, as well as human predators. Local warfare and cattle raiding were commonplace at this time. The construction of so many throughout the country, in a relatively short period (400–500 years), reflects on the stability and wealth of society at the time, and also its homogeneity. As well as farming-related activities like corn-grinding and animal husbandry, the ringfort was home to a wide variety of craft industries, including spinning, weaving, metal- and glass-working. Dwellings and outhouses were built on timber posts, with walls of wattle, mud or sods, which usually leave no trace above ground today. Excavation can trace the remains of these structures by revealing features like post-holes, stake-holes and sunken hearths (Power 1992, 131).

There are abundant examples of known ringfort/enclosure sites in the landscape immediately surrounding and to the north of the proposed project; in the townland of Rowgarrane (CO075-008----), two examples in the townland of Ballynaroon (CO075-009----

and CO075-010----), in the townland of Ballyregan (CO075-012----), and in the townland of Killacloyne (CO075-012----)

14.3.2.3 Post-medieval period (1540–1900)

By the 17th century the main village settlements in east Cork were Killeagh, Carrigtwohill, Castlemartyr and Cloyne, with the growth of Castlemartyr and Midleton gradually edging out Cloyne as it moved into the 19th century (Lee 2014, 74). Both Midleton and Castlemartyr were newly established centres in the 17th century. The majority of the railway line runs through the parish of Carrigtohill, and life in the early 19th century can be viewed through Samuel Lewis's 1837 A Topographical Dictionary of Ireland:

> CARRIGTOHILL, a parish in the barony of BARRYMORE, county of CORK, and province of MUNSTER, 3 miles (W.) from Midleton; containing 3666 inhabitants. This parish is situated on the road from Cork to Waterford, and comprises 10,025 statute acres, as applotted under the tithe act, and valued at £8270 per annum: about 800 acres are woodland and nearly 500 waste; and the remainder, 6600 are arable and 2600 pasture. The soil is in some places very light, and in others deep and rich, producing excellent crops: the system of agriculture has been extensively improved by the example and encouragement of the late Mr. Smith Barry and other resident proprietors. Great quantities of limestone are quarried and burnt into line for manure. The scenery in almost every part is exceedingly interesting, particularly near Foaty, around which the rich woods and thriving plantations are beautifully diversified with water. Several extensive plantations have been made in other parts of the parish, which in a few years will add greatly to the appearance of the country.
>
> The principal gentlemen's seats are Foaty, the elegant residence of the late J. Smith Barry, Esq.; Ann Grove, of F. Wise, Esq.; Tulligreen, of Hughes Martin, Esq.; Spring Hill, of W. J. Wakeham, Esq.; Rockville of T. Barry, Esq.; Green View, of R. Barry, Esq.; Barry's Lodge, of D. Barry, Esq.; Union Lodge, of the Rev. W. Gifford; Water Rock, of W. Wakeham, Esq.; and Johnstown, of Mrs. Palmer. The village consists principally of one large irregular street, and contains 98 small houses indifferently built. It is a constabulary police station; and fairs are held on the 12th of March and May, Aug. 26th, Sept. 19th, and Nov. 8th, chiefly for horses, cattle, pigs, and pedlery, and from the central situation of the place, are in general well attended. A new line of road from this place to Cove has been recently opened through Foaty, and a very handsome bridge has been erected over the arm of the sea.

The line terminates in the town of Midleton, which Lewis describes thus:

> MIDLETON, an incorporated market and post-town, and a parish, in the barony of IMOKILLY, county of CORK, and province of MUNSTER, 13 miles (E.) from Cork, and 137 ½ (S. W.) from Dublin; containing 6599 inhabitants, of which number, 2034 are in the town. This place, called anciently Chore Abbey and Castrum Chor, derived both its origin and ancient name from the foundation of a Cistercian monastery, in 1182, by Barry Fitzgerald, who placed in it monks from they abbey of Nenay or Magio, in the county of Limerick. The abbey, from its situation near a ford, was called the "abbey of St. Mary de Chore;" and the village which afterwards arose near it was for the same reason called Bally-na-Chore, (now Ballinacurrra), or "the town on the ford," which, previously to the incorporation of the town, was also the name of the parish.

The present town, deriving its name from its situation on the road from Youghal to Cork, at a nearly equal distance from each place, is pleasantly situated at the head of the vale of Imokilly, in a healthy and fertile country, screened by lofty hills and embellished with handsome seats; and on an inlet of the north-eastern angle of Cork harbour, which is navigable for vessels of 300 tons' burden to Ballinacurra: it consists principally of one main street, from the centre of which another branches off to the east, and contains 247 hours, most of which are uniformly built and of handsome appearance. The inhabitants are amply supplied with excellent water from springs; and there are two river, the Avannachora, or Midleton river, which bounds the town on the west and falls into the inlet about a mile below it; and the Rocksborough river, which skirts its southern part and flows into the former. Both rivers abound with salmon and trout, and over each is a handsome stone bridge.

Great improvements have been made since the year 1824, and others are in progress; several new buildings have been erected in the town and along its approaches, and a new line of road has been opened, forming a handsome western entrance. There are two news-rooms; and races are held in February. In addition to the traffic which this place derives from its situation on a great public thoroughfare, it possesses, by means of its creek from Cork harbour, which extends to the rear of the town, all the advantages of a sea-port. At Bailick, about a quarter of a mile below the town, are very commodious quays, accessible to vessels of 300 tons' burden, which may lie alongside and load and unload in security; also some extensive store-houses, where coal, timber, iron, slate, and other heavy goods are landed and warehoused: and within a mile of the town is the convenient port of Ballingacurra. At both these places are very spacious stores for grain, and large quantities of wheat and oats are annually shipped for Liverpool and Bristol.

The port of Ballinacurra is a member of that of Cork, and a deputy-water-bailiff is placed there to collect the dues claimed by the Harbour Board, and the Foundling hospital of that city. An attempt to introduce the woollen manufacture was made some years since by Marcus Lunch, Esq., a merchant of Cork, wo erected spacious buildings, which he furnished with requisite machinery for conducting it on a very extensive scale. The enterprise, however, was not attended with success, and the buildings and site were purchases by the government for £20,000 and converted into a military station, chiefly for regiments preparing for embarkation. On the breaking up of this latter establishment, the premises became the property of Lord Midleton, from whom they were purchased, in 1825, by Messrs. Murphy and Co., who converted them into a very extensive distillery and malting establishment, and present producing 400,000 gallons of whiskey annually, and affording employment to 180 persons.

On the Midleton river are the distillery and malt-works of Messrs. Hackett, erected in 1824, producing annually 200,000 gallons of whiskey, and employing 60 persons. On the same river are the boulting-mills of Messrs. Allin, which have been enlarged, and are now, in addition to their water-power, worked by a steam-engine, erected in 1835; they manufacture about 3000 bags of flour annually. They are also two very large breweries and two extensive malting establishments. The produce of these several works is exclusively for home consumption, and the amount of duty paid to Government by their proprietors collectively exceeds £100,000 per annum. At Bailick are the extensive lime-works of G. Swayne, Esq.; and within two miles of the town are Milltown mills, lately erected by Messrs.

Swayne and Leech, at an expense of £3000, and manufacturing annually 12,000 barrels of fine" flour. The market is on Saturday, but from its proximity to the markets of Cork and Youghal, is confined chiefly to the sale of butchers' meat, poultry, dairy produce, and potatoes. The chartered fairs are on May 14th, July 5th, Oct. 10th, and Nov. 22nd; and two fairs recently established are held on Feb. 14th and Sept. 10th. The market-house is a handsome building, surmounted by a turret, in which is the town clock, and crowned with a cupola; it was erected in 1789, and is the property of Viscount Midleton, who is lord of the manor; the lower part contains the shambles, weigh-house, and accommodations for the market; and the upper part contains an elegant assembly-room, and council-chambers for the use of the corporation; but they are now used principally as news-rooms. A chief constabulary police force is stationed in the town.

The town received a charter of incorporation from Charles II., in the 22nd of his reign, dated June 10th, 1670, which granted to Sir John Brodrick, Knt., that this estate should be constituted the manor of Midleton, with a seneschal, a court baron, and a court of record with jurisdiction within the manor to the amount of £200; and that the town, with the castle and lands of Castle-Redmond and Corabbey, part of the said manor, should be a free borough and corporation, under the designation of the "borough and town of Midleton." By this charter the corporation consists of a sovereign, two bailiffs, twelve free burgesses, and an indefinite number of freemen, assisted by a recorder, town-clerk, and other officers.

The sovereign, who is a justice of the peace within the borough, and the two bailiffs, are annually chosen from the burgesses by a majority of that body, by whom also freemen are admitted by favour only. The recorder, who is also town-clerk and seneschal of the major, is appointed by the lord of the major. The limits of the borough comprise an area of 100 acres encircling the town. Under the charter the corporation continued to return two members to the Irish parliament till the Union; when the borough was disenfranchised. The manorial court of record, formerly held by the seneschal every three weeks, for the recovery of debts not exceeding £200 late currency, has not been held since 1832. The general quarter sessions for the East Riding of the county are held here in June and November. The court-house is a neat and commodious edifice of hewn limestone, situated at the western entrance into the town; and adjoining it is a small but well-arranged bridewell.

The parish, which is also called Castra-na-chore, comprises 5320 statute acres, as applotted under the tithe act; the soil, though in some parts light, is fertile, and the system of agriculture greatly improved; there is neither waste land nor bog. The substratum is generally limestone, which is quarried for agricultural and building purposes; and the surrounding scenery is pleasingly diversified, and in many points highly picturesque.

The principal seats are Cahirmore, the property of Lord Midleton, at present occupied by his lordship's agent, T. Poole, Esq.; Bally-Edmond, the residence of R. Courtenay, Esq.; Broomfield House, of D. Humphreys, Esq.; Killeagh Farm, of W. Welland, Esq.; Charleston, of the Rev. R. Deane Freeman; Ballinacurra Lodge, of T. H. Rumley, Esq.; and Lake View, of S. Fleming, Esq.

The living is a rectory and vicarage, in the dioceses of Cloyne, and in the patronage of the Bishop; the tithes amount to £897. 16. 7. The glebe-house, a large and handsome residence, is pleasantly situated; and the glebe comprises 15 acres of good land. The church, erected in 1823 at an expense of £3000, a loan

from the late Board of First Fruits, isa handsome structure, in the later English style, with an embattled tower crowned with pinnacles, and surmounted by a light and elegant spire, erected after a design and under the immediate superintendence of Messrs. Pain: it was recently repaired by aid of a grant of £202 from the Ecclesiastical Commissioners. In the churchyard is a mausoleum of grey marble, in the Grecian style, having in front a pediment resting on two lofty pillars, between which is a tablet of white marble, inscribed to Charles Brodrick, D.D., Archbishop of Cashel, and formerly rector of the parish, fourth son of George, Viscount Midleton; and to his wife, the Hon. Lady Brodrick, second daughter of R. Woodward, D.D., Bishop of Cloyne, by their seven surviving children.

In the R. C. divisions the parish is the head of a union or district, comprising also the parishes of Ballyspillane, Inchynebacky, Mogeeshy, and Ballyouteragh; the chapel, near the eastern extremity of the town, is a spacious edifice, and there is also a chapel at Ballintoretis. A convent of nuns of the order of the Presentation has been recently completed; it is a handsome building on the road to Ballinacurra, and consists of a centre and two wings, one which forms the domestic chapel, and the other a school-room for girls, who are gratuitously taught by the ladies of the convent. This is one of the institutions of that order, for the erection of which Miss Gould, a sister in the Presentation convent of Deraile, bequeathed £10,000. A college was founded here, in 1709, by Lady Elizabeth Villiers, afterwards Countess of Orkney, who endowed it with lands in the baronies of Kinnalea, Kerrycurrihy, and Carbery, in this county, vested in trustees, with power to appoint the master.

These estates were let by the trustees in the perpetuity at a reserved rent of £200 per ann., of which £100 is paid as a salary to the master; in this school have been educated several eminent, among whom was the Rt. Hon. John Philpot Curran; it is now a seminary of very high character. Nearly 500 children are taught in four public schools, of which the parochial male and female schools are supported by Lord Midleton, who provided both school-rooms, and a residence each for the master and mistress, and by the rector. There are a dispensary and a fever hospital, the latter a handsome building. At Bailick are some remains of Castle Redmond, built by Redmond Fitzgerald, or Fitz-Edmund in the reign of Henry VIII., and in which the last R. C. Bishop of Cloyne, prior to the Reformation, was born.

There are at Cahirmore some remains of the castle built, in 1759, by R. Fitzgerald, or Barry, from which the seneschal of Imokilly was driven out by Captain Raleigh, in 1580, and obliged to take refuge in Chore abbey, which was formerly in the churchyard of Midleton, whence he was also compelled to retreat by the same assailant. The abbey, which was a stately edifice of great strength, was built by the Knights Templars in 1298, and the last remains of it were taken down to afford a site for the present church. At Coppingerstown are the ruins of a castle of the Fitzgeralds; on the south side of the town are some very slight remains of an hospital, founded by Edward I., at Ballinacurra are the ruins of the old parish church, and at Ballyannan are the remains of the mansion built by the first Lord Midleton.

A large belt and the horns of a moose deer were found in a bog on Lord Midleton's estate; and on Killeagh Farm were found numerous silver coins of the reign of Elizabeth. Midleton gives the title of Viscount to the family of Brodrick.

14.3.2.4 Cork and Youghal Railway (1859-1980s)

The Cork and Youghal Railway company began construction on rail links between Cork City and the town of Youghal in 1854. The first section of the rail line, between Midleton

and Dunkettle, was opened in 1859, and the full service from Cork to Youghal opened on 23 May 1860, stopping at Dunkettle, Little Island, Queenstown Junction, Carrigtohill, Midleton, Mogeely, and Killeagh en route. The passenger service operated continuously until ending on 2 February 1963, although Summer Sunday excursions from Cork to Youghal ran until 1987. Goods services ceased in June 1978, with only harvest-time beet transport running until 1981 (The History of the Railway at a Glance (askaboutireland.ie)).

46 years after the last passenger train operated on the line, and 35 after a campaign was begun to re-open the railway services, the Cork Suburban Rail opened 31 July 2009 with a service from Cork to Midleton. The project was funder under the Transport 21 investment programme, and involved the provision of a 10km single track railway to Midleton with a passing loop at Carrigtohill, new bridges to replace level crossings, improving existing bridges, new signalling systems, and reopening Carrigtohill and Midleton Stations (O'Brien 2009 - Cork-Midleton rail line opens (irishtimes.com)).

There are currently no plans to reopen the line between Midleton and Youghal. Instead, Cork County Council is developing a 23km greenway between the two towns, with connections in the villages of Mogeely and Killeagh (McNamara 2018 - Irish Rail rules out reopening Youghal to Midleton line, backs greenway development (echolive.ie)).

14.3.2.5 Toponomy of Townlands

The Irish landscape is divided into approximately 60,000 townlands and the system of landholding is unique in Western Europe for its scale and antiquity. Research into the names (toponomy) of these land units frequently provides information relating to the townland's archaeology, history, folklore, ownership, topography or land use. Most placenames (including townland names) were anglicised by the time the Ordnance Survey began in the 1830s. However, despite some inaccuracies in translation, the Gaelic, Viking, Anglo-Norman and English origins of place names are generally recognisable. A study of the townland names can provide information on aspects of cultural heritage including descriptions of the use of the landscape by man and the potential presence of archaeological or cultural heritage sites or features.

The proposed development extends through 13 townlands.

Table 14-8 Townlands traversed by the scheme

English Name	Irish Name	Glossary
Anngrove	*Baile na Speire*	baile townland, town, homestead
Ballyadam	*Baile Adaim*	baile townland, town, homestead
Ballyrichard More	*Baile Risteaird Mór*	baile townland, town, homestead mór great, big
Carrigane	*An Carragán*	
Carrigtohill	*Carraig Thuathail*	carraig rock
Gortnamucky	*Gort an Mhuicí*	gort field
Johnstown	*Baile Sheáin Gall*	baile townland, town, homestead gall foreigner; standing stone
Killacloyne	*Cill Mhic Leighin*	cill church
Killahora	*Coill an Hóraigh*	coill(also: coillidh, coillte, coille) wood
Knockgriffin (Barrymore)	*Cnocán Ghrífín*	cnocán hillock
Knockgriffin (Imokilly)	*Cnocán Ghrífín*	cnocán hillock

English Name	Irish Name	Glossary
Terry's Land	*Fearann an Tiaraigh*	fearann land
Water-Rock	*Carraig an Uisce*	carraig rock isce water

14.3.2.6 Recent Excavations

The Excavations Bulletin is an annual account of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2020. This database was consulted as part of the desktop research for this report to establish if any archaeological investigations had been carried out within the townlands traversed by the scheme route. The database produced 19 examples of licensed archaeological investigations undertaken within the townlands incorporated by the study area (see also Appendix 14.2). Of these 19 investigations, 14 sites did not identify any archaeological deposits. One investigation (06R0199) comprised a metal detection survey of the site of the proposed bridge over the Owenacurra River undertaken in 2007; nothing of archaeological significance was noted during this survey. The remaining archaeological investigations comprised four excavations;

- Ballyadam townland - *Fulacht Fiadh* and pits (06E0612)
- Carrigtohill townland - Linear features (11E0167)
- Carrigtohill and Terrysland townlands - Multi-period (15E0233)
- Knockgriffin and Townparks townlands - Industrial (06E1165)

At Ballyadam, five distinct areas were excavated (Ballyadam 1-5) under license number (06E0612). C14 dating of material from the excavations were largely Early Bronze Age in date although Ballyadam 1 returned an Iron Age date.

Ballyadam 1 – Pits and post-hole

Five pits and a post-hole were recorded in close proximity to each other. Two had lenses of charcoal-enriched soil and oxidised clay in the fills and the general impression was that the material was dumped into the pits from activity elsewhere rather than *in situ* burning. Burnt animal bone, a stone axehead fragment and a shaped stone were recovered from a single excavated pit. Blackthorn/cherry charcoal from the basal fill of one pit returned a 14C determination of 94–231 cal ad; 1847645 (uba 8450) while Hazel charcoal from another yielded a 14C determination of 88–178 cal ad; 1862629 bp (uba-8448) (Cleary 2006).

Ballyadam 2 - Fulacht Fiadh

Ballyadam 2 comprised the remains of a *Fulacht Fiadh.* The shattered stone spread was dispersed over an area measuring 20m x 15m. A mixture of alder, hazel and apple-type charcoal returned a 14C determination of 2283–2146 cal bc; 3788630 bp (uba 8449). The maximum extant height towards the north end was 0.4m and the stone tailed off towards the south. The stone was predominately sandstone sourced at some distance from the site. Twelve pits were recorded on the site with three were outside the limit of the stone spread. Two large pits were interpreted as the locations of troughs (*ibid.*).

Ballyadam 3 – Fulacht Fiadh

Ballyadam 3 comprised a dispersed spread of heat-shattered stones over a series of pits, including a trough, to the south of a naturally occurring pond. Three post-holes were recorded to the north-west of the trough and ten stake-holes were to the south of a pit. The pit fill comprised layers of heat-shattered stones and charcoal-rich silt and charcoal. Alder

charcoal from the basal layer yielded a 14C determination of 996–920 cal bc; 2804631 (uba 8452) (*ibid.*).

Ballyadam 4 – Burnt-stone spread

Ballyadam 4 comprised a spread of heat-shattered stone and three pits. The stone spread was irregular in plan and measured 6.8m x 6.3m with a maximum central thickness of 0.25m. The spread tailed off around the edges. Hazel charcoal from the basal layer of a pit returned a 14C date of 2197–2042 cal bc; 3726633 bp (uba 8453) (*ibid.*).

Ballyadam 5 – Fulacht Fiadh

Ballyadam comprised a spread of heat-shattered stones over a trough and eight pits. The pits were located to the north and south of the trough. The trough was the largest on site, was roughly oval in plan and the edges were irregular on the north side. A mixture of hazel, apple-type and birch charcoal from a pit returned a 14C determination of 2192–2938 cal bc; 3714634 bp (uba 8454) (*ibid.*).

In 2011 at Carrigtohill townland a programme of archaeological assessment (11E0167) for a proposed extension to St Mary's Boys National School, Carrigtohill, was undertaken. The extension is located near the site of a shell midden (CO075-068) excavated by Michael J. O'Kelly in the 1950s. Three test trenches were opened. A feature was uncovered in Trench 1 at a depth of 1.25m from present ground level at the eastern end of the trench. The cut had a broad, V-shaped profile and measured 0.55m in maximum depth. A sherd of glazed medieval pottery, dating from the 13th–14th century, was recovered from the upper portion of the fill. A second cut feature was also uncovered at the western end of the trench. The fill appeared to be similar to that of the aforementioned linear feature (Carroll 2011) (*ibid.*).

Also in the townland of Carrigtohill at Station Road during 2015, a further archaeological assessment (15E0233) took place at the site of a proposed Post-Primary school and an amalgamated National school. A total of forty-five test trenches with a combined total of 3,013 linear metres (6,026 sq. m) were excavated within the site. Only two features of interest were exposed, two linear ditches measuring approximately 2m in width and aligned roughly east-west. Both ditches were filled with a brown clay containing post-medieval pottery and glass and are on the same alignment as two field boundaries marked on the 25 inch OS map and obviously formed part of the farm (Murphy 2015).

At Knockgriffin and Townparks townlands in 2006 a centre-line test-trench was excavated along the proposed route of the Midleton northern relief road for a total distance of 1.15km (06E1165). Following testing, part of two mill-races, a wall and two drains associated with Avoncore Mills (built *c.*1824), in the townland of Townparks, were excavated. These features were to be retained *in situ* under the proposed road (Ní Loingsigh 2006).

14.3.3 Designated archaeological sites

Record of Monuments and Places (RMPs)

Section 12 (1) of the National Monuments Act 1994 made provision for the establishment and maintenance of a Record of Monuments and Places (RMP). Under this Act, each site recorded in the Record of Monuments and Places is granted statutory protection. When the owner or occupier of a property, or any other person proposes to carry out, or to cause, or to permit the carrying out of any work at or in relation to a recorded archaeological monument they are required to give notice in writing to the Minister for Housing, Local Government and Heritage 2 months before commencing that work.

There is one recorded archaeological monuments incorporated by the study area (Appendix 14.1; Figure 14.2; Plate 14.1):

- a lime-kiln (CH001) in the townland of Water-Rock.

National Monuments

National monuments are broken into two categories; National Monuments in the ownership or guardianship of the state and National Monuments in the ownership or guardianship of a local authority. Section 8 of the National Monuments (Amendment) Act 1954 provides for the publication of a list of monuments, the preservation, of which, are considered to be of national importance. Two months' notice must be given to the Minister for Housing, Local Government and Heritage where work is proposed to be carried out at, or in relation to, any National Monument.

There are no National Monuments incorporated by the study area.

Sites with Preservation Orders

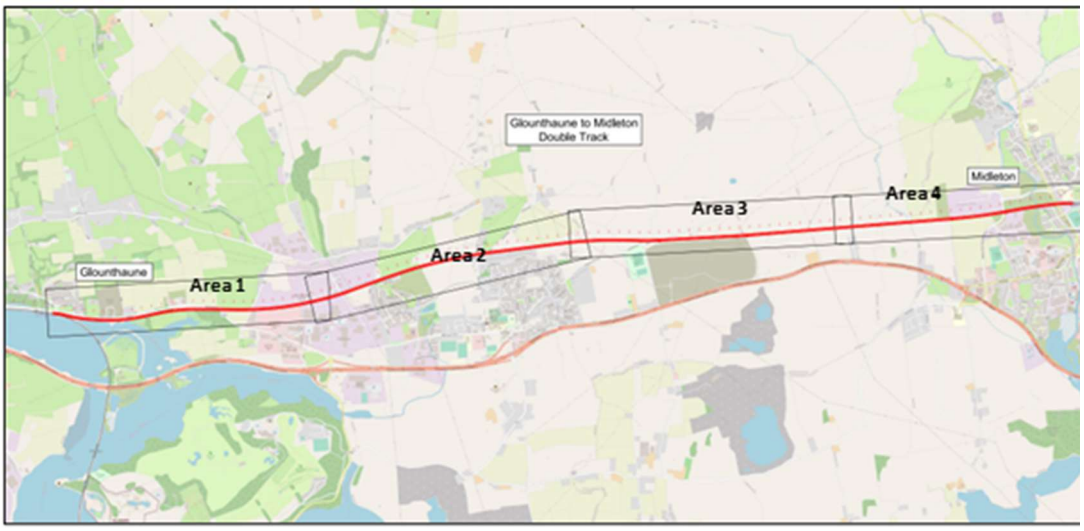
The National Monuments Act 1930-2004 provide for the making of Preservation Orders and Temporary Preservation Orders in respect of National Monuments. Under Section 8 of the National Monument Act 1930 (as amended) the Minister for Housing, Local Government and Heritage, can place a Preservation Order on a monument if, in the Ministers' opinion, it is a National Monument in danger of being or is actually being destroyed, injured or removed or is falling into decay through neglect. The Preservation Order ensures that the monument shall be safeguarded from destruction, alteration, injury, or removal, by any person or persons without the written consent of the Minister.

There are no sites with preservation orders incorporated by the study area.

14.3.4 Designated architectural heritage sites

For the purposes of the architectural assessment the proposed development is confined to the existing rail corridor, as shown below in Figure 14.1, and is broken up into four sections, Areas 1-4.

Figure 14.1: Railway Line divided into Areas 1 – 4



Source: CHSA

14.3.4.1 Protected Structures

The Cork County Development Plan (2022-2028) was consulted for schedules of Protected Structures. These are buildings that a planning authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social, and/or technical point of view. Protected Structures receive statutory protection from injury or demolition under Section 57 (1) of the Planning and Development Act 2000 (as amended). Protected structure status does not exclude development or alteration but requires the developer to consult with the relevant planning authority to ensure that elements which make the structure significant are not lost during development.

Table 14.9: Architectural Heritage Listed on the Record of Protected Structures in the Project Area

CH No.	Architectural heritage structure	Townland and location:	Area:	Character/ age:	Significance/Protection Status Ref:	Predicted Effect:
CH004	Midleton Railway Station	Townparks; adjacent to railway line	Area 4	1860	Planning and Development Act, 2000; RPS 02512 on the Draft County Development Plan, 2022-2028	None
CH042	Parochial House	Carrigtwohill; Station Rd, E of Barrys Bridge, S of railway	Area 2	1870-1890	Planning and Development Act, 2000; RPS 01315, CCDDP	None
CH013	Former Dispensary	Carrigtwohill; Station Rd, W of Barrys Bridge, S of railway	Area 2	1870-1890	Planning and Development Act, 2000; RPS 01316	None

14.3.4.2 Architectural Conservation Areas

The Planning and Development Act, 2000 also provided for Architectural Conservation Areas (ACAs). ACAs are defined as a place, area, group of structures or townscape that is of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest or contributes to the appreciation of protected structures. Midleton Railway Station and the railway line are located in relatively close proximity to the northern end of the Midleton ACA on the Mill Road, but not within the ACA, as shown below. While new work, even at a distance from an ACA can have an impact on its significance, the nature of the project as described in Chapter 6 is not considered to have an impact on the ACA.

Figure 14.2: Extract from Volume 7 of the Cork County Draft Development Plan 2022-2028 showing the railway line in relation to the northern end of the Mill Road which is part of Midleton ACA

Source: CCDP 2022-2028

14.3.4.3 National Inventory of Architectural Heritage (NIAH)

The National Inventory of Architectural Heritage (NIAH) is a list of structures compiled by the (then) Department of Arts Heritage and the Gaeltacht and now maintained by the Department of Housing, Local Government and Heritage. The purpose of the NIAH was to identify, record, and evaluate the post1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the architectural heritage. The NIAH has provided the basis for the recommendations of the Minister for Arts, Heritage and the Gaeltacht to planning authorities around the country for the inclusion of particular structures in their Record of Protected Structures.

Table 14.10: Architectural Heritage listed on the NIAH in the Project Area

CH No.	Architectural heritage structure:	Townland and location:	Area:	Character/ age:	Significance/ Protection Status Ref:	Predicted Effect:
CH002	Barrys Bridge (OBY6)	Carrigtwohill; Carries Carrigtwohill-Leamlara Road over railway	Area 2	1855-1860	CCDDP; NIAH 20907550 (Regional)	None
CH010	Former Stationmasters House	Carrigtwohill; to S of railway line, E of Barrys Bridge	Area 2	1855-1860	NIAH 20907552 (Regional)	None
CH009	Wises Bridge (OBY4)	Terrysland; Carries road from Terrysland to Forest Town over railway	Area 2	1855-1860	NIAH 20907553 (Regional)	None

CH No.	Architectural heritage structure:	Townland and location:	Area:	Character/ age:	Significance/ Protection Status Ref:	Predicted Effect:
CH008	Haly's Bridge (Killacloyne Bridge) (OBY2)	Killacloyne; Carries road N from Killacloyne Crossroads	Area 1	1855-1860	NIAH 20907548 (Regional)	Minor localized temporary manageable effect by CFA piling in close proximity; Slight, localised effect by demolition and re-construction of part of NE wing-wall to allow extension of culvert UBY2
CH003	Former Carrigtwohill Railway Station	Carrigtwohill; Station Rd, E of Barrys Bridge, S of railway, adjacent to it	Area 2	1855-1860	NIAH 20907551 (Regional)	None
CH006	Railway Station and Footbridge	Johnstown; Glounthaune Station, adjacent to railway line; footbridge carries pedestrian traffic over the railway line	Area 1	1860-1865	NIAH 20907540 (Regional, 1860-65)	None
CH007	Private House	Killacloyne; on N side of N25, at a distance from the railway line	Area 1	1925-1935	NIAH 20907546, (Regional, 1925 – 1935)	None
CH011	Post Box	Johnstown; Set in wall, opposite station, at a distance from the railway line	Area 1	1910-1920	NIAH 20907538 (Regional, 1910-1920)	None

14.3.4.4 Undesignated architectural heritage

The development of railway lines, and the structures and features associated with them form part of Irelands rich industrial archaeological heritage. These post-medieval and industrial items of architectural heritage include a variety of structures from bridges and railway features to mass rocks and famine burial grounds. They can make a valuable contribution to the local historic landscape and have potential to add to our understanding of the past.

Whilst some of these are Archaeological Monuments and/or Protected Structures, the vast majority have no such protection and are consequently very vulnerable items of our heritage. They have been assessed here using the second edition Ordnance Survey maps (the first edition being too early to show railway features, which also impacted on any earlier features).The list of extant features from the second edition 25-inch OS map is set out below:

Table 14.11: Architectural Heritage shown on Second Edition 25-inch OS maps in the project areas

CH No.	Architectural heritage structure:	Townland and location:	Area:	Character/ age:	Predicted Effect:
CH033	Killacloyne Bridge (OBY1)	Killacloyne	1	1858-59	None

CH No.	Architectural heritage structure:	Townland and location:	Area:	Character/ age:	Predicted Effect:
CH034	Ballyadam Bridge (OBY7)	Ballyadam	3	1858-59	None
CH035	Ballyadam House gate lodge	Ballyadam	3	Late 1850s/ early 1860s	None
CH036	Ballyadam House Bridge/ agricultural overpass (OBY8)	Ballyadam	3	1858/59	Significant, direct, irreversible, negative effect
CH037	Underpass	Water Rock	4	Possibly not historic - inaccessible	None
CH038	Level Crossing location (XY010)	Knockgriffen (Imokilly By.)	4	1899	None; crossing to be closed, (note only location original; fabric replaced)
CH039	River bridge buttresses (UBY 11)	Knockgriffin (Imokilly By.)/Townparks	4	1858-59	Minor, localized, visual and reversible effect on historic buttresses (note deck only to be replaced)
CH040	Level Crossing location, Mill Road (XY012)	Townparks	4	1858-59	None (note only location original; fabric replaced)
CH041	Ballast pit	Townparks/Broomfield East	4	1912	None

14.3.4.5 Undesignated cultural heritage sites

This section deals with sites that are considered to be of cultural heritage value but which do not fall within the above categories as they are not registered. Such sites may include lime kilns, dwellings / outhouses, trackways or townland boundaries etc. identifiable on the 1st edition 6-inch/25-inch OS maps. Aerial photography from the 1995, 2000, and 2005 fly-overs was inspected, as well as the latest OSI images, Google Earth and Bing Maps satellite imagery. In addition, publicly available LiDAR data published by TII and OPW was also consulted.

Undesignated cultural heritage sites that comprise extant remains

Undesignated cultural heritage sites which comprise extant remains are typically, though not always, post-1700 in date. The majority of these sites are represented on the 6” and/or 25” Ordnance Survey maps. Many constitute country houses and associated lodges, while others may be bridges or industrial features, hollow-ways, mass rocks etc.

There is one undesignated cultural heritage site that comprises extant remains present within the development site (Appendix 14.1; Figure 14.2);

- CH014, located in the townland of Townparks. The Historic 25-inch and Cassini 6-inch Ordnance Survey maps show a structure directly north of the tracks from the signal box, which is still extant.

Undesignated cultural heritage sites that do not comprise extant remains

Undesignated cultural heritage features which do not comprise extant remains typically include features such as lime kilns, dwellings, outhouses, trackways, etc. which are identifiable on maps such as the 6” and / or 25” Ordnance Surveys but which no longer have an above-ground presence. No undesignated cultural heritage features which do not comprise extant remains have been identified.

14.3.4.6 Townland boundaries

A townland is the smallest official land unit in the country. Ireland is made up of approximately 60,000 townlands. As a result, townland boundaries are ubiquitous in the Irish countryside, and have been incorporated into the modern agricultural landscape. Many townlands predate the arrival of the Anglo Normans, and Irish historical documents consistently use townland names throughout the historic period to describe areas and locate events accurately in their geographical context. This suggests that many the boundaries of many of these territorial units preserve landscape divisions from the medieval period and perhaps earlier. The townland names and boundaries were standardised in the nineteenth century when the Ordnance Survey began to produce large-scale maps of the country. Research into the name of these land units frequently provides information relating to its archaeology, history, folklore, ownership, topography or land use.

Although the project crosses 14 townland boundaries, each of these has been previously broken by the existing railway line.

Table 14-12 Townland boundaries intersected by the scheme

CH No	Summary	Summary
CH015	JOHNSTOWN	Johnstown/Killahora Townland Boundary
CH016	KILLAHORA	Killahora /Killacloyne Townland Boundary
CH017	KILLACLOYNE	Killacloyne/Anngrove Townland Boundary
CH018	ANNGROVE	Anngrove/Terrysland Townland Boundary
CH019	TERRY'S-LAND	Terrysland/Carrigtohill Townland Boundary
CH020	CARRIGTOHILL	Carrigtohill/Ballyadam Townland Boundary
CH021	BALLYADAM	Ballyadam/Carrigane Townland Boundary
CH022	CARRIGANE	Carrigane/Ballyrichard More Townland Boundary
CH023	BALLYRICHARD MORE	Ballyrichard More/Water Rock Townland Boundary
CH024	WATER-ROCK	Water Rock/Knockgriffin (Imokilly) Townland Boundary
CH025	KNOCKGRIFFIN (IMOKILLY)	Knockgriffin (Imokilly)/Knockgriffing (Barrymore) Townland Boundary
CH026	KNOCKGRIFFING (BARRYMORE)	Knockgriffing (Barrymore)/ Knockgriffin (Imokilly) Townland Boundary
CH027	KNOCKGRIFFIN (IMOKILLY)	Knockgriffin (Imokilly)/Townparks Townland Boundary
CH028	TOWNPARKS	Townparks/Broomfield East Townland Boundary
CH029	TOWNPARKS	Townparks/ Broomfield West Townland Boundary

14.3.4.7 Areas of Archaeological Potential

Areas of archaeological potential (AAPs) are areas or locations whose characteristics present a higher potential for unknown archaeological features to be present. Two AAPs were identified;

- Johnstown and Killahora townlands, where the route borders the Glounthaune Estuary / Salty Water Complex.
- In Knockgriffin townland where a temporary construction compound will be established immediately adjacent and to the existing railway line and the Owennacurra River.
- In Townparks townland where a temporary construction compound will be established immediately adjacent to the existing railway line and the Owennacurra River.

Watercourses are considered to be of high archaeological potential, often associated with fulachta fiadh or burnt mounds in rural settings and more commonly, fords, ancient bridging sites, mills, quays and harbours in urban locations. In addition, estuary sites, such as the location of the railway, have been favoured for human occupation since prehistoric times due to their proximity to rich food sources and have additionally served as routeways, boundaries, defences and as a focus for ritual and votive offering. As a result, the western area of the development site bordering the estuary is considered to be an Area of Archaeological Potential (AAP) (CH030), as well as the site of the temporary construction compounds adjacent to the Owenacurra River in the townlands of Knockgriffin (CH031) and Townparks (CH032).

14.3.4.8 Historic Background

The railway line between Cork and Youghal was initially proposed as part of a wider scheme to connect Cork and Waterford in the 1840s by the Cork and Waterford Railway Company. This proposal failed however given the physical difficulties and lack of financial support. In 1854 the *Cork & Youghal Railway Company* (C&YR) was granted legislative authority by the House of Commons to develop a railway between Cork and the town of Youghal, then a popular seaside resort and a town of some prosperity with a port and a hinterland accessible via the River Blackwater.

The company was led by Isaac Butt, leader of the Irish Party in the House of Commons and the M.P. for Youghal. It found it difficult to raise capital initially but managed to obtain sufficient funds to construct a railway line between Dunkettle and Midleton. The line could not be carried into the city and the main railway station there on the Lower Glanmire Road as the company did not own the land where it was intended to run the railway line nor have the finances to purchase it.

Initially the section of line between Dunkettle and Midleton was constructed in the period 1858-59. Over 1200 men and 70 horses were employed for its construction. This was facilitated by the presence of the Cork to Youghal road which ran close to the railway line route over much of its initial section. The line was opened on 10th November 1859 by the Lord Lieutenant, Lord Carlisle at Dunkettle. He then proceeded to Johnstown (Glounthaune) where he turned the sod for the construction of the branch line to Queenstown (Cobh). Passenger services began on 12th November 1859 with services to Youghal commencing 23rd May 1860, initially from Dunkettle and from October 1860 from a temporary terminus in Summerhill, across the road from the main Cork-Dublin railway station.

The C&YR was financially never secure. One of its principal investors was David Leopold Lewis, a London financier who had purchased C&YR shares at a 40% premium. He also purchased much of the town of Youghal from the Duke of Devonshire in 1861. Joining the company in 1859 he was an extravagant and generous character, laying on large ‘entertainments’ for shareholders, the local gentry and guests.

He was declared bankrupt for the third time in 1865 and jailed. His interest in the C&YR was purchased by the *Great Southern & Western Railway Company* (GS&WR) in 1866, that company having operated the C&YR line since 1865 to keep it in operation. An important element of the railway line was the large amount of emigrant traffic going to Queenstown and the mails incoming and outgoing to Britain and the US. The GS&WR doubled the track between Cork and Queenstown Junction in 1869 and to Queenstown itself in 1882. The railway line to Youghal then became a branch line. It was brought up to GS&WR standards soon after its takeover. Many of the stationmaster’s houses were refurbished or rebuilt in 1868.

The last scheduled passenger train between Cobh Junction and Youghal ran on 2nd February 1963 after which the route was replaced with a bus service. Occasional special services such as seaside excursions, Knock pilgrimage specials and others continued intermittently until 1987. Midleton station, used for storage was badly damaged in a malicious fire in November 1988. Damage was caused to the northwestern parapet of Killacloyne Bridge when a truck carrying butter overturned in March 1992, spilling some of its cargo on the track below. In August 1994 Cobh Junction station was renamed Glounthaune.

The railway line to Midleton was reopened 30th July 2009 for passenger traffic.

Construction

The construction of the Cork and Youghal Railway line was somewhat unusual in that its starting point was not really where its operators wanted to run their services from. The construction works began at Dunkettle, some distance from the city boundary and even further from the city centre. The reason for starting here was twofold – firstly the CYR had reached agreements with landowners from this point eastwards to run the railway line through their land. Indeed, some like Mr. Cummins of Annmount were shareholders in the company. Secondly the route westwards from Dunkettle was far more problematical. A section of the foreshore had to be obtained from the Cork Harbour Commissioners who held out for as much compensation as possible. Arbitration eventually saw the CYR pay £10,000 to the Commissioners. There were more houses and businesses located along the riverside nearer the city. Shipbuilding and sandstone quarrying were two of the active industries here and buying out theses or the right to cross their property was expensive. The further the railway line ventured closer to the city centre, the greater the outlay in compensation. Plans to build a station at the western end of King Street (the modern MacCurtain Street) were never realised, nor were plans for a station close to St. Patrick's Chapel on the Glanmire Road. Eventually a station was constructed on the higher ground above the Glanmire Road.

The significant compensation costs to be paid required continuous inputs of capital. The appearance of David Leopold Lewis appeared to solve many of the company's financial strains. This would be relatively short lived. The prize or the great promise of the line was not the opening up of a swift connection to east Cork and Youghal, it was the opening of a railway line to Queenstown (Cobh) where profits could be made. There was considerable mail traffic between Britain, Europe and America. There was also a steady stream of emigrants leaving in the aftermath of the Famine.

Contractors and engineers

Several contractors would be employed to build the railway line. First were the Messrs. Moore who turned the first sod near New Glanmire (Glounthaune) on March 26, 1855. They relinquished the contract in early 1858 and money for their work was not forthcoming and Brassey and Jackson took over. They too soon left. Then came the partnership of Carlisle and Hutchins. They took over in late 1858 but the partners fell out and quit by August 1859, Carlisle later working on the extension into Summerhill Station in Cork in 1862. Messrs. Ronayne would construct the line to Queenstown

Interestingly the initial proposal for a Cork, Youghal and Waterford Railway had appointed the great railway engineer Sir John Macneill as its engineer, The later company employed the equally talented I. K. Brunel as its engineer.

Description of original works

A description of the works appeared in the *Cork Constitution* on November 12, 1858 (p. 5) – 'Land for a double line of rails has been taken, and bridges for a double line built but at

present the company has contented itself with laying down only a single line…Between Dunkatel (Dunkettle) and Midleton were nine bridges, two of which are very heavy cast iron girder ones, each weighing about thirty-five tons. One crosses the railway at Killacloyne, and the other at Ballyadam. Besides these there is a wrought iron girder bridge over the river at Midleton…Rock cutting, and a sea embankment one mile long lie Dunkatel and Cork. There is a moveable bridge at Dunkatel to allow river traffic on the Glashaboy. The Cork terminal is to be on King Street, within a few houses of Bridge Street.'

A second description in the *Cork Examiner* on 22 August 1859 (p.2) gives a greater sense of what the construction of a railway line entailed – 'The line was inspected by (D.L.) Lewis and engineer Edwardes and others. 1500 men were employed initially but this was down to 1,000 now but would soon be increased. 80 draught horses of the Flemish breed were employed for their strength. There were two steam saw mills – one for sleepers and the other was larger for the manufacture of building timber, woodwork for the station houses. There were carpenters and joiners' workshops and several smithies. A ballasting engine ran between Dunkettle and Midleton. Five bridges have been built and several private ones. A temporary station is under construction at Dunkettle, with a permanent station built at Carrigtohill and the one at Midleton building. This was a brick two-storey building with cut stone facings, a covered platform, offices, etc. An engine house is under construction there also. Carriages for the line are being made by Messrs. Ashbury of Manchester and Messrs. Long of Youghal. The engines are to be built by Neillson of Glasgow.'

A feature of the construction often overlooked is that labouring gangs went around as the line was being built, realigning ditches and roads, installing trackside fencing and hedging as well as field boundaries and culverts.

Fatalities

Several people lost their lives in accidents over the length of the CYR line. Only two appear to have occurred in the section between Glounthaune and Midleton. The Cork Examiner, October 14, 1864 reported that a deaf and dumb beggar woman named Mary O' Callaghan (50) was struck by the 4.30pm Youghal bound train on the down line. She worked occasionally in Healy's (Haly's) farm and appears to have been going towards the farm when she crossed the track in front of the train just east of Haly's Bridge. She did not hear the train approaching despite warnings.

Two British Army officers were fired on by a group of men near Killacloyne Bridge on February 6, 1922.The officers, on their way to Queenstown, returned fire. Shortly afterwards, Michael Savage was found mortally wounded inside the ditch. It was ascertained that he had not been involved in the shooting but was hit in the crossfire. The bridge is described as 'broken-down' in the newspaper account which suggests that it may have been damaged during the War of Independence. This may explain the concrete road decking now in place.

14.4 Likely Significant Impacts of the Development

14.4.1 Construction Phase

Direct Impacts: Most impacts during construction phase are likely to be direct impacts as a result of sub-surface disturbance or construction works. All impacts at this phase are considered to be negative and permanent. These are summarised in Table 14.13 and described in detail in Table 14.14.

Note it is not considered that the twin track expansion will have any impact on townland boundaries where the townland boundary has already been transected by the existing track rail.

Indirect Impacts: It is not proposed to consider any impacts on setting for any sites either within the development site or the wider study area during the construction phase, as construction works constitute a short-term alteration to the landscape.

Table 14-13 Summary of CH sites subject to impacts at Construction Phase

Proposed Development	Descriptor (and Townland)	Construction Phase Impacts
Twin tracking of the single track sections	Carrigtohill Station (Carrigtohill; CH003)	None
	JOHNSTOWN/KILLHORA Townland Boundary (Johnstown; CH105)	None
	KILLAHORA/KILLACLOYNE Townland Boundary (Killahora; CH016)	None
	KILLACLOYNE/ANNGROVE Townland Boundary (Killacloyne; CH017)	None
	ANNGROVE/TERRY'S-LAND Townland Boundary (Anngrove; CH018)	None
	TERRY'S-LAND/CARRIGTOHILL Townland Boundary (Terry's-Land; CH019)	None
	CARRIGTOHILL/BALLYADAM Townland Boundary (Carrigtohill; CH020)	None
	BALLYADAM/CARRIGANE Townland Boundary (Ballyadam; CH021)	None
	CARRIGANE/BALLYRICHARD MORE Townland Boundary (Carrigane; CH022)	None
	BALLYRICHARD MORE/WATER-ROCK Townland Boundary (Ballyrichard More; CH023)	None
	WATER-ROCK/KNOCKGRIFFIN (IMOKILLY) Townland Boundary (Water-Rock; CH024)	None
	KNOCKGRIFFIN (IMOKILLY)/KNOCKGRIFFIN (BARRYMORE) – WEST Townland Boundary (Knockgriffin (Imokilly); CH025)	None
	KNOCKGRIFFIN (IMOKILLY)/KNOCKGRIFFIN (BARRYMORE) – EAST Townland Boundary (Knockgriffin (Imokilly); CH026)	None
	KNOCKGRIFFIN(IMOKILLY)/TOWNPARKS Townland Boundary (Knockgriffin (Imokilly); CH027)	None
Modification of existing bridges	Bridge OBY8 (Ballyadam) Owenacurra Bridge (Knockgriffin)	Refer to Section 14.11 Architectural Heritage
Provision of sidings/turn back facility at Midleton	Midleton Railway Station (Townparks; CH004)	None
	UCH Structure Midleton Railway Station (Townparks; CH014)	None
	TOWNPARKS/BROOMFIELD EAST Townland Boundary (Townparks; CH028)	None
	TOWNPARKS/BROOMFIELD WEST Townland Boundary (Townparks; CH029)	None
Reconfiguration of the operational track layouts, as required	Glounthaune Estuary AAP (Johnstown/Killahora; CH030)	Direct
All associated works (drainage, retaining walls, boundary treatments, etc.)	Glounthaune Estuary AAP (Johnstown/Killahora; CH030)	Direct
The provision of five temporary adjacent construction compounds in the townlands of	Killahora; immediately south of existing line Killacloyne; immediately south of existing line Ballyadam; immediately south of existing line	Direct

Proposed Development	Descriptor (and Townland)	Construction Phase Impacts
Killahora, Killacloyne, Ballyadam Townparks, and Knockgriffin	Knockgriffin; immediately north of existing line Townparks; immediately north of existing line	

Table 14-14 Description of Impacts to CH sites at Construction Phase

CH No	Summary	Description of Impact	Magnitude of Impact prior to implementation of mitigation measures	Baseline Value	Significance of Impact prior to implementation of mitigation measures
CH002	Road Bridge	No impact on CH002 and no mitigation required.	N/A	High	N/A
CH003	Railway Station	There are no works to station buildings	N/A	High	N/A
CH004	Railway Station	There are no works to station buildings	N/A	High	N/A
CH006	Foot Bridge	There are no modifications to this bridge	N/A	High	N/A
CH008	Road Bridge	There are no modifications to this bridge	N/A	High	N/A
CH009	Road Bridge	There are no modifications to this bridge	N/A	High	N/A
CH014	UCH Structure	Provision of sidings/turn back facility at Midleton	N/A	Medium High	Negligible
CH015	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH016	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH017	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH018	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH019	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible

CH No	Summary	Description of Impact	Magnitude of Impact prior to implementation of mitigation measures	Baseline Value	Significance of Impact prior to implementation of mitigation measures
CH020	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH021	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH022	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH023	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH024	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH025	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH026	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible
CH027	Townland Boundary	Twin tracking of single-track sections pass through this townland boundary; as the single-track is already in place, it is unlikely that any sub-surface archaeological material remains from the original boundary	Negligible	Low	Negligible

CH No	Summary	Description of Impact	Magnitude of Impact prior to implementation of mitigation measures	Baseline Value	Significance of Impact prior to implementation of mitigation measures
CH028	Townland Boundary	Provision of sidings/turn back facility at Midleton	Negligible	Low	Negligible
CH029	Townland Boundary	Provision of sidings/turn back facility at Midleton	Negligible	Low	Negligible
CH030	AAP	Reconfiguration of operation track layouts; all associated works (drainage, retaining walls, boundary treatments, etc.)	Major	High	Significant
CH031	AAP	Potential groundworks associated with the establishment of a temporary construction compound	Major	High	Significant
CH032	AAP	Potential groundworks associated with the establishment of a temporary construction compound	Major	High	Significant
CH033	UCH	None	Negligible	Medium/High	Negligible
CH034	UCH	None	Negligible	Medium/High	Negligible
CH035	UCH	None	Negligible	Medium/High	Negligible
CH036	UCH	Significant, direct, irreversible, negative effect	Significant	Major, localised, physical effect	Irreversible
CH037	UCH	None	Negligible	Medium/High	Negligible
CH038	UCH	None; crossing to be closed, (note only location original; fabric replaced)	Negligible	Medium/High	Negligible
CH039	UCH	Minor, localized, visual and reversible effect on historic buttresses (note deck only to be replaced)	Negligible	Minor, localised, visual effect	Negligible
CH040	UCH	None (note only location original; fabric replaced)	Negligible	Medium/High	Negligible
CH041	UCH	None	Negligible	Medium/High	Negligible
CH042	Protected Structure	None	Negligible	Very High	Negligible

The assessment of architectural effects is based on the EPA Guidelines (2022) as detailed in Chapter 2. Effects are generally categorised as either being direct, indirect, or as having no predicted effect, and are described in detail below.

Table 14.15: Assessment of Architectural Effects

CH No.	Architectural heritage structure:	Significance/ Protection Status:	Quality of effect:	Description of significance:	Extent and Context:	Probability and Duration of Effect:
CH009	Wise's Bridge (OBY4) safety signage:	NIAH 20907553 (Regional)	Neutral effect	Not significant	Minor, localised, visual effect	None
CH008	Haly's Bridge (OBY2) safety signage:	NIAH 20907548 (Regional)	Neutral effect	Not significant	Minor, localised, visual effect	None
CH008	Haly's Bridge (OBY2) piling in close proximity:	NIAH 20907548 (Regional)	Neutral effect	Not significant	Indirect, brief, physical effect	Brief, Imperceptible effect of CFA piling
CH008	Haly's Bridge (OBY 2) demolition & rebuilding of part of NE wing wall to allow for extension of culvert UBY2:	NIAH 20907548 (Regional)	Neutral effect	Not significant	Direct, brief, physical effect	Brief, slight effect
CH036	Ballyadam House Bridge/ OBY 8 Agricultural Overpass demolition	None. Shown on 25" OS map; Regional	Negative/ adverse	Significant	Major, localised, physical effect	Irreversible
CH039	River Bridge (Knockgriffen) buttresses (UBY 11) new bridge structure on historic buttresses	None. Shown on 25" OS map; Regional	Neutral effect	Not significant	Minor, localised, visual effect	None

14.4.2 Operational Phase and Maintenance

Direct Impacts: No direct impacts are foreseen on archaeological, architectural or cultural heritage sites at operational phase or during maintenance. However, it is recommended that all architectural heritage structures identified in this chapter are monitored on a routine basis to ensure that normal defects caused by age and weather are arrested at the earliest opportunity.

Indirect Impacts: Indirect impacts at operation stage would largely occur as a result of impacts on the setting of site (notably visual impacts) and on the integrity and character. As a result, no indirect impacts or impacts on setting have been identified at operational phase.

14.4.3 Decommissioning Phase

Direct Impacts: No direct impacts are foreseen on archaeological, architectural or cultural heritage sites at decommissioning phase.

Indirect Impacts: No indirect impacts are foreseen on archaeological architectural or cultural heritage sites at decommissioning phase. In the event that the railway line from Glounthaune – Midleton was decommissioned, and the existing care and maintenance routines ceased, the architectural heritage structures identified would be subject to weathering and eventual decay.

14.4.4 Do Nothing

The 'do-nothing' scenario will have no impact on archaeological, architectural or cultural heritage.

14.4.5 Cumulative Impact

Given the presence of a pre-existing railway line, and the broadly coterminous nature of the present project with the pre-existing railway, no cumulative impacts are foreseen.

14.5 Mitigation Measures

The mitigation strategies outlined in this section detail the techniques to be adopted in order to ameliorate the impacts that the proposed development may have on features of archaeological, architectural and / or cultural heritage within the study area during both the construction and operation phases of the scheme. The residual impacts that will remain once these mitigation measures have been implemented are set out in Section 14.1.8.

The following proposed mitigation measures are subject to approval by An Bord Pleanála and the National Monuments Service of DHLGH:

- All sub-surface groundworks associated with the proposed development works at the Glounthaune Estuary AAP (Johnstown/Killahora; CH030) and at the temporary compound areas adjacent to the Owenacurra River (CH031 and CH032) shall be subject to a programme of archaeological monitoring.
  - This should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.
  - If significant archaeological material is encountered during the course of archaeological monitoring, then resolution of any such significant material will be determined in consultation with the National Monuments Service (DHLGH).
  - Where possible, every reasonable effort should be made to preserve in situ or reduce the impact on any identified archaeological material. Where preservation in situ cannot be achieved, either in whole or in part, then a programme of full archaeological excavation should be implemented to ensure the preservation by record of the portion of the site that will be directly impacted upon. This work should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.
  - A written report will be prepared detailing the results of all archaeological work undertaken.

Table 14.16: Summary of Mitigation for Archaeological Heritage

CH No.	Architectural heritage structure	Mitigation
CH030	Area of Archaeological Potential Glounthaune Estuary / Salty Water Complex	All sub-surface groundworks associated with the proposed development works shall be subject to a programme of archaeological monitoring.
CH031	Area of Archaeological Potential (AAP) adjacent to the Owenacurra River in the townland of Knockgriffin	All sub-surface groundworks associated with the proposed development works shall be subject to a programme of archaeological monitoring.
CH032	Area of Archaeological Potential (AAP) adjacent to the Owenacurra River in the townland of Townparks	All sub-surface groundworks associated with the proposed development works shall be subject to a programme of archaeological monitoring.

It is recommended that architectural heritage structures along the railway line are monitored for signs of stress/cracking during the construction phase. Recommendations for a 5-year maintenance inspection on architectural heritage structures have also been identified.

In relation to the dismantling of OBY 8, Ballyadam House Bridge, conservation by record will be carried out, including laser-scanning; careful dismantling and storage for repair of similar

structures; and consideration of off-setting the effect by restoring Carrigtwohill Station building to compensate for loss of fabric at agricultural overpass.

During construction works to widen the bridge deck of the Owenacurra River bridge (UBY 11), the historic buttresses which carry the bridge will be protected during the works and assessed to ensure they can continue to carry the structure without being damaged at a later date through wear.

Piling for a retaining wall to realign culvert UBY 2 in close proximity to Haly's Bridge (OBY2) shall use CFA piles and the bridge shall be monitored frequently by conservation engineer to assess it for signs of stress. It is considered to be a neutral, manageable effect of brief duration.

The extension of UBY 2 by 2m north and south will also necessitate the demolition and re-building of the NE wing-wall of Haly's Bridge (OBY 2), listed on the NIAH. The proposal to record, demolish and re-build using lime mortar and the original stone is considered to be a slight, localised and brief effect.

Table 14.17: Summary of Mitigation for Architectural Heritage

CH No.	Architectural heritage structure	Mitigation
CH008	Haly's Bridge (OBY 2) piling in close proximity:	Piling for retaining wall to realign culvert should use CFA piles and OBY 2 monitored frequently by conservation engineer to monitor signs of stress
CH008	Haly's Bridge (OBY 2) demolition & rebuilding of c. 1m² section of NE wing wall to allow for extension of culvert UBY 2:	Obtain permission from Cork County Council; Photographic survey of NE wing wall to record arrangement of courses, pinning stones/ snecks etc. Inspection and photographic record by heritage consultant during demolition, to agree specification for re-building post culvert extension. Inspection of sample panel of re-building 0.5m² prior to complete re-building in original location and using original stone to match other wing-wall. Ensure soft joint between OBY2 and UBY2
CH036	Ballyadam House Bridge/ OBY 8 Agricultural Overpass	Conservation by record, including lazer-scanning; careful dismantling and storage for repair of similar structures; consideration of off-setting the effect by restoring Carrigtwohill Station building to compensate for loss of fabric at agricultural overpass
CH039	River Bridge (Knockgriffen) buttresses (UBY 11) new bridge structure on historic buttresses	Protect the historic buttresses that carry the bridge during the works and assess to ensure they can carry the structure without damaging them, during the operational phase.

14.6 Residual Impacts

Table 14-18 Residual Impacts to CH sites once mitigation measures have been implemented

CH No	Summary	Mitigation Measures	Magnitude of Impact after implementation of mitigation measures	Baseline Value	Significance of Impact after implementation of mitigation measures
CH001	Lime kiln	No impact on CH001 and no mitigation required.	N/A	High	N/A
CH002	Road Bridge	No impact on CH002 and no mitigation required.	N/A	High	N/A
CH003	Railway Station	There are no works to station buildings and no mitigation required	N/A	High	N/A
CH004	Railway Station	There are no works to station buildings and no mitigation required	N/A	High	N/A
CH005	Chapel	No impact on CH005 and no mitigation required.	N/A	High	N/A
CH006	Foot Bridge	There are no modifications to this bridge and no mitigation required	N/A	High	N/A
CH007	House	No impact on CH007 and no mitigation required.	N/A	High	N/A
CH008	Road Bridge	There are no modifications to this bridge and no mitigation required	N/A	High	N/A
CH009	Road Bridge	There are no modifications to this bridge and no mitigation required	N/A	High	N/A
CH010	Station master's house	No impact on CH010 and no mitigation required.	N/A	High	N/A
CH011	Cast Iron Post-box	No impact on CH011 and no mitigation required.	N/A	High	N/A
CH012	Hosing terrace	No impact on CH012 and no mitigation required.	N/A	High	N/A
CH013	Dispensary	No impact on CH013 and no mitigation required.	N/A	High	N/A
CH014	UCH Structure	Provision of sidings/turn back facility at Midleton	N/A	Medium High	Negligible
CH015	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH016	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH017	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH018	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible

CH No	Summary	Mitigation Measures	Magnitude of Impact after implementation of mitigation measures	Baseline Value	Significance of Impact after implementation of mitigation measures
CH019	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH020	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH021	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH022	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH023	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH024	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH025	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH026	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH027	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH028	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH029	Townland Boundary	Townland Boundary already cut by existing track – no mitigation required.	Negligible	Low	Negligible
CH030	AAP	A programme of archaeological monitoring shall be undertaken of construction works within the Glounthaune Estuary AAP (Johnstown/Killahora; CH030)	Moderate	High	Moderate
CH031	AAP	A programme of archaeological monitoring shall be undertaken for any groundworks within the Knockgriffin temporary construction compound AAP (Knockgriffin; CH031)	Moderate	High	Moderate

CH No	Summary	Mitigation Measures	Magnitude of Impact after implementation of mitigation measures	Baseline Value	Significance of Impact after implementation of mitigation measures
CH032	AAP	A programme of archaeological monitoring shall be undertaken for any groundworks within the Townparks temporary construction compound AAP (Townparks; CH032)	Moderate	High	Moderate
CH033	UCH	No mitigation required.	Negligible	Medium/High	Negligible
CH034	UCH	No mitigation required.	Negligible	Medium/High	Negligible
CH035	UCH	No mitigation required.	Negligible	Medium/High	Negligible
CH036	UCH	Conservation by record, including laser-scanning; careful dismantling and storage for repair of similar structures; consideration of off-setting the effect by restoring Carrigtwohill Station building to compensate for loss of fabric at agricultural overpass	Major, localised, physical effect	Medium/High	Moderate
CH037	UCH	No mitigation required.	Negligible	Medium/High	Negligible
CH038	UCH	No mitigation required.	Negligible	Medium/High	Negligible
CH039	UCH	Protect the historic buttresses that carry the bridge during the works and assess to ensure they can carry the structure without damaging them, during the operational phase.	Neutral effect	Medium/High	Negligible
CH040	UCH	No mitigation required.	Negligible	Medium/High	Negligible
CH041	UCH	No mitigation required.	Negligible	Medium/High	Negligible
CH042	Protected Structure	No mitigation required.	Negligible	Very High	Negligible

All physical archaeological, architectural and cultural heritage effect issues will be resolved at the pre-construction and construction stage of the development. There are no potential residual effects envisioned at the operation stage of the proposed development.

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Chapter 15 – Roads and Traffic

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15 Roads and Traffic

15.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors. This Chapter of the EIAR presents the assessment of the likely significant Roads and Traffic effects of the proposed development, as set out in Chapter 6 of this EIAR.

The existing conditions of the receiving environment and details of the traffic that is likely to be generated during the construction and operational phase of the proposed development are set out. An assessment of the effect upon the local, regional, and national road network and identified measures to reduce network disruption has been undertaken.

Consistent with advice set out in the TII Traffic and Transport Guidelines (May 2014), a full Traffic and Transport Assessment (TTA) is not warranted in respect of the operational phase given the low volume of traffic that will be generated by the development in operation. However, this EIAR chapter does assess the construction phase in a manner that is consistent with the same TII advice, in respect that it fully details the levels of traffic generated and the routes likely to be subject to traffic impacts and is coherently supported by a Construction Traffic Management Plan (CTMP). Due to the relatively low number of construction phase workers (expected to peak at approximately 125 persons) to the area that the proposed development covers, and the distribution of those workers to worksites at several dispersed geographical locations, a Workplace Travel Plan is not considered necessary, based on professional judgement.

A detailed description of the proposed development is provided in Chapter 6 of this EIAR. Air Quality and Noise pertaining to Roads and Traffic are discussed in Chapter 8 and Chapter 16 respectively. Mapping is provided in Appendix 15.1. Appendix 15.2 includes construction phase traffic flow data. A CTMP is included in Appendix 6.1 of this EIAR.

15.2 Methodology and Limitations

15.2.1 Policy and Guidance

This section sets out transport policies and guidance that are relevant to the assessment of traffic and transport effects of the proposed development. Table 15-1 provides a summary of the policies relevant to Roads and Traffic.

Table 15-1: Policy Summary

Document Title	Policy Detail	Relevance to Assessment
Cork County Council Development Plan 2022 (Volume One: Main Policy Material)	This plan includes a strategy for Cork's transport and land use, with several policy objectives relevant to the proposed development: • 'Walking TM12-2-1: 'Development should incorporate the retention of existing routes and linkages which contribute to permeability of an area, particularly those providing access to key services, facilities and public transport infrastructure. Loss of existing links shall not occur if their loss results in more circuitous trips.' • 'National, Regional and Local Road Network TM12-13: h) Support and provide for improvements to the national road network including reserving corridors for proposed routes to prevent inappropriate development which might compromise future road schemes. b) Support the maintenance of the efficiency and safety of the existing national primary and secondary roads network by targeted transport demand management and infrastructure improvements. m) Avoid the creation of additional access points from new developments or the generation of increased traffic from existing accesses onto national roads to which speed limits of greater than 50kph apply. n) Prevent the undermining of the strategic transport function of national roads and protect the capacity of interchanges from locally generated traffic. k) Limit access to regional roads where appropriate so as to protect the carrying capacity of the network and have regard to safety considerations, particularly where access to a lower category road is available. o) Ensure that in the design of new development adjoining or near National, Regional or Local Roads, account is taken of the need to include measures that will serve to protect the	All acknowledged and considered as an integral part of the assessment process unless stated otherwise. Upon completion of the development, there are no extra flows and there will not be an impact on the road network overall. All effects are temporary in nature during construction. Consistent with advice set out in the TII Traffic and Transport Guidelines (May 2014), a full Traffic and Transport Assessment (TTA) is not warranted in respect of the operational phase given the low volume of traffic that will be generated by the development in operation. However, this EIAR chapter does assess the construction phase in a manner that is consistent with the same TII advice, in respect that it fully details the levels of traffic generated and the routes likely to be subject to traffic impacts and is coherently supported by Traffic Management Plan. Due to the relatively low number of construction phase workers (expected to peak at approximately 125 persons) to the area that the proposed development covers, and the distribution of those workers to work sites at a number of dispersed geographical locations, a Workplace Travel Plan is not considered necessary, based on professional judgement. In alignment with NRA Standard NRA HD 19 'Road Safety Audits' a Road safety Audit will not be required as no permanent change to the layout of a national road is proposed.

Document Title	Policy Detail	Relevance to Assessment
	development from the adverse effects of traffic noise for the design life of the development.' • 'Road Safety and Traffic Management TM12-8: a) Where traffic movements associated with a development proposal have the potential to have a material impact on the safety and free flow of traffic on National, Regional or other Local Routes, the submission of a Traffic and Transport Assessment (TTA) and Road Safety Audit will be required as part of the proposal. Where a Local Transport Plan exists, it will inform any TTA.' • '12.11.2 Where traffic movements associated with a development proposal have the potential to have a material impact on the safety and free flow of traffic on a National or Regional Route, this Plan will require the submission of a Traffic Impact Assessment (TIA), Traffic and Transport Assessment (TTA) and a Road Safety Audit to be prepared in accordance with the Traffic Management Guidelines Manual 2003 issued by the Department of Transport and the Traffic and Transport Assessment Guidelines published by the TII in 2014.' • '12.11.3 National Guidance is available in relation to best practice in 'Achieving Effective Workplace Travel Plans – guidance for local authorities' published by the NTA in 2012.'	
Project Ireland 2040	The National Development Plan 2021-2030, which makes up part of Project Ireland 2040, includes the Irish Government's strategy for sustainable mobility. The plan highlights phase 1 of the Cork Commuter Rail Programme, which includes double tracking the current single tracks at the eastern end of the corridor between Glounthaune and Midleton.	Acknowledged that the proposed development will support an increased frequency of trains and considered as an integral part of the assessment.
Cork Metropolitan Area Transport Strategy 2040	This plan details the Cork Metropolitan Area's transport strategy with several strategy objectives relevant to the proposed development: • 'Ensure effective integration between transport and land-use through the delivery of Public	Acknowledged that public transport and active travel shall be prioritised over the use of private vehicles, such as cars, and considered as an integral part of the assessment process unless stated otherwise.

Document Title	Policy Detail	Relevance to Assessment
	Transport Orientated Development, which provides higher density, a balanced mixed of land uses and compact settlements that reduce trip distances and are of a magnitude that supports the viability of high capacity public transport.' • 'Higher densities contribute to a more compact urban footprint that bring more people closer to destinations and public transport services within easy walking and cycling distance.' • 'Deliver consolidated development in a manner that can avail of existing transport infrastructure, nearby amenities and facilities in the short term to deliver a critical mass of growth in population and employment which can support the transition and sequencing of investment to higher capacity public transport infrastructure and services.' • 'Land use policies that support the provision and design of new development in locations, layouts and at densities which prioritise walking and cycling and enable the efficient provision of public transport services.'	

This assessment has been carried out applying professional judgement with reference to the following key guidance documents, as set out in Table 15-2.

Table 15-2: Core Guidance Summary

Document Title	Source and Year	Guidance Detail
Guidelines on the Information to be Contained in Environmental Impact Reports	Environmental Protection Agency (EPA) (2022)	These guidelines provide advice of best practice, principles and practice of developing an EIAR. Specific reference to transport assessment includes: "*Material assets can now be taken to mean built services and infrastructure. Traffic is included because in effect traffic consumes roads infrastructure*." and "*The provision of new access facilities (e.g., access roads) or the upgrading of existing facilities (e.g., road widths, bridges and junctions) carried out by other parties can give rise to significant environmental effects"*
Advice notes on current practice (in the preparation of Environmental Impact Statements)	Environmental Protection Agency (EPA) (DRAFT 2015)	These notes provide general guidance on assessment practice. Defined environmental topics; 'human beings' and 'material assets' have relevance to transport assessment
Traffic and Transport Assessment Guidelines	Transport Infrastructure Ireland (TII) (2014)	The guidelines provide guidance for scoping and developing Traffic and Transport assessment requirements to support development proposals. The guidelines outline the need for assessment of public transport, walking and cycling networks, rather than singularly focussing on the road network. The focus of these guidelines relates to operational traffic aspects.
Rural Road Link Design	Transport Infrastructure Ireland (TII) (2017)	This guideline provides guidance for the design of single and dual carriageway roads, including motorways) in rural areas.
The Institute of Environmental Management and Assessment Guidelines for the Environmental Assessment of Road Traffic	The Institute of Environmental Management and Assessment (IEMA) (1993)	The guidelines provide internationally referable guidance specific to best practice in transport EIA process and practice.
The UK Design Manual for Roads and Bridges (DMRB)	The UK Design Manual for Roads and Bridges (DMRB) (various dates)	The UK DMRB document set details requirements for appraisal, design, maintenance, operation and disposal of UK motorway and all-purpose trunk roads. DMRB may also be applied to other roads with local authority approval.
Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment	Department of Housing, Planning and Local Government (2018)	Outlines the requirement to assess the potential of the proposed development to cause accidents and/or disasters, including implications for human health, cultural heritage, and the environment. It also highlights consultation; details of consultation

Document Title	Source and Year	Guidance Detail
		undertaken for this EIAR is covered in the headline chapters.
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)	This guidance sets out what should be covered in logical sections of EIA. With particular reference to Traffic and Transport, it provides a checklist, including the following: Description of traffic flows, type, volume, temporal pattern and geographical distributed generated or diverted resulting from the proposed development; Description of resources and raw materials to the proposed development site and the associated traffic movements; Description of project risks, including mention of the risk of traffic accidents; Description of the effects on the environment caused by activities ancillary to the main proposed development.
Guidelines for Classification and Scheduling of Roads in Ireland	Department of Transport Tourism and Sport (2013)	This document provides guidance on the classification of Irish Roads. Specifically national and regional roads.
Temporary Traffic Management Design Guidance	Department of Transport Tourism and Sport (2019)	This document provides design level guidance for Temporary Traffic Management (TTM) for urban and low speed roads, rural single carriageway roads, and dual carriageways and motorways.

15.2.2 Study area

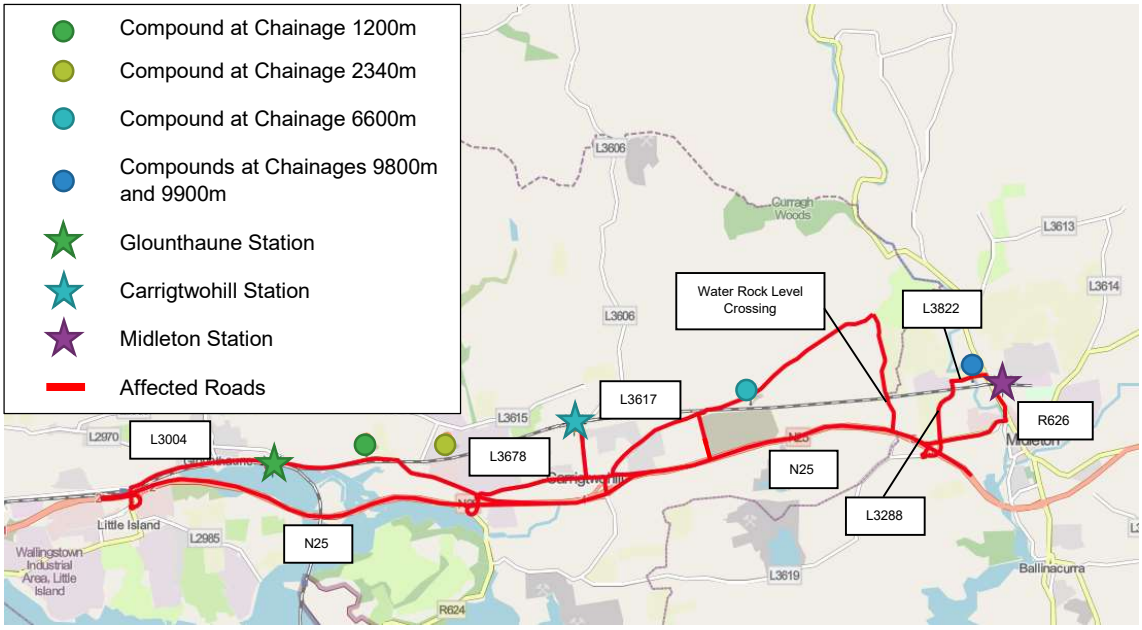
The study area for the Roads and Traffic Chapter is the public road network associated with construction access and diversion routes due to a temporary level crossing closure. The study area also includes road sections potentially impacted during the operational phase of the proposed development.

There are five construction compounds proposed for the works. These will be located at chainages 1200m, 2340m, 6600m, 9800m and 9900m. The construction compounds will contain portacabins for offices and welfare facilities, parking for construction staff and material stockpiles. The construction programme necessitates a period when the railway will be closed to passenger services between Midleton Railway Station and Glounthaune Railway Station. Glounthaune Railway Station will remain open to serve the Cork – Cobh line but Carrigtwohill Railway Station and Midleton Station will be closed to all passenger services. During this period a rail replacement service in the form of buses will be in operation. The closure is expected to be for four months, between months 29 and 32.

The construction programme also includes a period where a level crossing at Water Rock (L3618 Castle Rock Avenue) will be closed. Diversions routes will be in place for this period and are detailed in this Chapter.

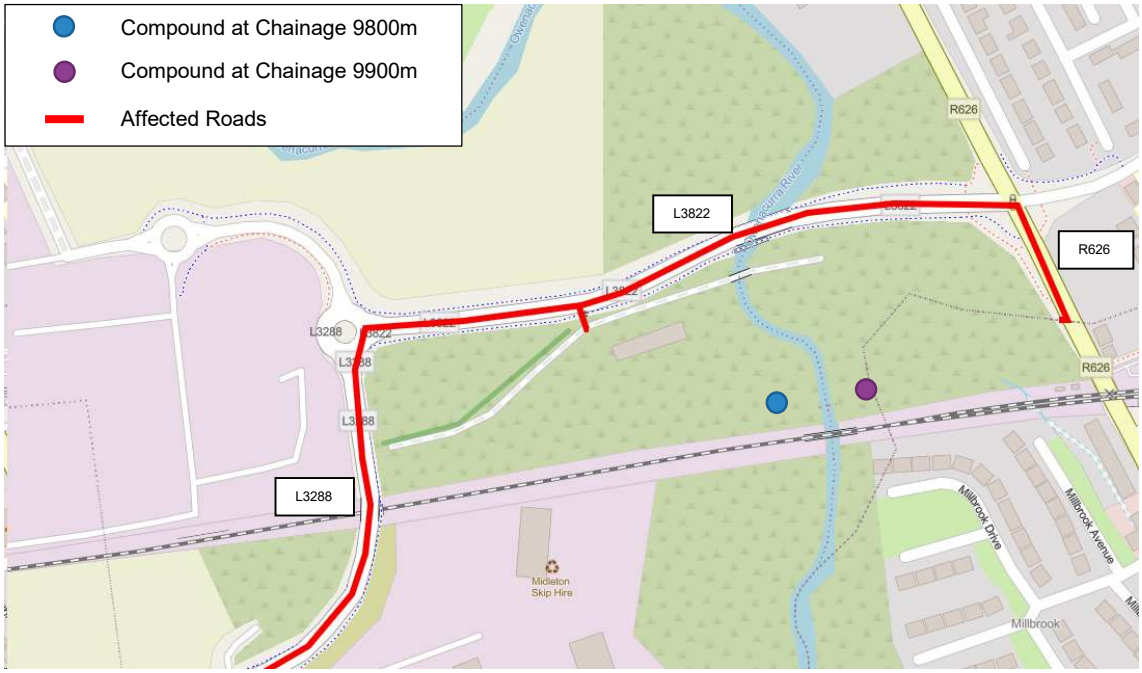
Figure 15-1 Figure 15-1Figure 15-1: study area provides an overview of the study area for the purposes of this Roads and Traffic assessment. Public road sections included in the study area which are proposed to be utilised during construction are listed in Table 15-3.

Figure 15-1: study area



Source: Mott MacDonald/OpenStreetMap

Figure 15-2: Compounds at Chainages 9800m and 9900m



Source: Mott MacDonald/OpenStreetMap

The primary traffic route in the local area is the N25. The N25 varies between dual and single carriageway National road and provides the main road transport link between Cork and Rosslare Europort via Dunvargan and Waterford. The N25 provides linkage to the broader National road network including:

- The M8 motorway, the main route north between Cork and Dublin; and

- The N72, situated north of the proposed development study area which provides an east-west link between the M8 and Dungarvan.

Beyond the study area traffic will subdivide into smaller volumes, and professional judgement therefore suggests that effects relating to Roads and Traffic across the wider road network outside of the study area presented in Figure 15-1 are unlikely to be significant, and therefore not assessed further in this EIAR.

Table 15-3: Public Roads within study area

Road Section	Direction	Compound at chainage 1200m	Compound at chainage 2340m	Compound at chainage 6600m	Compound at chainage 9800m	Compound at chainage 9900m	Castle Rock Avenue Diversion	Rail Replacement Bus Route	Additional Information
R623 (Bridge over N25)	Northbound	✓	N/A	N/A	N/A	N/A	N/A	N/A	Note this is an overpass over the N25, and therefore not analysed as part of the review.
L3004 (N25 J2 to Glounthaune Station)	Eastbound	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A
L3004 (Glounthaune Station to Compound at chainage 1200m)	Eastbound	✓	N/A	N/A	N/A	N/A	N/A	✓	N/A
L3004 (Compound 1 to Glounthaune Station)	Westbound	✓	N/A	N/A	N/A	N/A	N/A	✓	N/A
L3004 (N25 J2 to Compound at chainage at 1200m)	Eastbound	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A
L3004 (Compound at chainage at 1200m to N25 J2)	Westbound	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R623 (Bridge over N25)	Southbound	✓	N/A	N/A	N/A	N/A	N/A	N/A	Note this is an overpass over the N25, and therefore not analysed as part of the review.
L3004 (Fota Retail and Business Park to Compound at chainage at 1200m)	Westbound	✓	N/A	N/A	N/A	N/A	N/A	✓	N/A
L3004 (Compound at chainage at 1200m to Fota Retail and Business Park)	Eastbound	✓	N/A	N/A	N/A	N/A	N/A	✓	N/A
R624 (Bridge over N25)	Southbound	✓	N/A	N/A	N/A	N/A	N/A	N/A	Note this is an overpass over the N25, and therefore not analysed as part of the review.
L3004 (N25 J3 to Fota Retail and Business Park)	Westbound	✓	✓	N/A	N/A	N/A	N/A	✓	N/A
L3004 (Fota Retail and Business Park to N25 J3)	Eastbound	✓	✓	N/A	N/A	N/A	N/A	✓	N/A
R624 (Bridge over N25)	Northbound	N/A	✓	N/A	N/A	N/A	N/A	N/A	Note this is an overpass over the N25, and therefore not analysed as part of the review.
L7642 (between N25 and Carrigane Road)	Northbound	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A
L7642 (between Compound at chainage 6600m and N25)	Southbound	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A

Road Section	Direction	Compound at chainage 1200m	Compound at chainage 2340m	Compound at chainage 6600m	Compound at chainage 9800m	Compound at chainage 9900m	Castle Rock Avenue Diversion	Rail Replacement Bus Route	Additional Information
L7642 (between N25 and Compound at chainage 6600m)	Northbound	N/A	N/A	✓	N/A	N/A	N/A	N/A	N/A
Carrigane Road/L3617 (between L7642 and L3680)	Westbound	N/A	N/A	✓	N/A	N/A	✓	N/A	N/A
L3680 (between L3617 and L3612)	Westbound	N/A	N/A	✓	N/A	N/A	✓	N/A	N/A
L3680 (between L3617 and L3612)	Eastbound	N/A	N/A	✓	N/A	N/A	N/A	✓	N/A
L3612 (Bridge over N25)	Southbound	N/A	N/A	✓	N/A	N/A	N/A	N/A	Note this is an overpass over the N25, and therefore not analysed as part of the review.
L3612 (Bridge over N25)	Northbound	N/A	N/A	✓	N/A	N/A	N/A	N/A	Note this is an overpass over the N25, and therefore not analysed as part of the review.
L3680 (between L3617 to N25)	Eastbound	N/A	N/A	✓	✓	N/A	N/A	N/A	N/A
R907 (between N25 and L3288)	Eastbound	N/A	N/A	N/A	✓	N/A	N/A	✓	N/A
L3288/L3822 (to Compound at chainage 9800m)	Northbound	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A
L3288/L3822 (from Compound at chainage 9800m)	Southbound	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A
R907 (between N25 and L3288)	Southbound	N/A	N/A	N/A	✓	N/A	N/A	✓	N/A
R907 (between N25 and L3288)	Northbound	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A
R907 (between N25 and L3288)	Westbound	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A
R907 (between N25 and L3288)	Eastbound	N/A	N/A	N/A	✓	N/A	N/A	✓	N/A
N25 (J1 - J2)	Eastbound	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N25 (J2 - J1)	Westbound	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N25 (J4 - J3)	Westbound	✓	✓	✓	N/A	N/A	N/A	N/A	N/A
N25 (J3 - J4)	Eastbound	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A
N25 (J2 - J3)	Eastbound	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A
N25 (J3 - J2)	Westbound	N/A	✓	N/A	N/A	N/A	N/A	N/A	N/A
N25 (L3680 – L3617)	Eastbound	N/A	N/A	✓	✓	N/A	✓	✓	N/A
N25 (J5 - J4)	Westbound	N/A	N/A	✓	✓	N/A	✓	✓	N/A
N25 (L3617 - J5)	Eastbound	N/A	N/A	✓	✓	N/A	✓	✓	N/A
N25 (J6 - J5)	Westbound	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A
N25 (J5 -J6)	Eastbound	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A
L3678	Eastbound	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A
L3678	Westbound	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A

Road Section	Direction	Compound at chainage 1200m	Compound at chainage 2340m	Compound at chainage 6600m	Compound at chainage 9800m	Compound at chainage 9900m	Castle Rock Avenue Diversion	Rail Replacement Bus Route	Additional Information
L3680 (L3678 to L3612)	Eastbound	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A
L3680 (between L3617 to N25)	Eastbound	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A
R907 (L3288 to roundabout)	Eastbound	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A
R907 (Roundabout to L3288)	Westbound	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A
R626 (Roundabout to Station Road)	Northbound	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A
R626 (Station Road to Roundabout)	Southbound	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A
Ballyrichard More (Castle Rock Avenue to L7642)	Westbound	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A
L3680 (between L3617 and L3612)	Eastbound	N/A	N/A	✓	N/A	N/A	✓	N/A	N/A
L3617 to Castle Rock Avenue	Eastbound	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A
L3606	Northbound	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A
L3606	Southbound	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A
R626 (Midleton Crossing to L3822)	Northbound	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A
R626 (L3822 to Midleton Crossing)	Southbound	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A

Source: Mott MacDonald

15.2.3 Data Sources

A desktop study and a site visit to the study area (undertaken on 9th and 10th May 2022) were undertaken to review proposed development access routes. Constraints and likely sensitive road sections were identified, i.e., locations which are likely to be more vulnerable to change in traffic flow or profile, e.g., potential accident hot spots, high footfall areas, and / or areas in close proximity to a school. Data sources for the desktop study includes:

- EIAR and TA documents from neighbouring developments, accessed via the Cork County Council Planning Portal, the Department of Housing, Local Government and Heritage's EIA Portal and the Environmental Planning Agency Website; and
- National Transport Model (NToM) Update, Travel Demand Forecasting Report, NToM Volume 3, December 2019, TII, AECOM.

Data relating to Personal Injury Collisions (PIC) was sought from the Road Safety Authority (RSA).

Information in relation to existing traffic volumes within the study area was obtained from traffic surveys undertaken in March 2022 (Friday 4th March to Thursday 10th March) and June 2022 (Thursday 9th June to Wednesday 15th June), by Nationwide Data Collection. 7-day Automated Traffic Counts (ATC), undertaken in March 2022 and June 2022, provided information including total number of vehicles in both directions, of the specified road, broken down into twelve vehicle classifications.

Additional information in relation to pedestrian volumes (sample size of 888 pedestrians) and queue lengths (sample size of 547 vehicles) across the Mill Road (Midleton) Level Crossing were obtained from pedestrian count and queue length surveys, both undertaken on 9th June 2022, by Nationwide Data Collection. The pedestrian count survey provided the number of pedestrians crossing the level crossing in both directions, northbound and southbound, from 07:00 to 19:00 in 15 minutes intervals. The queue length survey provided the number of vehicles queuing in both directions, northbound and southbound, when the level crossing barriers were down during peak hours (between 07:00 and 10:00, and 16:30 and 19:00).

15.2.4 Methodology and Approach

The assessment detailed in this Chapter has been undertaken combining desktop study, site observations and reference to current policy advice and best practice in line with consultation with statutory agencies. Predicted construction vehicle movement volumes have been compared to baseline traffic flows to identify if there are likely to be periods where the increase in traffic, either all traffic or specifically Heavy Goods Vehicle (HGV) traffic, exceeds standard thresholds. This additional traffic may cause effects, for example, on driver delay, road safety or community, those of which have been identified and their significance assessed.

The IEMA Guidelines infer two-fold rules that can be used to determine both the scale and extent of the assessment of road traffic as a screening process:

- Rule 1 – Include highway links where traffic flows would increase by more than 30% (or the number of Heavy Goods Vehicles (HGVs) would increase by more than 30%).
- Rule 2 – Include any other specifically sensitive areas where traffic flows would increase by 10% or more.

It is acknowledged by the IEMA guidelines that daily variation can vary +/- 10%. As such, it is assumed that projected changes in traffic below 10% means no discernible environmental impact.

Where the predicted increase in traffic volume (whether general or HGV) falls short of these thresholds, the significance of the effects can be termed as 'not significant'. This means that

further assessment is not warranted. Consequently, where the predicted traffic flow increase exceeds thresholds, the effects are considered potentially 'significant' and accordingly, are assessed in greater detail.

The assessment has clearly identified transport routes which are to be used in connection with the proposed development. Quantitative assessments have been undertaken alongside the application of professional judgement to determine whether or not the effects are considered to be of significance. Based on the Rule 1 and 2 of the IEMA Guidelines (IEMA, 1993), the predicted significance of the effect was determined considering both the sensitivity of the receiving environment and the magnitude of change against the baseline. As a guide to inform the assessment, but not as a substitute for professional judgement, criteria for determining the significance of traffic related effects are set out in Table 15-4. It should be noted that the assessment considers the effects of the % increase in general traffic (HGV+ Light Goods Vehicles (LGVs), cars and buses), and also % increase in HGV traffic only based on related baseline traffic flows e.g. % increase in HGVs from existing HGV baseline flow.

The studya encompasses a predominantly rural area; as such, all routes have been treated as 'sensitive' and therefore the 10% significance threshold has been applied in view of Rule 2 of the IEMA Guidelines (IEMA, 1993), thereby ensuring a robust assessment.

The operational phase assessment focuses upon the potential impact associated with the increased frequency of level crossing operation at both Water Rock and Mill Road (Midleton).

During the operational phase of the proposed development a notable increase in the volume of traffic generated is not anticipated. Anticipated operational traffic associated with the proposed development would include rail users, rail staff as well as general servicing and maintenance. It is not anticipated that traffic associated with the existing development would significantly increase due to the proposed development and that any increases in traffic would be accounted for in local traffic growth figures.

The assessment primarily focuses on the construction phase Roads and Traffic impacts, with a qualitative summary of effects during the operational phase and decommissioning phase.

The thresholds shown in Table 15-4 have been developed based upon the Rule 2 criteria above, as well as the consideration that 'Major' and 'Moderate' effects are 'significant' in the context of Environmental Protection Agency (EPA) Guidelines (2022).

Table 15-4: Effect Significance Matrix

Significance of Effect	% Increase in general traffic volume % Increase in HGV traffic volume
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%

Source: IEMA

The guidance above does not give thresholds to determine significance associated with driver delay. As such, professional judgement has been applied. For driver delay, using terminology outlined for effect significance in Table 15-4, a similar rationale has been used, with thresholds having been determined and applied as shown below in Table 15-5.

Table 15-5: Driver Delay Effect Significance Matrix

Significance of Effect	Increase in Journey Time
Major (Significant)	16 – 20 minutes

Significance of Effect	Increase in Journey Time
Moderate (Significant)	11 – 15 minutes
Minor (Not Significant)	6 – 10 minutes
None (Not Significant)	0 – 5 minutes

Source: Mott MacDonald

The significance of all effects under consideration is linked to the volume of traffic generated by the proposed development, therefore it is deemed appropriate to link significance criteria with the scale of the forecast traffic increase. The IEMA Guidelines (IEMA, 1993), also state however that:

"For many effects there are no simple rules or formulae which define the thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible."

As such, professional judgement (led by good practice guidance) has also been applied in the assessment of effects so as to provide more meaningful conclusions in particular where it is not quantifiable by set rules or formulae, particularly in relation to driver delay caused by full or partial road closure and resultant traffic diversion, the assessment of community (pedestrian delay, pedestrian amenity / fear, and intimidation) and road safety effects. Information of this nature, gathered from desktop research, where available, in addition to technical knowledge from the wider technical team has also been used.

Furthermore, where baseline traffic flows are very low, it is possible to derive unrealistic determinations of significance when considered against purely numerical assessment criteria. For example, when traffic flow is very low, it is possible to show relatively large traffic increases and for the road to operate well below capacity. Under the numerical criteria defined above, a 60% increase in traffic volume would represent a major effect, but in reality, the effect is in many cases likely to be less significant, given the residual capacity of the routes section.

Effects associated with works which might physically restrict usable road space, thus resulting in localised road or lane closure have also been assessed, considering requirements for diversion and/or journey time delay to traffic by road section.

The following effect classifications are considered having regard to IEMA Guidelines (1993):

- Driver Delay
- Accidents and Safety
- Community Effects (Severance, Pedestrian Delay, Pedestrian and Cyclist Amenity; including fear and intimidation)

The IEMA Guidelines (1993) also necessitate the consideration of Noise, Visual Impact, Air Pollution and Dust and Dirt which are addressed in other chapters of this EIAR.

The predicted significance of any potential Roads and Traffic-related environmental impacts has been determined by considering both the sensitivity of the receiving environment and the magnitude of change against the baseline.

The likely duration of an effect is also a relevant consideration and the Environmental Protection Agency have categorised duration of effects in their 2022 guidelines. Potentially of relevance, in respect of the proposed development, the categories include:

- 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.

15.2.4.1 Sensitivity

In accordance with guidelines from the IEMA, road links may be highlighted as 'specifically sensitive'. In other words, these portions of road are considered to be more vulnerable to changes in either the profile or volume of flows of traffic.

Within the context of this study and using the IEMA Guidelines for reference, the receptors of sensitivity have been defined in Table 15-6 for various roads links.

Table 15-6: Receptor Sensitivity

Receptor Sensitivity / Importance	Description
High	• Urban/residential roads without pedestrian / cycle facilities that are used by pedestrians
Medium	• Main vehicular route with pedestrian/cycle facilities provided in a built-up area • Congested Junctions, roads with degree of active frontage
Low	• National roads or 'N' class roads constructed to accommodate significant HGV volumes • Strategic vehicular route, such as Regional Roads, in a rural setting with pedestrian/cycle facilities provided • Urban road with limited active frontage and pedestrian/cycle facilities provided
Negligible	• Roads with no significant settlements including new strategic national roads or motorways • Rural road with no/pedestrian cycle facilities provided

Source: IEMA/Mott MacDonald

15.2.4.2 Magnitude

The magnitude of change has been calculated as the proportional change in traffic flow anticipated on each public road section within the study area. This calculation compares the forecast development traffic generation against the baseline traffic during the construction phase. It is crucial to ensure that professional judgment is applied in tandem with the criteria stated above; particularly when considering numerical changes in traffic volume.

Given the predominantly rural nature of the environment in which the proposed development is situated, the rural roads are likely to have small flows. Where baseline traffic flows are very low, it is possible to derive unrealistic determinations of significance when considered against purely numerical assessment criteria. As such, further qualitative criteria have also been employed when assessing magnitude, details of which or provided in Table 15-7 below. This is of particular importance when considering community effects.

Table 15-7: Magnitude Criteria

Magnitude	Impact
High / Major (Significant)	Where the proposed development could be expected to have a considerable effect (either positive or negative) on receptors
Medium / Moderate (Significant)	Where the proposed development could be expected to have a noticeable effect (either positive or negative) on receptors
Low / Minor (Not Significant)	Where the proposed development could be expected to result in a small, barely noticeable effect (either positive or negative) on receptors
Negligible (Not Significant)	Where no discernible effect is expected as a result of the proposed development on receptors (i.e., the effect is insignificant)

Source: IEMA

As a guide to inform the assessment, but not as a substitute for professional judgement, criteria for determining the significance of traffic-related effects are set out in Table 15-8 and are based on combining the magnitude of the effect with the receptor sensitivity.

Table 15-8: Significance Assessment Matrix

Magnitude of Change	Sensitivity of Receptor			
	High	**Medium**	**Low**	**Negligible**
High / Major (Significant)	Substantial Adverse	Moderate Adverse	Minor Adverse	Minor Adverse
Medium / Moderate (Significant)	Moderate Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Low / Minor (Not Significant)	Minor Adverse	Minor Adverse	Negligible	Negligible
Negligible (Not Significant)	Minor Adverse	Negligible	Negligible	Negligible

Source: IEMA

Significance is categorised as Substantial Adverse, Moderate Adverse, Minor Adverse or Negligible. Effects deemed to be Substantial Adverse or Moderate Adverse are considered to be 'significant' and effects that are judged to be 'minor adverse' or 'negligible' are considered 'not significant'. The same criteria also apply to positive/beneficial impacts.

15.2.4.3 Traffic Forecasting

Information in relation to existing traffic volumes within the study area was obtained from traffic surveys undertaken in March 2022 and June 2022, as detailed in Section 15.2.3.

In addition to the traffic data road capacities relating to national, regional, and local roads have been determined using a combination of data sources.

- For national and regional roads in the study area, professional judgement has been applied in determining vehicles per hour (vph) by reviewing road characteristics on a site visit (9th and 10th May 2022) alongside using Google Street View and referring to road classification descriptors provided in TII Guidance DN-GEO-03031 'Rural Road Link Design' (June 2017). These were then compared to those outlined in UK DMRB Guidance Volume 5, Part 3 TA 79/99 to determine an equivalent on the basis of said road characteristics. After assignment of a road classification comparing these two sets of guidance, the relevant road capacity (busiest directional flow in vehicles per hour) was noted.
- For local roads, it has been assumed that, given the rural nature of the study area and associated small traffic flows, the local roads be classed as 'minor', and as such hold an AADT of 1000 or fewer, with reference to Temporary Traffic Management Design Guidance (Department of Transport, Tourism and Sport - August 2019).

15.3 Receiving Environment

15.3.1 Road Network and Route Profiles

The road network included in the study area was determined on the basis of likely construction access routes (which are defined in Section 15.3.2. Confirmation of construction route selection will be agreed with the Cork County Council and TII when a contractor has been appointed as an integral part of the Construction Traffic Management Plan (CTMP)). The CTMP which is included in Appendix 6.1 of this EIAR, will require to be adopted by the appointed contractor(s) in consultation with Cork County Council.

The key characteristics of the defined public road sections in the study area have been appraised through desktop study and are set out below in Table 15-9. These are presented graphically in Figure 15-1.

Table 15-9: Road Network and Route Profiles

Section Name	Direction of Travel	Description	Construction Access Route	Castle Rock Avenue Diversion	Rail Replacement Bus Route
L3004 (N25 J2 to compound at chainage 1200m)	Eastbound (and westbound)	This is an 80km/h single carriageway lined with a mixture of grass verges, laybys, and footways, with access to commercial and residential properties. On the approach to Glounthaune, there is a traffic calming measure in place (narrowing of the road), with two sets of warning signs approximately 400m apart. The speed limit reduces to 60km/h as the road approaches and goes through Glounthaune. The speed limit continues to be 60kph until approximately 125m east of Killahoura Service Station. There is also a separate cycleway to the north of the road from approximately 285m west of Glounthaune Train Station to the compound at chainage 1200m.	Y	N/A	Y
L3004 (Fota Retail and Business Park to compound at chainage 1200m)	Westbound (and eastbound)	This is an 80km/h single carriageway (changes to 50km/h for crossing the bridge (OBY1)) lined with a mixture of grass verges, laybys, and footpaths, with access to commercial properties. There is a signal-	Y	N/A	Y

Section Name	Direction of Travel	Description	Construction Access Route	Castle Rock Avenue Diversion	Rail Replacement Bus Route
		control pedestrian crossing approximately 50m east of the compound entrance. Between the pedestrian crossing and there is a separate cycleway to the north of the road.			
L3004 (N25 J3 to Fota Retail and Business Park)	Westbound (and eastbound)	This is an 80km/h single carriageway lined with a mixture of grass verges, laybys, and footways, with access to commercial properties	Y	N/A	Y
Carrigane Road/L3617 (between L7642 and L3680)	Westbound	This is an 80km/h single carriageway (approximately 100m to the east of the junction with the L7642 the speed limit is 50km/h) lined with hedges and have accesses to commercial and residential properties. From approximately 325m north of Rose Lawn there are footways on either one or both sides of the road until the junction with the L3680, where the footways stop. The road also features multiple pedestrian crossings including a Toucan crossing.	Y	Y	N/A
L3680 (between L3617 and L3612)	Westbound (and eastbound)	This is a 50km/h single carriageway, with footways on either side of the road, which leads through a commercial area, with on-street parking.	N/A	Y	N/A

Section Name	Direction of Travel	Description	Construction Access Route	Castle Rock Avenue Diversion	Rail Replacement Bus Route
R907 (between N25 and L3288)	Eastbound (and westbound)	This is a 50km/h single carriageway. There is a footway on the north side of the road, with access to residential and commercial properties either side of the road. At the junction with the L3288, there is a four-arm traffic intersection with a traffic light system and pedestrian crossing on each arm.	Y	N/A	Y
L3288/L3822 (to compound at chainage 9800m)	Northbound (and southbound)	This is a 50km/h single carriageway, with footways and cycleways either side of the road. The road has access to multiple industrial sites.	Y	N/A	N/A
R907 (between N25 and L3288)	Southbound (and northbound)	This is a 50km/h single carriageway with a footway along the east side of the road.	Y	N/A	Y
N25	Eastbound (and westbound)	The N25 forms part of the National Road Network in Ireland, connecting Rosslare Europort to Cork. The N25 is a national single carriageway road with a 100km/h speed limit including hard shoulder and verges to both sides and features several watercourse crossings. This is a single carriageway, however, at some points along the N25 the directional lanes are	Y	Y	Y

Section Name	Direction of Travel	Description	Construction Access Route	Castle Rock Avenue Diversion	Rail Replacement Bus Route
		separated by an extended central reservation or a steel divider. The road has slip lanes for access to side roads. There are several accesses to farmland and laybys, and a few residences. Several points on the road are marked with 'No overtaking' signage.			
L3678	Eastbound (and westbound)	This is a 50km/h single carriageway, with footways on either side of the road, which runs through Carrigtwohill. There are three schools Scoil Mhuine Naofa, Scoil Chlochair Mhuire National School, and St. Aloysius College on this road, and has multiple access to commercial and residential properties, on-street parking on both sides of the road, and a Toucan crossing.	N/A	N/A	Y
L3680	Eastbound	This is a 50km/h single carriageway. Between the junctions at L3617 and L312 there are footways on either side of the road, which leads through a commercial area, with on-street parking. From the junction at L3617 to the N25 there is only a footway on the north side of the road and has multiple access to commercial and residential properties.	N/A	N/A	Y

Section Name	Direction of Travel	Description	Construction Access Route	Castle Rock Avenue Diversion	Rail Replacement Bus Route
L3680 (between L3612 to N25)	Eastbound	This is a 50km/h single carriageway, with a footway on the north side of the road and has multiple access to commercial and residential properties.			Y
R907 (L3288 to roundabout)	Westbound (and eastbound)	This is a 50km/h single carriageway. From the R907 roundabout, R907 goes through a residential area, with footways on both side of the carriageway and on-street parking on the north side, until the junction with The Green and L3620 (Dwyer Road). Continuing from the junction with The Green and L3620 to the Midleton Northern Relief Road Phase 1, New Cork Road provides access to commercial and residential properties, and there are footways on both sides of the road, until the junction with the Midleton Northern Relief Road Phase 1. From the R907 roundabout there are a total of three road crossings; at the R907 roundabout junction (dropped kerb with tactile paving); at the junction with The Green and L3620 (pelican crossing); and at the Midleton Northern Relief Road Phase 1 (pelican crossing).	N/A	N/A	Y

Section Name	Direction of Travel	Description	Construction Access Route	Castle Rock Avenue Diversion	Rail Replacement Bus Route
R626 (Roundabout to Station Road)	Northbound (and southbound)	This is a 50km/h single carriageway, with footways on either side of the road, which leads through a mixed residential and commercial area. From the junction with Park Street there is on-street parking on the east side of the road. There is four-arm traffic intersection with a traffic light system with station road, though there is no pedestrian crossing on the south junction, only on the north, east and west junctions.	there is a four-arm traffic intersection with a traffic light system and pedestrian crossing on each arm.	N/A	Y
Ballyrichard More (Castle Rock Avenue to L7642)	Westbound	This is an 80km/h single carriageway (the speed limit reduces to 35kph over the bridge (OBY7)). The road is lined with hedges and has accesses to commercial and residential properties. In some locations, there are overhanging trees.	N/A	Y	N/A
L3617 to Castle Rock Avenue	Eastbound	This is an 80km/h single carriageway. From the junction with the L3680 to the junction with the L7642, just before the bridge (OBY7), the road is lined with hedges and has accesses to commercial and residential properties. From the junction with the L3680 to approximately 325m north of Rose Lawn there are sections of footway on either	N/A	Y	N/A

Section Name	Direction of Travel	Description	Construction Access Route	Castle Rock Avenue Diversion	Rail Replacement Bus Route
		one or both sides of the road.. The road also features multiple pedestrian crossings including a Toucan crossing. The carriageway's speed limit changes to 50km/h approximately 100m to the east of the junction with the L7642, before reducing to 35km/h over the bridge (OBY7). Continuing over the bridge, to the junction with Castle Rock Avenue, the speed limit increases to 80km/h approximately 50m to the east of the bridge. This section of the road is lined with hedges and has accesses to commercial and residential properties. In some locations, there are overhanging trees.			
L3606 (between Carrigtwohill Railway Station and L3680)	Northbound (and Southbound)	This is a 50km/h single carriageway. L3606 is a marked single carriageway, with access to multiple commercial and residential properties, St. Mary's Cemetery and St Mary's Convent National School, from the junction with L3680 for approximately 170m before it changes to an unmarked single carriageway until the OBY6 crossing. Immediately south of OBY6, at the junction of	N/A	N/A	Y

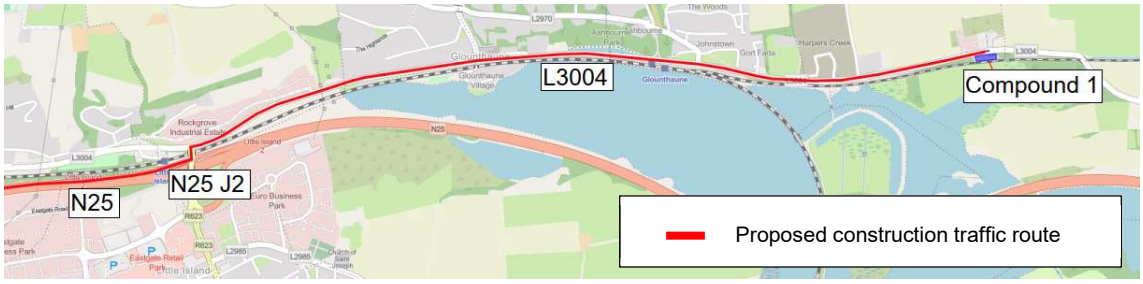
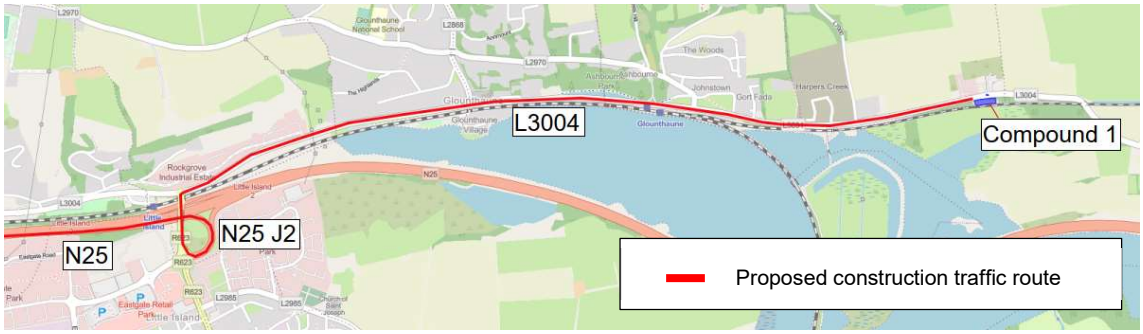
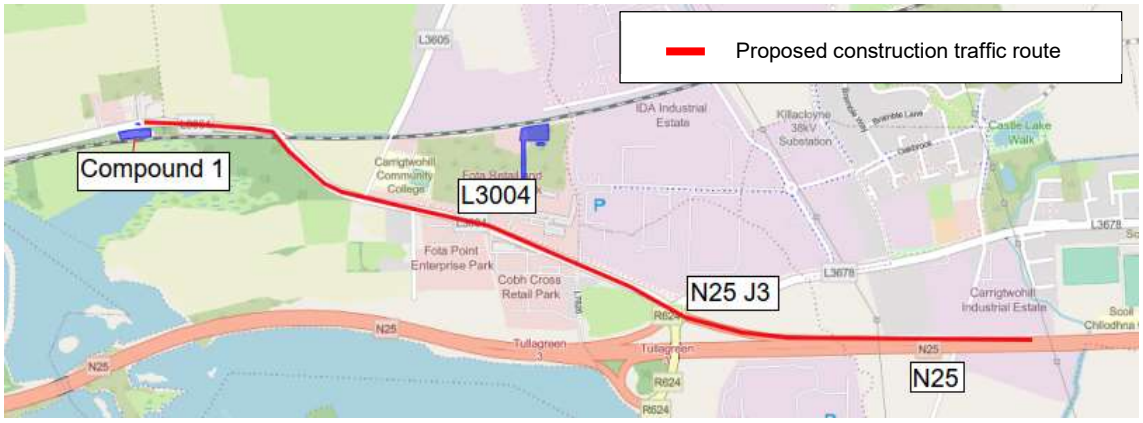
Section Name	Direction of Travel	Description	Construction Access Route	Castle Rock Avenue Diversion	Rail Replacement Bus Route
		the Carrigtwohill Train Station, there is a three-arm traffic intersection with a traffic light system, including a pedestrian crossing on Station Road. The L3606 and L3680 junction is relatively narrow.			
L3680 (between L3617 and L3612)	Westbound	This is a 50km/h single carriageway, with a footway on the north side of the road and has multiple accesses to commercial and residential properties.	Y	Y	Y
L7642 (between N25 and Carrigane Road)	Northbound (and Southbound	This is a narrow unmarked 50km/h rural road lined with hedges and overhanging trees. On this road are accesses to farmland, residential properties, and compound at chainage 9800m. There is only one passing place along the road.	Y	N/A	N/A
R626 (L3822 to Midleton Crossing)	Northbound (and Southbound)	This is a 50km/h single carriageway, with footways on either side of the road. There is a four-arm traffic intersection with a traffic light system at the junction with L3822, with pedestrian crossings on each junction.	Y	N/A	N/A

Source: Mott MacDonald

15.3.2 Construction Route Sections in study area

Table 15-10 shows proposed construction route sections, as highlighted in red, in the study area.

Table 15-10: Construction Routes

Compound Reference and Route Description
To Compound 1 at chainage 1200m from the west on the N25 Route: • N25 (J2) • L3004 (N25 (J2) to Compound 1) • Compound 1 opposite The Elm Tree

From Compound 1 at chainage 1200m towards the west on the N25 Route: • Compound 1 opposite The Elm Tree • L3004 (Compound 1 to N25 (J2)) • N25 (J2)

To Compound 1 at chainage 1200m from the east on the N25 Route: • N25 (J3) • L3004 (N25 (J3) to Compound 1) • Compound 1 opposite The Elm Tree


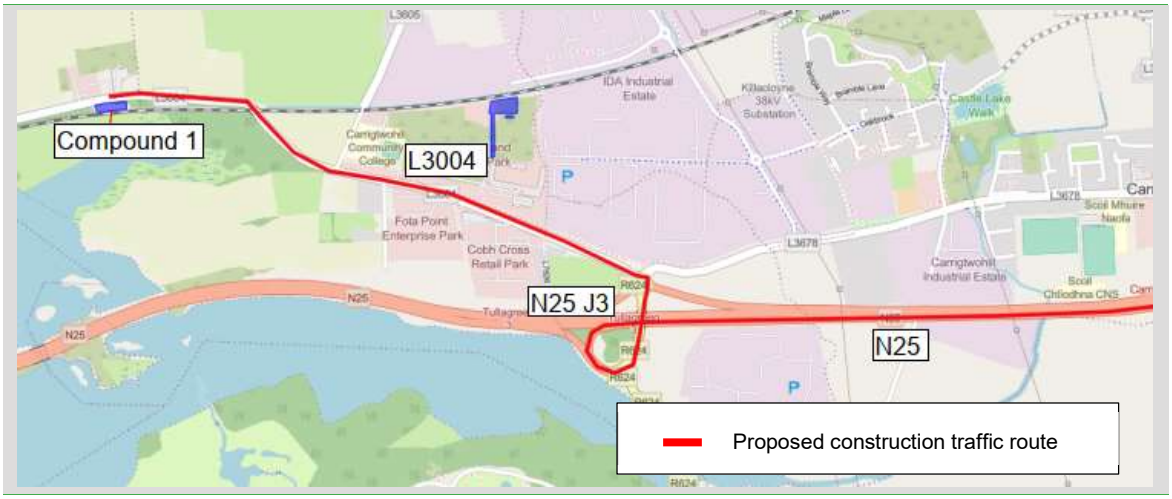
Compound Reference and Route Description

Compound Reference and Route Description

From Compound 1 at chainage 1200m towards the east on the N25

Route:

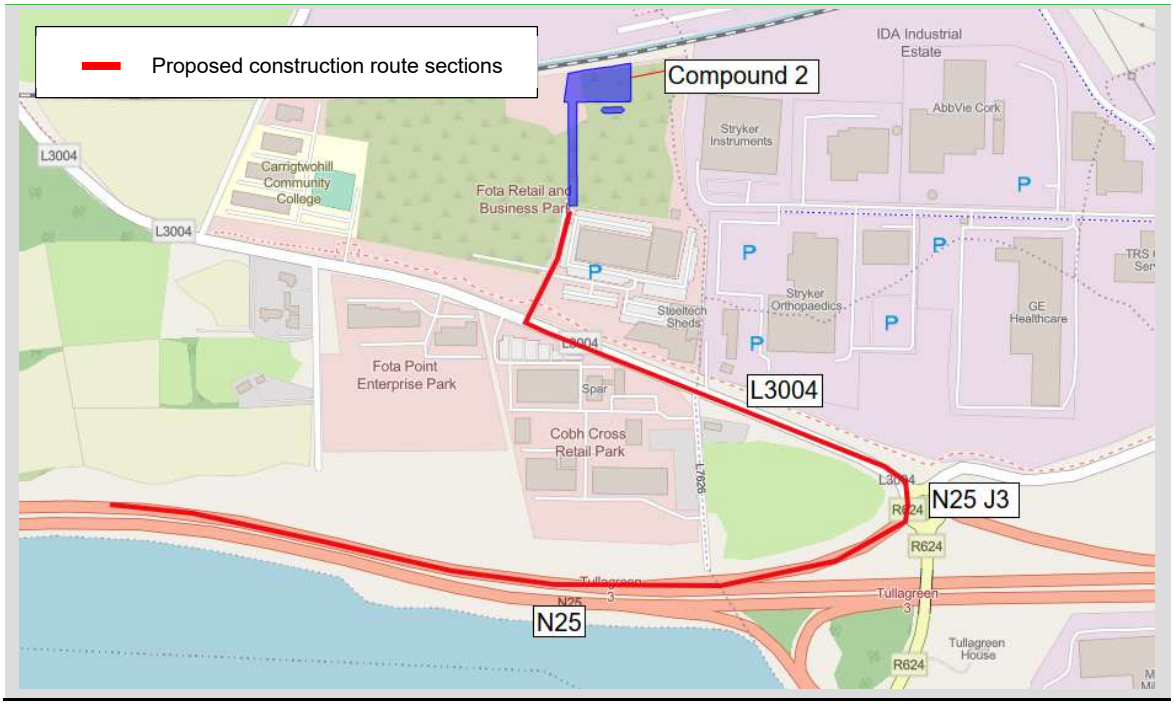
- Compound 1 opposite The Elm Tree
- L3004 (Compound 1 to N25 (J3))
- N25 (J3)



To Compound 2 at chainage 2340m from the west on the N25

Route:

- N25 (J3)
- L3004 (N25 (J3) to Fota Retail and Business Park)
- Compound 2 at Fota Retail and Business Park



Compound Reference and Route Description

From Compound 2 at chainage 2340m towards the west on the N25

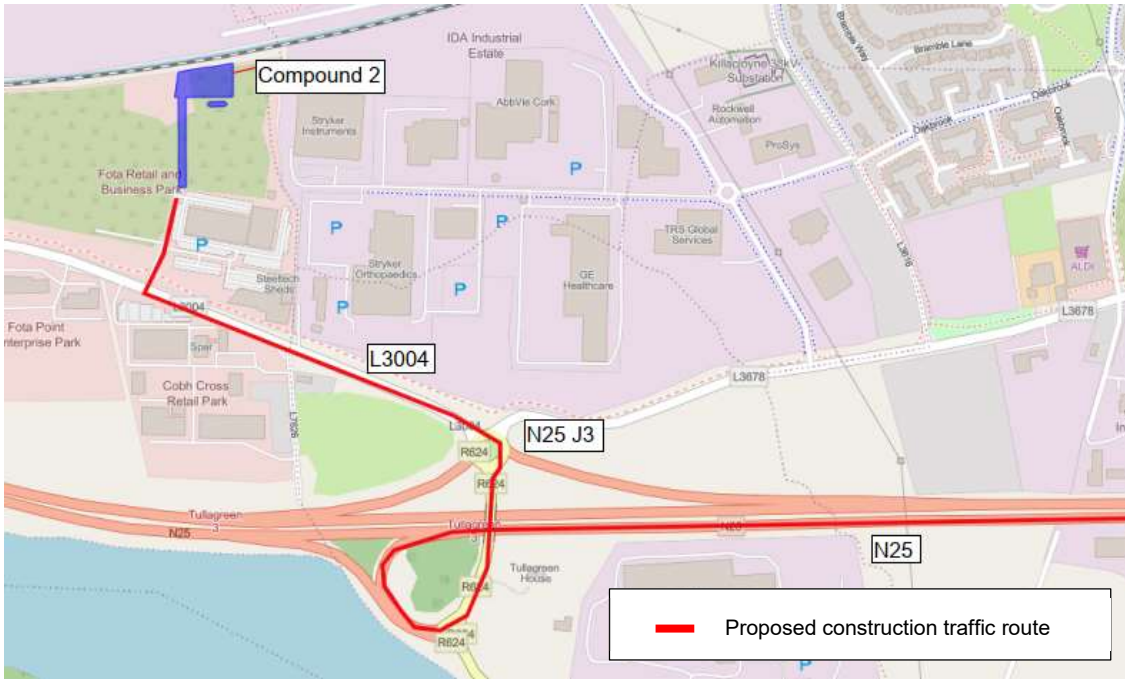
Route:

- Compound 2 at Fota Retail and Business Park
- L3004 (Fota Retail and Business Park to N25 (J3))
- N25 (J3)

To Compound 2 at chainage 2340m from the east on the N25

Route:

- N25 (J3)
- L3004 (N25 (J3) to Fota Retail and Business Park)
- Compound 2 at Fota Retail and Business Park

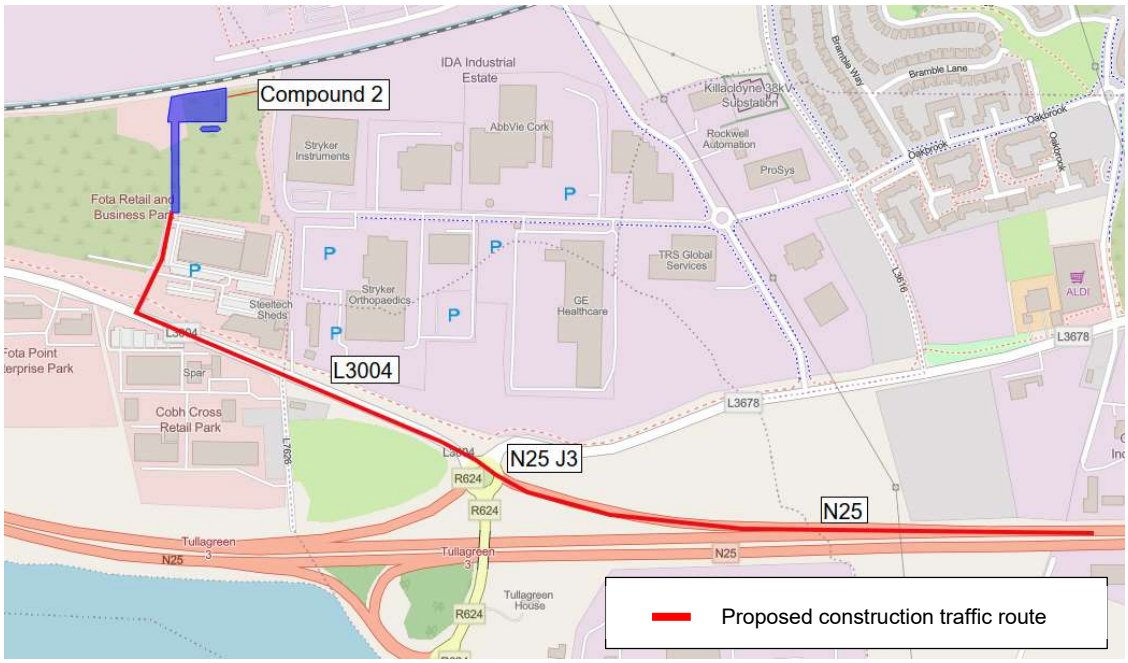


Compound Reference and Route Description

From Compound 2 at chainage 2340m towards the east on the N25

Route:

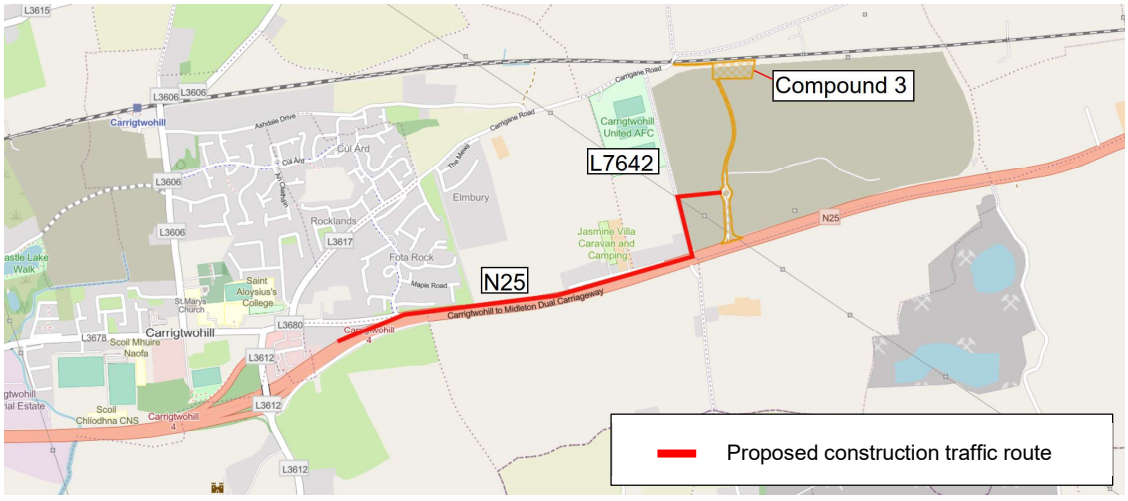
- Compound 2 at Fota Retail and Business Park
- L3004 (Fota Retail and Business Park to N25 (J3))
- N25 (J3)



To Compound 3 at chainage 6600m from the west on the N25

Route:

- N25
- L7642 Private Access (c. 200m north of N25 junction)

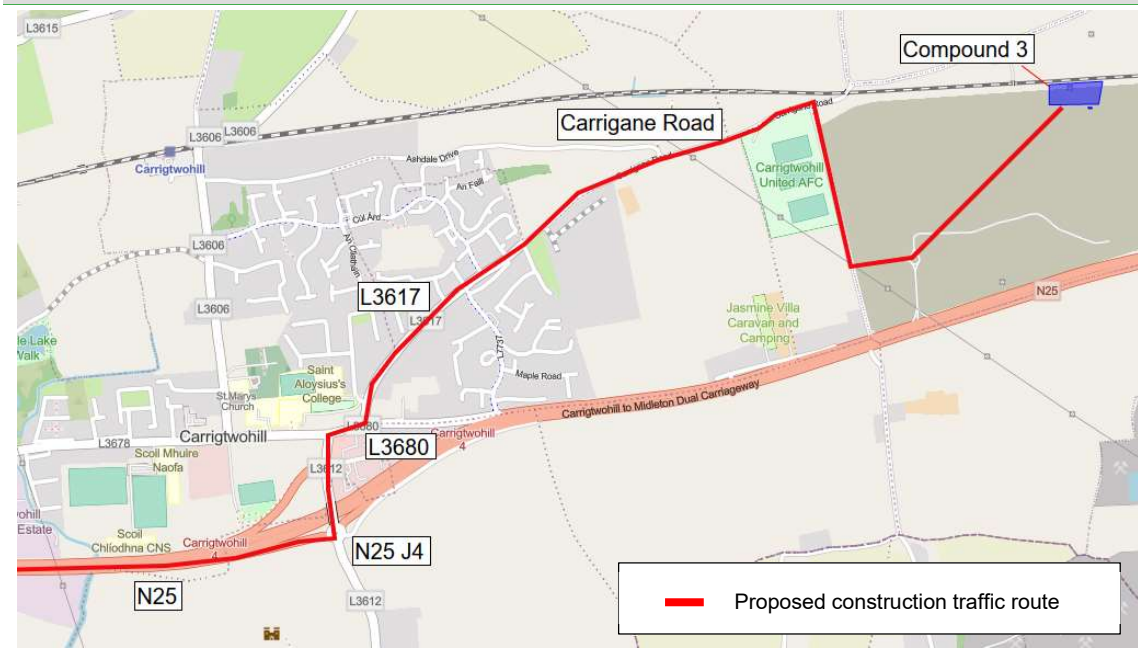


Compound Reference and Route Description

From Compound 3 at chainage 6600m towards the west on the N25

Route:

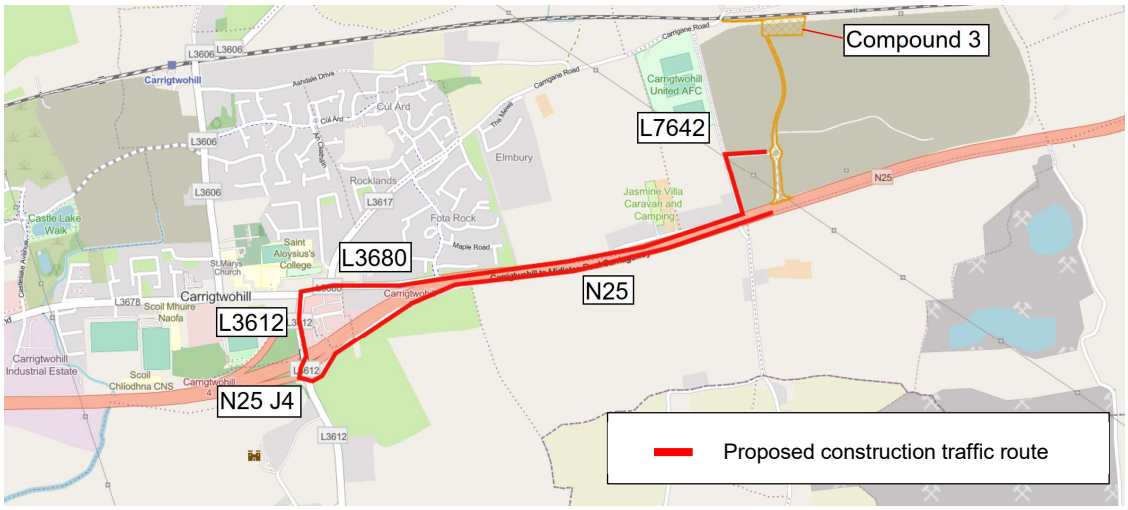
- Private Access Track from Compound 3
- L7642 (between Private Access and Carrigane Road)
- Carrigane Road/L3617 (between L7642 and L3680)
- L3680 (between L3680 and L3612)
- N25 (J4)



To Compound 3 at chainage 6600m from the east on the N25

Route:

- N25 (J4)
- L3612/L3680 (‘U’ turn via N25 (J4))
- L7642 Private Access (c. 200m north of N25 junction)

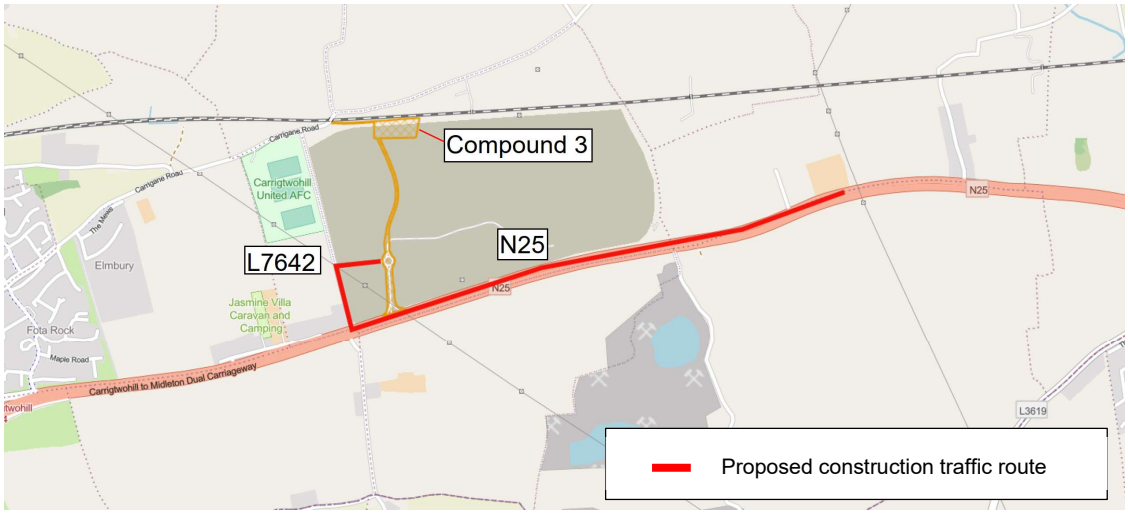


Compound Reference and Route Description

From Compound 3 at chainage 6600m towards the east on the N25

Route:

- Private Access Track from Compound 3
- L7642 Private Access (c. 200m north of N25 junction)



To Compound 4 at chainage 9800m from the west on the N25

Route:

- N25 (J5)
- R907 (between N25 (J5) and L3288)
- L3288/L3822 (to Compound 4 via private access)

Compound Reference and Route Description

From Compound 4 at chainage 9800m to the west on the N25

Route:

- L3288/L3822 (from Compound 4 via private access)
- R907 (between L3288 and N25 (J5))
- N25 (J5)

To Compound 4 at chainage 9800m from the east on the N25

Route:

- N25 (J5)
- R907 (between N25 (J5) and L3288)

L3288/L3822 (to Compound 4 via private access)

Compound Reference and Route Description

From Compound 4 at chainage 9800m towards the east on the N25

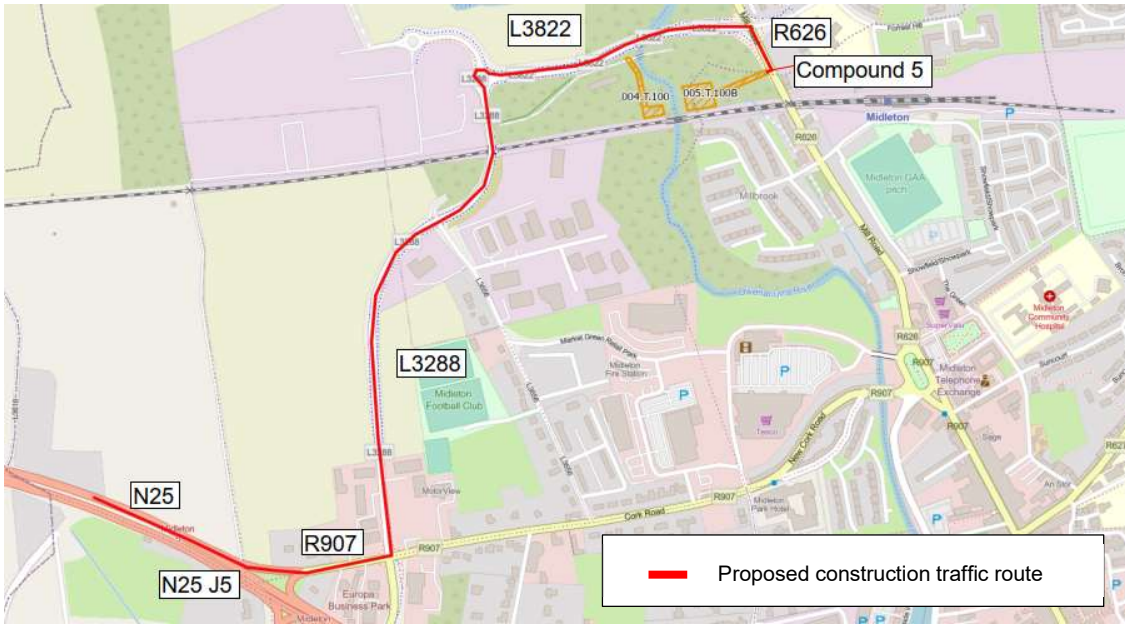
Route:

- L3288/L3822 (from Compound 4 via private access)
- R907 (between L3288 and N25 (J5))
- N25 (J5)

To Compound 5 at chainage 9900m from the west on the N25

Route:

- N25 (J5)
- R907 (between N25 (J5) and L3288)
- L3288
- L3822
- R626 (between L3822 and Compound 5)

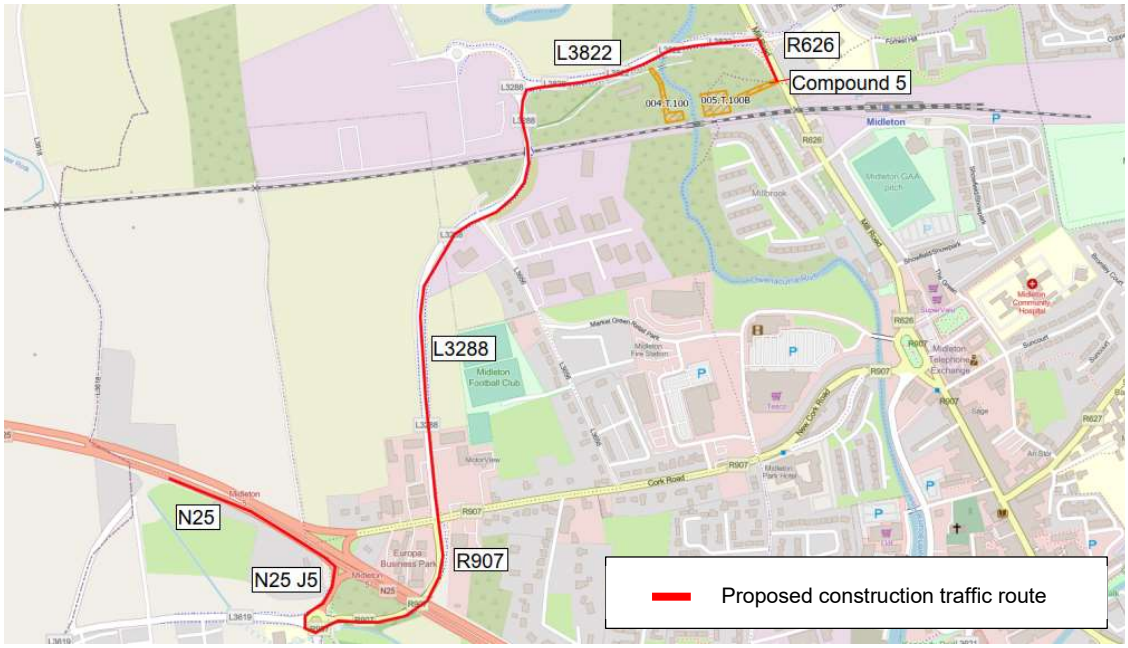


Compound Reference and Route Description

From Compound 5 at chainage 9900m to the west on the N25

Route:

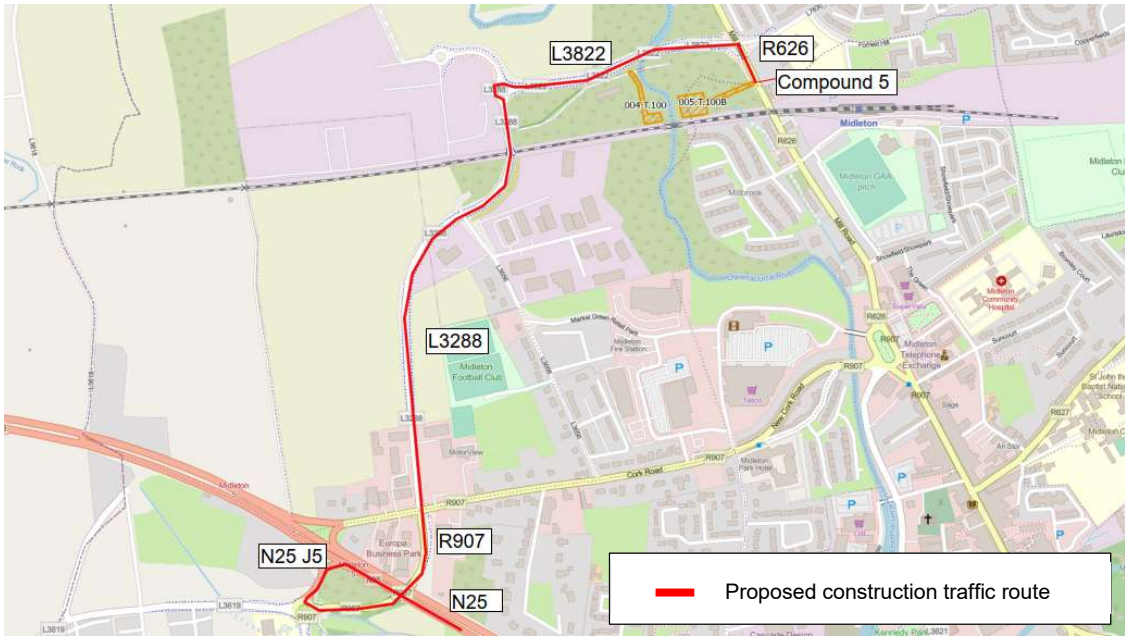
- R626 (between L3822 and Compound 5)
- L3822
- L3288
- R907 (between N25 (J5) and L3288)
- N25 (J5)



To Compound 5 at chainage 9900m from the east on the N25

Route:

- N25 (J5)
- R907 (between N25 (J5) and L3288)
- L3288
- L3822
- R626 (between L3822 and Compound 5)

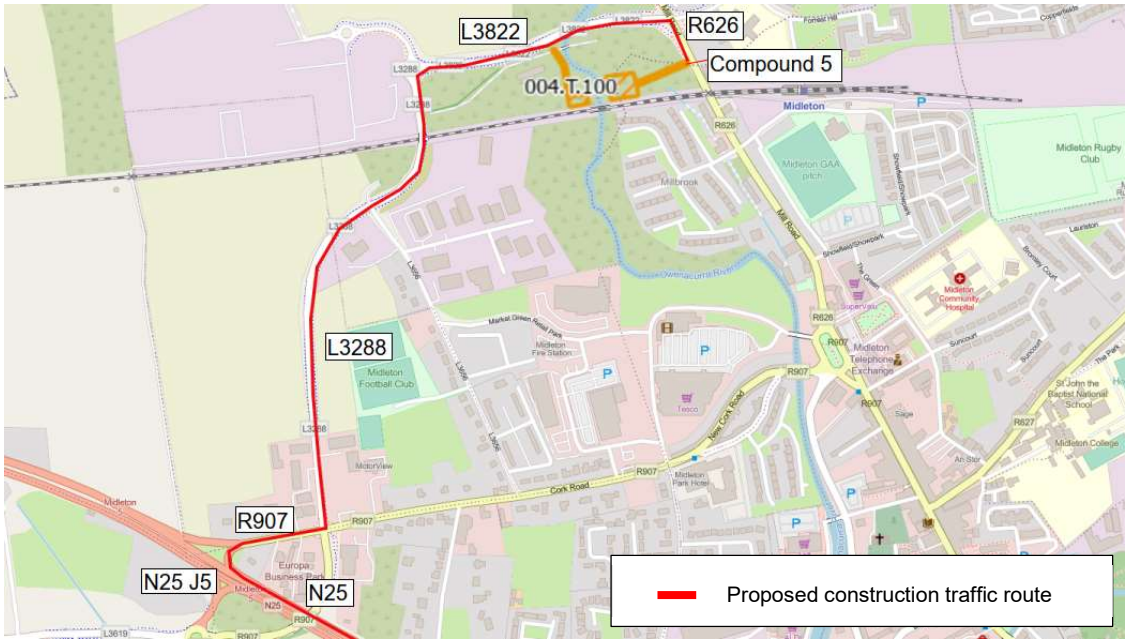


Compound Reference and Route Description

From Compound 5 at chainage 9900m to the east on the N25

Route:

- R626 (between L3822 and Compound 5)
- L3822
- L3288
- R907 (between N25 (J5) and L3288)
- N25 (J5)



Source: Mott MacDonald/OpenStreetMap

15.3.3 Walking and Cycling Routes

Within the study area there are a number of local communities, including Glouthaune, Carrigtwohill and Midleton. In addition, there are some smaller residential clusters, including farm buildings and hamlets.

The study area overlaps with several recreational and in some cases commuter routes for walking and cycling, as listed in Table 15-11.

Table 15-11: Local Walking and Cycling Routes

Route Type	Description	Location	Existing / Proposed
Cycling	Inter-Urban Route (IU-1): Glounthaune to Midleton. Construction between lounthaune between Fitzpatrick's shop and the Elm Tree restaurant completed in July 2021. Public consultation opened for Carrigtwohill to Midleton Phase 1 in November 2021.	Glounthaune to Midleton	Proposed
Cycling	CT-U8 along Western Distributor Road (Cork Road)/ Kilahora Road, connecting Old N28 to Fota Retail Park. Currently subject to public consultation.	Carrigtwohill	Proposed
Cycling	CT-U6 along Main Street/ Western Distributor Road (Cork Road), from intersection with Maryville Estate to the IDA Business Park. Currently subject to public consultation.	Carrigtwohill	Proposed
Cycling	CT-U9 along Main Street/Midleton Road, from the western end of Main Street to Fota Rocks Estate. Currently subject to public consultation.	Carrigtwohill	Proposed
Cycling	CT-U14 along New Link, from Castlelake Road to Station Road.	Carrigtwohill	Existing
Cycling	CT-U4 along Cul Ard, from Station Road to Carrigane Road	Carrigtwohill	Existing
Cycling	CT-U3 along Fota Rock Estate from Midleton Road to Carrigane Road.	Carrigtwohill	Existing
Cycling/Walking	M-U2 Northern Relief Road, between Cork Road to Mill Road	Midleton	Existing
Cycling	M-GW3 along the Owenacurra River Greenway, between Water Rock Master Plan area to Gyratory. Currently sunject to public consultation.	Midleton	Proposed
Cycling	M-GW2 from Midleton to Youghal Greenway. Construction scheduled to start in Spring 2023.	Midleton to Youghal	Proposed

Source: Mott MacDonald

15.3.4 Public Transport

There is one rail service and several local bus routes which traverse sections of the study area. Table 15-12 summarises the local rail and bus services and their associated frequencies.

Table 15-12: Local Bus and Rail Services

Service Number	Route Summary	Service Operator	Weekday Frequency (Mon-Fri) (Two-way)	Weekend Frequency (Two-way)	Existing / Proposed
40	Tralee – Rosslare Europort via Cork	Bus Éireann	Between 08:00 and 21:00 (between Cork and Waterford City): 26 services in total	Saturday: between 08:00 and 21:00 (between Cork and Waterford	Existing

Service Number	Route Summary	Service Operator	Weekday Frequency (Mon-Fri) (Two-way)	Weekend Frequency (Two-way)	Existing / Proposed
				City): 26 services in total Sunday: between 09:00 and and 21:00 (between Cork and Waterford City): 22 services in total	
240	Cork Bus Station - Ballycotton	Bus Éireann	Between 06:00 and 17:45: four services in total	Saturday: between 08:50 and 15:30: three services in total	Existing
241	Cork Bus Station - Trabolgan	Bus Éireann	Between 07:15 and 18:00: nine services in total	Saturday: between 11:00 and 18:40: three services in total	Existing
260	Cork Bus Station - Ardmore	Bus Éireann	Between 07:00 and 23:00: seven services in total	Saturday: between 07:55 and 23:00: five services in total Sunday: between 10:30 and 23:00: four services in total	Existing
261	Cork Bus Station - Ballinacurra	Bus Éireann	Between 07:20 and 22:50: 31 services in total	Saturday: between 08:25 and 22:50: 20 services in total Sunday: between 07:50 and 22:05: 16 services in total	Existing
Rail Service	Midleton - Cork	Irish Rail	Between 05:45 and 22:45: 62 services in total	Saturday: between 05:45 and 22:45: 36 services in total Sunday: between 08:15 and 20:45: 17 services in total	Existing
Rail Station	Glounthaune Station	-	-	-	Existing
Rail Station	Carrigtwohill Station	-	-	-	Existing
Rail Station	Midleton Station	-	-	-	Existing

Source: https://www.transportforireland.ie/getting-around/by-bus/route-maps/ , https://www.buseireann.ie/, https://www.irishrail.ie/en-ie/train-timetables/timetables-by-route

15.3.5 Existing Traffic Flows

Capacities for a variety of road types have been determined through a review of TII Guidance DN-GEO-03031 'Rural Road Link Design' (June 2017) in combination with the UK Design Manual for Roads and Bridges Guidance Volume 5, Part 3. These capacities, which are quoted in each direction in vehicles per hour (vph), are summarised in Table 15-13.

Traffic flow information for roads within the defined study area were sourced from traffic survey outputs; undertaken in March 2022 and June 2022. Table 15-13 details the existing traffic flows and capacities on the routes within the study area considered in the assessment.

Table 15-13: Route Capacities and Existing Traffic Count Data

Road	Speed Limit (/km/h)	Direction	7 Day Average (24-hour AADT)		%HGV	Capacity (vph)
			Cars/LGVs	HGVs		
N25 (west of J3)	120	Eastbound	21767	993	5%	1300
	120	Eastbound	20576	678	3%	1300
L3606	80	Northbound	771	54	7%	500
	80	Southbound	884	51	6%	500
L3004	80	Eastbound	4160	105	3%	1020
	80	Westbound	4413	118	3%	1020
Main road within IDA Industrial Estate	20	Northbound	778	15	2%	900
	20	Southbound	783	13	2%	900
L3678	50	Eastbound	4756	27	1%	1300
	50	Westbound	4124	26	1%	1300
L3606	50	Northbound	2124	6	0%	500
	50	Southbound	1888	5	0%	500
L3617	50	Eastbound	2148	20	1%	500
	50	Westbound	2309	43	2%	500
Castle Rock Avenue	80	Northbound	370	2	1%	500
	80	Southbound	319	3	1%	500
L3288	50	Northbound	3639	142	4%	1860
	50	Southbound	4126	148	4%	1860
N25 (west of J5)	100	Eastbound	27408	1263	5%	1300
	100	Westbound	27148	1215	4%	1300
R907	50	Eastbound	6369	35	1%	1300
	50	Westbound	5761	35	1%	1300
R626 (south of Midleton Crossing)	50	Northbound	4216	12	0%	750
	50	Southbound	3694	13	0%	750
L7642 (between N25 and Carrigane Road)	80	Northbound	158	19	11%	500
	80	Southbound	66	2	3%	500
R626 (north of	50	Northbound	4126	252	6%	750
	50	Southbound	3444	203	6%	750

Road	Speed Limit (/km/h)	Direction	7 Day Average (24-hour AADT)		%HGV	Capacity (vph)
			Cars/LGVs	HGVs		
Midleton Crossing)						

Source: Mott MacDonald

15.3.6 Railway Infrastructure

The proposed development is located along the existing single railway track from Glounthaune to Midleton in County Cork. There are three stations along the route, at Glounthaune, Carrigtwohill and Midleton. There are three level crossings situated on the rail line, these are described in context of their geographical location and reference to proposed works at each level crossing in Table 15-14.

Table 15-14: Existing Level Crossings

Level Crossing Ref.	Crossing Type	Works	Chainage (m)
Water Rock CCTV XY009	Remotely controlled	To be retained with widening to accommodate twin tracking	8600
Ford CCTV XY010	Remotely controlled	To be closed/extinguished, private road not currently used.	9000
Mill Road R626 CCTV XY012	Remotely controlled	None proposed	10050

Source: Mott MacDonald

The operation of the level crossing at Midleton (Mill Road) was observed on a site visit on 9th and 10th May 2022. In the AM peak period (between 0800 and 0900 on 10th May 2022) traffic queueing as a result of the barriers being closed was observed, to some extent, affecting the operation of the signalised junction to the north (R626/L3822/L7630), and to a lesser extent the signalised junction to the south (R626/Millbrook Lawn/McSweeney Terrace) of the level crossing. Observed traffic levels were much lower prior to 08:00 and after 09:00. In the PM peak period (between 1630 and 1830 on 9th May 2022) the traffic flow volume and the associated queueing activity observed was notably less than during the AM peak and accordingly did not affect the operation of the adjacent signalised junctions.

15.3.7 Collision Data

Recorded Personal Injury Collision (PIC) data (Road Safety Authority) was obtained from Cork County Council (22 October 2020) for the period 2010-2017, the most recent available data. In line with guidelines, data has been reviewed for the five-year period, 2013-2017 inclusive. Within the study area there were 57 collisions recorded between 2013 and 2017, of which:

- 47 classified ‘Minor Injury’;
- 8 classified ‘Serious Injury’; and
- 3 classified ‘Fatal’.

Recorded PIC are tabulated in Table 15-15. Where no collisions were recorded on a public road section within the study area ‘Not Applicable’ has been stated. A collision cluster analysis is documented in Table 15-16.

Table 15-15: Collisions within study area

Route Section	Assessment
N25 between Junction 1 (Irish Rail Freight Terminal) and Junction 2	There were seven recorded PICs during the five-year period ending 2017. Of the seven collisions recorded, two resulted in serious injuries and five in minor injuries. Of these collisions, two involved a single vehicle.
N25 between Junction 2 and Junction 3	There were 12 recorded PICs during the five-year period ending 2017. Of the 12 collisions recorded, one resulted in fatal injuries and 11 in minor injuries. Of these collisions, two involved a single vehicle.
N25 between Junction 3 and Junction 4	There were three recorded PICs during the five-year period ending 2017. Of the three collisions recorded, all resulted in minor injuries.
N25 between Junction 4 and Junction 5	There were eight recorded PICs during the five-year period ending 2017. Of the eight collisions recorded, one resulted in fatal injuries, two in serious injuries and five in minor injuries. Of these collisions, the fatal collision and one of the serious injuries involved pedestrians, and two involved a single vehicle.
N25 between Junction 5 and Lake View Roundabout	There were six recorded PICs during the five-year period ending 2017. Of the six collisions recorded, one resulted in serious injuries and five in minor injuries.
R623 (bridge over the N25)	There were two recorded PICs during the five-year period ending 2017. Of the two collisions recorded, both resulted in minor injuries.
R624 (bridge over the N25)	There was one recorded PICs during the five-year period ending 2017. The single collision recorded resulted in serious injuries and involved a pedestrian.
L3612 (bridge over the N25)	Not Applicable
R907 (bridge over the N25 to L3288)	Not Applicable
L3004 (between R623 and R624)	There were four recorded PICs during the five-year period ending 2017. Of the four collisions recorded, one resulted in serious injuries and four in minor injuries. Of these collisions, one involved a single vehicle.
L3678	There was one recorded PICs during the five-year period ending 2017. The single collision recorded resulted in minor injuries.
L3606 (between L3678 and Carrigtwohill Station)	There was one recorded PICs during the five-year period ending 2017. The single collision recorded resulted in minor injuries.
L3617 (between L3680 and L3618)	There was one recorded PICs during the five-year period ending 2017. The single collision recorded resulted in minor injuries.
L3680	There were two recorded PICs during the five-year period ending 2017. Of the two collisions recorded, both resulted in minor injuries. Of these collisions, both involved pedestrians.

Route Section	Assessment
L7642	Not Applicable
L3618	Not Applicable
R907	There were five recorded PICs during the five-year period ending 2017. Of the five collisions recorded, one resulted in serious injuries and four in minor injuries. Of these collisions, one involved a pedestrian.
R626 (between R907 roundabout and L3822)	There were three recorded PICs during the five-year period ending 2017. Of the three collisions recorded, all resulted in minor injuries. Of these collisions, one involved a pedestrian.
L3822	Not Applicable
L3288	There was one recorded PICs during the five-year period ending 2017.

Source: RSA (via CCC), Mott MacDonald

Table 15-16: Cluster Analysis

Route Section	Number of collisions within 200m radius of each other	Assessment
N25 between Junction 1 and Junction 2	• Two 60m apart • Two 170m apart • Two 150m apart	• Two collisions located on the westbound lanes of the N25 near the off-slip at Junction 1. One resulted in minor injuries (2014) and one in serious injuries (2016). The one resulting in minor injuries involved only a single vehicle. The frequency of collisions indicates there is no cluster here. • Two collisions located on the eastbound lanes of the N25 near the off-slip at Junction 2. Both resulted in minor injuries, recorded in 2014 and 2016. One of the collisions was a rear end. The frequency of collisions indicates there is no cluster here. • Two collisions located on the eastbound lanes of the off-slip at Junction two. One resulted in serious injuries (2014) and one minor injuries (2017). The one resulting in serious injures only involved a single vehicle, whilst the one resulting in minor injuries was a rear-end. Due to the different types of collisions and frequency, it indicates there is no cluster here.
N25 between Junction 2 and Junction 3	• Two 120m apart • Four 170m apart	• Two collisions located on the westbound lanes of the N25 near the Junction 2 slip roads. Both resulted in minor injuries, with one being a rear-end, whilst the other was a head-on conflict. Both were recorded in 2015, though one in the morning and one in the afternoon, and in different months (April and August). For the reasons above, it is unlikely that these have a related cause. • Four collisions located on the westbound lanes of the N25, to the east of Harper's Island. One resulted in fatal injuries, and three in minor injuries. The fatal collision and one minor collision occurred in 2017, though in July and January, respectively. The fatal collision was a head-on

Route Section	Number of collisions within 200m radius of each other	Assessment
		conflict. The two other minor collisions were both rear-ends, though recorded in 2014 and 2016. For the reasons stated above it is unlikely that these have a related cause.
N25 between Junction 3 and Junction 4	• Two 160m apart	• Two collisions located on the westbound lanes of the N25 near the R624 bridge. Both resulted in minor injuries. Both were rear-ends, and recorded at night in 2014 and in the morning in 2015. The frequency of collisions, circa 1 per year, indicates there is no cluster here.
N25 between Junction 4 and Junction 5	• Two 180m apart	• Two collisions on the eastbound lanes of the N25 near the junction with L3680. One resulted in fatal injuries, and one in serious injuries, Both were recorded in 2013 and involved pedestrians. The collision resulting in serious injuries was recorded in January in the early morning (01:30), whilst the collision resulting in fatal injuries was recorded in December in the evening (18:50). It is noted that within the vicinity of the collisions there is a footway, protected by a crash barrier, to the north of the N25, though at approximately 250m from L7737 the barrier and footpath stops. However, the collisions were approximately 11 months apart and therefore indicates there is no cluster here.
N25 between Junction 5 and Lake View Roundabout	• Four located at Lake View Roundabout	• Four collisions on Lake View Roundabout. All resulted in minor injuries and recorded at 08:40 November 2014, 08:00 September 2015, 19:05 February 2016 and 15:15 March 2017. Two of the collisions were rear-ends, whilst the other two were not specified. The frequency of collisions, circa 1 per year, indicates there is no cluster here.
R623 (bridge over the N25)	• Two 130m apart	• Two collisions resulted in minor injuries, recorded in 2015 and 2016. Collision types have not been specified, however the frequency of collisions, circa 1 per year, indicates there is no cluster here.
L3680	• Two 130m apart	• Two collisions resulted in minor injuries on the Main Street through Carrigtwohill. Both were recorded in the morning in 2014, in November and December, and both involved pedestrians. These occurred within a built up area of Carrigtwohill. Within the 2013-2017 dataset there have been no collisions within the area since 2014.
R907	• Three 40m apart • Two located at the R907 roundabout	• Three collisions on R907 to the east of the junction with L3620. One of the collisions resulted in serious injuries (2017) and two in minor injuries (2015 and 2017). The collision resulting in serious injuries involved a pedestrian, whilst the collision resulting in minor injuries in 2017 was a rear-end, and the other not specified. The two collisions resulting in minor injuries were recorded in late afternoon in June, whilst the collision resulting in serious injuries was recorded in late afternoon in February. Due to the different collision types

Route Section	Number of collisions within 200m radius of each other	Assessment
		provided, it suggests there is not a factor connecting the three collisions. • Two collisions on the R907 roundabout recorded in 2013 and 2014. Both resulted in minor injuries, with one a rear-end. The frequency of collisions, circa 1 per year, indicates there is no cluster here.
R626 (between R907 roundabout and L3822)	• Three 240m apart (70m and 170m)	• Three collisions located on the R626 between the junction with L3822 and the junction with McSweeney Terrace. All collisions resulted in minor injury, with one involving a pedestrian (2013), one a rear-end (2017) and one not specified. The two collisions recorded in 2013 were recorded at different times of day and year; 11:40 in August and 18:20 in January. For the stated reasons stated, it is unlikely that these have a related cause.

Source: RSA (via CCC), Mott MacDonald

15.4 Key Features of the Proposed Development

The assessment of the likely Roads and Traffic effects of the proposed development presented in Section 15.5 is based on the detail set out in Chapter 6 of this EIAR, in addition to the following assumptions.

15.4.1 Construction Programme

15.4.1.1 General

Subject to the grant of statutory approvals, it is anticipated that the pre-construction works will commence in Q4 2023, and construction works will commence in Q1 2024. For the duration of works, it is anticipated that construction-related traffic will take the most appropriate direct route from the N25. It is anticipated that works will take c.36 months to complete.

Construction will take place between 0700 and 1900 Monday to Sunday when outside the operational railway footprint. Works within the operational railway footprint will be undertaken between 1900 and 0700 daily.

15.4.1.2 Construction Workers

The number of construction workers required during the construction phase is expected to peak at approximately 125 persons. It is assumed that staff will travel to site via a combination of public transport, cycle, minibus and private passenger vehicles (in some cases accommodating more than one occupant).

15.4.1.3 Railway Closure

During the period of the railway closure, works will be undertaken around the clock. It is anticipated that the closure period will be approximately four months (months 29 to 32 inclusive) and rail replacement buses will be provided to transfer passengers between Glounthaune, Carrigtwohill and Midleton.

15.4.2 Construction Compounds

There are five construction compounds proposed for the works and these will be located at chainages 1200m, 2340m, 6600m, 9800m and 9900m. The construction compounds will contain temporary offices and welfare facilities, parking for construction staff and material stockpiles. The compound at chainage 9800m is proposed only for machinery access, with the main compound being the compound at chainage 9900m. It has been assumed that the construction traffic will be split in the ratio 20:80 between the compounds at chainage 9800m and 9900m respectively.

15.4.3 Construction Traffic

The majority of construction traffic will be generated during phase three and phase four, the earthworks phase and the track construction phase resepctively.

For the earthworks and track construction it is estimated that up to 5,500 Heavy Good Vehicles (HGVs) loads to and from the site (11,000 HGV movements) will be required (with a maximum of 30 loads per day) to deliver and remove material over the period of works which is expected to extend over an initial period of 11 months, with a further four months of ballast deliveries in the finishing stages of the works.

It is planned that sleepers and rails will be transported to site by train.

15.4.4 Road Closures

Castle Rock Avenue will be closed to through traffic in order to facilitate level crossing upgrading works to Water Rock CCTV XY009. It is expected that the closure will last for 16 weeks with diversions via Ballyrichard More, the R626 and N25.

15.4.5 Future Baseline Traffic Flow

The National Transport Model Update, Travel Demand Forecasting Report, NTpM Volume 3, TII, AECOM, December 2019 has been used to predict local road network traffic flows in the absence of the proposed development.

Low growth of traffic has been assumed given that the study area of the proposed development is sparsely populated. The likelihood of high or medium levels of traffic growth would be appropriate in a scenario in which both car ownership and population significantly increase in the area during or prior to the construction of the proposed development, which is not currently foreseen. Table 15-17 outlines the growth factors used to uplift traffic flows on the local road network. Table 15-18 lists forecast future baseline traffic flows.

Table 15-17: Future Year Scenario Growth Rates

Future Year Scenario	Growth Rate from 2022
2023	1.23%
2024	2.46%
2025	3.68%
2026	4.91%

Table 15-18: Future Baseline Traffic Flow Data

Road Section	Direction of flow	2023 Average Daily Traffic Flow		2024 Average Daily Traffic Flow		2025 Average Daily Traffic Flow		2026 Average Daily Traffic Flow	
		Total One-Way Flow	HGV Only	Total One-Way Flow	HGV Only	Total One-Way Flow	HGV Only	Total One-Way Flow	HGV Only
L3004 (N25 J2 to Glounthaune Station)	Eastbound	4368	106	4421	108	4473	109	4474	110
L3004 (Glounthaune Station to Compound 1)	Eastbound	4368	106	4421	108	4473	109	4474	110
L3004 (Compound 1 to Glouthaune Station)	Westbound	4641	119	4696	121	4752	122	4754	124
L3004 (Glounthaune Station to N25 J2)	Westbound	4641	119	4696	121	4752	122	4754	124
L3004 (Fota Retail and Business Park to Compound 1)	Westbound	4641	119	4696	121	4752	122	4754	124
L3004 (Compound 1 to Fota Retail and Business Park)	Eastbound	4368	106	4421	108	4473	109	4474	110
L3004 (N25 J3 to Fota Retail	Westbound	4641	119	4696	121	4752	122	4754	124

Road Section	Direction of flow	2023 Average Daily Traffic Flow		2024 Average Daily Traffic Flow		2025 Average Daily Traffic Flow		2026 Average Daily Traffic Flow	
and Business Park)									
L3004 (Fota Retail and Business Park to N25 J3)	Eastbound	4368	106	4421	108	4473	109	4474	110
L7642 (Compound 3 and Carrigane Road)	Northbound	181	19	183	19	185	20	186	20
L7642 (between Compound 3 and N25)	Southbound	70	2	70	2	71	2	71	2
L7642 (between N25 and Compound 3)	Northbound	181	19	183	19	185	20	186	20
Carrigane Road/L3617 (between L7642 and L3680)	Westbound	2409	44	2438	44	2467	45	2468	45
L3680 (between L3617 and L3612)	Westbound	4252	26	4303	27	4354	27	4354	27
L3680 (between L3617 and L3612)	Eastbound	4900	27	4959	28	5018	28	5018	28
L3680 (between L3617 to N25)	Eastbound	4900	27	4959	28	5018	28	5018	28

Road Section	Direction of flow	2023 Average Daily Traffic Flow		2024 Average Daily Traffic Flow		2025 Average Daily Traffic Flow		2026 Average Daily Traffic Flow	
R907 (between N25 and L3288)	Eastbound	6561	35	6639	36	6718	36	6719	37
L3288/L3822 (to Compound 4)	Northbound	3872	144	3919	145	3965	147	3967	149
L3288/L3822 (from Compound 4)	Southbound	4377	150	4430	152	4482	153	4484	155
R907 (between N25 and L3288)	Southbound	4377	150	4430	152	4482	153	4484	155
R907 (between N25 and L3288)	Northbound	3872	144	3919	145	3965	147	3967	149
R907 (between N25 and L3288)	Westbound	5938	35	6009	36	6080	36	6081	37
R907 (between N25 and L3288)	Eastbound	6561	35	6639	36	6718	36	6719	37
N25 (J1 - J2)	Eastbound	23307	1006	23587	1018	23866	1030	23878	1042
N25 (J2 - J1)	Westbound	21767	686	22028	695	22289	703	22298	711
N25 (J4 - J3)	Westbound	21767	686	22028	695	22289	703	22298	711
N25 (J3 - J4)	Eastbound	23307	1006	23587	1018	23866	1030	23878	1042
N25 (J2 - J3)	Eastbound	23307	1006	23587	1018	23866	1030	23878	1042
N25 (J3 - J2)	Westbound	21767	686	22028	695	22289	703	22298	711
N25 (L3680 - L7642)	Eastbound	29360	1279	29712	1294	30064	1310	30079	1325
N25 (J5 - J4)	Westbound	29045	1230	29393	1245	29741	1260	29756	1275

Road Section	Direction of flow	2023 Average Daily Traffic Flow		2024 Average Daily Traffic Flow		2025 Average Daily Traffic Flow		2026 Average Daily Traffic Flow	
N25 (L7642 - J5)	Eastbound	29360	1279	29712	1294	30064	1310	30079	1325
N25 (J6 - J5)	Westbound	29045	1230	29393	1245	29741	1260	29756	1275
N25 (J5 -J6)	Eastbound	29360	1279	29112	695	29457	703	29466	711
L3678	Eastbound	4900	27	4959	28	5018	28	5018	28
L3678	Westbound	4252	26	4303	27	4354	27	4354	27
L3606	Northbound	2182	6	2208	6	2235	6	2235	6
L3606	Southbound	1939	5	1963	5	1986	5	1986	5
L3680 (L3678 to L3612)	Eastbound	4900	27	4959	28	5018	28	5018	28
L3680 (between L3612 to L3617)	Eastbound	4900	27	4959	28	5018	28	5018	28
L3680 (between L3617 to N25)	Eastbound	4900	27	4959	28	5018	28	5018	28
L3680 (L3678 to L3612)	Westbound	4252	26	4303	27	4354	27	4354	27
R907 (L3288 to roundabout)	Eastbound	6561	35	6639	36	6718	36	6719	37
R907 (Roundabout to L3288)	Westbound	5938	35	6009	36	6080	36	6081	37
R626 (Roundabout to Station Road)	Northbound	4332	12	4384	12	4436	12	4436	13
R626 (Station Road to Roundabout)	Southbound	3798	13	3843	13	3889	13	3889	14

Road Section	Direction of flow	2023 Average Daily Traffic Flow		2024 Average Daily Traffic Flow		2025 Average Daily Traffic Flow		2026 Average Daily Traffic Flow	
Ballyrichard More (Castle Rock Avenue to L7642)	Westbound	2410	44	2438	44	2467	45	2468	45
L3680 (between L3680 and L3612)	Eastbound	4900	27	4959	28	5018	28	5018	28
L3617 to Castle Rock Avenue	Eastbound	2221	20	2248	20	2274	21	2274	21
L3822 (compound 4) to R626	Eastbound/Southbound	3487	205	3530	208	3572	210	3614	213
R626 to L3822 (compound 4)	Northbound/Westbound	4176	255	4226	258	4277	261	4328	264

Source: Mott MacDonald

15.5 Likely Significant Effects of the Proposed Development

Likely significant effects from the proposed development assessed are be summarised as follows:

- Construction Phase:
  - Driver delay: Disruption and delay to users of roads from the road closures (temporary closure of a level crossing) and construction traffic;
  - Community Effects: Disruption and delay of users of footways and cycleways from the temporary closure of a level crossing;
  - Collisions and Safety: Detrimental effect on road safety as a result of the additional traffic movements that will be generated by the proposed development.
- Operational Phase
  - Driver delay: Disruption and delay to users of roads from the increase in operation of level crossing barriers (as a result of an increase in rail services);
  - Community Effects: Disruption and delay of users of footways and cycleways from the increase in operation of level crossing barriers (as a result of an increase in rail services).

15.5.1 Construction Phase

Assessment of the magnitude of construction related effects have been derived with reference to both the IEMA Guidelines and the EPA Guidelines.

The overall construction period durations are described in Chapter 6 of this EIAR. Construction will take place between 07:00 and 19:00 Monday to Sunday when outside the operational railway footprint. Works within the operational railway footprint will be undertaken between 19:00 and 07:00 daily. During the railway closure period it is envisaged that works will be undertaken around the clock.

It is anticipated that the pre-construction works will commence in Q4 2023, and construction works will commence in Q1 2024. For the duration of works, it is anticipated that construction-related traffic will take the most appropriate direct route from the N25. It is anticipated that the full works package will require c.36 months to complete.

The assessed number of traffic movements generated by construction activity for each compound site are summarised in Table 15-19.

For the purpose of a robust assessment the following assumptions have been made:

- Construction-associated vehicles have been distributed amongst active /compounds throughout the study area;
- The number of construction vehicles will peak at 30 loads per day during Q4 of 2024 and Q1 and Q4 of 2025, with an average of 10 loads per day during the remainder of stages 3 and 4, and all other stages;
- The number of construction workers required during the construction phase is expected to peak at approximately 125 persons and will be distributed across active worksites/compounds throughout the study area. The maximum number of construction workers will align with when the maximum construction loads will occur. For the rest of the construction period half the number of personnel would be required;
- Each compound will serve a certain proportion of the track:
  - Compound 1 serves chainage 0m – 1770m

- Compound 2 server chainage 1770m – 4470m
- Compound 3 serves chainage 4470m – 8200m
- Compounds 4 and 5 serves chainage 8200m to 10600m

Compounds at chainage 9800m and 9900m have separate entrances, however the two compounds will effectively act as a single compound as the compound at chainage 9800m is only intended for machinery access. The compound at 9900m will experience a larger proportion of construction associated vehicles than the compound at chainage 9800m;

- All construction workers will travel individually in cars (via same route as HGVs). As discussed in Chapter 6, it is expected that construction workers will travel to/from site via a combination of public transport, cycle, minibus and private passenger vehicles (in some cases accommodating more than one occupant). However, for the purpose of undertaking a robust assessment it has been assumed that all construction workers travel individually in cars. It should be noted that this is unlikely to occur due to limits on number of parking provision at compounds.

Table 15-19: Construction and Diversion Related Traffic Flows

Road Section	Direction of Flow	2023 Peak Period Average Daily Traffic Flow		2024 Peak Period Average Daily Traffic Flow		2025 Peak Period Average Daily Traffic Flow		2026 Peak Period Average Daily Traffic Flow	
		Total One-Way Vehicles	HGV Only	Total One-Way Vehicles	HGV Only	Total One-Way Vehicles	HGV Only	Total One-Way Vehicles	HGV Only
L3004 (N25 J2 to Glounthaune Station)	Eastbound	19	3	155	30	78	15	40	8
L3004 (Glounthaune Station to Compound 1)	Eastbound	19	3	155	30	86	23	74	42
L3004 (Compound 1 to Glouthaune Station)	Westbound	19	3	155	30	86	23	74	42
L3004 (Glounthaune Station to N25 J2)	Westbound	19	3	155	30	78	15	40	8
L3004 (Fota Retail and Business Park to Compound 1)	Westbound	19	3	155	30	86	23	74	42
L3004 (Compound 1 to Fota Retail and Business Park)	Eastbound	19	3	155	30	86	23	74	42
L3004 (N25 J3 to Fota Retail	Westbound	38	6	156	30	110	26	114	50

Road Section	Direction of Flow	2023 Peak Period Average Daily Traffic Flow		2024 Peak Period Average Daily Traffic Flow		2025 Peak Period Average Daily Traffic Flow		2026 Peak Period Average Daily Traffic Flow	
and Business Park)									
L3004 (Fota Retail and Business Park to N25 J3)	Eastbound	32	0	126	0	92	8	98	34
L7642 (Compound 3 and Carrigane Road)	Northbound	19	3	104	20	104	20	52	10
L7642 (between Compound 3 and N25)	Southbound	19	3	104	20	104	20	52	10
L7642 (between N25 and Compound 3)	Northbound	19	3	104	20	104	20	52	10
Carrigane Road/L3617 (between L7642 and L3680)	Westbound	19	3	104	20	104	20	55	13
L3680 (between L3617 and L3612)	Westbound	19	3	104	20	104	20	52	10
L3680 (between L3617 and L3612)	Eastbound	19	3	104	20	104	20	52	10
L3680 (between L3617 to N25)	Eastbound	19	3	104	20	393	20	378	13
R907 (between N25 and L3288)	Eastbound	19	3	109	15	124	24	46	9

Road Section	Direction of Flow	2023 Peak Period Average Daily Traffic Flow		2024 Peak Period Average Daily Traffic Flow		2025 Peak Period Average Daily Traffic Flow		2026 Peak Period Average Daily Traffic Flow	
L3288/L3822 (to Compound 4)	Northbound	19	3	109	15	124	24	46	9
L3288/L3822 (from Compound 4)	Southbound	19	3	109	15	124	24	46	9
R907 (between N25 and L3288)	Southbound	19	3	109	15	132	32	80	43
R907 (between N25 and L3288)	Northbound	19	3	109	15	124	24	46	9
R907 (between N25 and L3288)	Westbound	19	3	109	15	124	24	46	9
R907 (between N25 and L3288)	Eastbound	0	0	0	0	8	8	34	34
N25 (J1 - J2)	Eastbound	19	3	155	30	78	15	40	8
N25 (J2 - J1)	Westbound	19	3	155	30	78	15	40	8
N25 (J4 - J3)	Westbound	57	9	157	31	156	30	130	26
N25 (J3 - J4)	Eastbound	38	6	156	30	102	18	80	16
N25 (J2 - J3)	Eastbound	19	3	155	30	102	18	50	10
N25 (J3 - J2)	Westbound	19	3	155	30	102	18	50	10
N25 (L3680 - L7642)	Eastbound	38	6	157	31	437	38	452	55
N25 (J5 - J4)	Westbound	38	6	157	31	164	38	153	73
N25 (L7642 - J5)	Eastbound	38	6	157	31	274	38	289	55
N25 (J6 - J5)	Westbound	19	3	109	15	124	24	46	9
N25 (J5 -J6)	Eastbound	19	3	109	15	124	24	46	9

Road Section	Direction of Flow	2023 Peak Period Average Daily Traffic Flow		2024 Peak Period Average Daily Traffic Flow		2025 Peak Period Average Daily Traffic Flow		2026 Peak Period Average Daily Traffic Flow	
L3678	Eastbound	0	0	0	0	8	8	34	34
L3678	Westbound	0	0	0	0	8	8	34	34
L3606	Northbound	0	0	0	0	16	16	68	68
L3606	Southbound	0	0	0	0	16	16	68	68
L3680 (L3678 to L3612)	Eastbound	0	0	0	0	8	8	34	34
L3680 (between L3612 to L3617)	Eastbound	0	0	0	0	8	8	34	34
L3680 (between L3617 to N25)	Eastbound	0	0	0	0	8	8	34	34
L3680 (L3678 to L3612)	Westbound	0	0	0	0	8	8	34	34
R907 (L3288 to roundabout)	Eastbound	0	0	0	0	8	8	34	34
R907 (Roundabout to L3288)	Westbound	0	0	0	0	8	8	34	34
R626 (Roundabout to Station Road)	Northbound	0	0	0	0	8	8	34	34
R626 (Station Road to Roundabout)	Southbound	0	0	0	0	8	8	34	34
Ballyrichard More (Castle Rock Avenue to L7642)	Westbound	0	0	0	0	326	3	326	3

Road Section	Direction of Flow	2023 Peak Period Average Daily Traffic Flow		2024 Peak Period Average Daily Traffic Flow		2025 Peak Period Average Daily Traffic Flow		2026 Peak Period Average Daily Traffic Flow	
L3680 (between L3680 and L3612)	Eastbound	0	0	0	0	179	19	179	19
L3617 to Castle Rock Avenue	Eastbound	0	0	0	0	179	19	179	19
L3822 (compound 4) to R626	Eastbound/Southbound	16	3	88	12	100	20	38	8
R626 to L3822 (compound 4)	Northbound/Westbound	16	3	88	12	100	20	38	8

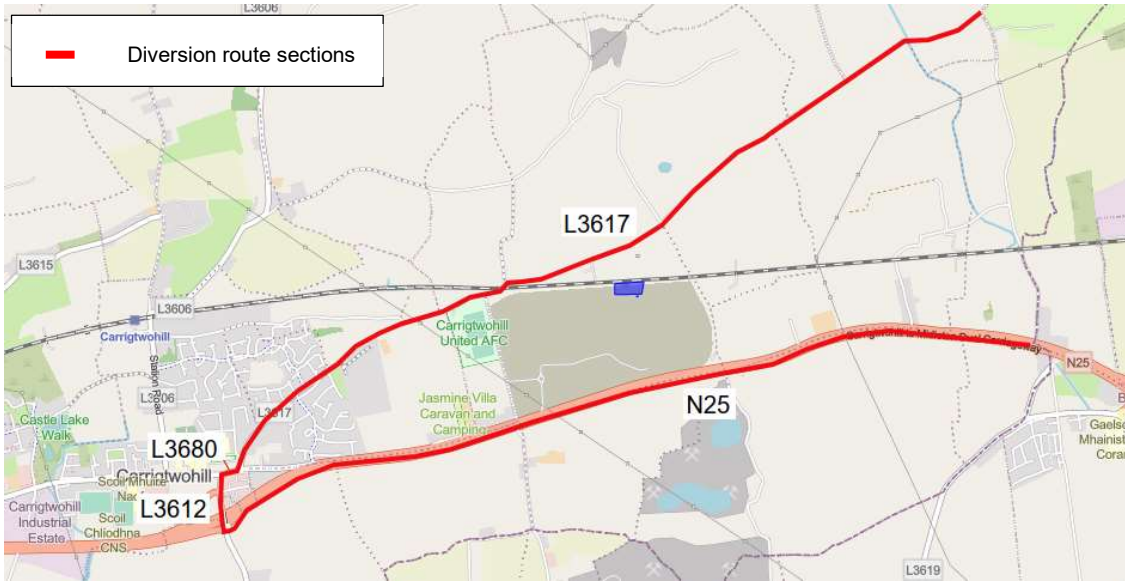
Source: Mott MacDonald

15.5.1.1 Predicted Construction Effects

Driver delay has the potential to arise as a result of the construction worksites associated with level crossing closure at Water Rock CCTV XY009 which will result in the closure of Castle Rock Avenue.

Table 15-20 shows the planned diversion due to the temporary closure of the Water Rock level crossing on Castle Rock Avenue.

Table 15-20: Castle Rock Avenue Diversion

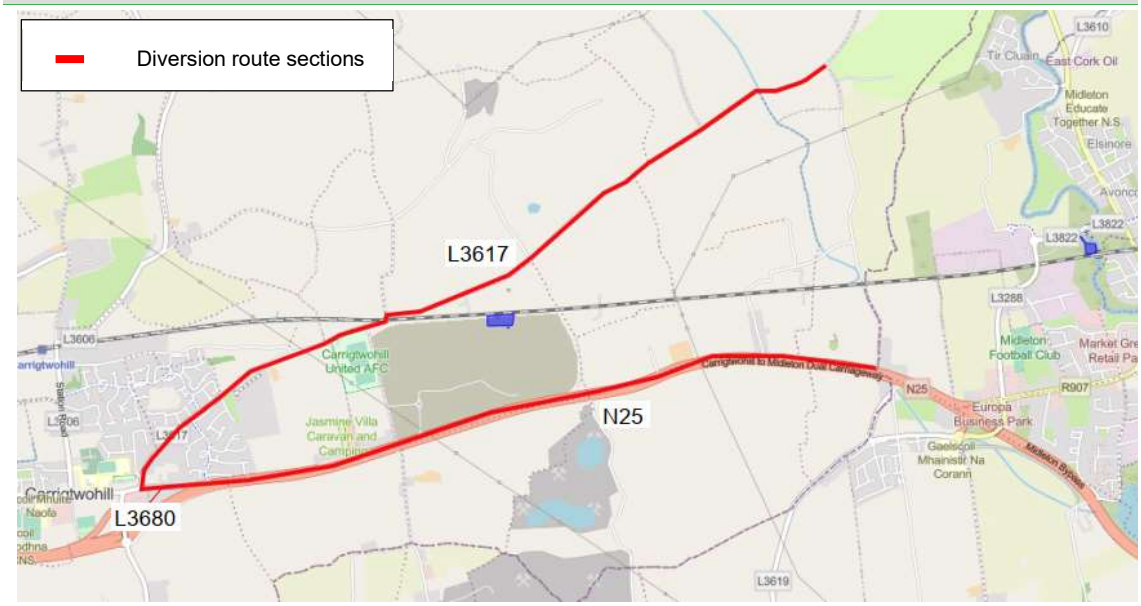
Section Name and Route Description
Diversion for traffic going north on Castle Rock Avenue Route: • N25 (Castle Rock Avenue to J5) • L3612 • L3680 (between L3612 and Avenue) • L3617 (to Castle Rock Avenue)


Section Name and Route Description

Diversion for traffic going south on Castle Rock Avenue

Route:

- L3617 (Castle Rock Avenue to L3680)
- L3680 (between L3617 and N25)
- N25 (to Castle Rock Avenue)



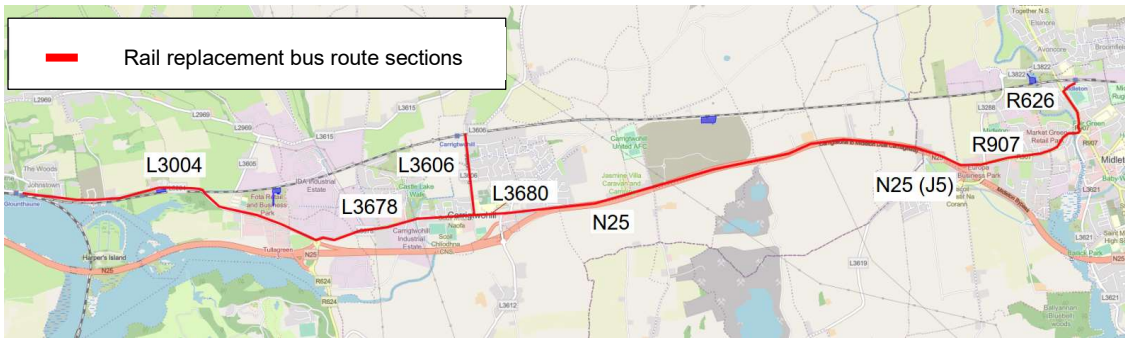
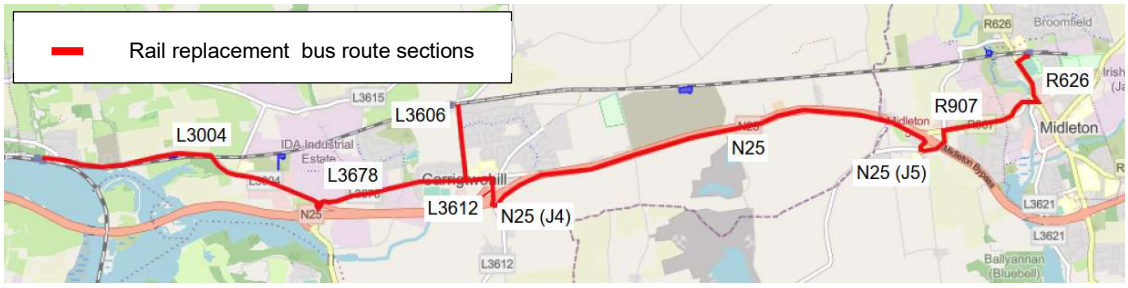
Source: Mott MacDonald/OpenStreetMap

It is anticipated that the Castle Rock Avenue diversion will be in place for approximately 16 weeks. The additional length of the diversion route would be 6.7km and would add six minutes travel time onto journeys previously utilising Castle Rock Avenue when the level crossing barriers were open.

It is likely that the railway line will be closed for a period of four months commencing in Q1 2026. Rail replacement bus services will be used to accommodate passengers. Table 15-21 shows the assumed rail replacement bus route.

Replacement bus services will serve Glounthaune Station, Carrigtwohill Station and Midleton Station. It is assumed that the number of replacement bus services will match the number of train services, and that the number of buses will match the maximum seated capacity of the trains.

Table 15-21: Rail Replacement Bus Routes

Section Name and Route Description
Bus service eastbound (Glounthaune Station to Carrigtwohill Station to Midleton Station) Route: • L3004 (From Glounthaune Station) • L3678 • L3606 • L3680 • N25 (to J5) • R907 • R626

Bus route westbound (Midleton Station to Carrigtwohill Station to Glounthaune Station) Route: • R626 • R907 • N25 (J5 to J4) • L3612 • L3606 • L3678 • L3004 (To Glounthaune Station


Source: Mott MacDonald/OpenStreetMap

Table 15-22 indicates the estimated daily vehicle movements for the peak construction period of each road within the study area. This highlights the worst-case representation for each road section within the study area, however, it should be noted that not all these peak periods will occur at the same time. A full breakdown across the entire construction period can be found in the Appendix 15.2.

The impact of construction associated traffic on the affected roads is shown in Table 15-22.

The number of vehicle movements for each month of construction has been calculated based on the indicative construction programme and the associated likely vehicle movements for each activity. These vehicle movements have then been distributed across the study area and individual route sections as appropriate.

It should be noted that all construction traffic related effects are deemed ‘temporary effects’ at each particular location. The peak period of construction will exceed one day and will be less than one year and as such all effects are deemed temporary[1].

[1] Environmental Protection Agency (EPA) Guidelines (2022).

Table 15-22: Impact Assessment Summary

Road (Route Section)	Direction	Capacity (vph)	Baseline 2023 Flow AADT	Peak Daily Additional HGV Movements	% increase - HGVs	Peak Daily Additional Vehicle Movements	% increase – All Vehicles	Duration of All Vehicles Peak	Significance of effect HGV increase (quantitative assessment)	Significance of effect per traffic increase (quantitative assessment)	Significance of effect HGV increase (professional assessment)	Significance of effect per traffic increase (professional assessment)
L3004 (N25 J2 to Glounthaune Station)	Eastbound	1020	4368	30	28%	155	4%4 weeks		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3004 (Glounthaune Station to Compound 1)	Eastbound	1020	4368	42	38%	155	4%5 weeks		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3004 (Compound 1 to Glouthaune Station)	Westbound	1020	4641	42	34%	155	3%5 weeks		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3004 (Glounthaune Station to N25 J2)	Westbound	1020	4641	30	25%	155	3%4 weeks		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3004 (Fota Retail and Business Park to Compound 1)	Westbound	1020	4641	42	34%	155	3%5 weeks		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3004 (Compound 1 to Fota Retail and Business Park)	Eastbound	1020	4368	42	38%	155	4%5 weeks		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3004 (N25 J3 to Fota Retail and Business Park)	Westbound	1020	4641	50	40%	156	3%6 weeks		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3004 (Fota Retail and Business Park to N25 J3)	Eastbound	1020	4368	34	31%	126	3%6 weeks		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L7642 (Compound 3 and Carrigane Road)	Northbound	500	181	20	103%	104	57%1 week		Major (Significant)	Moderate (Significant)	Minor (Not Significant)	Minor (Not Significant)
L7642 (between Compound 3 and N25)	Southbound	500	70	20	976%	104	149%1 week		Major (Significant	Major (Significant	Minor (Not Significant)	None (Not Significant)
L7642 (between N25 and Compound 3)	Northbound	500	181	20	103%	104	57%1 week		Major (Significant	Moderate (Significant)	Minor (Not Significant)	Minor (Not Significant)
Carrigane Road/L3617 (between L7642 and L3680)	Westbound	500	2409	20	45%	104	5%1 week		Moderate (Significant)	Minor (Not Significant)	Minor (Not Significant)	Minor (Not Significant)
L3680 (between L3617 and L3612)	Westbound	1020	4252	20	75%	104	2%1 week		Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3680 (between L3617 and L3612)	Eastbound	750	4900	20	72%	104	2%1 week		Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3680 (between L3617 to N25)	Eastbound	750	4900	20	72%	393	8%1 week		Major (Significant)	Minor (Not Significant)	Minor (Not Significant)	None (Not Significant)
R907 (between N25 and L3288)	Eastbound	1300	6561	24	66%	124	2%1 week		Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3288/L3822 (to Compound 4)	Northbound	1860	3872	24	16%	124	3%1 week		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
L3288/L3822 (from Compound 4)	Southbound	1860	4377	24	16%	124	3%1 week		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
R907 (between N25 and L3288)	Southbound	1300	4377	43	28%	132	3%1 week		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
R907 (between N25 and L3288)	Northbound	1300	3872	24	16%	124	3%1 week		Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
R907 (between N25 and L3288)	Westbound	1300	5938	24	66%	124	2%1 week		Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
R907 (between N25 and L3288)	Eastbound	1300	6561	34	93%	34	1%12 weeks		Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)
N25 (J1 - J2)	Eastbound	1860	23307	30	3%	155	1%5 weeks		None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)
N25 (J2 - J1)	Westbound	1860	21767	30	4%	155	1%5 weeks		None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)
N25 (J4 - J3)	Westbound	1860	21767	31	4%	157	1%1 week		None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)
N25 (J3 - J4)	Eastbound	1860	23307	30	3%	156	1%6 weeks		None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)
N25 (J2 - J3)	Eastbound	1860	23307	30	3%	155	1%1 week		None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)

Road (Route Section)	Direction	Capacity (vph)	Baseline 2023 Flow AADT	Peak Daily Additional HGV Movements	% increase - HGVs	Peak Daily Additional Vehicle Movements	% increase – All Vehicles	Duration of All Vehicles Peak	Significance of effect HGV increase (quantitative assessment)	Significance of effect per traffic increase (quantitative assessment)	Significance of effect HGV increase (professional assessment)	Significance of effect per traffic increase (professional assessment)
N25 (J3 - J2)	Westbound	1860	21767	30	4%	155	1%1 week	None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)	
N25 (L3680 - L7642)	Eastbound	1860	29360	55	4%	452	1%1 week	None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)	
N25 (J5 - J4)	Westbound	1860	29045	73	4%	164	1%1 week	None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)	
N25 (L7642 - J5)	Eastbound	1860	29360	55	4%	289	2%1 week	None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)	
N25 (J6 - J5)	Westbound	1860	29045	24	2%	124	0%1 week	None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)	
N25 (J5 -J6)	Eastbound	1860	29360	24	3%	124	0%1 week	None (Not Significant)	None (Not Significant)	None (Not Significant)	None (Not Significant)	
L3678	Eastbound	1300	4900	34	120%	34	1%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
L3678	Westbound	1300	4252	34	125%	34	1%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
L3606	Northbound	500	2182	68	1080%	68	3%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
L3606	Southbound	500	1939	68	1296%	68	3%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
L3680 (L3678 to L3612)	Eastbound	750	4900	34	120%	34	1%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
L3680 (between L3612 to L3617)	Eastbound	750	4900	34	120%	34	1%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
L3680 (between L3617 to N25)	Eastbound	750	4900	34	120%	34	1%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
L3680 (L3678 to L3612)	Westbound	750	4252	34	125%	34	1%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
R907 (L3288 to roundabout)	Eastbound	750	6561	34	93%	34	1%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
R907 (Roundabout to L3288)	Westbound	750	5938	34	93%	34	1%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
R626 (Roundabout to Station Road)	Northbound	750	4332	34	270%	34	1%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
R626 (Station Road to Roundabout)	Southbound	750	3798	34	249%	34	1%12 weeks	Major (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
Ballyrichard More (Castle Rock Avenue to L7642)	Westbound	500	2410	3	7%	326	13%12 weeks	Minor (Not Significant)	Moderate (Significant)	Minor (Not Significant)	Minor (Not Significant)	
L3680 (between L3680 and L3612)	Eastbound	750	4900	19	69%	179	4%12 weeks	Major (Significant)	Minor (Not Significant)	Minor (Not Significant)	Minor (Not Significant)	
L3617 to Castle Rock Avenue	Eastbound	500	2221	19	93%	179	8%12 weeks	Major (Significant)	Minor (Not Significant)	Minor (Not Significant)	Minor (Not Significant)	
L3822 (compound 4) to R626	Southbound	750	3613	20	10%	100	3%1 week	Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	
R626 to L3822 (compound 4)	Northbound	750	4309	20	8%	100	2%1 week	Moderate (Significant)	None (Not Significant)	Minor (Not Significant)	None (Not Significant)	

Source: Mott MacDonald

For all sections of the N25 itself the traffic volume increase will not exceed the significance threshold and the significance of the effect is assessed to be 'none' and accordingly 'not significant'. Since the 10% traffic increase threshold will not be exceeded on the N25 no detailed assessment has been undertaken for the N25.

Three rural roads (L7642 between N25 and Carrigane Road NB), Ballyrichard More (Castle Rock Avenue to L7642) and L3617 (between L3680 and L3618) have been identified from the quantitative assessment to feature a total traffic volume increase resulting in a 'moderate (significant)' effect.

A number of rural routes have been identified from the quantitative assessment to feature a HGV traffic increase resulting in a 'moderate (significant)' effects or 'major (significant)' effect.

Each of the road sections included in Table 15-22, and identified as 'moderate (significant)' or 'major (significant)' but featuring a residual capacity to readily accommodate the expected additional traffic flow are summarised in Table 15-23.

Table 15-23: Route Sections where total traffic % increase is significant

Road (Route Section)	Significance
L7642 (Compound 3 and Carrigane Road)	Moderate (Significant)
L7642 (between Compound 3 and N25)	Major (Significant
L7642 (between N25 and Compound 3)	Moderate (Significant)
Ballyrichard More (Castle Rock Avenue to L7642)	Moderate (Significant)

Source: Mott MacDonald

Table 15-24: Route Sections where HGV traffic % increase is significant

Road (Route Section)	Significance
L3004 (N25 J2 to Glounthaune Station) (HGVs)	Moderate (Significant)
L3004 (Glounthaune Station to Compound 1)	Moderate (Significant)
L3004 (Compound 1 to Glouthaune Station)	Moderate (Significant)
L3004 (Glounthaune Station to N25 J2)	Moderate (Significant)
L3004 (Fota Retail and Business Park to Compound 1)	Moderate (Significant)
L3004 (Compound 1 to Fota Retail and Business Park)	Moderate (Significant)
L3004 (N25 J3 to Fota Retail and Business Park)	Moderate (Significant)
L3004 (Fota Retail and Business Park to N25 J3)	Moderate (Significant)
L7642 (Compound 3 and Carrigane Road)	Major (Significant)
L7642 (between Compound 3 and N25)	Major (Significant
L7642 (between N25 and Compound 3)	Major (Significant
Carrigane Road/L3617 (between L7642 and L3680)	Moderate (Significant)
L3680 (between L3617 and L3612)	Major (Significant)
L3680 (between L3617 to N25)	Major (Significant)
R907 (between N25 and L3288)	Major (Significant)
L3288/L3822 (to/from Compound 4)	Moderate (Significant)
R907 (between N25 and L3288)	Major (Significant)
L3678	Major (Significant)
L3606	Major (Significant)
L3680 (L3678 to L3612)	Major (Significant)
L3680 (between L3612 to L3617)	Major (Significant)

Road (Route Section)	Significance
L3680 (between L3617 to N25)	Major (Significant)
L3680 (L3678 to L3612)	Major (Significant)
R907 (L3288 to roundabout)	Major (Significant)
R907 (Roundabout to L3288)	Major (Significant)
R626 (Roundabout to Station Road)	Major (Significant)
L3680 (between L3617 and L3612)	Major (Significant)
L3617 to Castle Rock Avenue	Major (Significant)
L3822 (compound 4) to R626 (compound 5)	Moderate (Significant)

Source: Mott MacDonald

It should be noted that whilst construction traffic on these public road sections is assessed to exceed the 10% significance threshold, based on professional judgement, given that the total traffic volume assessed during construction, in all cases, will be at a level notably lower than the theoretical capacity, the derived effect will at worst be ‘minor’ and therefore ‘not significant’ in terms of the EPA 2022 EIAR Guidelines.

15.5.1.2 Driver Delay

Driver journey times will be affected due to the temporary level crossing closure at Water Rock, as diversion routes will be required. Driver delay resultant from Castle Rock Avenue closure would typically add six minutes travel time onto journeys previously utilising the length of Castle Rock Avenue (assuming the level crossing barriers were open).

The assessment assumes a road closure at the existing level crossing with local access to the road north and south of the closed level crossing only.

Using the methodology discussed in Section 15.2.4 and Table 15-5 the driver delay effect significance would be classified as ‘minor (not significant)’.

On this basis, the significance of effect of driver delay for users is considered to be ‘minor’ and accordingly considered to be ‘not significant’ in the context of the EPA 2022 EIAR Guidelines.

The full railway closure between Glouthaune and Midleton will result in no rail services operating between Glouthaune, and Midleton via Carrigtwohill for a period of around four months.

Rail replacement buses will be provided to transfer passengers between Glouthaune, Carrigtwohill and Midleton Railway Stations. Table 15-25 compares the train travel times against the predicted rail replacement bus travel times, between Glounthaune, Carrigtwohill, and Midleton.

Table 15-25: Train and Bus Travel Times

Route	Train Travel Time (Minutes)	Bus Travel Time (Minutes)	Travel Time Difference	Significance of Effect
Glounthaune to Carrigtwohill	4	8	4	None (Not Significant)
Carrigtwohill to Glounthaune	4	8	4	None (Not Significant)
Carrigtwohill to Midleton	5	11	6	Minor (Not Significant)
Midleton to Carrigtowhill	5	12	7	Minor (Not Significant)

Source: Mott MacDonald, derived from Train Timetables by Route (irishrail.ie)

Further to the application of professional judgement, the significance of effect of driver delay for users is considered to be at worst 'minor' and accordingly not 'significant' in the context of the EPA 2022 EIAR Guidelines. Additionally, the significance of delays to users of the railway due to the use of rail replacement buses is considered to be 'minor' and accordingly not 'significant' in the context of the EPA 2022 EIAR Guidelines.

15.5.1.3 Community Effects (Severance, Pedestrian Delay, Pedestrian and Cycle Amenity, Fear and Intimidation)

The IEMA Guidelines define severance as 'the perceived division that can occur within a community when it becomes separated by a major traffic artery'. Severance may result from a road carrying large traffic flows or a physical barrier created by the road itself, and the IEMA guidelines suggest that consideration is given to the severity of existing severance and how this might be exacerbated by proposed construction traffic generated by a development. As shown in Table 15-22 the roads within the study area will continue to operate notably below capacity, even with the addition of traffic generated by construction of the proposed development. Severance should not occur when there is such a notable level of residual road capacity.

Pedestrian amenity is broadly defined by the IEMA as the 'relative pleasantness of a journey', and this definition also takes into account 'fear and intimidation'. The IEMA Guidelines suggest that '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'. The construction of the proposed development is predicted to generate increased HGV flows on the rural roads within the study area, with up to 68 HGV movements per day occurring during the peak construction period.

As such, the CTMP (refer to Appendix 6.1) includes a commitment to provide signage to warn drivers to the presence of public paths and cycling routes and appropriate signage advising of dates and hours of working will be installed on the 'rights of way' commonly utilised by pedestrians and cyclists in advance of road crossing points to warn users of the potential of construction traffic. On this basis, the significance of the effect on pedestrian amenity, is considered to be 'minor' and accordingly considered to be not 'significant' in terms of the EPA 2022 EIAR Guidelines.

The proposed development will have a positive impact on the economy, environment, safety, and accessibility and social inclusion, as detailed within AECOM's Cork Area Commuter Rail Programme Strategic Assessment Report (November 2021).

Cycling and walking routes (existing or future) that are potentially affected by construction access, level crossing closures or diversion routes whether on the road or in proximity, include the following shown in Table 15-26.

Table 15-26: Walking and Cycling Routes Potentially Affected by Construction

Route Type	Description	Location	Existing/Proposed	Construction Access	Castle Rock Avenue Diversion	Rail Replacement Bus Route
Cycling	Inter-Urban Route (IU-1): Construction of the section between Burys Bridge, Kilcoolishal and Glounthaune is currently in progress.	Glanmire to Glounthaune to Midleton	Proposed	√	√	√

Route Type	Description	Location	Existing/Proposed	Construction Access	Castle Rock Avenue Diversion	Rail Replacement Bus Route
	Construction between Fitzpatrick's shop, Glounthaune and the Elm Tree restaurant, Glounthaune was completed in July 2021. Public consultation was open for Carrigtwohill to Midleton Phase 1 in November 2021.					
Cycling	CT-U8 along Western Distributor Road (Cork Road)/ Kilahora Road, connecting Old N28 to Fota Retail Park. Currently in public consultation.	Carrigtwohill	Proposed	√		√
Cycling	CT-U6 along Main Street/ Western Distributor Road (Cork Road), from intersection with Maryville Estate to the IDA Business Park. Currently in public consultation.	Carrigtwohill	Proposed			√
Cycling	CT-U9 along Main Street/Midleton Road, from the western end of Main Street to Fota Rocks Estate.	Carrigtwohill	Proposed	√		√
Cycling	CT-U14 along New Link, from Castlelake Road to Station Road.	Carrigtwohill	Existing			√
Cycling	CT-U4 along Cul Ard, from Station Road to Carrigane Road	Carrigtwohill	Existing			√
Cycling	CT-U3 along Fota Rock Estate from Midleton Road to Carrigane Road.	Carrigtwohill	Existing	√		√
Cycling/Walking	M-U2 Northern Relief Road, between Cork Road to Mill Road	Midleton	Existing	√		√
Cycling	M-GW3 along the Owenacurra River Greenway, between Water Rock Master	Midleton	Proposed	√		

Route Type	Description	Location	Existing/Proposed	Construction Access	Castle Rock Avenue Diversion	Rail Replacement Bus Route
	Plan area to Gyratory. Currently in construction and expected to be completed in 2023.					
Cycling	M-GW2 from Midleton to Youghal Greenway. Currently scheduled to be opened in Q1 2023.	Midleton to Youghal	Proposed	√		

Source: cork-metropolitan-area-cycle-plan-final-report-january-2017-pdf.pdf (corkcoco.ie)

Two cycle routes run parallel to the railway line: IU-1 runs between Glanmire and Midleton, and M-GW2 runs between Midleton and Youghal, with both cycleways situated to the north of the railway line. Construction of the Inter-Urban Route between Burys Bridge, Kilcoolishall and Glounthaune is currently in progress, and the section between Fitzpatrick's Shop, Glounthaune and the Elm Tree restaurant, Glounthaune was completed in July 2021. The remainder of the cycleway is currently subject to public consultation, with no proposed dates for construction. The M-GW2 is scheduled for construction in Q1 2023 and will be situated to the east of Midleton Station. Therefore, construction activities are unlikely to overlap. All other proposed cycleways that are currently subject to public consultation have no proposed dates for construction. Cycleways that are already existing will not be required to be closed or have diversions put in place due to construction of the proposed development.

Overall, based on professional judgement, the construction traffic generated by proposed development study area will have a 'minor' temporary effect upon community receptors and is therefore 'not significant' in the context of the EPA 2022 EIAR Guidelines.

15.5.1.4 Collisions and Safety

The UK Design Manual for Roads and Bridges 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 now been superseded but based upon professional judgement and experience the statement is considered currently valid. Accordingly, 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 results of this analysis are summarised in Table 15.27

Table 15.27: Projected Collisions increase by Route Section and Serving Roads

Route Section	Number of Collisions Baseline Average (Based on 2013-2017 PIC Data)	Projected Average Number of Collisions Due to Predicted Traffic Increases
N25 between Junction 1 (Irish Rail Freight Terminal) and Junction 2	1.4	1.4
N25 between Junction 2 and Junction 3	2.4	2.4
N25 between Junction 3 and Junction 4	0.6	0.6
N25 between Junction 4 and Junction 5	1.6	1.6

Route Section	Number of Collisions Baseline Average (Based on 2013-2017 PIC Data)	Projected Average Number of Collisions Due to Predicted Traffic Increases
N25 between Junction 5 and Lake View Roundabout	1.2	1.2
R623 (bridge over the N25)	0.4	0.4
R624 (bridge over the N25)	0.2	0.2
L3612 (bridge over the N25)	0	0.0
R907 (bridge over the N25 to L3288)	0	0.0
L3004 (between R623 and R624)	0.8	0.8
L3678	0.2	0.2
L3606 (between L3678 and Carrigtwohill Station)	0.2	0.2
L3617 (between L3680 and L3618)	0.2	0.2
L3680	0.4	0.4
L7642	0	0.0
L3618	0	0.0
R907	1	1.0
R626 (between R907 roundabout and L3822)	0.6	0.6
L3822	0.6	0.6
L3288	0.2	0.2

Source: RSA (via CCC), Mott MacDonald

Using this basis of assessment, there would be a negligible increase in PICs in the study area during the construction period as a consequence of the increased traffic generated by the proposed development and the significance of the effect would be none and therefore not significant.

15.5.2 Operational Phase and Maintenance

Operational traffic associated with the proposed development would include journeys generated by rail users, rail staff as well as general servicing and maintenance type activities. It is not anticipated that traffic associated with the existing development would significantly increase due to the proposed development and that any increases in traffic would therefore be accounted for in assumed local traffic growth figures.

The operational phase will see the number of peak period rail services increase from two trains per hour (30-minute frequency in each direction) up to six trains per hour (10-minute frequency in each direction). This will result in both the Water Rock and Mill Road (Midleton) level crossing barriers increasing in operation. The potential effects on the public road network due to an increase in the Water Rock and Mill Road (Midleton) level crossing barriers increasing in operation is discussed in the following sub-sections.

15.5.2.1 Mill Road (Midleton) Level Crossing

Existing Operation

Based on observations from site visits (undertaken on 9th and 10th May 2022) the barriers at the Mill Road (Midleton) level crossing on R626 Mill Road close for approximately two minutes when a train passes (traveling to or from Midleton Railway Station which is situated approximately 140m east of the level crossing). Based on the number of peak time services,

(two in each direction) this equates to the barriers being closed four times, for a total of approximately eight minutes per hour in peak operational periods.

The capacity of R626 Mill Road between the level crossing and the R626/Millbrook Lawn/McSweeney Terrace signalised junction (c.90m south of the Mill Road (Midleton) level crossing) is approximately 15 vehicles. The capacity of R626 Mill Road between the level crossing and the R626/L3822 Midleton Northern Relief Road/L7630 signalised junction (c. 105 metres north of the Mill Road (Midleton) level crossing), is approximately 17 vehicles.

Vehicle queue length surveys were undertaken at the Mill Road (Midleton) level crossing on Thursday 9th June 2022 for the AM peak period, between 0700 and 1000, and for the PM peak period, between 16:00 and 19:00. The surveys recorded the level crossing barriers being closed for an average duration of 2 minutes 11 seconds between 0700 and 1000 and an average duration of 2 minutes 18 seconds between 1600 and 1900. It is duly noted that this day was a school holiday and accordingly traffic data for a count location near Midleton (site reference: 5229D2644906) was extracted from the TII traffic data website and was used to derive a growth rate to increase the traffic survey data to that of a non-school holiday.

The peak queue lengths recorded in each period are shown in Table 15-28.

Table 15-28: Mill Road (Midleton) Level Crossing (XY012) Peak Period Vehicle Queue Lengths

Period	Peak Vehicle Queue Lengths (No. of Vehicles) when barrier closed	
	Northbound (Time)	Southbound (Time)
AM	40 (08:35)	21 (08:44)
PM	33 (17:34)	30 (17:34)

Source: Mott MacDonald, Nationwide Data Collection

As shown in Table 15-28 vehicle queue lengths were recorded extending up to and through both the R626/Millbrook Lawn/McSweeney Terrace signalised junction to the south and the R626/L3822 Midleton Northern Relief Road/L7630 signalised junction to the north. This was also observed on the site visit undertaken on Tuesday 10th May 2022 AM and to a lesser extent on Monday 9th May 2022 PM.

Assuming a queue dispersal rate of approximately 30 vehicles per minute all queues would dissipate between barrier closures and this correlates with what was observed in May 2022. Therefore, the maximum driver delay associated with the existing operation of the Mill Road (Midleton) level crossing is approximately two minutes.

Pedestrian count surveys were undertaken at the Mill Road (Midleton) level crossing on Thursday 9th June 2022. Peak pedestrian counts are shown in Table 15-29.

Table 15-29: Mill Road (Midleton) Crossing (XY012) Peak Pedestrian Counts

Time Period	Number of Pedestrians			
	Northbound	Time	Southbound	Time
AM Peak Hour	37	11:00-12:00	38	1100-1200
AM Peak - 15-minute period	21	11:45-12:00	14	1130-1145
PM Peak Hour	69	17:00-1800	67	1400-1500 & 1500-1600

Time Period	Number of Pedestrians			
PM Peak - 15-minute period	23	1615-1630 & 1745-1800	31	1515-1530

Source: Mott MacDonald

Maximum pedestrian delay associated with the existing operation of the Mill Road (Midleton) level crossing is expected to be approximately two minutes.

Proposed Operation

The number of peak period rail services will increase from two trains per hour (30-minute frequency in each direction) up to six trains per hour (10-minute frequency in each direction) as a result of the proposed development. This will result in the Mill Road (Midleton) level crossing barriers potentially increasing in operation from four times per hour to up to 12 times per hour, with a maximum closure period of two minutes per operational cycle.

The peak queue lengths recorded for each period for 2022 (shown in Table 15-28) have been increased using a low growth factor of 4.91% (from Table 15-17) and are shown for 2026 in Table 15-30.

Table 15-30: Mill Road (Midleton) Level Crossing Proposed Operation Peak Period Vehicle Queue Lengths

Period	Peak Vehicle Queue Lengths (No. of Vehicles) when barrier closed	
	Northbound (Time)	Southbound (Time)
AM	42 (08:35)	22 (08:44)
PM	35 (17:34)	31 (17:34)

Source: Mott MacDonald, Nationwide Data Collection

As shown in Table 15-30 local traffic growth (discussed in Section 15.4.5) would lead to an increase in the peak period queue lengths.

Assuming the level crossing barriers are closed up to twelve times in an hour (approximately 24 minutes per hour), and barrier opening and closure times are regularised and distributed evenly over an hour, this would result in barriers opening for approximately three minutes and then closing for approximately two minutes. Applying a queue dispersal rate of approximately 30 vehicles per minute, it is assessed that queues will typically dissipate between barrier closures during regular operation.

Using the driver delay effect significance matrix (in Table 15-4), the increase in journey time due to the delay during this regularised operational scenario would result in a maximum of delay of approximately two minutes. It is therefore likely that the significance of the effect would be ‘none’ and therefore ‘not significant’ in terms of the EPA 2022 EIAR Guidelines.

However, two consecutive closure periods may on occasions coincide (i.e. up to a four-minute closure) dependent upon timetabling or due to an unexpected operational incident. In this scenario, applying a queue dispersal rate of approximately 30 vehicles per minute, it is assessed that at peak periods of network operation, queues may not fully disperse between the end of this extended closure period and the next regular closure period. As a result, at peak period of road network operation it is possible that some vehicles may be delayed for around seven minutes, though in most cases the delay is likely to be notably less than this.

Using the driver delay effect significance matrix (in Table 15-4), the increase in journey time due to the delay associated with the scenario of two consecutive closures would result in a

maximum delay of between four and seven minutes. It is therefore likely that the significance of the effect would be at worst 'minor' and therefore 'not significant' in terms of the EPA 2022 EIAR Guidelines.

During regularised operation it is not anticipated that an increase of operation of the Mill Road (Midleton) level crossing barriers would increase the maximum delay, in comparison to the existing situation, for pedestrians when the barriers are closed. In regular operation the maximum pedestrian delay associated with the proposed operation of the Mill Road (Midleton) level crossing is expected to be approximately two minutes. It is therefore likely that the significance of the effect would be 'none'.

In a scenario where two consecutive closure periods coincide (i.e. up to a four minute closure) dependent upon timetabling or due to an unexpected operational incident, pedestrians could be delayed by approximately four minutes. Although this for some pedestrians would represent a discernible change from the existing situation, it is assessed likely that the significance of the effect would be 'none' and therefore 'not significant' in terms of the EPA 2022 EIAR Guidelines.

15.5.2.2 Water Rock Level Crossing

Existing Operation

Based on observations from the site visit (undertaken on 9th and 10th May 2022) the barriers at the Water Rock level crossing on Castle Rock Avenue close for approximately two minutes when a train passes. Based on the number of peak time services, (two in each direction) this equates to the barriers being closed four times, for a total of approximately eight minutes per hour in peak operational periods.

The capacity of Castle Rock Avenue between the level crossing and the N25/Castle Rock Avenue junction (c.450m south of the Water Rock level crossing) is approximately 75 vehicles. The capacity of Castle Rock Avenue between the level crossing and the Castle Rock Avenue/ Ballyrichard More junction (c. 220m north of the Water Rock level crossing), is approximately 36 vehicles.

A traffic volume survey (in the form of an Automatic Traffic Counter (ATC)) was undertaken on Castle Rock Avenue, approximately 110m south of the level crossing, between Friday 4th March and Thursday 10th March 2022. The AM and PM peak hours over seven days were identifying as 0800-0900 and 1400-1500.

The recorded average seven-day peak hour vehicle counts for each peak hour are shown in Table 15-31.

Table 15-31: Water Rock Level Crossing Vehicle Flows

Peak Hour	7 Day Average Peak Hour Vehicle Flow	
	Northbound	Southbound
AM	31	55
PM	32	30

Source: Mott MacDonald, Nationwide Data Collection

Assuming a queue dispersal rate of approximately 30 vehicles per minute, all queues would dissipate between barrier closures. The maximum driver delay associated with the existing operation of the Water Rock level crossing is two minutes.

On the site visit pedestrian activity on Castle Rock Avenue was observed to be very low, likely in part due to a lack of pedestrian infrastructure on Castle Rock Avenue.

Proposed Operation

The number of peak period rail services will increase from two trains per hour (30-minute frequency in each direction) to six trains per hour (10-minute frequency in each direction) as a result of the proposed development. This will result in the Water Rock level crossing barriers potentially increasing in operation from four times per hour to up to 12 times per hour.

Assuming the level crossing barriers are closed up to twelve times in an hour (approximately 24 minutes per hour), and with the barrier opening and closure times distributed evenly over an hour, this would result in barriers opening for approximately three minutes then closing for approximately two minutes. Applying a queue dispersal rate of approximately 30 vehicles per minute, it is assessed that queues will typically dissipate between barrier closures during regularised operation.

Using the driver delay effect significance matrix, the increase in journey time due to the delay during this regularised operational scenario would result in a maximum of delay of approximately two minutes. It is therefore likely that the significance of the effect would be 'none' and therefore 'not significant' in terms of the EPA 2022 EIAR Guidelines.

However, two consecutive closure periods may on occasions coincide (i.e. up to a four minute closure) dependent upon timetabling or due to an unexpected operational incident. Applying a queue dispersal rate of approximately 30 vehicles per minute, during this operational scenario it is assessed that queues will typically dissipate between barrier closures operation.

Using the driver delay effect significance matrix, the increase in journey time due to the delay associated with the scenario of two consecutive closures would result in a of maximum delay of up to four minutes. It is therefore likely that the significance of the effect would be 'none' and therefore 'not significant' in terms of the EPA 2022 EIAR Guidelines.

During regular operation it is not anticipated that an increase of operation of the Water Rock level crossing barriers would increase the delay for pedestrians when the barriers are closed. In regular operation the maximum pedestrian delay associated with the proposed operation of the Water Rock level crossing is expected to be approximately two minutes. It is therefore likely that the significance of the effect would be 'none' and therefore 'not significant' in terms of the EPA 2022 EIAR Guidelines.

In a scenario where two consecutive closure periods coincide (i.e. up to a four minute closure) dependent upon timetabling or due to an unexpected operational incident, pedestrians could be delayed by approximately four minutes. Although this for some pedestrians would represent a discernible change from the existing situation, it is assessed likely that the significance of the effect would be 'none' and therefore 'not significant' in terms of the EPA 2022 EIAR Guidelines.

15.5.2.3 Maintenance and Servicing

It is not anticipated that there would be any notable changes to the current maintenance regime and the associated traffic generation once the proposed development is in operation.

15.5.2.4 Operational Phase Summary

Overall, it is ascertained that there are no significant changes to traffic flows arising directly from operation of the proposed development. Roads and Traffic impacts can, as a result, be stated as 'minor (not significant)' or 'none (not significant)', therefore not significant in terms of the EPA 2022 EIAR Guidelines.

15.5.3 Do Nothing

The 'do-nothing' scenario will have no impact on Roads and Traffic.

15.5.4 Decommissioning

The design life of the proposed development is a minimum of 60 years, dependent on the type of infrastructure. Iarnród Éireann do not have current plans to decommission the railway infrastructure between Glounthaune and Midleton.

It is anticipated that should future decommissioning occur in part or whole that it is probable that the associated traffic generation will be notably less that that generated during the construction phase.

15.5.5 Cumulative Effects

A number of developments are proposed within the immediate environs of the proposed development, as detailed in Table 2.2 of Chapter 2 of this EIAR. These developments are listed in Table 15-32 with comment on their inclusion in the cumulative assessment.

Table 15-32: Proposed developments within the study area

Development	Reference	Location	Summary
Burys Bridge, Kilcoolishal to Carrigtwohill via Glounthaune Pedestrian and Cycle scheme. (Part of the Inter-Urban Cycleway 1).	ABP confirmed associated CPO (Ref. CH04.310856) on 04/08/2021	Burys Bridge, Kilcoolishal to Carrigtwohill	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. The Scheme involves the construction of a dedicated pedestrian and cycle route on the northern side of the L3004.
Carrigtwohill to Midleton Inter-Urban Cycleway. (Part of the Inter-Urban Cycleway 1).		Carrigtwohill to Midleton Inter-Urban Cycleway	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. The proposed development is for a dedicated pedestrian and cycle route from the western side of the L3616-0 west of Carrigtwohill to the south of L3617-0 the east of Carrigtwohill.
Ballinacurra to Midleton pedestrian and cycle route (M-U2)		Ballinacurra to Midleton Station	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. The proposed development is for a dedicated pedestrian and cycle route from Ballinacurra to Midleton Train Station.
Dunkettle Interchange Improvement Motorway Scheme	ABP - MA0011 and HA0039	Cork City	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. The proposed development is to increase capacity at the junction for future growth, therefore traffic associated with this development would be included in national traffic growth.
Ballyadam Proposed new 110kV substation and associated works	ABP - VC04.309585	Ballyadam, former Amgen site	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development.

Development	Reference	Location	Summary
			The Electricity Supply Board (ESB) proposes to construct a new 110 kV substation within the IDA owned Ballyadam site. Traffic associated with this development would be included in national traffic growth.
Water Rock Urban Expansion Area Infrastructure Works	Local Authority Own Development – Part 8 Approved with Modifications	Water-Rock and various townlands	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. The proposed development is for various infrastructural works and services, including traffic management measures for L3618 and a new railway stop along the Cork to Midleton Railway line. Traffic associated with this development would be included in national traffic growth.
North Midleton Wastewater pumping station	Future Irish Water application to Cork County Council	Townparks	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. The proposed development is for a new wastewater pumping station and associated network infrastructure. Traffic associated with this development would be included in national traffic growth.
South Midleton Wastewater Network Diversion Project	Future Irish Water application to Cork County Council	Townlands of Ballynanelagh, Ballyadam and other various townlands, County Cork	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. The proposed development is for upgrades to the existing facility. Traffic associated with this development would be included in national traffic growth.
Celtic Interconnector	310798	Harpers Creek	**POTENTIAL CUMULATIVE EFFECT** Traffic associated with construction of the Celtic Interconnector project has been considered as part of the cumulative assessment for the proposed development.
Harpers Creek	ABP-301197-18	Ballynaroon, Glounthaune, Co. Cork.	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 174 residential units and traffic associated with this development would be included in national traffic growth.

Development	Reference	Location	Summary
Ballynaroon Housing development	ABP Ref. 312658	Water-Rock and various townlands	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 112 residential units and traffic associated with this development would be included in national traffic growth.
A new vehicular access and pedestrian entrance onto Ballynaroon Road	ABP Pre-App Ref.:309195		**NOT CONSIDERED RELEVANT** Pre-application stage so not a committed development proposal, therefore not considered further.
BAM Property Limited – housing development	311855 – ABP SHD Pre-App Consultation	Castlelake, Terry's land and Carrigtwohill (townlands).	**NOT CONSIDERED RELEVANT** Pre-application stage so not a committed development proposal, therefore not considered further.
Bluescape Development	17/5699	Bluescape Development	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 31 2-storey houses and traffic associated with this development would be included in national traffic growth.
Castle Rock Homes (Midleton) Ltd – Bloomfield Village	166818	Broomfield Village, Broomfield East and Broomfield West, Midleton, Co. Cork	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 26 residential units and traffic associated with this development would be included in national traffic growth.
Church Road Development, Murnane & O'Shea Ltd	174498	Church Road, Carrigtwohill, Co. Cork	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 25 residential units and traffic associated with this development would be included in national traffic growth.
Bluescape Ltd.	175315	Cluain Cairn, Station Road, Carrigtwohill, Co. Cork	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 19 2-storey houses and traffic associated with this development would be included in national traffic growth.

Development	Reference	Location	Summary
Cork Co-operative Marts Ltd	175516	Market Green, Knockgriffin, Midleton	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 42 residential units and traffic associated with this development would be included in national traffic growth.
Stryker Ireland Ltd	185546		**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for an extension to a manufacturing facility. Traffic associated with this development would be included in national traffic growth.
Castle Rock Homes (Midleton) Ltd	186553	Midleton	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 26 residential units and traffic associated with this development would be included in national traffic growth.
Park Hill View Estates Ltd,	187236	Broomfield West, Midleton. NE of existing Carrigtwohill station	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for a temporary wastewater treatment system. Traffic associated with this development would be included in national traffic growth.
Castle Rock Homes (Midleton) Ltd	187321	Midleton	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 13 residential units and traffic associated with this development would be included in national traffic growth.
Murnane & O'Shea Ltd	194124	Carrigane Rd. Carrigtwohill (townland), Carrigtwohill	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 10 residential units and traffic associated with this development would be included in national traffic growth.

Development	Reference	Location	Summary
Ancelstierre Investments Ltd,	194216	Avoncore Mill Rd, Broomfield West, Midleton	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 40 residential units and traffic associated with this development would be included in national traffic growth.
Smithkline Beecham (Cork) Ltd	204090	IDA Business & Technology Park, Killacloyne, Carrigtwohill	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for a single storey laboratory building. Traffic associated with this development would be included in national traffic growth.
The Cork Education and Training Board – Post Primary School accommodation:	204810	Fota Retail & Business Park, Killacloyne, Carrigtwohill.	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 8 prefabricated structures, and only has temporary permission for a period of no longer than five years (from 07/2020). Traffic associated with this development would be included in national traffic growth.
Midleton Association Football Club Ltd	214154	Immediate south of Midleton Station	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is an upgrade to the existing facility. Traffic associated with this development would be included in national traffic growth.
Murnane & O'Shea Ltd	214267	Carrigane Rd. Carrigtwohill (townland), Carrigtwohill	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 10 residential units and traffic associated with this development would be included in national traffic growth.
Barlow Properties Ltd	215072	Ashbourne House, Johnstown, Glounthaune	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 94 residential units and traffic associated with this development would be included in national traffic growth.

Development	Reference	Location	Summary
Murnane & O'Shea Ltd	215150	Carrigtwohill (townland), Carrigtwohill	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 67 residential units and traffic associated with this development would be included in traffic national growth.
Park Hill View Estates Ltd,	215664	Land at Broomfield West, Midleton, Co. Cork	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for a temporary wastewater treatment. Traffic associated with this development would be included in national traffic growth.
Compass Homes Ltd	216240	Station Road, Carrigtwohill, Carrigtwohill (townland), Co. Cork	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 38 residential units and a café, and traffic associated with this development would be included in national traffic growth.
Vella Homes Ltd	216874	Junction of Mill Rd & Northern Relief Rd, Broomfield West, Midleton.	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 284 residential units and a café, and traffic associated with this development would be included in national traffic growth.
Connaught Trust Limited	217130	Ballyadam and Carrigtwohill (townland), Carrigtwohill.	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 63 residential units and traffic associated with this development would be included in national traffic growth.
EMR Projects Ltd	217264	Knockgriffin and Water Rock, Midleton	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for 284 residential units, 7,525m2 for non-residential units, and traffic associated with this development would be included in national traffic growth.

Development	Reference	Location	Summary
IDA Ireland	217374	Carrigane Rd, Ballyadam, Carrigtwohill	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for local road improvement works and site development works. Traffic associated with this development would be included in national traffic growth.
Cruachan Investment Limited Partnership	217424		**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for new site access, local road improvement works and site development works. Traffic associated with this development would be included in national traffic growth.
Proposed Water Rock Railway Station	-	Water Rock	**NO POTENTIAL CUMULATIVE EFFECT** It is anticipated that construction for this development will take place outside of the construction period for this proposed development.
Proposed Carrigtwohill West Railway Station	-	Carrigtwohill	**NO POTENTIAL CUMULATIVE EFFECT** It is anticipated that construction for this development would take place outside of the construction for this proposed development.
Carrigtwohill Public Realm Improvements	-	Carrigtwohill	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is to upgrade the area with better quality public spaces. Traffic associated with this development would be included in national traffic growth.
New access road and temporary carpark	225378	Fota Retail and Business Park, Killacloyne, Carrigtwohill	**NO POTENTIAL CUMULATIVE EFFECT** This proposed development overlaps with the compound at chainage 1200m. Therefore, it is anticipated that construction for this proposed development would be implemented at a later stage.
Single storey prefabricated office and general lab building	224567	Stryker Innovation Centre, IDA Business Park, Tullagreen, Anngrove, Carrigtwohill	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for a temporary single prefabricated office and general lab building. Traffic associated with this development would be included in national traffic growth.

Development	Reference	Location	Summary
Irish Water Compulsory Purchase (Midleton LIHAF Wastewater Project) Order, 2021	ABP Case Ref: CH04.311549	Related to Irish Water planning application for North Midleton Wastewater pumping station (225032)	**NO POTENTIAL CUMULATIVE EFFECT** Unlikely to result in a significant cumulative effect in conjunction with traffic associated with the proposed development. This proposed development is for wastewater pipeline connection from North Midleton Pumping Station to the wastewater treatment plant in Carrigtwohill. Traffic associated with this development would be included in national traffic growth.

Source: Planning and Development | Cork County Council (corkcoco.ie), ePlan::Find a planning application (corkcoco.ie)

There is only one notable committed development (the Celtic Interconnector project) that will generate construction traffic on some road sections in the study area and has the potential to result in a significant cumulative effect in conjunction with the proposed development.

Committed developments with known information have been considered within the assessment, however, some developments do not have full information per traffic generation or construction information available. Based on a review of the information available and applied professional judgement, aside from the Celtic Connector, there are assessed to be no other developments which have potential to combine cumulatively (and significantly) with the proposed development. Accordingly, it has been assumed that such traffic generation will be accounted for in the National Transport Model and therefor accounted for in the baseline traffic volumes derived, see Section 15.4.5.

It has been identified that HGV traffic generated by Celtic Interconnector are anticipated to use the roads listed in Table 15-33 between 2024 Q1 and Q3, inclusive. From the quantitative assessment it demonstrates that HGV traffic increase resulting in a ‘moderate (significant)’ effects of ‘major (significant)’ effects will occur. However, Table 15-33 shows the affected routes will have residual capacity to readily accommodate the expected additional traffic from Celtic Interconnector.

It should be noted that whilst construction traffic on these public road sections is assessed to exceed the 10% significance threshold, based on professional judgement, given that the total traffic volume assessed during construction, in all cases, will be at a level notably lower than the theoretical capacity the derived effect will at worst ‘minor’ and therefore ‘not significant’ in terms of the EPA 2022 EIAR Guidelines.

Table 15-33: The Proposed Development and Celtic Interconnector Cumulative Effects

Road (Route Section)	Direction	Capacity (vph)	Proposed Development + Celtic Interconnector Peak Additional Daily HGV Movements	Proposed Development + Celtic Interconnector % Increase - HGVs	Proposed Development + Celtic Interconnector Peak Daily Additional Vehicle Movements	Proposed Development + Celtic Interconnector % Increase – All Vehicles	Significance of effect HGV increase (quantitative assessment)	Significance of effect per traffic increase (quantitative assessment)	Significance of effect HGV increase (professional assessment)	Significance of effect per traffic increase (professional assessment)
Carrigane Road/L3617 (between L7642 and L3680	Westbound	500	20	79%	104	5%	Major (Significant)	Minor (Not Significant)	Minor (Not Significant)	Minor (Not Significant)
Ballyrichard More (Castle Rock Avenue to L7642)	Westbound	500	15	34%	179	13%	Moderate (Significant)	Moderate (Significant)	Minor (Not Significant)	Minor (Not Significant)
L3617 to Castle Rock Avenue	Eastbound	1020	19	73%	179	17%	Major (Significant)	Moderate (Significant)	Minor (Not Significant)	Minor (Not Significant)

Source: Planning and Development | Cork County Council (corkcoco.ie), ePlan::Find a planning application (corkcoco.ie)

With specific reference to TII's, in conjunction with Cork County Council's, there are plans for an upgrade to the N25 corridor between Carrigtwohill and Midleton; the proposal includes upgrading the part of the existing N25 between Carrigtwohill and Midleton. This road project will involve the expansion of the existing road corridor to dual carriageway. The options are available to view on the N25 Brochure published by Cork County Council's RDO in October 2020.

The project is also included in Project Ireland 2040 and the National Development Plan 2018-2027. There is potential for an overlap in construction for the period of 2025-2026.

Prior to commencement of construction, and during the construction phase, engagement with the proponents of other developments (including Transport Infrastructure Ireland, the IDA, Irish Water and Cork County Council) will continue and where there is potential for works to be carried out in parallel, appropriate mitigation measures will be implemented including the scheduling of works and regular liaison meetings between project teams to ensure that plans are co-ordinated and impacts on population and human health are minimised. The specific detail will be developed by the appointed contractor within the parameters assessed in this EIAR.

Provided this and other appropriate mitigation measures are implemented, such as those outlined below, the cumulative Roads and Traffic impacts associated with the construction phase, based on our assessment, will not be 'significant'.

15.6 Mitigation and Monitoring Measures

15.6.1 Construction Phase

The temporary effects of construction (none of which have been assessed as 'significant') or otherwise) will be mitigated through adoption of a regulated and approved CTMP.

15.6.1.1 Construction Traffic Management Plan

A summary of key CTMP mitigation elements follow, however the CTMP is provided in full in Appendix 6.1.

The assessment of post-mitigation effects has been undertaken on the assumption that key measures set out in the CTMP will be developed as appropriate by the appointed contractor and be implemented during the proposed development construction phase.

The appointed contractor will agree temporary traffic management measures then adopt and monitor an appropriate way of working in consultation with Cork County Council, the appointed contractor, TII and/or their Agents and An Garda Síochána as appropriate. Construction activity generated vehicles (with the exception of site personnel in cars and vans) will travel on pre-defined routes to and from the relevant sites to reduce effects on existing local traffic.

The CTMP has been developed for the purposes of this assessment and will be further developed as necessary in consultation with Cork County Council and the Gardai prior to construction commencing. The CTMP will document measures to promote the efficient transportation of components and materials to site, whilst reducing congestion and disruption which might impact negatively on local communities or general traffic and in particular the emergency services. The CTMP will be considered a 'live' document and will be developed accordingly, within the parameters assessed in this EIAR.

Signed diversion routes will be provided to mitigate journey disruption. 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 would be provided within the four worksite compounds. Adequate vehicle parking space will be provided on-site and car parking will not be permitted on any public road network adjacent to the site, so that sight lines will be maintained and to minimise potential for obstruction and delay for other road users.

Furthermore, only vehicles essentially required to facilitate construction will be allowed to attend worksites. Car sharing will be promoted to construction personnel by the contractor during the induction process.

In order to reduce the potential for mud and other debris being deposited onto the local road network in the vicinity of worksite accesses, the appointed contractor will ensure that all concrete truck wash watering / cleaning is undertaken onsite where practical and remote from watercourses, in accordance with Chapter 12 (Biodiversity). This will minimise the amount of deleterious material deposited on the road surface and the appointed contractor will ensure that the nearest public road (between the worksite and the N25) will be kept clear of debris by monitoring and then utilising a road sweeper where necessary.

The appointed contractor could employ a number of sub-contractors and all will fall under the umbrella of the CTMP and will have an obligation to adhere to the Plan; this obligation will form part of the procurement process and will be written into any contract of employment.

Compliance will be monitored by the Project Manager, on behalf of the appointed contractor, via spot checks to ensure that vehicles follow the measures set out in the CTMP and recording of any complaints. The appointed contractor will be required to stipulate that all contractors disseminate these rules to their sub-contractors.

In liaison with Iarnród Éireann the appointed contractors will be required to maintain close liaison with local community representatives, landowners and statutory consultees throughout the construction period. This will include circulation of information about ongoing activities; particularly those that could potentially cause disturbance, including due to traffic.

The appointed contractor will nominate a person to be responsible for the co-ordination of all elements of Roads and Traffic during the construction process (Liaison Officer). This person will liaise with the local community so that the community has a direct point of contact within the developer organisation who they could contact for information purposes or to discuss matters pertaining to traffic management or site operation.

If the construction phase of any notably sized development(s) appears likely to overlap with the proposed development, the appointed contractor will seek to liaise with the appropriate developer organisation regarding the scheduling of deliveries to identify potential means of reducing the effects of combined construction.

15.6.1.2 Construction Access Arrangements

Transportation, including deliveries to and from the construction areas will be taken from the existing public road network and in some cases the rail network (it is planned that sleepers and rails will be brought to site using rail haulage).

The local area road network is shown on Figure 15-1 Given the nature of construction of the railway, there will be multiple work sites along the route throughout the construction programme.

The construction methodology, including construction access arrangements are provided within Chapter 6. The proposed programme of worksite locations will be confirmed by the appointed contractor as an integral part of their adopted CTMP provided as Appendix 6.1. All construction vehicle drivers will be instructed to access their destination worksite via an approved route; this is to be determined by the approved contractor in conjunction with the administering local authority.

15.6.2 Operational Phase

The operational phase assessment (in Section 15.5) ascertained that there are no significant changes to traffic flows arising directly from operation of the proposed development. Roads and Traffic impacts can, as a result, be stated as 'minor (not significant)' or 'none (not significant)'.

Although not assessed to result in a significant impact, there is some potential that train timings could be co-ordinated and signalling adjusted to reduce closure periods of the level crossing barriers. Iarnród Éireann will investigate the potential to reduce the closure periods of the Mill Road (Midleton) level crossing barriers through optimising train times and through rationalisation of the train signalling system.

Furthermore, vehicle queueing activity at the Mill Road (Midleton) level crossing could potentially be reduced through the optimisation of traffic signal timing and phasing at the existing signalised junctions to both the north and south of the level crossing location. Although not assessed to be 'significant' in terms of Community Effects, the likelihood of pedestrians being held at a closed barrier at the Mill Road (Midleton) level crossing will certainly increase. Sheltered waiting space for pedestrians on both sides of the level crossing would enhance the user experience in this locality and accordingly, Iarnród Éireann and Cork County Council may investigate the practicality of options to implement such infrastructure improvements.

15.7 Residual Impacts

In the context of the EPA 2022 EIAR Guidelines there are 'no significant' residual traffic and road impacts predicted during the construction and operational phases and this will be assured through the incorporation of measures described in Section 15.6.2 and described within the CTMP; see Appendix 6.1 of the EIAR.

15.8 Transboundary Effects

All elements of the proposed development are found in County Cork, Ireland, therefore there will be 'no significant' transboundary effects on Roads and Traffic outside of County Cork.

15.9 Summary

Table 15-34 provides a summary of the impact assessment undertaken for both construction and operation in the context of traffic impacts on the public road network.

Table 15-34: Impact Assessment Summary

Phase	Aspect	Embedded design, mitigation and enhancement measures	Duration of impact	Magnitude of impact (with mitigation)	Significance impact
Construction	Driver Delay – disruption and delay to users of	Implementation of CTMP including signage	16 weeks	6 minutes (typical)	Minor (Not Significant) Temporary

Phase	Aspect	Embedded design, mitigation and enhancement measures	Duration of impact	Magnitude of impact (with mitigation)	Significance impact
	roads from closure of Castle Rock Avenue	advising of closure and diversion routing			
	Driver Delay – disruption and delay to users of roads from additional traffic generated by the development	Implementation of CTMP	None	None	None (Not Significant) Temporary
	Community Effects (including Severance) - Disruption and delay of users of footpaths and cycle paths from construction work in or adjacent to active travel infrastructure	Implementation of CTMP	None	None	None (Not Significant) Temporary
	Accidents and Safety - Detrimental impact on road safety as a result of the additional traffic movements that will be generated by the proposed development	Implementation of CTMP	None	None	None (Not Significant) Temporary
Operational	Driver Delay – disruption and delay to users of roads from additional closure periods of level crossing at Midleton	Iarnród Éireann and Cork County Council will investigate potential implement measures to reduce the magnitude	Permanent	Range 0 to 5 minutes	Minor (Not Significant)
	Driver Delay – disruption and delay to users of	None	Permanent	Range 0 to 2 minutes	None (Not Significant)

Phase	Aspect	Embedded design, mitigation and enhancement measures	Duration of impact	Magnitude of impact (with mitigation)	Significance impact
	roads from additional closure periods of level crossing at Castle Rock Avenue				
	Driver Delay – disruption and delay to users of roads as a result of the additional traffic movements that will be generated by the proposed development	None	None	None	None (Not Significant)
	Community Effects (including Severance) - Disruption and delay of users of footways as a result of additional closure periods of the Mill Road (Midleton) level crossing barriers	Iarnród Éireann and Cork County Council will investigate potential to implement measures to enhance the amenity of pedestrians adjacent to the level crossing	None	Range 0 to 2 minutes	None (Not Significant)
	Community Effects (including Severance) - Disruption and delay of users of footpaths and cycle paths as a result of the additional traffic movements that will be generated by the proposed development	None	None	None	None (Not Significant)
	Accidents and Safety - Detrimental	None	None	None	None (Not Significant)

Phase	Aspect	Embedded design, mitigation and enhancement measures	Duration of impact	Magnitude of impact (with mitigation)	Significance impact
	impact on road safety as a result of the additional traffic movements that will be generated by the proposed development				

Chapter 16 – Noise and Vibration

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16 Noise and vibration

16.1 Introduction

This chapter considers potential noise and vibration impacts arising from the proposed development and the corresponding effects on noise and vibration sensitive receptors based on the information presented in Chapter 6 of this EIAR.

The assessment predicts the potential noise and vibration effects on the surrounding environment arising from the construction, operation, maintenance and decommissioning of the proposed development and, where appropriate, specifies mitigation measures to reduce potential effects.

The construction, operation, maintenance and decommissioning of the proposed development will involve activities and equipment which emit noise. Some types of construction work and the passing of trains will also result in ground-borne vibration.

The construction assessment has been undertaken based on the effects of worst-case construction activities that are expected to be required, based on extensive experience of construction of these types of civil infrastructure developments.

16.2 Methodology and limitations

16.2.1 Legislation and guidance

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 (‘the 2001 Act’).

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors. As mentioned above, this chapter considers potential noise and vibration impacts arising from the proposed development and the corresponding effects on noise and vibration sensitive receptors based on the information presented in Chapter 6 of this EIAR.

The assessment has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out in the following sections. In addition to specific noise and vibration guidance documents, the following guidelines were considered and consulted in the preparation of this chapter:

- 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).
- Draft EPA Advice Notes for Preparing Environmental Impact Statements (hereafter referred to as the Draft EPA Advice 2015) (EPA 2015).

There are no statutory standards in Ireland relating to noise and vibration limit values for construction works or for environmental noise relating to the operational Phase. In the absence of specific statutory Irish guidelines, the assessment has made reference to non-statutory national guidelines, where available, in addition to international standards and guidelines relating to noise and / or vibration impact for environmental sources. These are summarised below:

- British Standard Institute (BSI) British Standard (BS) 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise.
- BS 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration.
- BS 7385 (1993) Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.
- BS 6472 (2008) Guide to Evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting.
- BS 8233:2014 Sound Insulation and Noise Reduction for Buildings.
- BS 4142 (2014+A1 2019) Methods for rating and assessing industrial and commercial sound.
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability & Environmental Appraisal. Noise and Vibration Rev 2.
- European Communities (EC) (Environmental Noise) Regulations 2018 (S.I. No. 549 / 2018).
- EC (Environmental Noise) Regulations 2006 (S.I. No. 140/2006).
- EC Noise Emission by Equipment for Use Outdoors (Amendment) Regulations (S.I. No. 241 / 2006).
- International Organization for Standardization (ISO) 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation.
- ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures.
- ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels.
- Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1.
- Good Practice Guide for the Treatment of Noise during the Planning of National Road Schemes Noise Guidelines 2014.
- The UK Department of Transport Calculation of Road Traffic Noise.
- World Health Organization (WHO) Environmental Noise Guidelines for the European Region (WHO 2018).
- EN 16272-2: 2012 Railway Applications - Track - Noise Barriers and Related Devices Acting on Airborne Sound Propagation - Test Method for Determining the Acoustic Performance - Part 2: Intrinsic Characteristics - Airborne Sound Insulation in the Laboratory Under Diffuse Sound Field Conditions.
- Calculation of Railway Noise 1995
- Study on Dublin [Noise Action Plan 2018 - 2023, Dublin City Council]
- Cork Agglomeration Area Noise Action Plan 2018-2023.
- Noise Insulation (Railways and Other guided Transport Systems) Regulations 1996 [NIR, 1996]
- IEMA Guidelines for Environmental Noise Assessment 2014

The Environmental Noise Regulations (ENR)[1] transpose EU Directive 2002/49/EC[2] [commonly referred to as the Environmental Noise Directive (END)] 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. and the Protection of the Environment Act 2003 S.I. No.27/2003 (as amended) require 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*". It clarifies that noise includes vibration.

16.2.2 Study Area

The study area is defined as 300m from the red line boundary of the scheme for noise, and 100m for vibration for both construction and operation. Locations within the study area have been identified that are sensitive to noise and vibration. These include residential properties and care homes. Representative locations have been identified which reflect the worst affected locations along the route, and these are reported as Noise Sensitive Locations (NSL) as described in the next section.

16.2.3 Desktop studies

The potential noise effects during the construction and operation of the proposed development have been predicted using a combination of spreadsheet calculations and noise modelling software DataKustik CadnaA. These methods implement the procedures described within:

- British Standard (BS) 5228 'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise' (2009+A1:2014)[3] Annex F for the prediction of construction noise impacts
- International Standard ISO 9613 'Acoustics - Sound Attenuation During Propagation Outdoors Part 2 General Method of Calculation' (1996)[4] for the prediction of noise from fixed sources of noise
- Calculation of Railway[5] noise for the prediction of noise from railways

The methodology and case studies described within 'BS 5228 - Part 2: Vibration (2009+A1:2014)'[6] have been used for the prediction of ground-borne vibration from some types of construction activity. It should be noted that the generation, transmission and reception of ground-borne vibration is affected by many parameters including energy input, boundary impedances and the properties of the intervening ground and predictions are therefore indicative.

[1] Environmental Noise Regulations, 2006 (S.I. No. 140/2006) and European Communities (Environmental Noise Regulations) 2018 (S.I. No. 549/2018).

[2] 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.

[3] British Standards Institution (2009+A1:2014). Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise

[4] International Standard Organization (1996). ISO 9613 Acoustics - Sound Attenuation During Propagation Outdoors Part 2 General Method of Calculation

[5] 'Calculation of Railway Noise' 1995, Department of Transport

[6] British Standards Institution (2009+A1:2014). Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2 Vibration

16.2.4 Field studies

Field studies were undertaken at various times between 23rd March 2022 and 23rd April 2022, by Diarmuid Keaney (MIOA M.Sc. in Applied Acoustics, Diploma in Acoustics and Noise Control B.E) of ICAN Acoustics. Background noise measurements were undertaken at NSLs to quantify the existing noise climate for the closest affected receptors. Measurements were also made of the existing levels of vibration from the railway at a number of locations along the route – these have been used as the basis for forecasting the future levels of vibration. Details and location maps of the measurements are included in Appendix 16.1, and summaries appear in the following sections.

16.2.5 Methodology for assessment of effects

16.2.5.1 Construction noise

There is no published Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project.

The National Roads Authority[7] (now Transport Infrastructure Ireland) sets out typical construction noise limits for road schemes in "Guidelines for the Treatment of Noise and Vibration in National Road Schemes" [NRA 2014] shown in Table 16.1.

Table 16.1: NRA construction noise limits at sensitive receptors (residential)

Assessment category and threshold value period	Threshold value $L_{Aeq,1hr}$ dB
Monday to Friday 7 a.m.- 7 p.m.	70
Monday to Friday 7 p.m. to 10 p.m.	60
Saturdays 8 a.m. to 4.30 p.m.	65
Sundays and Bank Holidays 8 a.m. to 4.30 p.m.	60

In the absence of suitable criteria applicable for railways, and the night-time period where most of the construction will occur, consideration has also been given to BS 5228 Part 1:2009+A1:2014. It provides guidance including details of typical noise levels associated with items of plant and activities, prediction methods, and options for mitigation measures, and therefore has been considered appropriate for use in this assessment.

Based on the BS 5228 Part 1 'Example method 1 – ABC Method' in BS 5228 Part 1:2009+A1:2014, noise levels generated by site activities are deemed to be potentially significant if the predicted construction noise level ($L_{Aeq,T}$) at the receptor exceeds the applicable threshold value. Table F.1 of the BS 5228 Part 1:2009+A1:2014 is reproduced in Table 16.2 along with the levels at which a significant effect is indicated.

Table 16.2: Threshold of potential significant effects due to construction noise at sensitive receptors (residential)

Assessment category and threshold value period	Threshold value $L_{Aeq,T}$ dB		
	Category A	Category B	Category C
Night-time (any day 11 p.m. – 7 a.m.)	45	50	55
Evenings and Weekends (weekdays 7 p.m. – 11 p.m., Saturdays 1 p.m. – 11 p.m., and Sundays 7 a.m. – 11 p.m.)	55	60	65

[7] "Guidelines for the Treatment of Noise and Vibration in National Road Schemes" [NRA 2004]

Assessment category and threshold value period	Threshold value $L_{Aeq,T}$ dB		
	Category A	Category B	Category C
Standard working hours (weekdays 7 a.m.- 7 p.m. and Saturdays 7 a.m. – 1 p.m.)	65	70	75

The threshold value is assigned based on the representative baseline ambient noise level for the receptor:

- Category A: Threshold value to use when ambient noise levels (when rounded to the nearest 5 dB) are less these threshold values;
- Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values; and,
- Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values.

If the (baseline) ambient noise level exceeds the Category C threshold value, a significant effect is identified if the contribution of site noise results in a 3 dB increase in the period ambient noise level.

BS 5228 Part 1:2009+A1:2014 states: "*The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect*".

BS 5228 Part 1:2009+A1:2014 provides the following criteria for impact duration:

- A period of 10 or more days of working in any 15 consecutive days; or
- A total number of days exceeding 40 in any 6 consecutive months.

16.2.5.2 Construction vibration

Vibration, even of very low magnitude, can be perceptible to people. It is generally tolerated, at low magnitudes, if prior notification has been issued. Vibration from construction activity can affect the occupiers or the structure itself.

BS 5228 Part 2:2009+A1:2014 provides comprehensive guidance on the assessment of vibration due to construction activity. It considers levels of vibration from construction in terms of peak particle velocity (PPV) defined as the instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position and is expressed in millimetres per second (mm/s). It states:

"Human beings are known to be very sensitive to vibration, the threshold of perception being typically in the PPV range of 0.14 mm/s to 0.3 mm/s. As vibrations increase above these values they can disturb, startle, cause annoyance or interfere with work activities. At higher levels they can be described as unpleasant or even painful."

BS 5228 Part 2:2009+A1:2014 also provides guidance on the levels of vibration associated with human perception and disturbance and the onset of potential structural damage to different types of buildings.

Table 16.3 presents guidance on threshold values for the human perception of vibration arising during construction. For the purpose of this assessment, the significance of effects is also given.

Table 16.3: BS 5228 Part 2 guidance on the human perception effects of vibration due to construction activity and significance of effect

Vibration level PPV mm/s	Effect	Significance
0.14	Vibration might be perceptible in most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Not significant
0.3	Vibration might be just perceptible in residential environments.	Not significant
1.0	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning has been given to the residents.	Significant
10.0	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.	Significant

BS 5228 Part 2:2009+A1:2014 states that low frequency vibration at a PPV of 15mm/s may cause cosmetic damage in un-reinforced or light framed structures e.g. for residential / light commercial use and that vibration at a PPV of 50mm/s may cause cosmetic damage in heavy commercial buildings. These values apply to transient vibration which does not induce a resonant response in structures and low-rise buildings. A source of continuous low frequency vibration may induce a vibration response in buildings or structures at their resonant frequencies. The building would then be subject to additional dynamic forces arising from its own motion. Therefore, BS 5228 Part 2:2009+A1:2014 recommends that the values given should be reduced by 50% to take into account for dynamic magnification due to resonances.

Table 16.4 presents guidance on threshold values for the potential onset of cosmetic damage to buildings due to vibration arising during construction. For the purpose of this EIAR, the significance of effects is also given.

Table 16.4: BS 5228 Part 2 guidance on potential cosmetic damage to buildings due to construction activity and significance of effect

Vibration level ppv mm/s	Effect	Significance
Less than 7.5	Low risk of cosmetic damage to un-reinforced or light framed structures / buildings (e.g. residential buildings)	Not significant
7.5 or more	Onset of increased risk of cosmetic damage to un-reinforced or light framed structures / buildings	Significant

It is noted that the thresholds for human exposure to vibration in Table 16.3 are lower than those for building damage in Table 16.4, and compliance with the former is sufficient to protect against building damage as well.

16.2.5.3 Operational noise

There are no Irish statutory requirements of acceptable criterion in relation to rail development however, the acceptable UK Noise Insulation (Railway and other Guided Transport System) Regulation 1995 are considered appropriate in this instance. The Regulation impose a duty upon the developer to offer noise mitigation to properties subject to rail noise levels equal to, or in excess of 68 dB $L_{Aeq,\ 18hr}$ (daytime) or 63 dB, 6hr (night time).

There are no Irish guidance or standards, however an acceptable assessment methodology is based on the UK's Calculation of Railway Noise guidance.

Calculation of Railway Noise 1995

CRN provides procedures for predicting noise levels from moving railway vehicles. These procedures are used in a more general sense to assess the noise impacts from railways. They take into account the noise of each train vehicle, the speed, and a number of corrections for the presence of bridges, crossovers, and the number of movements in each time period.

World Health Organization "Environmental Noise Guidelines for European Region" 2018

The World Health Organization (WHO) 'Environmental Noise Guidelines for European Region' 2018 [WHO, 2018] contains recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise. They provide robust public health advice underpinned by evidence, which is essential to drive policy action that will protect communities from the adverse effects of noise. On the subject of railway noise it recommends that railway traffic should be kept below 54 dB L_{den} and 44 dB L_{night} for daytime and night-time respectively to avoid adverse health effects. A recent study in Dublin [Noise Action Plan 2018 - 2023, Dublin City Council] established a relationship between L_{den} and L_{day} within agglomerations of 3 dB. A further 1 dB adjustment is then made to convert from 12 hours to 18 hours. On this basis, the 54 dB L_{den} has been approximated to 50 dB $L_{Aeq,\ 06.00\ to\ 24.00}$.

IEMA Guidelines for Environmental Noise Assessment 2014

IEMA Guidelines for Environmental Noise Assessment [IEMA, 2014] provide guidance on noise assessment in the EIA context. The guidelines define key methodologies used within the noise impact assessment process and provides advice on their limitations. They are relevant to all scales of project. In the context of this assessment the IEMA Guidelines have been used to inform the definition of sensitivity of receptor and the magnitude of impact of noise changes upon those receptors.

Based on Table 7-12 in IEMA, Table 16.5 shows the magnitude of impact of noise changes.

Table 16.5: IEMA guidelines noise impact description

Criteria	Impact
Façade noise levels below 50 dB $L_{Aeq,06:00\ to\ 24:00}$ or 44 dB $L_{Aeq,00:00\ to\ 06:00}$ after changes	No impact
Noise changes relative to baseline less than 3 dB	Negligible
Noise changes relative to baseline 3 to 4.9 dB	Minor
Noise changes relative to baseline 5 to 9.9 dB	Moderate
Noise changes relative to baseline 10 dB or more	Major

The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996

As noted above there is no Irish statutory requirements of acceptable criterion in relation to rail development however, the acceptable UK Noise Insulation (Railway and other Guided Transport System) Regulation 1995 are considered appropriate in this instance.

Criteria for setting the point at which a significant effect from railway noise has been derived from the Noise Insulation (Railways and Other guided Transport Systems) Regulations 1996 [NIR, 1996]. The criteria are defined below:

- Specified day-time level (06:00 to 24:00): 68 dB L_{Aeq} at façade
- Specified night-time level (24:00 to 06:00): 63 dB L_{Aeq} at façade

Noise mitigation will be provided to avoid exceedance of these criteria.

16.2.5.4 Operational vibration

Operational vibration due to the Proposed Development is quantified through measurements of the existing railway activity, and calculations made to reflect the increased number of movements, and any changes to the railway alignment or new tracks.

BS 6472-1 (2008) 'Guide to Evaluation of Exposure to Vibration in Buildings Part 1: Vibration sources other than blasting'[8] outlines a method where vibration dose values (eVDV) can be calculated in relation to a series of events and compared against a table which indicates probability of adverse comment in relation to the events. Table 16.6 details the values of eVDV where various comments from occupiers are possible.

Table 16.6: Vibration dose values ($m/s^{1.75}$) above which adverse comment may be expected in residential buildings

Place	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Residential Buildings – 16hr Day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential Buildings – 8hr Night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

*The above thresholds are doubled for commercial and industrial buildings.

16.2.6 Significance of effect

The significance of effect criteria applied to this scheme, in accordance with EPA Guidelines 2022, is detailed in Table 16.7

Table 16.7: EIAR guidelines significance description

Significance of effect	Description
Imperceptible	An effect capable of measurement 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.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
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.

These effects can be temporary or permanent in nature, indirect, or cumulative in nature.

16.2.7 Summary of significance of effect criteria

Table 16.8 below summarises the numerical values at which significant effects have occurred:

[8] British Standards Institution (2008). Guide to Evaluation of Exposure to Vibration in Buildings Part 1: Vibration sources other than blasting

Table 16.8: Significance of effect

Category	Significance of effect
Construction vibration	Exceedance of 1.0 mm/s for a period of 10 or more days of working in any 15 consecutive days is considered to be a significant effect
Construction noise	Exceedance of the appropriate threshold values in Table 16.2 for a period of 10 or more days of working in any 15 consecutive days is considered to be a significant effect
Operational vibration	A significant effect is considered to occur where the VDV values with the scheme exceed 0.4 $m/s^{1.75}$ (daytime) and 0.2 $m/s^{1.75}$ (night time) with an increase of more than 40% at any residential dwelling. These values are doubled for commercial and industrial receptors
Operational noise	A significant effect is considered to occur where the specified day or night time levels are exceeded at a residential property with the scheme with a minor noise increase (or higher); or where the WHO levels are exceeded at a residential property with the scheme with a major noise increase

16.3 Receiving environment

16.3.1 Noise

The area surrounding the proposed development route corridor consists of urban and rural aspects where transportation noise dominates the noise climate to varying degrees both from roads and the existing railway line. Published strategic noise maps for the area around the Proposed Development shows that the area falls just outside the agglomeration of Cork but is close to the strategic road network where noise from the N25 road is shown to influence the noise climate for some receptors in the area. Rail noise from the existing line is not captured in the strategic map as it falls below the assessment criteria for the maps. There are no current actions identified in the noise action plan for the area.

In order to capture and quantify the existing noise climate, background sound measurements were undertaken by ICAN Acoustics between 23rd and 25th March 2022. These comprised a combination of short term daytime attended and long term unattended noise measurements covering day evening and night periods. The measurement positions used were:

- Killahoura Service Station;
- The Elm Tree;
- Maple Lane;
- The Bog Road/Rocklands;
- Castle Rock Avenue (1);
- Castle Rock Avenue (2); and
- Millbrook Drive.

The detailed results of the measurements are included in the report[9] attached in Appendix 16.1.

The closest noise sensitive receptors are described in Table 16.9 and illustrated in Figures 16.1 to 16.4 are adopted as the NSLs for the assessment of potential effects. The baseline measurement positions associated with each NSL are also indicated. These include a number of commercial properties which are considered to be of low sensitivity to noise and vibration, and residential properties which are considered to be of high sensitivity to noise and vibration.

[9] Baseline noise and vibration survey for the Glounthaune to Midleton Twin Track Project, ICAN Acoustics, May 2022

Table 16.9: Baseline noise levels of identified NSL

NSL ID	NSL Name	NSL Type	Representative NSL	Representative Daytime BNL, L_{Aeq},T dB
NSL 1	Glouthaune Co. Cork	Residential	Killahoura Service Station	71
NSL 2	Aranjuaz Killahora	Residential	Killahoura Service Station	71
NSL 3	Harbour Lights Killahora	Residential	Killahoura Service Station	71
NSL 4	Con Dennehy & Co. Ltd. Lochmhor	Commercial	Killahoura Service Station	71
NSL 5	Carrigtwohil Community College Building	Education	The Elm Tree	70
NSL 5B	Carrigtwohil Community College Temporary Pre-Fab Building B	Education	The Elm Tree	70
NSL 5C	Carrigtwohil Community College Building C	Education	The Elm Tree	70
NSL 6	1 Maple Lane, Castlelake	Residential	Maple lane	55
NSL 7	30 Maple Lane, Castlelake	Residential	Maple Lane	55
NSL 8	1 Ashgrove Lodge, Rocklands	Residential	The Bog Road/Rocklands	50
NSL 9	2 Ashgrove Lodge, Rocklands	Residential	The Bog Road/Rocklands	50
NSL 10	Ballyadam House, Ballyadam	Residential	Ballyrichard More	63
NSL 11	Ballyrichard More Midleton	Residential	Castle Rock Avenue 2	51
NSL 12	Ballyrichard More Midleton	Residential	Castle Rock Avenue 2	51
NSL 13	Water Rock Cottage Waterock	Residential	Castle Rock Avenue 1	64
NSL 14	24 Millbrook Drive, Midleton	Residential	Millbrook Drive	49
NSL 15	Dineco Cleaning Concepts Ltd, 16 Millbrook Avenue, Midleton	Commercial	Millbrook Drive	49

In order to establish the evening and night time criteria for all NSLs, the relationship between the day, evening and night periods was established from the long term measurements at NSLs 8 and 14 and extrapolated to all other locations along the route. This is considered to provide a conservative estimate of the night time climate for the assessment.

Location of identified NSLs

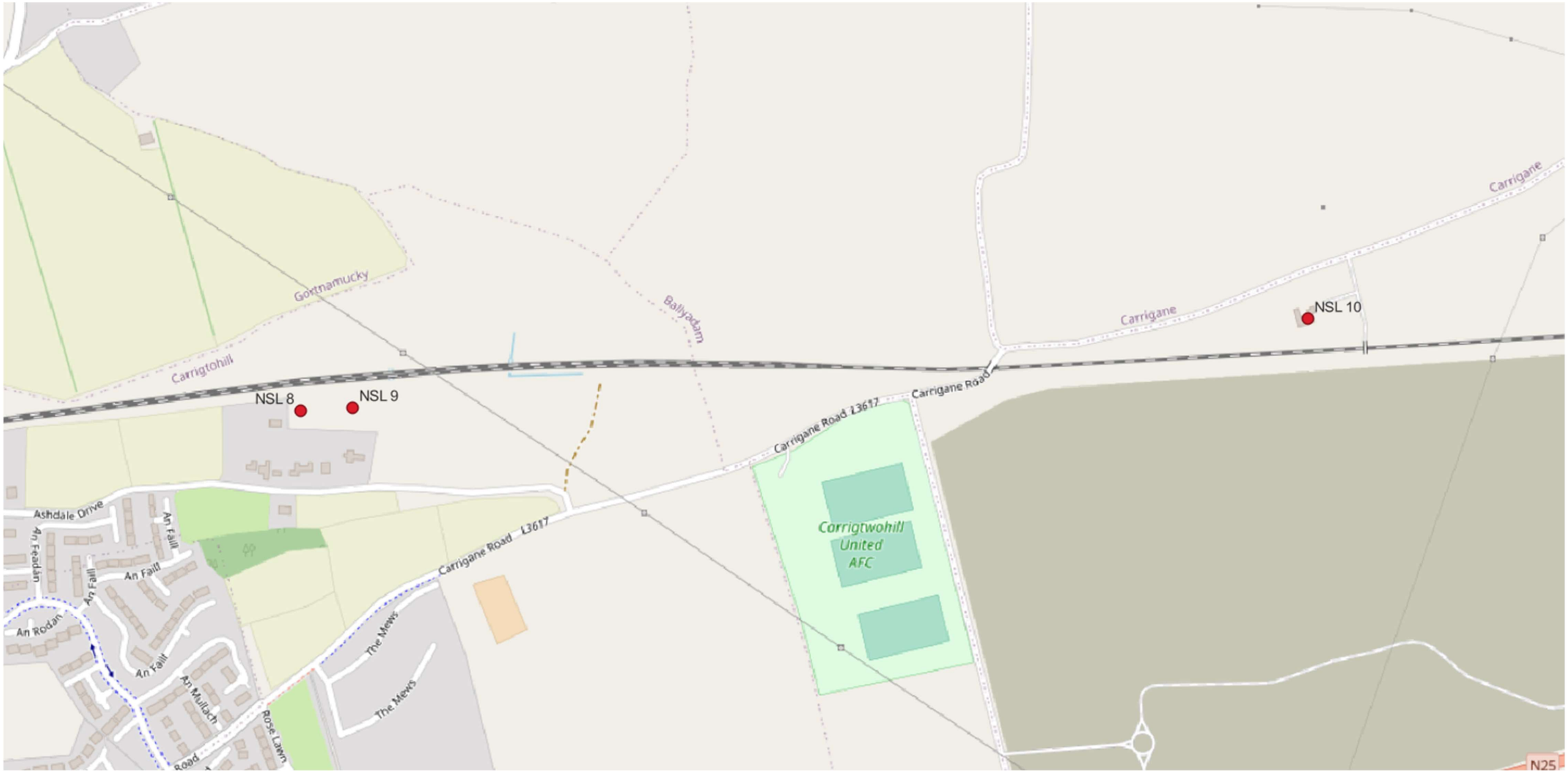
Figure 16.1: Location of identified NSLs (1 of 4)

Map source: © OpenStreetMap contributors, Receptor numbering starts from west (towards Glounthaune station) to east (towards Midleton station) of Proposed Development.

Figure 16.2: Location of identified NSLs (2 of 4)

Map source: © OpenStreetMap contributors, Receptor numbering starts from west (towards Glounthaune station) to east (towards Midleton station) of Proposed Development.

Figure 16.3: Location of identified NSLs (3 of 4)



Map source: © OpenStreetMap contributors, Receptor numbering starts from west (towards Glounthaune station) to east (towards Midleton station) of Proposed Development.

Figure 16.4: Location of identified NSLs (4 of 4)

Map source: © OpenStreetMap contributors, Receptor numbering starts from west (towards Glounthaune station) to east (towards Midleton station) of Proposed Development.

A review of the ICAN report in Appendix 16.1 was conducted to confirm the local noise contributions at the NSLs. In general, the NSLs were found to be dominated by local road traffic noise, occasional rail noise, and distant road traffic noise from N25. NSLs 1, 2, 3 and 4 were dominated by relatively high levels of road traffic noise from Johnstown Close (L3004), which masked individual rail noise events.

NSL 5 is located at the outskirts of Fota Retail and Business Park. It is dominated by local road traffic, industrial and school noise. The remaining NSLs (NSL 6 to NSL 15) are located in residential areas, that also see minor contributions from birdsong, residential activities (lawn mowing, kids playing etc.) and leaves rustling.

16.3.2 Vibration

In order to quantify the existing vibration levels from the railway, and the propagation characteristics with distance, a number of measurement positions were chosen in order to capture railway passbys. Table 16.10 shows a summary of the highest measured results for the event VDV levels between 23, 24 and 25 March 2022 at the eight measurement locations as set out in Appendix 16.1 at which vibration from the existing train movements was measurable. The VDV values correspond to the vertical direction which consistently produced the highest values and with W_b weighting applied.

Table 16.10: Summary of measured event vibration results

Location	Start date and time	Duration (hh:mm:ss)	Event VDV in Wb axis ($m.s^{-1.75}$)	Distance to track (m)
VM1 (Millbrook Drive)	23/03/2022 08:45	00:30.0	0.0003	17.0
VM2 (Castle Rock Ave 1)	24/03/2022 17:46	00:30.0	0.0670	7.5
VM3 (Castle Rock Ave 2)	23/03/2022 11:35	00:30.0	0.0050	29.7
VM4 (Ballyrichard More)	24/03/2022 19:48	00:30.0	0.0170	13.0
VM5 (The Bog Road/Rocklands)	23/03/2022 13:33	00:30.0	0.0050	15.5
VM6 (Maple Lane)	25/03/2022 11:29	01:04.0	0.0030	12.0
VM7 (The Elm Tree)	23/03/2022 15:53	00:30.0	0.0070	27.0
VM8 (Kilahoura Service Station)	23/03/2022 16:53	00:30.0	0.0009	14.2

Source: Mott MacDonald

16.4 Likely Significant Effects

16.4.1 Construction

16.4.1.1 Noise

The majority of the construction work will occur at night as the track will be used during the day for passenger and freight trains. Table 16.11 below summarises the major noise intensive activities that are expected for the Proposed Development.

Table 16.11: Construction activities proposed

Construction activity	Description of works
Earthworks	Predominantly night-time works, with rate of progress about 150m per week on average along the track
Formation treatment	Predominantly night-time works, with rate of progress about 350m per week on average along the track
Ballasting	Predominantly night-time works, with rate of progress about 350m per week on average along the track
Track installation	Daytime and night-time works, with rate of progress about 350m per week on average along the track.
Tamping	Daytime and night-time works, with rate of progress about 1km per week on average along the track.
Stressing and welding works	Daytime and night-time works, with rate of progress about 1km per week on average along the track.
Retaining structure	Predominantly night-time works, with rate of progress about 20-35m per day along the track at discrete proposed locations depending on ground conditions.
Owennacurra bridge widening	Predominantly night-time works, with works expected to last 9 weeks.
Material stockpile and haulage at site compounds	Daytime and night-time works, locomotive trains haul materials and equipment to 4 site compound locations, depending on the current location of work.

Due to night-time working, the site noise levels were assessed with the night-time baseline noise levels at the NSLs. An indicative night-time baseline noise level was derived from the description of local noise climate described in Appendix 16.1. The daytime baseline noise levels were derived from the long and short-term noise measurement survey results from the same report.

The baseline noise levels were assessed with 'Example method 1 – The ABC method' described in Annex E of BS 5228 for construction noise. Table 16.12 shows the acoustic threshold values of the identified NSLs for day and night-time periods. The night-time acoustic thresholds present the worst-case scenario for each activity. Commercial receptors are not expected to be sensitive during the night-time periods.

Table 16.12: Construction noise assessment thresholds

NSL ID	Daytime category	Daytime acoustic threshold, dB	Night-time category	Night-time acoustic threshold, dB
NSL 1	C	75	A	45
NSL 2	C	75	A	45
NSL 3	C	75	A	45
NSL 4	C	75	A	45
NSL 5	C	75	A	45
NSL 5B	C	75	A	45
NSL 5C	C	75	A	45
NSL 6	A	65	A	45
NSL 7	A	65	A	45
NSL 8	A	65	A	45

NSL ID	Daytime category	Daytime acoustic threshold, dB	Night-time category	Night-time acoustic threshold, dB
NSL 9	A	65	A	45
NSL 10	B	70	A	45
NSL 11	A	65	A	45
NSL 12	A	65	A	45
NSL 13	B	70	A	45
NSL 14	A	65	A	45
NSL 15	A	65	A	45

Daytime noise assessment

The daytime noise assessment is only applicable for track installation, tamping, stressing and welding works. The Table 16.13 summarizes the resultant construction noise levels at the respective NSLs and a comparison to the daytime acoustic thresholds for these activities. The numbers highlighted in red show that the construction noise level is higher than the daytime acoustic threshold. This indicates a potential significant impact before accounting for the duration of work.

Table 16.13: Daytime construction for track installation, tamping, stressing and welding works

NSL ID	Daytime acoustic threshold, dB	Track installation noise levels, dB	Tamping noise levels, dB	Stressing and welding noise levels, dB
NSL 1	75	37	35	32
NSL 2	75	79	75	70
NSL 3	75	76	72	67
NSL 4	75	79	75	70
NSL 5	75	75	71	67
NSL 5B	75	79	75	70
NSL 5C	75	71	67	62
NSL 6	65	73	69	64
NSL 7	65	74	70	66
NSL 8	65	44	44	35
NSL 9	65	48	40	39
NSL 10	70	68	64	59
NSL 11	65	65	61	56
NSL 12	65	68	64	59
NSL 13	70	76	72	67
NSL 14	65	70	66	62
NSL 15	65	73	69	64

BS 5228 states that the significant effect assessment at a receptor should also depend on the work duration. The representative average of construction work progress stated in Table 16.11 was used to forecast the number of days where the NSL is subjected to noise levels above the

applicable threshold. Table 16.14 summarizes the likely duration of noise levels above the applicable threshold at the NSL in days (assuming a 5-day working week).

Table 16.14: Daytime construction durations for track installation, tamping, stressing and welding works

NSL ID	Track Installation, duration of exposure	Tamping, duration of exposure	Stressing and welding, duration of exposure
NSL 1	NA	NA	NA
NSL 2	1 day	NA	NA
NSL 3	1 day	NA	NA
NSL 4	1 day	NA	NA
NSL 5	NA	NA	NA
NSL 5B	1 day	NA	NA
NSL 5C	NA	NA	NA
NSL 6	1 day	1 day	NA
NSL 7	1 day	1 day	1 day
NSL 8	NA	NA	NA
NSL 9	NA	NA	NA
NSL 10	NA	NA	NA
NSL 11	NA	NA	NA
NSL 12	1 day	NA	NA
NSL 13	1 day	1 day	NA
NSL 14	1 day	1 day	NA
NSL 15	1 day	1 day	NA

After accounting for the duration of exposure, the daytime noise impact for track installation, tamping, stressing and welding works is therefore not considered to be significant as it falls below the duration criteria of 10 in any 15 consecutive days or 40 days in any six-month period.

Night-time noise assessment

The night-time noise assessment is applicable to all the construction works proposed. Certain NSLs (NSL 4, NSL 5 and NSL 15) are commercial receptors that will not be affected by night-time construction works. Table 16.15 summarises the resultant construction noise levels at the respective NSLs and a comparison to the night-time acoustic thresholds. The numbers highlighted red show that the construction noise level is higher than the night-time acoustic threshold. This indicates a potential significant impact before accounting for the duration of work.

Table 16.15: Night-time construction levels for all track works

NSL ID	Night-time acoustic threshold, dB	Earthworks noise level, dB	Formation treatment noise level, dB	Track installation noise level, dB	Tamping noise level, dB	Ballasting noise level, dB	Stressing and welding noise level, dB
NSL 1	45	37	37	37	37	34	35
NSL 2	45	77	79	79	75	72	70

NSL ID	Night-time acoustic threshold, dB	Earthworks noise level, dB	Formation treatment noise level, dB	Track installation noise level, dB	Tamping noise level, dB	Ballasting noise level, dB	Stressing and welding noise level, dB
NSL 3	45	74	76	76	72	69	67
NSL 4	45	NA	NA	NA	NA	NA	NA
NSL 5	45	NA	NA	NA	NA	NA	NA
NSL 5B	45	NA	NA	NA	NA	NA	NA
NSL 5C	45	NA	NA	NA	NA	NA	NA
NSL 6	45	71	73	73	69	66	64
NSL 7	45	72	74	74	70	68	66
NSL 8	45	42	44	44	44	37	35
NSL 9	45	45	47	48	40	41	39
NSL 10	45	65	67	68	64	61	59
NSL 11	45	63	65	65	61	58	56
NSL 12	45	66	68	68	64	61	59
NSL 13	45	74	76	76	72	69	67
NSL 14	45	68	70	70	66	64	62
NSL 15	45	NA	NA	NA	NA	NA	NA

BS 5228 states that the significant effect assessment at a receptor should also depend on the work duration. The works will move away from the closest NSLs as work progresses along the track. The representative average of construction work progress stated in Table 16.11 was used to understand the number of days where the NSL is subjected to noise levels above the applicable threshold. Table 16.16 summarizes the duration of noise levels above the applicable threshold at the NSL in days (assuming a 5-day working week).

Table 16.16: Night-time construction durations for all track works

NSL ID	Earthworks, duration of exposure	Formation Treatment, duration of exposure	Track Installation, duration of exposure	Tamping, duration of exposure	Ballasting, duration of exposure	Stressing and Welding, duration of exposure
NSL 1	NA	NA	NA	NA	NA	NA
NSL 2	14 days	7 days	4 days	1 day	2 days	1 day
NSL 3	10 days	5 days	3 days	1 day	2 days	1 day
NSL 4	NA	NA	NA	NA	NA	NA
NSL 5	NA	NA	NA	NA	NA	NA
NSL 5B	45	NA	NA	NA	NA	NA
NSL 5C	45	NA	NA	NA	NA	NA
NSL 6	7 days	4 days	4 days	1 day	2 days	1 day
NSL 7	8 days	4 days	4 days	1 day	2 days	1 day
NSL 8	NA	NA	NA	NA	NA	NA
NSL 9	NA	1 day	1 day	1 day	NA	NA
NSL 10	4 days	2 days	2 days	1 day	1 day	1 day

NSL ID	Earthworks, duration of exposure	Formation Treatment, duration of exposure	Track Installation, duration of exposure	Tamping, duration of exposure	Ballasting, duration of exposure	Stressing and Welding, duration of exposure
NSL 11	3 days	2 days	2 days	1 day	1 day	1 day
NSL 12	4 days	2 days	2 days	1 day	1 day	1 day
NSL 13	10 days	5 days	5 days	1 day	2 days	1 day
NSL 14	5 days	3 days	3 days	1 day	2 days	1 day
NSL 15	NA	NA	NA	NA	NA	NA

After accounting for the duration of exposure, it is predicted that there could be significant adverse impacts at NSL 2, NSL 3 and NSL 13 for earthworks, highlighted red. The duration of exposure is slightly above the duration criteria of 10 in any 15 consecutive days or 40 days in any six-month period based on worst-case predictions. Active mitigation is required at these locations to minimize the potential for temporary significant adverse noise effects. Other construction activities fall below the duration criteria due to the construction work progress being faster than earthworks. Thus, the duration of exposure is lower than the duration criteria of 10 in any 15 consecutive days or 40 days in any six-month period.

An example noise contour for track installation is presented in Figure 16.5 and Figure 16.6 to illustrate the propagation of construction noise levels along the track. The noise levels were set to 65 dB for daytime and 45 dB for night-time respectively as they represent the lowest baseline noise levels present at all the NSLs.

Figure 16.5: Noise contour for track installation towards Glounthaune station

Map source: © OpenStreetMap contributors

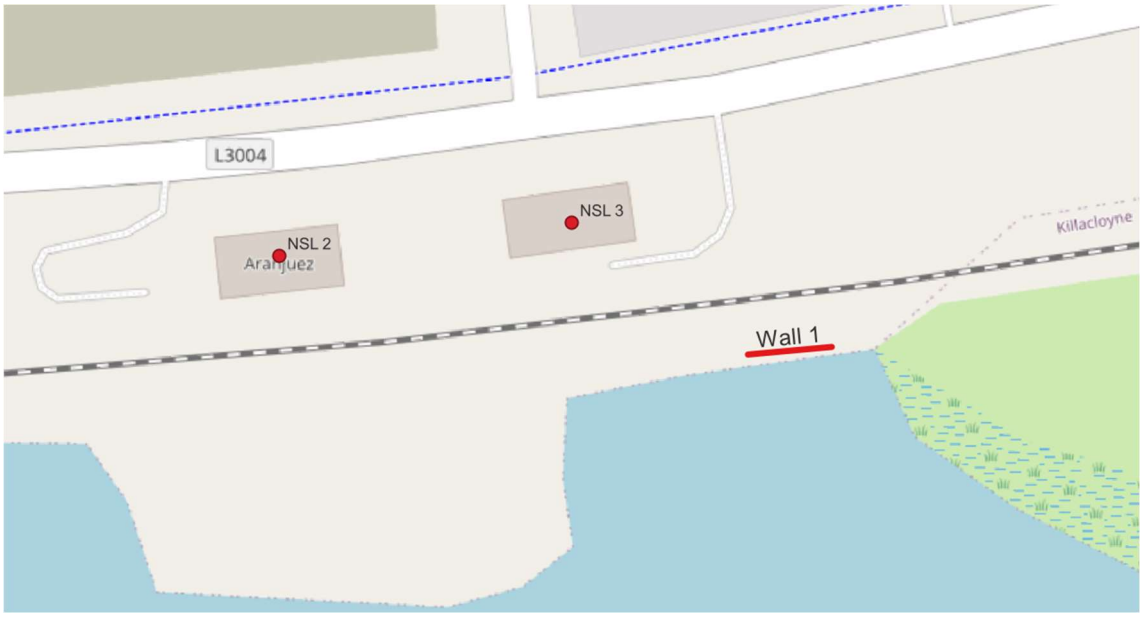
Figure 16.6: Noise contour for track installation towards Midleton station

Map source: © OpenStreetMap contributors

Retaining structures

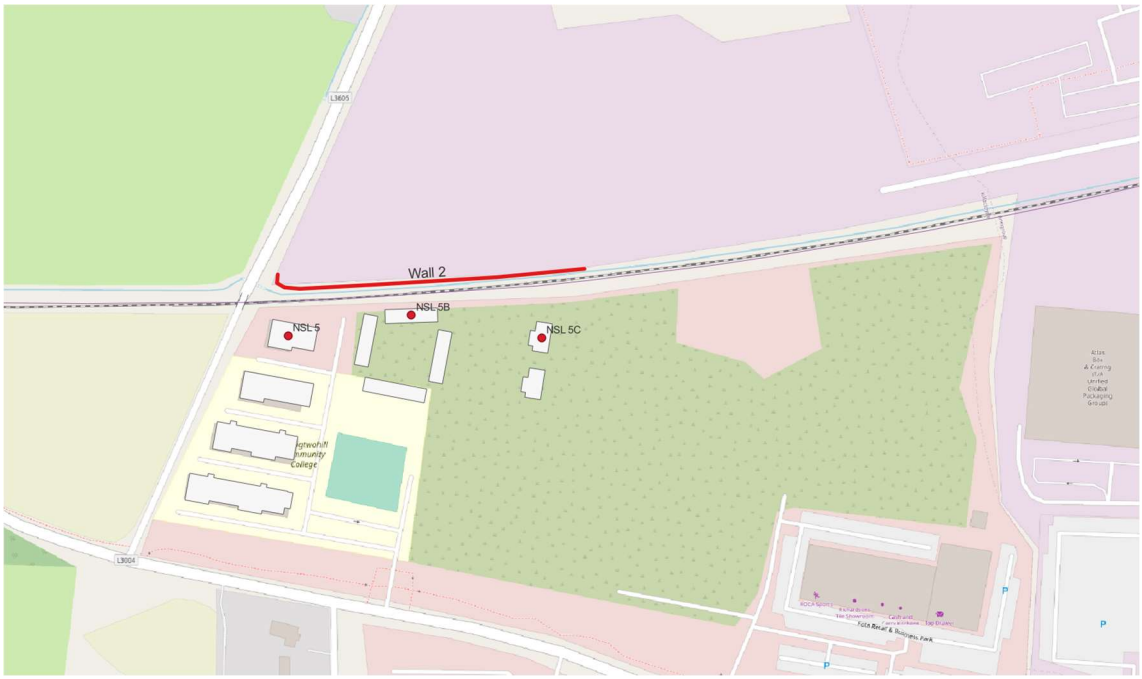
Retaining structures are proposed at various discrete locations along the track. The works include the construction of sheet piled walls, gravity walls and rock breaking works. Sheet pile walls and rock breaking works involve vibratory and percussive piling depending on ground conditions. Gravity walls involve typical earthworks instead of piling for its foundation. Noise levels are assessed at the closest NSLs. It is assumed that works progress linearly along the track where the retaining structures are required. The closest NSLs to the retaining structures and the proposed methodology are summarized in Table 16.17 and shown in Figure 16.7 to Figure 16.11.

Figure 16.7: Proposed retaining structure location 1 of 5 (denoted by red line)



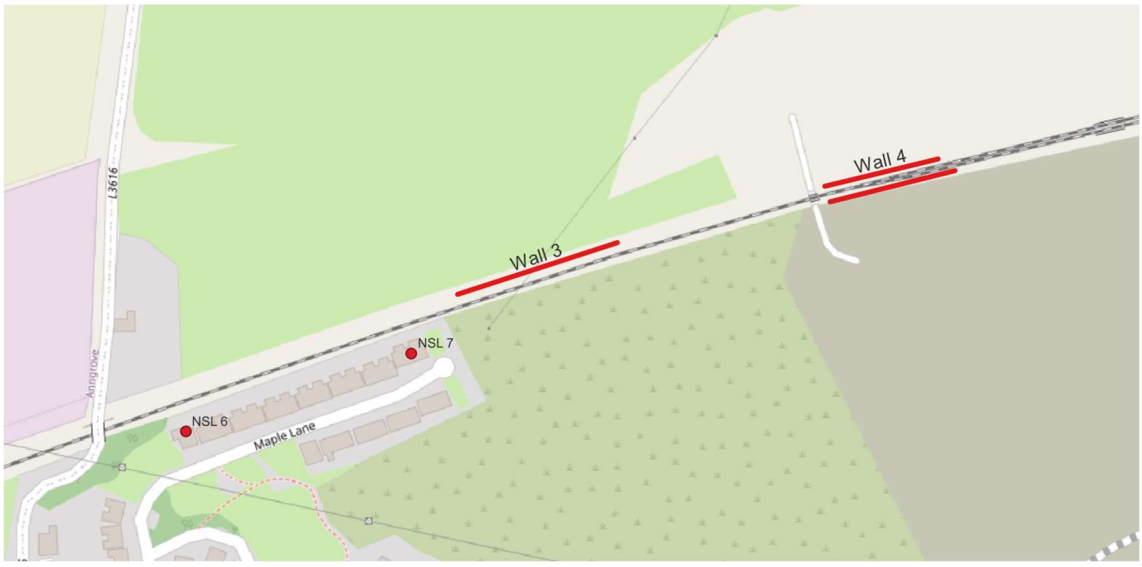
Map source: © OpenStreetMap contributors

Figure 16.8: Proposed retaining structure location 2 of 5 (denoted by red line)



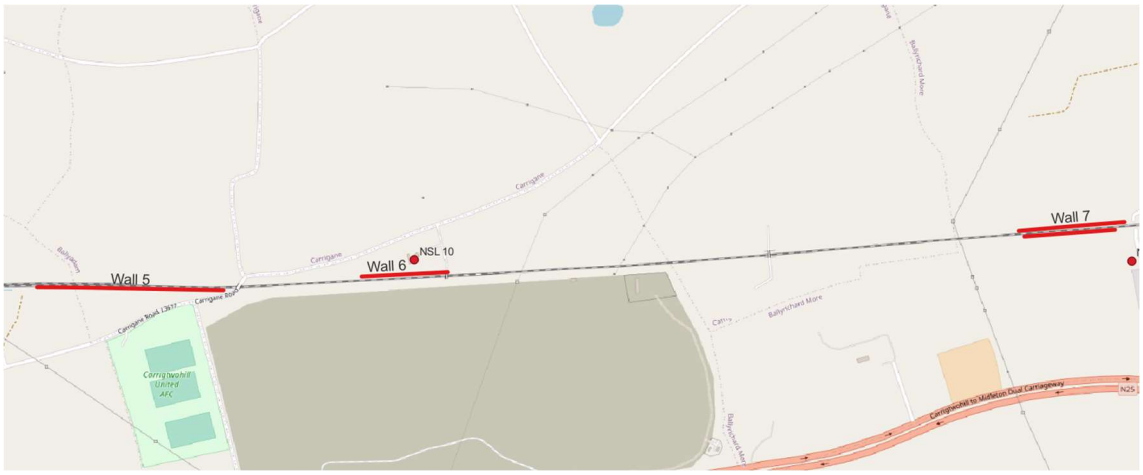
Map source: © OpenStreetMap contributors

Figure 16.9: Proposed retaining structure location 3 of 5 (denoted by red line)



Map source: © OpenStreetMap contributors

Figure 16.10: Proposed retaining wall location 4 of 5 (denoted by red line)



Map source: © OpenStreetMap contributors

Figure 16.11: Proposed retaining wall location 5 of 5 (denoted by red line)

Map source: © OpenStreetMap contributors

Table 16.17: Retaining structure construction work parameters

Retaining structure	Chainage	Closest NSL ID	Wall type	Proposed construction methodology
Wall 1	730-750	NSL 3	Sheet pile wall	Vibration or percussive piling
Wall 2	1985-2200	NSL 5B	Sheet pile wall	Vibration or percussive piling
Wall 3	3535-3600	NSL 7	Sheet pile wall	Vibration or percussive piling
Wall 4	3760-3810	NSL 7	Sheet pile wall	Vibration or percussive piling
Wall 5B	5600-6015	NSL 9	Sheet pile wall	Vibration or percussive piling
Wall 6	6310-6500	NSL 10	Sheet pile wall	Vibration or percussive piling
Wall 7	7715-7940	NSL 11	Gravity wall	Conventional earthworks
Rock breaking works	8350-8600	NSL 13	N/A	Conventional earthworks
Wall 8	9710-9805	NSL 14	Sheet pile	Vibration or percussive piling

The retaining structure works are expected to occur during day and night-time hours. It is assumed that noise levels arising from percussive piling is higher than vibratory piling and will present the most conservative approach to predictions.

Table 16.18 presents the construction noise levels at the nearest NSLs for percussive pilling and earthworks at respective NSLs. The numbers highlighted in red show that the construction noise level is higher than the respective acoustic threshold. This indicates a potential significant impact before accounting for the duration of work.

Table 16.18: Construction noise levels arising from percussive piling at closest NSLs

Retaining Structure	Closest NSL ID	Daytime acoustic threshold, dB	Daytime construction noise level, dB	Night-time acoustic threshold, dB	Night-time construction noise level, dB
Wall 1	NSL 3	75	69	45	69
Wall 2	NSL 5B	75	71	45	71
Wall 3	NSL 7	65	63	45	63
Wall 4	NSL 7	65	45	45	45
Wall 5	NSL 9	65	45	45	45
Wall 6	NSL 10	70	68	45	68
Wall 7	NSL 11	65	63	45	63
Rock breaking works	NSL 13	70	67	45	67
Wall 8	NSL 14	65	58	45	58

BS 5228 states that the significant effect assessment at a receptor should also depend on the work duration. The representative average of construction work progress stated in Table 16.11 was used to understand the number of days where the NSL is subjected to noise levels above the applicable threshold. Table 16.19 summarises the duration of noise levels above the applicable threshold at the NSL in days (assuming a 5-day working week).

Table 16.19: Construction durations for retaining structure works

Retaining structure	Closest NSL ID	Daytime duration of exposure, days	Night-time duration of exposure, days
Wall 1	NSL 3	NA	7 days
Wall 2	NSL 5B	NA	NA
Wall 3	NSL 7	NA	4 days
Wall 4	NSL 7	NA	NA
Wall 5	NSL 9	NA	NA
Wall 6	NSL 10	NA	6 days
Wall 7	NSL 11	NA	4 days
Rock breaking works	NSL 13	NA	5 days
Wall 8	NSL 14	NA	2 days

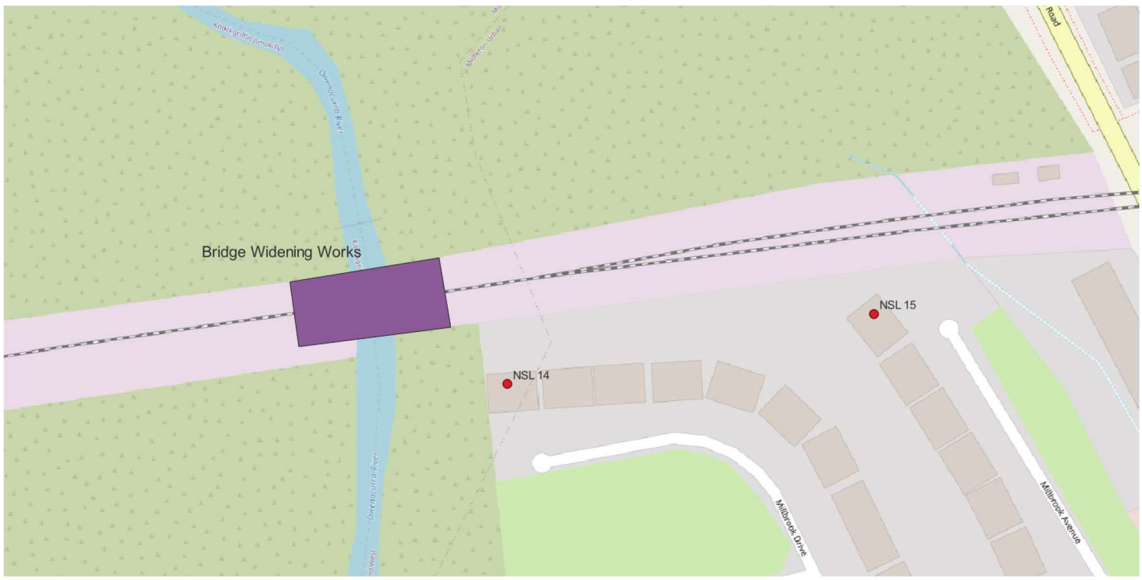
After accounting for the duration of exposure, it is predicted that there would be no significant adverse noise impacts arising from retaining structure works. The duration of exposure falls below the duration criteria of 10 in any 15 consecutive days or 40 days in any six-month period based on worst-case predictions.

Owennacurra bridge works

The Owennacura bridge works consist of bridge piling and widening of the bridge to accommodate the new twin tracks. The works are expected to last eight weeks for the

preparation works and an additional one week for deck works. Noise levels related to the bridge works were assessed at the closest NSLs as the noise sources are static and do not progress linearly along the track. The closest receptors to the bridge works were identified to be NSL 14 and NSL 15. The location of the Owennacurra bridge works in relation to the closest NSLs are shown in Figure 16.12.

Figure 16.12: Location of Owennacurra bridge works



Map source: © OpenStreetMap contributors

Table 16.20 summarises the resultant construction noise levels at the respective NSLs and a comparison to the day and night-time acoustic thresholds. The numbers highlighted red show construction noise levels that are higher than the NSLs respective acoustic thresholds.

Table 16.20: Bridge construction work noise levels

NSL ID	Daytime acoustic threshold, dB	Daytime construction noise level, dB	Night-time acoustic threshold, dB	Night-time construction noise level, dB
NSL 14	65	63	45	63
NSL 15	65	47	45	47

It is predicted that daytime acoustic thresholds were not exceeded at the closest NSLs for the bridge works. However, the night-time acoustic thresholds were exceeded and as the noise source is considered static and the duration of works expected to last nine weeks, it is expected that the bridge construction works could cause adverse noise impacts at the closest NSLs. Active mitigation is required at these locations to minimize the potential for temporary significant adverse noise effects.

Site compound noise assessment

The site compound usage will depend on the location of work at any given time, and therefore will not necessarily be in use for the duration of construction. Trains will periodically transport construction materials and plant into the compound during day and night-time periods. Noise levels related to site compounds were assessed at the closest NSLs as the noise sources are static and do not progress linearly along the track. The work duration at each compound is though anticipated to be longer than the duration criteria of 10 in any 15 consecutive days or 40 days in any six-month period. The locations of site compounds were summarized in Table 16.21 and shown in Figure 16.13 and Figure 16.15.

Table 16.21: Construction compound locations

Site compound	Description	Closest NSL
Compound 1	Along L3004	NSL 4
Compound 2	Located in Fota Retail and Business Park	NSL 5C
Compound 3	Opposite Ballyadam House	NSL 10
Compound 4	Beside Owenacurra River bridge	NSL 14 and NSL 15
Compound 5	Beside Owenacurra River bridge	NSL 14 and NSL 15

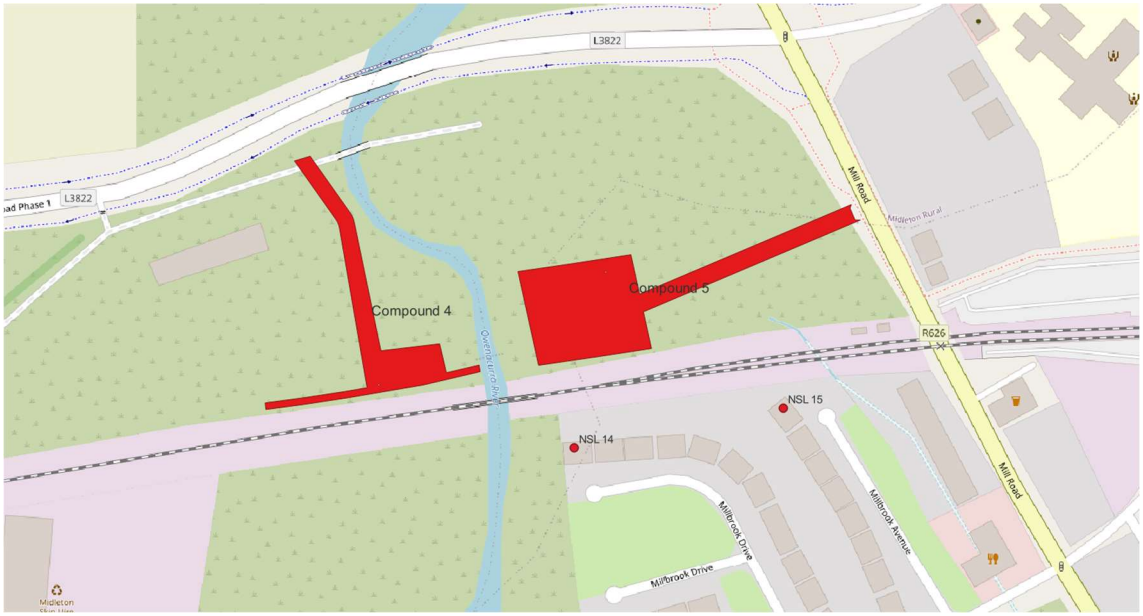
Figure 16.13: Location of construction compounds 1 & 2

Map source: © OpenStreetMap contributors

Figure 16.14: Location of construction compound 3

Map source: © OpenStreetMap contributors

Figure 16.15: Location of construction compounds 4 & 5



Map source: © OpenStreetMap contributors

An activity noise level prediction has been made for each construction compound taking into account the range of likely activities taking place regularly in the compounds. Table 16.22 summarises the resultant construction noise levels at the respective NSLs and a comparison to the day and night-time acoustic thresholds. The numbers highlighted red show construction noise levels that are higher than the NSLs respective acoustic thresholds.

Table 16.22: Construction compound noise levels

NSL ID	Daytime acoustic threshold, dB	Daytime site compound noise level, dB	Night-time acoustic threshold, dB	Night-time site compound noise level, dB
NSL 4	75	54	45	54
NSL 5C	75	55	45	55
NSL 10	70	51	45	51
NSL 14	65	58	45	58
NSL 15	65	62	45	62

The assessment shows that there will be no predicted significant adverse impacts for daytime construction works. However, there are predicted significant adverse impacts for night-time construction works at all the identified NSLs. Active mitigation is required for these NSLs to minimize the significant adverse noise impacts and is discussed in Section 16.7. Exception is made for NSL 5C Carrigtwohill Community College. As the significant adverse impacts were only predicted for night-time works, the college is expected to be uninhabited and therefore do not require mitigation.

16.4.1.2 Vibration

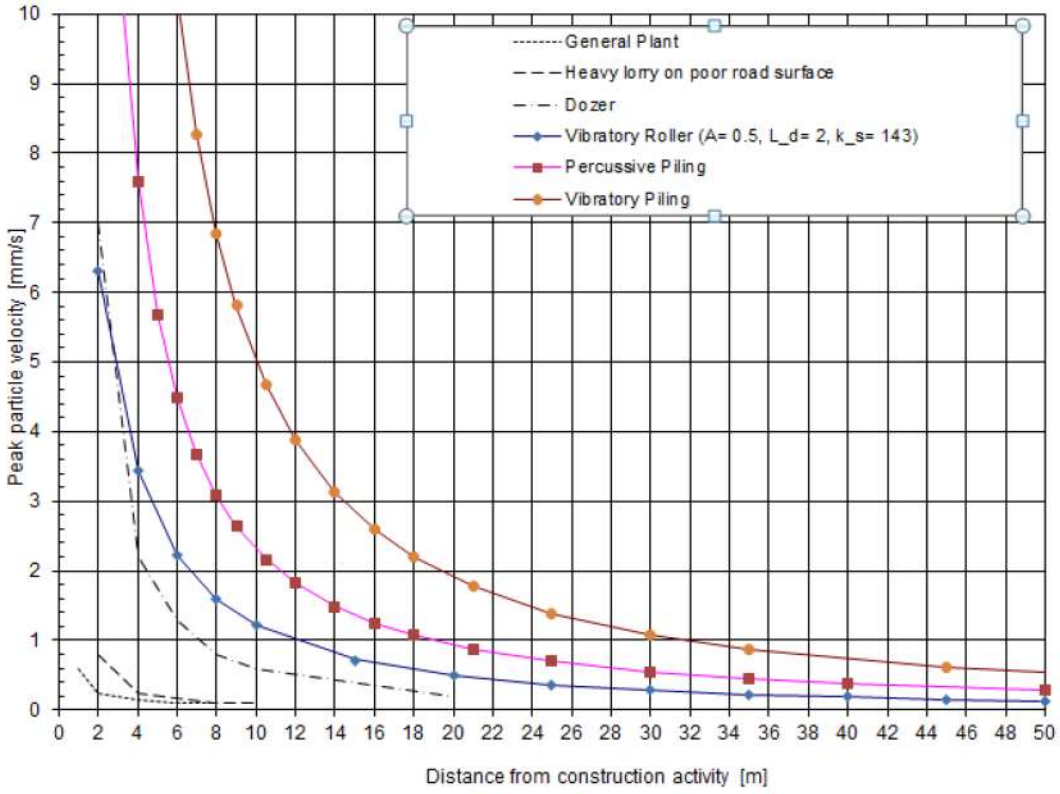
Vibration, even of very low magnitude, may be perceptible to people. Vibration nuisance is frequently associated with the assumption that, if vibrations can be felt, then damage may occur. However, considerably greater levels of vibration (than those which have been measured on site) are required to cause damage to buildings and structures (for example, BS 7385: Part 2

states that vibration transmitted from site activities to the neighbourhood may, therefore, cause anxiety as well as annoyance, and can disturb sleep, work or leisure activities).

Vibratory compaction activities

It is anticipated that the vibration intensive activities will come from the use of vibratory rollers, ballast ploughs, and tampers. These vibration-generating equipment are similar to the vibratory compaction activity described in BS 5228. Annex E of BS 5228 Part 2:2009+A1:2014 includes an empirical method for the prediction of vibration arising from steady state vibratory compaction. Using parameters corresponding with a moderate-size vibratory roller (one vibrating drum, 2m width and 0.5mm maximum amplitude of drum vibration), the distances at which the thresholds of significant effects are exceeded are given in Figure 16.16.

Figure 16.16: Vibration from compaction: PPV vs distance



Source: Mott MacDonald Based on BS5228

This figure shows that vibration arising during vibratory compaction at distances within ~12m of surfacing works is likely to be of sufficient magnitude to cause complaint, and within 1.5m it may cause cosmetic damage to residential buildings or light-framed structures. Table 16.23 summarizes the predicted impacts after accounting for work duration at NSL distances.

Table 16.23: Predicted vibration levels at NSLs for vibration compaction

NSL ID	Distance to NSL, m	Resultant PPV, mm/s	Duration of PPV exceeding 1mm/s	Significant impact assessment
NSL 1	5	2.7	1 day	Significant disturbance but no structural damage is anticipated
NSL 2	5	2.7	1 day	Significant disturbance but no structural damage is anticipated
NSL 3	8	1.6	1 day	Significant disturbance but no structural damage is anticipated

NSL ID	Distance to NSL, m	Resultant PPV, mm/s	Duration of PPV exceeding 1mm/s	Significant impact assessment
NSL 4	6	2.2	1 day	Significant disturbance but no structural damage is anticipated
NSL 5B	7	1.9	1 day	Significant disturbance but no structural damage is anticipated
NSL 6	17	0.6	NA	Not significant
NSL 7	14	0.8	NA	Not significant
NSL 8	18	0.6	NA	Not significant
NSL 9	20	0.5	NA	Not significant
NSL 10	26	0.3	NA	Not significant
NSL 11	37	0.2	NA	Not significant
NSL 12	22	0.4	NA	Not significant
NSL 13	12	1.0	NA	Not significant
NSL 14	23	0.4	NA	Not significant
NSL 15	14	0.8	NA	Not significant

The results show that vibration levels at NSL 1, NSL 2, NSL 3, NSL 4 and NSL 5B could give rise to potential significant impacts due to the distances to the vibration intensive equipment. However, after accounting for the duration of exposure to the vibration levels, and that the vibration impacts will be temporary, it is considered that vibration impacts will not give rise to significant effects. Impacts at NSL5B could be reduced if the works were undertaken outside of school hours. It also follows that no NSLs are subjected to vibration levels that will cause cosmetic damage to buildings.

Construction piling activities

It is anticipated that the construction of retaining structures and Owennacura bridge widening works will involve the use of vibratory and percussive piling depending on ground conditions. Piling is considered vibration intensive and could cause adverse vibration impact at nearby NSLs. Annex E of BS 5228 Part 2:2009+A1:2014 includes empirical methods for the prediction of vibration arising from vibratory and percussive piling. It is noted that piling is not considered at Wall 7 due to soil depth unsuitable for sheet pile wall construction and thus omitted from assessment. Table 16.24 outlines the parameters for the exposed pile height, pile depth and distance to the nearest NSLs. Ground conditions were assumed to be medium dense granular soils.

Table 16.24: Parameters used in vibration assessment of percussive and vibration piling

Wall Location ID	Exposed pile height, m	Pile depth*, m	Closest NSL	Distance to closest NSL, m
Wall 1	2.3	4.6	NSL 3	19
Wall 2	2.5	5.0	NSL 5B	18
Wall 3	2.0	4.0	NSL 7	44
Wall 4	2.0	4.0	NSL 7	296
Wall 5	1.7	3.4	NSL 9	304
Wall 6	2.9	5.8	NSL 10	23
Wall 8	1.1	2.2	NSL 14	75

Wall Location ID	Exposed pile height, m	Pile depth*, m	Closest NSL	Distance to closest NSL, m
Owennacurra Bridge	8.6	17.2	NSL 14	37

* In the absence of any ground investigation the pile depth is assumed to be twice the length of the exposed pile height.

Table 16.25 summarizes the predicted impacts at the closest NSLs with the duration of exposure accounted for.

Table 16.25: Predicted vibration levels at NSLs for piling

Wall Location ID	Closest NSL	Vibratory piling resultant PPV, mm/s	Duration of exposure above threshold	Percussive piling resultant PPV, mm/s	Duration of exposure above threshold
Wall 1	NSL 3	2.0	1 day	0.244	NA
Wall 2	NSL 5B	2.2	1 day	0.258	NA
Wall 3	NSL 7	0.6	NA	0.084	NA
Wall 4	NSL 7	0.0	NA	0.007	NA
Wall 5	NSL 9	0.0	NA	0.007	NA
Wall 6	NSL 10	1.6	1 day	0.189	NA
Wall 8	NSL 14	0.3	NA	0.042	NA
Owennacurra Bridge	NSL 14	0.8	NA	0.094	NA

The results show that vibration levels at NSL 3, NSL 5B, and NSL 10 could give rise to potential significant adverse impacts for disturbance due to vibratory piling. However, it is considered that the vibration impacts will be temporary as they will only last 1 night in close proximity to each receptor. No NSLs are subjected to vibration levels that will cause cosmetic or structural damage to buildings.

16.4.2 Operation and Maintenance

16.4.2.1 Noise

The existing railway line includes the stations of Glounthaune, Carrigtwohill and Midleton which are mostly comprised of single track. The proposed development proposes to construct a new and directly adjacent additional railway track which will make the route a twin track between Glounthaune and Midleton. This will enable the frequency of trains to be increased.

The operational noise levels of rail traffic before and after implementation of the upgrade tracks are calculated using the methodology described in CRN which is implemented within the acoustic modelling software CadnaA [DataKustik GmbH, 2021]. The assessment is based on the comparison of existing baseline conditions with those expected upon Proposed Development opening year. Furthermore, the number of existing and future train movements are provided in Table 16.26.

Table 16.26: Train movements

Train movement	Daytime (06:00-24:00)	Night-time (24:00-06:00)
Existing	62	1 [A]
Proposed	140 [B]	1 [C]

Remarks:

[A] - Baseline survey indicate train movement between 05:30 and 06:00. For the purpose of this assessment, 1 passenger train movement are assumed during the night-time period (early morning, i.e. before 06:00) from the direction of Glounthaune to Midleton.

[B] - The trains operation time start around 06:00 and finish around midnight. Early morning (06:00 – 07:00) will have 6 movements, peak hours (07:00 – 10:00 and 16:00 – 19:00) will have 12 movements per hour, off-peak hours will have 6 movements per hour, and late evening (22:00 – midnight) will have 4 movement per hour.

[C] - 1 movement will be assumed during the night-time (early morning, i.e. before 06:00) from the direction of Glounthaune to Midleton.

The following assumptions were made for the noise modelling:

- Each train comprises two vehicles;
- The acceleration (leaving station) / deceleration (approaching station) of the train is modelled at 0.8 m/s^2;
- The tracks when leaving and approaching train stations have been divided into smaller sections to represent increases and decreases in speed of 16 km/h (10 mph) intervals;
- The speed limit of the train is 97 km/h (60 mph), or track speed (if lower);
- The track sections with crossing, point, concrete bridges and level crossing for road traffic have been considered;
- Ground absorption G=0.5
- Study area is 300m from the track

The result of the existing and future operational railway noise at the closest sensitive locations, as well as the change in total noise are provided in Table 16.27 for daytime hours. Noise contour plots showing the change in noise levels for the Proposed Development are shown in Figure 16.17 to Figure 16.20 for daytime hours. Areas shown in green are predicted to experience a noise increase of less than 3 dB, the areas in blue an increase of between 3 dB and 5dB, and orange areas an increase of between 5 dB and 10 dB. The entire study area will experience a noise increase as a result of increased rail traffic, the highest increases being where tracks are brought closer to residential areas, speeds have increased, or a combination of the two.

Figure 16.17: Noise contour plot showing noise changes for receptors at Glounthaune (NSL 1 to NSL 4)

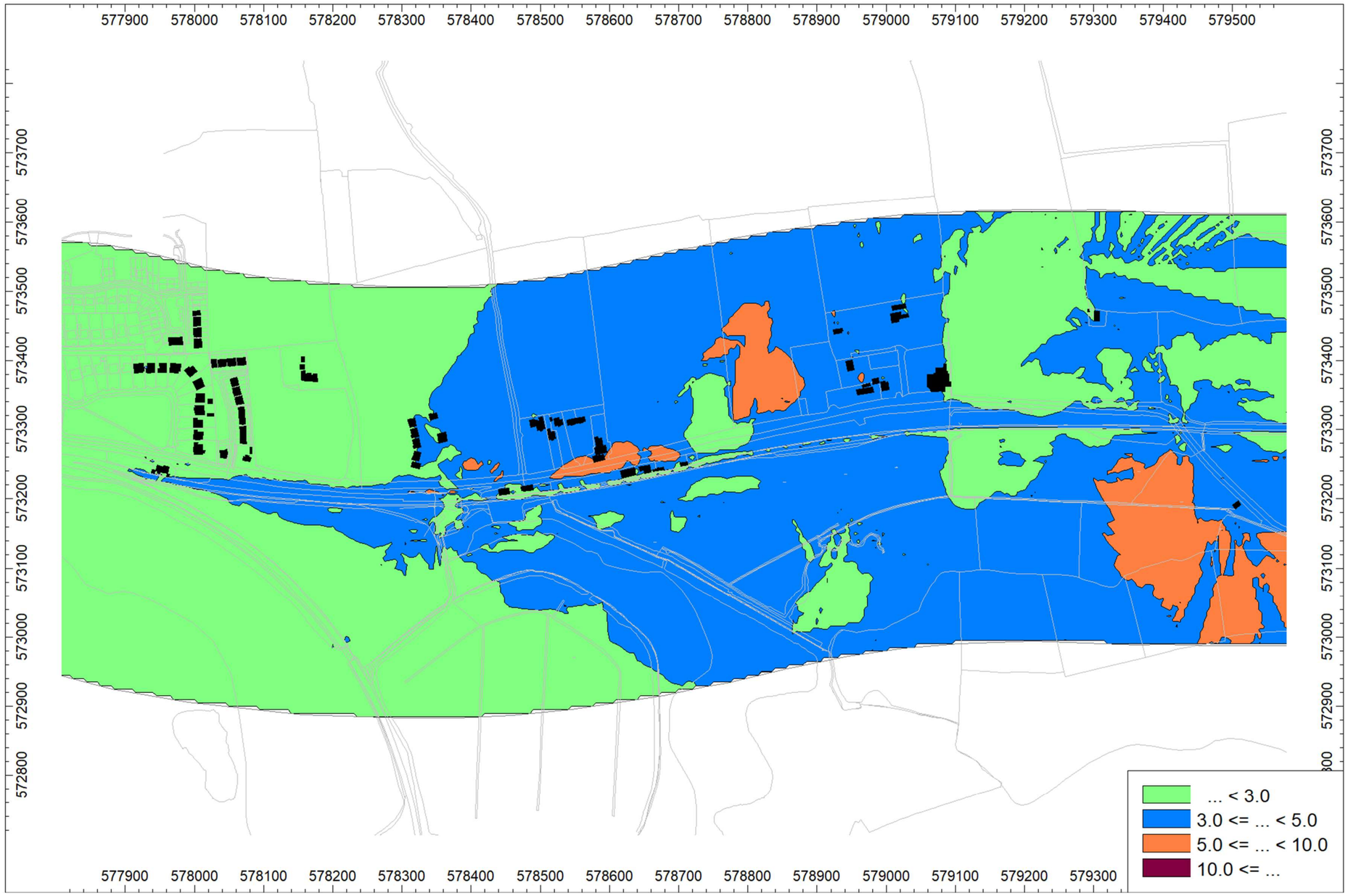


Figure 16.18: Noise contour plot showing noise changes for receptors at Carrigtwohill West (NSL 5 to NSL 7)

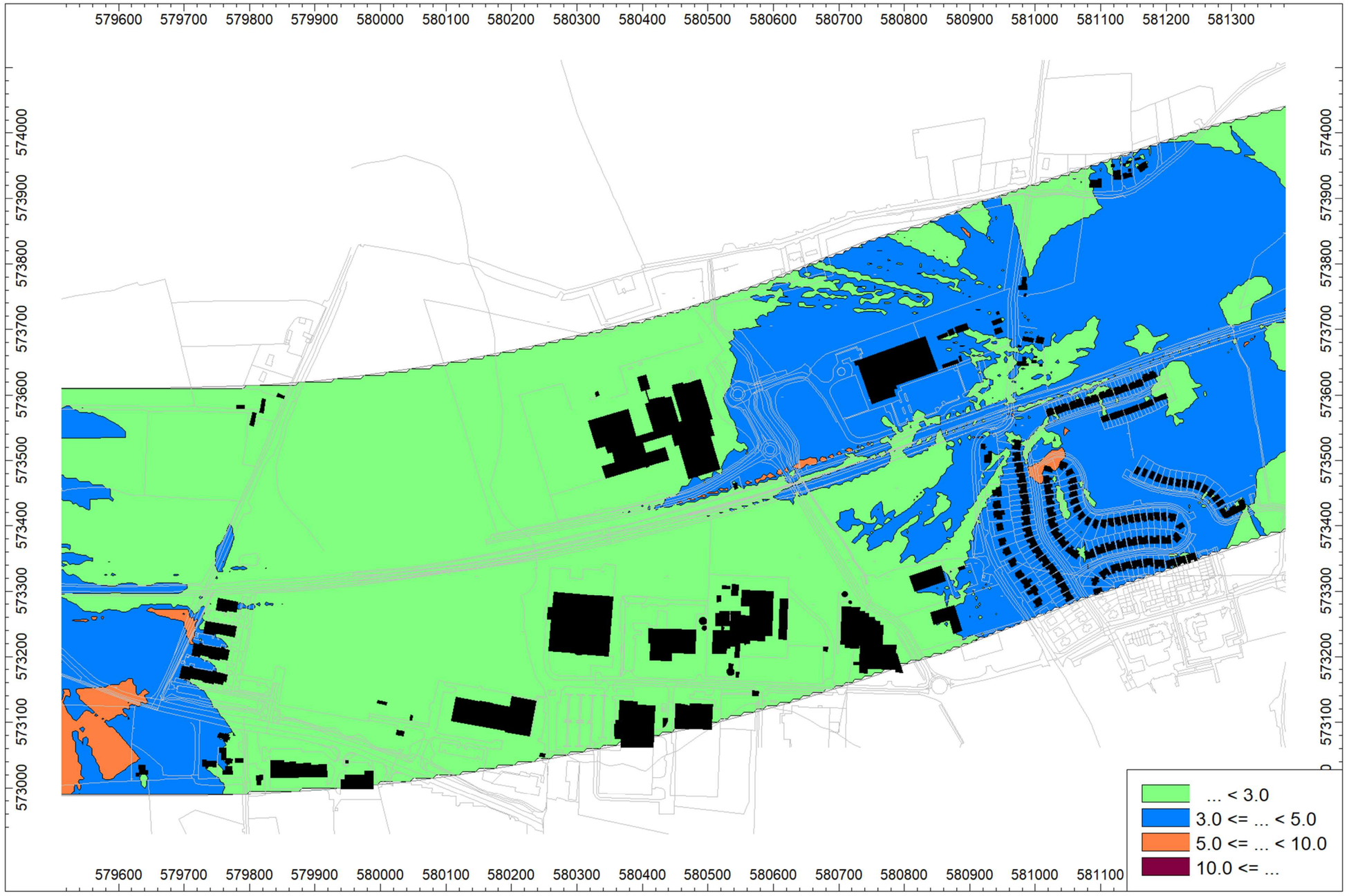


Figure 16.19: Noise contour plot showing noise changes for receptors at Carrigtwohill (NSL 9 to NSL 10)

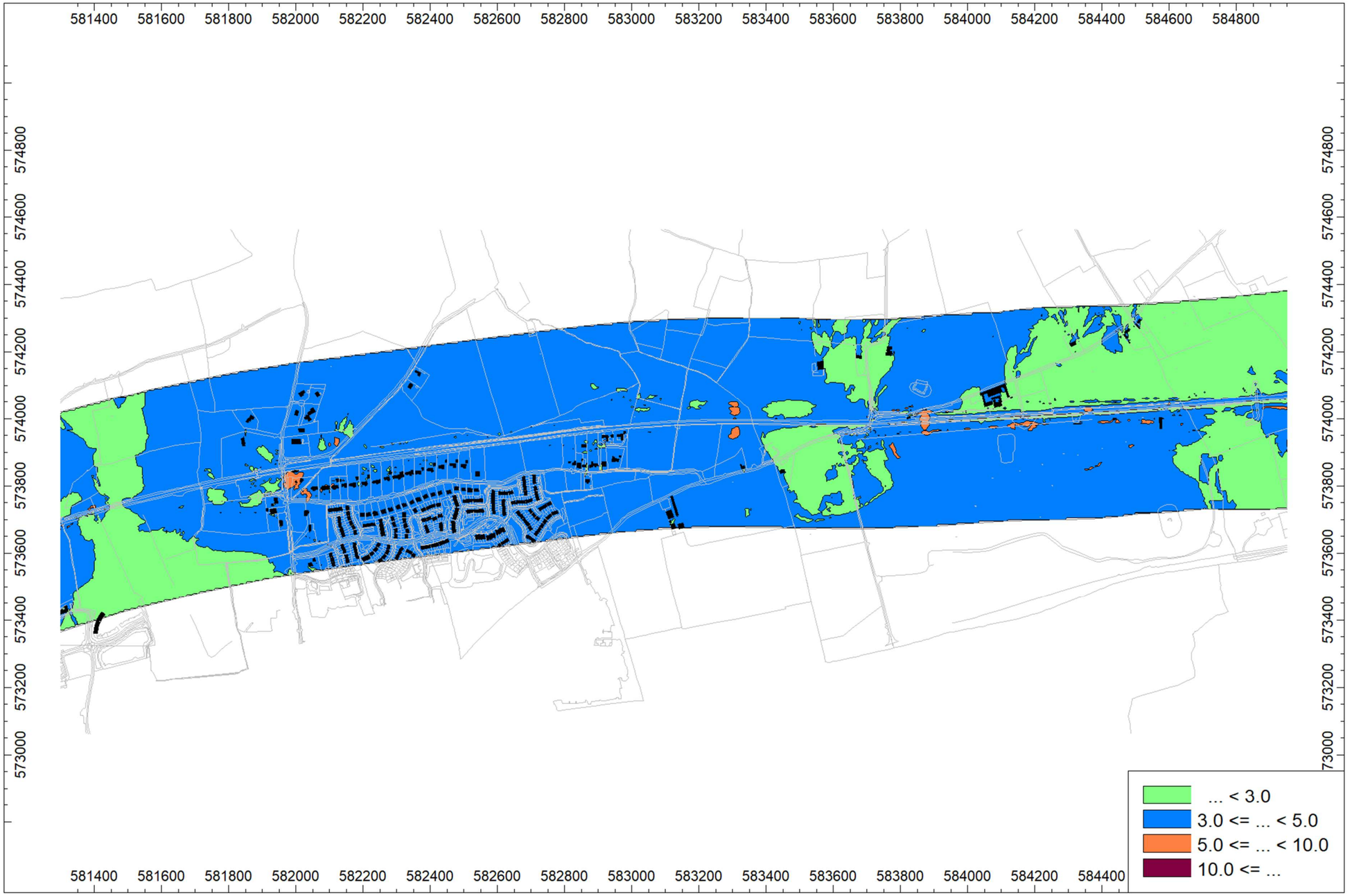


Figure 16.20: Noise contour plot showing noise changes for receptors at Water Rock and Midleton (NSL 11 to NSL 15)

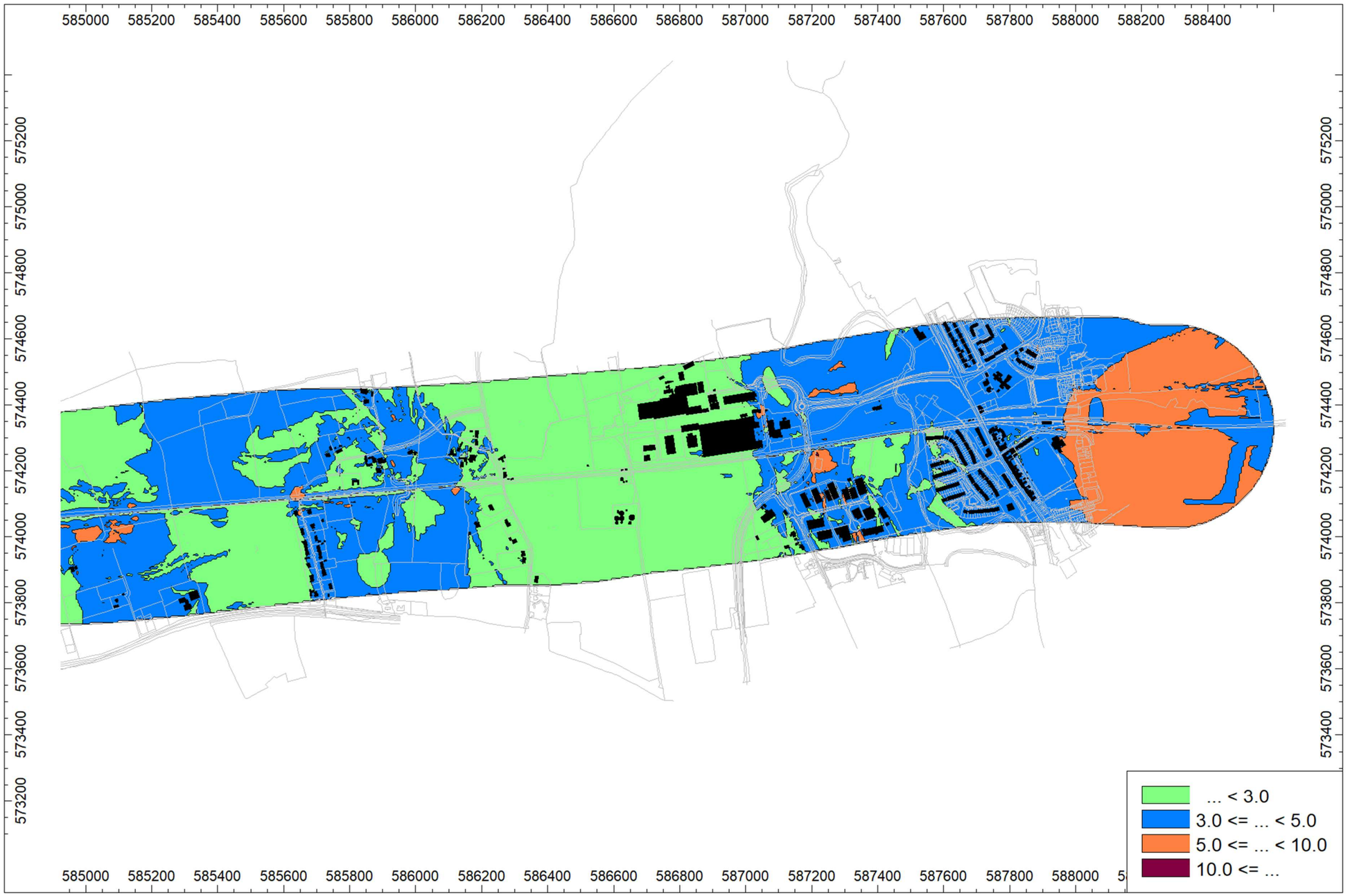


Table 16.27: Operational railway noise assessment results at the facades of the closest sensitive locations

NSL ID	Use	Daytime, $L_{Aeq,18h}$ dB						
		Existing	Future	Difference	Ambient	Rail + Ambient	Future Rail + Ambient	Difference
NSL 1	Residential	63	66	+3	71	72	72	0
NSL 2	Residential	64	67	+3	71	72	73	+1
NSL 3	Residential	61	63	+2	71	71	72	+1
NSL 4	Commercial	65	68	+3	71	72	73	+1
NSL 5	Education	63	64	+1	70	71	71	0
NSL 5B	Education	65	67	+2	70	71	72	+1
NSL 5C	Education	59	58	-1	70	70	70	0
NSL 6	Residential	62	65	+3	62	65	67	+2
NSL 7	Residential	62	66	+4	62	65	67	+2
NSL 8	Residential	63	67	+4	63	66	68	+2
NSL 9	Residential	63	66	+3	63	66	68	+2
NSL 10	Residential	59	60	+1	63	64	65	+1
NSL 11	Residential	58	61	+3	58	61	63	+2
NSL 12	Residential	59	61	+2	59	62	63	+1
NSL 13	Residential	64	65	+1	64	67	68	+1
NSL 14	Residential	58	61	+3	58	61	63	+2
NSL 15	Commercial	58	62	+4	58	61	64	+3

Figure 16.17 to Figure 16.20 and Table 16.27 reveals that the properties in Glounthaune (NSL 1 to NSL 4) are predicted to experience negligible to minor increases in daytime railway noise, which are negligible when the total ambient noise is considered. NSL 2 will be within 1 dB of the specified daytime level, and at the detailed design stage Iarnród Éireann will consult with the owner of this property to improve the existing noise barrier on the boundary with the railway.

The properties in Carrigtwohill West including the Carrigtwohill Community College (NSL 5) and residential area at Maple Lane (NSL 6 to NSL 7) are predicted to experience negligible to minor increases in daytime railway noise, which will be negligible when the total ambient noise is considered.

The properties in Carrigtwohill (NSL 8 to NSL 10) and Water Rock (NSL 11 to NSL 13) are predicted to experience negligible to minor increases in daytime railway noise, which are negligible when the total ambient noise is considered since the area is dominated by distant traffic and railway noise.

The properties in Midleton (NSL 14 to NSL 15) are predicted to experience negligible to minor noise increases in daytime railway noise, which are negligible when the total ambient noise is considered.

The predicted night-time noise levels would be expected to remain mostly the same throughout the area of the proposed development as it is assumed that the number of night-time train events will remain unchanged. There will be some negligible decreases where the new tracks are further away, and some negligible increases where new tracks are closer to properties.

Table 16.28 summarises all the changes in railway noise as a result of the proposed development.

Table 16.28: Change in railway noise levels for existing and future scenarios

Noise sensitive location	Change in noise level, $L_{Aeq,T}$	Overall		Above WHO levels in future case	
		Daytime	Night-time	Daytime	Night-time
Residential	0 dB or less	9	1885	1	48
	0 to 3 dB	267	52	34	2
	3 to 4.9 dB	1313	0	98	0
	5 to 9.9 dB	348	0	1	0
	10 dB or more	0	0	0	0
Commercial / Industrial	0 dB or less	43	188	4	8
	0 to 3 dB	39	29	13	4
	3 to 4.9 dB	124	0	47	0
	5 to 9.9 dB	8	0	3	0
	10 dB or more	0	0	0	0

It is considered that the permanent changes in railway noise as a result of the Proposed Development will not be significant since the area is already used to a level of railway noise in the existing noise environment, and increases are negligible to moderate. One residential property at NSL 2 will need mitigation and it is proposed to modify the existing barrier.

All trains have horns which are used for emergencies, and locations along the track where the presence of a train is required to be notified, such as at a level crossing. There are no plans to increase the number of locations along the route where this may occur, but where there are existing locations, the increased number of train movements will increase the number of horns sounded. Receptors in close proximity to these locations will notice the increase in horn noise, but would be expected to habituate to it over time. This is considered to be a slight impact.

16.4.2.2 Vibration

The current rail movements information[10] indicates that a typical weekday scenario during the daytime (07:00-23:00) period has 58 passenger trains movements. At night (23:00-07:00), there are up to five passenger train movements. For the future case, it will increase up to 136 daytime movements, and remain at five movements for night-time. It is noted that these figures are not the same as those for airborne noise since the time periods are different, i.e. there are four movements between 06.00 and 07.00 which are in the day for noise, but in the night for vibration.

Results in Table 16.10 shows the derived $VDV_{b,day}$ and $VDV_{b,night}$ from the measured event VDV in Table 4.4 using Vibration dose summation equations in BS6472-1:2008 equation 2:

$$VDV_{b/d,day} = \left(\frac{t_{day}}{t_T}\right)^{0.25} \times VDV_{b/d,T}$$

Where: t_{day} is the duration of exposure per day (s).

[10] Obtained from www.realtimetrains.co.uk and checked against observed movements on site

Table 16.29: Summary of existing VDV_{day} and VDV_{night}

Location	Event VDV in Wb axis ($m.s^{-1.75}$)	Distance to track (m)	Existing $VDV_{,day}$ ($m.s^{-1.75}$)	Existing, $VDV_{,night}$ ($m.s^{-1.75}$)
MP1	0.0003	17.0	0.0008	0.0005
MP2	0.0670	7.5	0.0709	0.0438
MP3	0.0050	29.7	0.0127	0.0078
MP4	0.0170	13.0	0.0430	0.0266
MP5	0.1110	15.5	0.0127	0.0078
MP6	0.0030	12.0	0.0076	0.0047
MP7	0.0070	27.0	0.0177	0.0110
MP8	0.0009	14.2	0.0023	0.0014

Source: Mott MacDonald

In order to extrapolate for the existing case at NSLs, the single event VDV has been factored up to account for the current daily movements, and the distance between track to receptor updated to reflect the differences between the vibration measurement positions MP1-8 (some low outliers have been excluded from the analysis), any additional discontinuities in the track, and the NSL locations. The measurements obtained are fairly consistent with each other, which suggests that ground conditions are fairly uniform across the scheme. Chapter 10 reports on the ground conditions across the scheme. This presents a conservative estimate of future vibration levels for all receptors.

The predicted VDV for the existing case of full 16-hour daytime period at VM1-8 is ranged between 0.0010 to 0.0953$m.s^{-1.75}$ and for the full 8 hour night-time period ranged between 0.0005 to 0.0438$m.s^{-1.75}$. These values indicate that the probability of adverse comment is low for all receptors as per BS 6472-1:2008. Locations adjacent to track discontinuities will experience higher levels of vibration. No residential receptors have been identified in close proximity to any new track discontinuities.

In order to extrapolate for the future case, the single event VDV has been factored up to account for the additional movements, and the distance between track to receptor updated to reflect the changes in track alignment.

Figure 16.21 shows the measured VDV day and night against distance for the existing case, and a prediction for the future case reflecting the increased number of movements. The trend line shows that receptors as close as at 2m (daytime) and 1m (night-time) to the closest track should pose no adverse comment despite the increase of movements.

Figure 16.21: Predicted VDV day and night levels vs distance

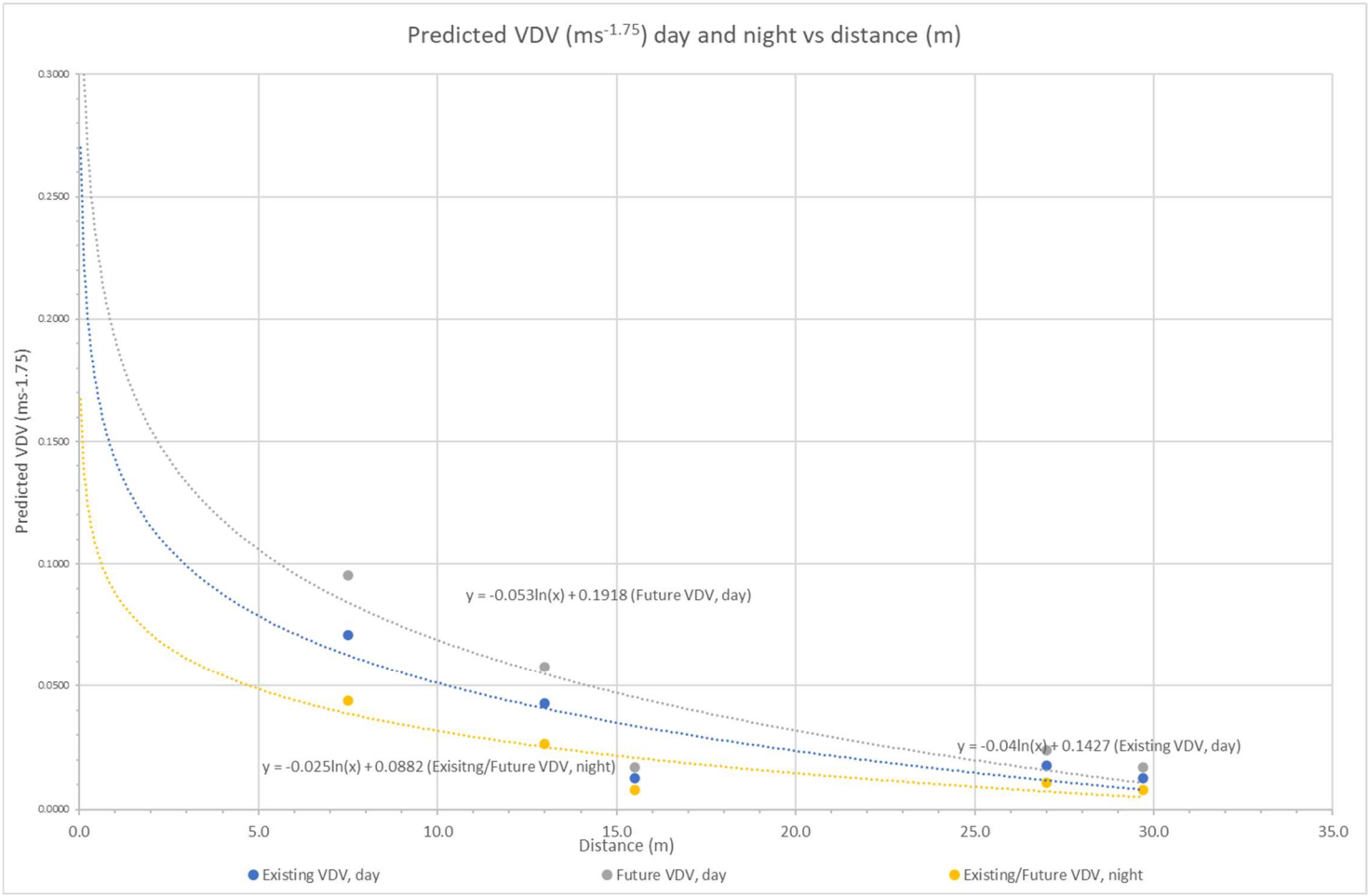


Table 16.30 sets out the predicted vibration levels for the operational phase at NSLs for the baseline and future scenarios for both day and night-time periods. BS 6472–1:2008 requires that the VDV is determined at the point at which it enters the human body in order to assess the likelihood of adverse comment. The findings of the assessment were that vibration levels at receptors distances are predicted to be well below these thresholds in the ground outside the receptor building. It is anticipated that there will be loss of vibration energy due to the impedance of the interface between the ground and the foundation of the buildings. Therefore, the VDV inside the property, transmitted to the occupier is expected to be less than the VDV outside the property/at the measurement positions. The likelihood of adverse comment due to operational vibration impact due to train movements is considered to be negligible.

Table 16.30: Summary of existing and future VDV_{day} and VDV_{night} at NSLs

Location	Address	Distance to the nearest track, existing (m)	Distance to the nearest track, future (m)	Existing VDV, $_{day}$ ($m.s^{-1.75}$)	Existing VDV, $_{night}$ ($m.s^{-1.75}$)	Future VDV, $_{day}$ ($m.s^{-1.75}$)	Future VDV, $_{night}$ ($m.s^{-1.75}$)	Percentage Change (day)*
NSL 1	Glounthaune Co. Cork	4.5	4.5	0.083	0.051	0.112	0.051	+36%
NSL 2	Aranjuaz Killahora	5.1	5.1	0.078	0.047	0.105	0.047	+36%
NSL 3	Harbour Lights Killahora	7.7	7.7	0.061	0.037	0.084	0.037	+37%
NSL 4	Con Dennehy & Co. Ltd. Lochmhor	6.0	6.0	0.071	0.043	0.097	0.043	+36%
NSL 5	Carrigtwohill Community College	12.9	11.7	0.040	0.024	0.061	0.027	+52%
NSL 6	1 Maple Lane Castlelake	17.3	16.5	0.029	0.017	0.043	0.018	+51%
NSL 7	30 Maple Lane Castlelake	15.9	14.4	0.032	0.019	0.050	0.022	+57%
NSL 8	1 Ashgrove Lodge Rocklands	17.8	17.8	0.028	0.016	0.039	0.016	+42%
NSL 9	2 Ashgrove Lodge Rocklands	19.8	19.8	0.023	0.014	0.034	0.014	+44%
NSL 10	Ballyadam House Ballyadam	29.1	25.7	0.008	0.004	0.020	0.007	+151%
NSL 11	Ballyrichard More Midleton	37.1	37.1	0.000	0.000	0.000	0.000	0%
NSL 12	Ballyrichard More Midleton	25.6	22.0	0.013	0.007	0.028	0.011	+115%
NSL 13	Water Rock Cottage, Waterock	11.7	11.7	0.044	0.027	0.061	0.027	+39%

Location	Address	Distance to the nearest track, existing (m)	Distance to the nearest track, future (m)	Existing VDV, $_{day}$ ($m.s^{-1.75}$)	Existing VDV, $_{night}$ ($m.s^{-1.75}$)	Future VDV, $_{day}$ ($m.s^{-1.75}$)	Future VDV, $_{night}$ ($m.s^{-1.75}$)	Percentage Change (day)*
NSL 14	24 Millbrook Drive Midleton	23.4	23.4	0.017	0.009	0.025	0.009	+49%
NSL 15	Dineco Cleaning Concepts Ltd. 16 Millbrook Avenue	13.7	13.7	0.038	0.023	0.053	0.023	+40%

*Any changes at night will only occur where new twin tracks are laid, which will be minimal.

It can be seen from Table 16.30 that whilst most receptors will experience an increase in vibration from the railway (a few will have a slight decrease at night due to the additional track taking traffic further away from the properties), none of the existing residential receptors will exceed the significance thresholds for day or night-time periods. The change in operational vibration is therefore not considered to be significant.

16.4.3 Do-nothing scenario

In the event that the Proposed Development did not proceed, there would be no increased movements, or new track, so the existing noise and vibration from the railway would remain at current levels. At some point in the future, the rolling stock is likely to be replaced with newer and quieter models, but there would be no opportunities for additional capacity on the route.

16.4.4 Cumulative effects

The construction of the Proposed Development will occur at the same time as a number of other projects as set out in Chapter 2 Table 2.2. There is sufficient separation distance between the scheme and these other activities for no temporary significant cumulative noise effects to occur.

The operation of the Proposed Development will occur at the same time as a number of other projects as set out in Chapter 2 Table 2.2. Additional receptors could also be constructed before operation of the scheme commences. None of these new receptors would experience noise and vibration levels higher that that already assessed for the existing receptors. There is sufficient separation distance between the proposed development and these other activities and new receptors for no permanent significant cumulative noise effects to occur.

16.4.5 Decommissioning

The Proposed Development could be decommissioned after a sixty-year period. Construction activities to remove the infrastructure would be less intensive than those to construct the new tracks, and therefore any temporary impacts from decommissioning noise and vibration are not expected to result in significant adverse effects.

16.5 Mitigation and monitoring measures

16.5.1 Construction phase

A CEMP including noise and vibration mitigation will be implemented during the construction phase in consultation with Cork County Council.

The contractor is obliged to comply with Local Authority controls on noise and vibration during construction. This will include (but is not limited to) the setting of limits for the control of noise and vibration from construction activities, the provision of mitigation measures required whilst adopting best practicable means, and any noise or vibration monitoring where significant adverse effects are required to be monitored. A comprehensive noise and vibration monitoring protocol will also be implemented.

As part of the CEMP, the Contractor will also develop and implement a stakeholder communications plan which will facilitate community engagement prior to the commencement of construction.

16.5.1.1 Mitigation applicable to HGV deliveries

The number of vehicle movements and levels of noise are expected to be relatively low but have the potential to cause disturbance as being unusual, noise-emitting activity in a quiet, rural area. Measures will be implemented to control vehicle movements:

- To avoid the need to perform reverse manoeuvres and therefore use of audible reverse alarms. However, in the interest of safety, the use of adjustable or directional audible vehicle-reversing alarms or use of alternative warning systems, e.g. white noise alarms rather than tonal alarms will be adopted.
- To avoid the need to queue or wait to gain access to the site
- To ensure vehicle engines are switched off when not in use
- To ensure unloading activities are undertaken during the daytime
- Further to the mitigation measures set out within the CEMP, the Contractor will:
  - Manage the timing of activities so that noise-emitting works are conducted in the daytime only
  - Where it is required that noise-emitting activities are undertaken in the evening or at night, provide prior notification to the occupiers of nearby dwellings

16.5.1.2 Mitigation applicable to construction works

Construction works are expected to take place predominantly at night. The construction works with the potential to result in noise and vibration impacts and effects may include the following:

- Earthworks
- Track installation
- Formation treatment
- Tamping and ballasting on track surface
- Retaining structures
- Owennacurra bridge works

Typical means by which noise and vibration will be minimised include the following:

- Selecting quiet equipment;
- Ensuring equipment is maintained, in good working order, and is used in accordance with the manufacturer's instructions
- Members of the construction team should be trained and advised during toolbox briefings on quiet working methods
- Equipment shall not be left running unnecessarily
- Equipment shall be fitted with silencers or mufflers where possible
- Use plant enclosures whenever feasible
- Materials shall be lowered instead of dropped from height
- Manage deliveries to prevent queuing of site traffic at access points
- Use of adjustable or directional audible vehicle-reversing alarms and/or alternative warning systems (i.e. white noise alarms)
- Utilising low vibration working methods
- Provision of noise insulation measures and/or temporary rehousing of residents during periods of particularly intense noise construction work

Night works should be avoided where possible at predominantly residential areas to reduce the adverse noise impacts at receptors. Conversely, construction works should be avoided during daytime or school term at NSL 5 to prevent disruption at the Carrigtwohill Community College.

Good public relations are invaluable in securing public acceptance of construction noise. People are more tolerant of noise if they understand the reason behind it, the likely duration, start and completion dates, and mitigation measures used to minimise noise levels. Letter box drops

explaining these shall be considered. A dedicated site contact will be nominated to liaise with residents and establish good rapport. A complaint handling procedure shall also be put in place.

16.5.1.3 Mitigation applicable to site compound works

Five site compounds will be located along the tracks. The utilization of the site compound will depend on the current progress of the track works. Site compound works with potential to result in noise impacts may include the following:

- Material stockpiling
- Transportation of materials and equipment to work locations
- Material and equipment haulage by locomotive

Typical means by which noise impacts will be minimised include the following:

- Selecting quiet equipment
- Ensure equipment is maintained, in good working order, and is used in accordance with the manufacturer's instructions.

Trains will be at the opposite end of the site compounds when idling during material deliveries to ensure greater distances to the NSLs.

The provision of noise barriers or site hoarding is needed at site compounds 1, 3, 4 and 5 due to their close proximity to residential receptors. In accordance with BS 5228, as an approximation, a noise barrier that can partially block the line of sight between the noise source and receiver could achieve 5 dB attenuation. Where line of sight is completely broken a reduction of 10 dB may be achieved. Such screening will reduce the adverse noise impacts on the affected NSLs.

16.5.2 Operation and Maintenance phase

16.5.2.1 Mitigation applicable to the operational railway

The main component of the railway noise and vibration is generated by the interaction of wheel and rail. Reduction of the roughness at wheel and rail will minimise the potential for noise at source. This will be undertaken as part of maintenance by the rail operator.

Noise barriers will be installed for the areas predicted to exceed adverse effect levels for operational noise, in this case NSR2. However, the use of noise barriers would be subjected to some safety and practical concerns:

- Obscure line of sight for the train driver if noise barriers located on bends in the track; and
- The practicality of the barrier location with consideration of emergency trackside evacuation, maintenance and integration with other trackside infrastructure, such as signalling and drainage.

Receptor NSR2 requires an enhancement to the current noise barrier in terms of length and height. Suitable mitigation will be agreed between Iarnród Éireann/Community liaison officer and the landowner.

16.6 Residual impacts

Noise and vibration arising during construction will be controlled by the implementation of measures described in the CEMP, included in Appendix 6.1 of this EIAR. In general, noise effects arising during the construction of the proposed development could lead to temporary significant effects due to the need to conduct most activities at night, some in close proximity to residential properties. Every effort will be made at the construction stage to avoid these impacts where possible.

Noise and vibration during operation is not predicted to result in significant effects.

There are therefore no significant residual noise and vibration effects predicted during the construction and operational phases with the successful incorporation of the specific mitigation measures described in Section 16.6.

16.7 Summary

This chapter provides an assessment of predicted noise and vibration effects arising during the construction and operation of the proposed development. This has been informed by the prediction of effects using theoretical and empirical models and the results of background noise surveys conducted in 2022.

Noise and vibration arising during construction may lead to temporary significant adverse effects, however with the implementation of mitigation there will be no significant residual effects. Noise and vibration during operation is not predicted to result in significant adverse effects. There are predicted to be no significant adverse cumulative effects or adverse effects from decommissioning.

Chapter 17 – Material Assets

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17 Material Assets

17.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors. This chapter considers potential impacts on material assets arising from the proposed development and the corresponding effects on receptors based on the information presented in Chapter 6 of this EIAR.

Impacts on roads and traffic are discussed in Chapter 15. A Construction Resource Waste Management Plan is provided as part of the CEMP included in Appendix 6.1 of this EIAR.

17.2 Methodology

17.2.1 Methodology

This chapter has been prepared having regard to the following documents:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, May 2022);
- Advice Notes for Preparing Environmental Impact Statements (EPA, Draft September 2015);
- EPA (2021) Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects.

The significance of effects has been determined in line with the methodology described in Chapter 2 EIAR Methodology.

17.2.2 Limitations

Identification of utility services has been based on publicly available datasets and mapping and consultations with utility providers.

It is possible that some utility services located in proximity to the works may not be identified in this EIAR, however the embedded and additional mitigation detailed and proposed as part of this EIAR will be implemented when dealing with any such features to ensure that the proposed development will not result in impacts beyond the parameters assessed in this EIAR.

There were no other limitations encountered in compiling the information required to carry out this assessment of likely significant impacts on the built services and waste management as a result of the proposed development.

17.3 Receiving Environment

17.3.1 Utility Services

A review of the existing cable trough along the existing railway line has been undertaken. It is expected that where the railway tracks are being retained, cable troughs will also be retained along these sections of tracks. Utility providers within the project area were contacted to establish the potential impact of the planned works on their installations. There are no known third party utility providers within the works corridor. No diversions are currently planned.

17.3.2 Structures to be modified

There are two existing bridges structures along the Glounthaune to Midleton railway track, which will require modification during the works. The Ballyadam House Overbridge is to be dismantled and the Owenacurra River Bridge is to be widened.

There are works proposed at four culverts along the route, details of which re provided within Chapter 6 – Description of the Development:

- IDA Open Culvert
- Culvert UBY2A
- Culvert UBY1B
- Culvert UBY1C

The works will require the removal of one level crossing (Ford CCTV XY010) and the widening of one level crossing (Water Rock CCTV XY009).

17.3.3 Waste Management

The Southern Region Waste Management Plan 2015-2021, which includes County Cork, outlines the strategy for waste management in the southern region. The Plan notes the following:

"To date the European Commission has not developed specific regulations governing the end of waste criteria for C&D waste, therefore the EPA is allowed to decide on a case by case basis."

"Given the sharp decrease in the number of operational landfills nationally, which have been a significant outlet for C&D waste in the past, alternative recovery options will be required in future years".

A review of Environmental Protection Agency (EPA) datasets identified East Cork Landfill Site in Rossmore, Carrigtwohill. The landfill licence (Registration Number W0022-01) indicates a maximum of 13,800 tonnes of C&D waste permitted.[1]

The Waste Framework Directive 2008/98/EC defines waste as *"any substance or object that the holder discards or intends to or is required to discard".*[2]

The Waste Hierarchy described in the framework prioritises prevention over re-use, recycling recovery and disposal, as illustrated in Figure 17.1. The framework also provides a target of 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 press release in November 2021 (reference year 2019), Ireland achieved 84% material recovery in 2019.

[1] https://epawebapp.epa.ie/terminalfour/waste/waste-view.jsp?regno=W0022-01

[2] https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en

96% of C&D waste underwent final treatment in Ireland in 20119; only 4% was exported abroad for final treatment. Most of the C&D waste finally treated in Ireland (82%) was backfilled in 2019, while only 7% of all C&D waste was recycled. Recycling was the main treatment operation for the smaller fractions of metal, plastic, glass and wood.

Figure 17.1: Waste Framework Directive – Waste Hierarchy

Source: Waste Framework Directive (https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en)

Iarnrod Eireann have an operating procedure in place for the management of spent ballast. This sets out the roles and responsibilities, classification of the ballast, disposal removal and best practice measures which include the following:

- The requirement for potential assessment of spent ballast and the waste classification process should be considered at the earliest stages of the process.
- Spent ballast should ideally be classified at source, however, due to the restrictive nature of the railway corridor, it is permissible to temporarily store spent ballast at compounds while awaiting classification.
- Spent ballast should be separated at source or at a designated IE compound from other material such as vegetation, soil and other building/construction materials before undergoing waste classification sampling.
- Spent ballast which is uncontaminated should never be mixed with spent ballast that is likely to be contaminated.
- Ideally, where spent ballast from cluster worksites is stored at a hub compound, the stockpile should be labelled with the line name and mileage point from which the spent ballast was excavated from in order to differentiate between plane line and stations/sidings material.

This procedure will ensure that uncontaminated ballast is re-used and minimises waste arisings.

17.4 Likely Significant Impacts of the Proposed Development

17.4.1 Construction Phase

17.4.1.1 Utility Services

All reasonable measures will be taken to avoid unplanned disruptions to any services during the proposed works. This will include thorough investigations to identify and confirm the location of all utility infrastructure within the works areas. At the time of writing, there are no known utility diversions required for the works.

If services are identified, prior notification of disruptions will be given to all impacted properties. This will include information on when disruptions are scheduled to occur and the duration of the disruption. Consultation with relevant neighbouring parties will be undertaken prior to any proposed disruptions.

There is limited potential for disruption to services during construction works, however, if services are identified, impacts will be localised and brief in duration and the measures detailed above will ensure that this will not result in significant impacts in the receiving environment.

17.4.1.2 Utility Use

During the construction phase temporary construction compounds will be required. Welfare facilities will be provided at these locations and any discharges will be connected to a sealed holding tank to be emptied and disposed of off-site by a licenced contractor to an approved licenced facility. Water will be tankered onto site as required. Consequently, significant adverse effects on utility services during the construction phase are not likely.

17.4.1.3 Structures to be modified

The design of the proposed development has been developed to retain structures and bridges in so far as is practicable. The removal of the Ballyadam House overbrige will have a permanent slight negative effect. The widening of the Owenacurra River Bridge will have a slight positive effect, as it will facilitate the proposed twin track layout. The modification of the culverts and level crossings will also have a slight beneficial effect, facilitating the proposed development.

17.4.1.4 Waste Management

Ca. 40,000m^3 of cutting/excavation is required and ca. 38,000m^3 of fill is required for the works and ca. 14,000 m^3 of ballast. These volumes can be reduced if cut ground can be reused on site.

The main waste stream arisings (including surplus materials) which are likely to be generated during the construction phase, are presented in Table 17.1.

The Contractor will be obliged to aim for an overall recycling rate of 70% of construction and demolition waste, in accordance with EU targets under the Waste Framework Directive (2008/98/EC). Waste management targets for anticipated waste arisings regarding reuse / recycling / recovery and disposal rates are presented in Table 17.2 below.

Waste will be managed in accordance with the Waste Management Hierarchy and *Guidance on Waste Acceptance Criteria at Authorised Soil Recovery Facilities* (EPA. 2020) and the Waste Management Act 1996, and associated Regulations. Consequently, significant adverse effects associated with waste management are not anticipated. During construction effects will be imperceptible - slight. Further detail on waste management is provide in Appendix 6.1 - CEMP.

Table 17.1: Main Waste Types and Associated EWC Codes

Waste Type	European Waste Classification (EWC) Code[3]	Waste Classification
Concrete	17 01 01	Non-hazardous
Bricks	17 01 012	Non-hazardous
Tiles and ceramics	17 01 03	Non-hazardous
Soil and Stones	17 05 04	Non-hazardous
Track ballast containing hazardous substances	17 05 07*	Hazardous
Nominally Empty Containers containing residues of or contaminated by dangerous substances	15 01 10*	Hazardous
Waste Diesel and Oil	13 07 01*	Hazardous
Waste Fuels (Miscellaneous)	13 07 03*	Hazardous
Scrap Metal	17 04 07	Non-hazardous
Gypsum-based construction material	17 08 02	Non-hazardous
Mixed construction and demolition waste	17 09 04	Non-hazardous
Electrical and electronic components	20 01 35*	Hazardous
Electrical and electronic components	20 01 36	Non-hazardous
Batteries and accumulators	20 01 33*	Hazardous
Batteries and accumulators	20 01 34	Non-hazardous
Insulation materials and asbestos-containing construction materials*	17 06 04*	Hazardous
Plastic Pipe Cut-offs	17 02 03	Non-hazardous
Plastic Packaging	15 01 02	Non-hazardous
Paper and Cardboard Packaging	15 01 01	Non-hazardous

Table 17.2: Waste Management Targets

Waste Type	Reuse/Recovery %	Recycling %	Disposal %
Concrete	85	-	15
Non-hazardous Soils	100	-	0
Nominally Empty Containers containing residues of or contaminated by dangerous substances	100	-	-
Waste Diesel and Oil	80	20	-
Waste Fuels (Miscellaneous)	80	20	-

[3] The selected European Waste Classification (EWC) codes provided are provisional only. In a number of instances more than one EWC may be considered appropriate. Care should be taken to ensure that the waste collectors permit includes all EWC codes specified in the appropriate documentation. In addition, there will be a requirement for a technically competent person to assess waste as it arises and to make a determination as to the classification of the material in accordance with the Hazardous Waste List.

Waste Type	Reuse/Recovery %	Recycling %	Disposal %
Scrap Metal	85	10	5
Plastic Packaging	-	85	15
Paper and Cardboard Packaging	15	85	-

In terms of waste, effects will be minimised as far as possible, and the effect will be slight in the short-term during the construction phase.

17.4.2 Operational Phase and Maintenance

There will be no effects on utilities during the operational phase.

The culverts, widened level crossing and widened Owenacurra River bridge will facilitate the operation of the proposed development, having a slight positive effect.

In terms of waste, waste materials will arise, as is currently the case during periods of maintenance along the railway line. Effects will be long term and imperceptible to slight.

Maintenance activities will result in the removal of spent ballast over the long term and the effect will be slight.

Maintenance will have no effect on utilities.

17.4.3 Decommissioning Phase

The impacts associated with the decommissioning phase will be similar to the impacts associated with the construction phase. Therefore, provided that appropriate mitigation is used, the impact of the decommissioning phase should be reduced to a level that is not significant. Therefore, no further assessment of the decommissioning phase has been undertaken.

17.4.4 Cumulative Effects

There is a risk of cumulative construction phase impacts associated with the construction phases of the proposed development occurring at the same time as the construction phases of other developments (see Chapter 2 for further details of these developments). Consequently, there will be a need to ensure that where works are occurring in parallel that appropriate mitigation measures are considered within the parameters assessed in this EIAR, including the scheduling of works, regular liaison meetings between project teams to ensure plans are co-ordinated and impacts are minimised. With the implementation of these, and the subsequently identified mitigation measures, the cumulative impacts associated with the construction phase will not be significant.

In terms of the operational phase, the provision of a new twin track along the railway line is a positive effect, a new asset in the area. Other projects in the area such as the pedestrian and cycle routes, Celtic Interconnector, upgrade of the N25, wastewater infrastructure and housing will also result in new assets for the area once constructed, cumulatively having a moderate positive effect.

17.5 Mitigation and Monitoring Measures

17.5.1 Construction Phase

17.5.1.1 Utilities

All reasonable measures will be taken to avoid unplanned disruptions to any services during the proposed works.

17.5.1.2 Structures to be modified

Mitigation during the construction phase for the alteration to the culverts and the Owenacurra Rive Bridge is detailed in Chapters 10, 11 and 12 of this EIAR.

17.5.1.3 Waste Management

A Construction Resource Waste Management Plan (as part of the CEMP) is appended to Appendix 6.1 of this EIAR. The plan provides for the segregation of all construction wastes to facilitate optimum levels of re-use, recovery, and recycling operations.

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

Waste arisings will be handled, stored, managed and re-used or recycled as close as practicable to the point of origin.

Wastes sent off site for recovery or disposal will only be conveyed by an authorised waste contractor and transported from the proposed development site to an authorised site of recovery / disposal in accordance with the Waste Management Act 1996 and associated amendments and regulations and in a manner which will not adversely affect the environment. All employees will be made aware of their obligations under the CEMP.The CEMP will be available for inspection at all reasonable times for examination by the Local Authority.

17.5.2 Operational Phase and Maintenance

17.5.2.1 Utilities

As no significant adverse operational phase impacts on utilities are anticipated, no specific mitigation measures are proposed. No adverse effects are likely on utilities during maintenance and therefore no mitigation measures are proposed.

17.5.2.2 Structures to be modified

No negative effects have been identified during the operational phase and therefore no mitigation measures are required.

17.5.2.3 Waste Management

All waste generated during the operational phase will be managed in accordance with the relevant provisions of the Waste Management Act 1996 and associated amendments and regulations, particularly with regard to the use of appropriately permitted waste contractors and appropriately authorised destinations for waste materials.

17.5.3 Residual Impacts

Once construction is complete significant adverse residual impacts associated with the proposed development on utilities, built assets and waste management are unlikely.

The implementation of the mitigation measures detailed above, including the CEMP will reduce the environmental impact of the proposed development and the residual effect will be imperceptible over the temporary – short term during construction. Residual operational effects are slight and long-term due to maintenance along the railway line.

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Chapter 18 – Major Accidents and/or Disasters

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18 Major Accidents and / or Disasters

18.1 Introduction

This chapter considers the potential for significant adverse effects of the proposed development on the environment deriving from the vulnerability of the proposed development to risks of relevant major accidents and / or disasters.

18.2 Methodology and Limitations

18.2.1 Legislation

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

Accordingly, an examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

The EIA Directive 2014/52/EC requires:

"A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and / or disasters…

In order to avoid duplications, it should be possible to use any relevant information available and obtained through risk assessments carried out pursuant to Union legislation, such as Directive 2012/18/EU of the European Parliament and the Council (13) and Council Directive 2009/71/Euratom (14), or through relevant assessments carried out pursuant to national legislation provided that the requirements of this Directive are met".

18.2.2 Guidance

For the purpose of this assessment the following definitions, defined in the Institute of Environmental Management and Assessment (IEMA) document *Major Accidents and Disasters in EIA: A Primer* (September 2020), are used:

- Major Accidents: Events that threaten immediate or delayed serious environmental effects to human health, welfare and / or the environment and require the use of resources beyond those of the client or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome (e.g. train derailment) may be the same and therefore many mitigation measures will apply to both deliberate and accidental events.
- Disaster: May be a natural hazard (e.g. earthquake) or a man-made / external hazard (e.g. act of terrorism, human error on rail infrastructure, driver error) with the potential to cause an event or situation that meets the definition of a major accident.

- Risk: For a risk to arise there must be hazard that consists of a 'source' (e.g. high rainfall); a 'receptor' (e.g. people, property, environment); and a pathway between the source and the receptor (e.g. flood routes).
- Vulnerability: Describes the potential for harm as a result of an event, for example due to sensitivity or value of receptors. In the context of the EIA Directive, the term refers to the 'exposure and resilience' of the development to the risk of a major accident and / or disaster. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.

18.2.3 Methodology for Assessment of Effects

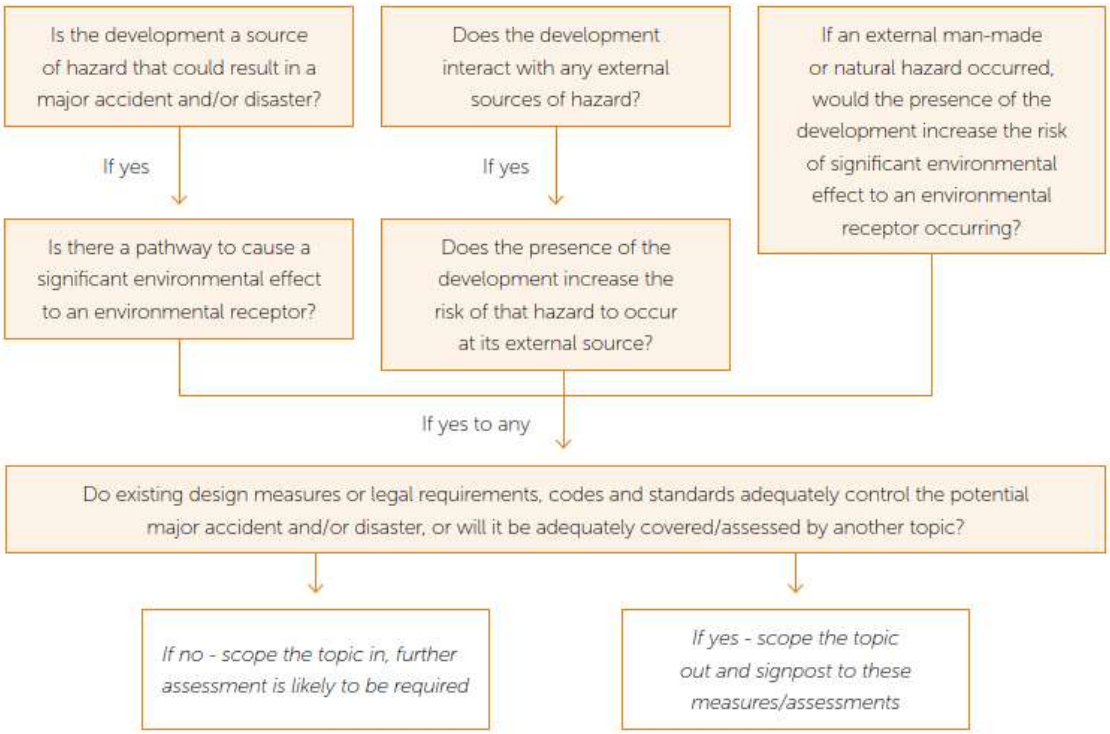
The methodology applied is based on the scoping decision process flow provided in Figure 18.1 *Scoping Decision Process Flow*.

The potential for source, pathway, receptor linkages is first established having regard to the location, type, context, existing and future constraints, and likely receptors relevant to the proposed development.

For established linkages, the risks of major accidents and / or disasters are low / unlikely where existing design measures or legal requirements, codes and standards adequately control the potential for major accident and / or disaster, or where such risks are adequately covered/assessed by another topic in this EIAR.

Where required, additional mitigation measures are proposed to manage the identified risks to the environment.

Figure 18.1: Scoping Decision Process Flow



Source: Major Accidents and Disasters in EIA: A Primer (IEMA, September 2020)

18.2.4 Limitations of this EIAR

There were no difficulties or limitations encountered gathering the information required to inform this Major Accidents and / or Disasters chapter of the EIAR.

18.3 Receiving Environment

Table 18.1: Receiving Environment

Proposed Development	Descriptor (and Townland)	Receiving Environment	Characteristics of the Development
Widening of existing track route and addition of 2nd track	Johnstown, Killahora, Killacloyne, Anngrove, Terry's-Land, Carrigtohill, Carrigane, Ballyadam, Ballyrichard More, Water-Rock, Knockgriffin, Townparks,	From Glounthaune for approximately 800m the track is adjacent to tidal flats to the south. The train line passes through an industrial area to the north and south, for about 1km. To the south of the proposed development is a residential area, followed by an area of agricultural and residential prior to Carrigtwohill Station. The proposed development passes to the north of a residential area prior to passing through approximately 3km of agricultural fields before approaching Midleton Station. The proposed development is within a low-lying area adjacent to the coastal plan. Initial section is directly adjacent to the Great Island Channel SAC and Cork Harbour SPA	It is proposed to construct new track alongside the existing single track sections so that the line will have full twin tracks to facilitate the increase in train trips. Up to a ten minute service operating at up to 100km/hr is considered. It will be necessary to realign the existing track slightly due to constraints along the railway line. There is existing twin track at Glounthaune and at the approaches to Carrigtwohill station and Midleton station. Over the length of the route, twin tracking is in place over ca. 35% of the route. The new track will be required between these areas. In some cases, the original alignment of the single track will remain in place. However, due to the existing track layout it will be required to adjust the track position to slew the track within Iarnrod Eireann's ownership boundary.
Widening of Water Rock Level Crossing	Ballyrichard More	The existing bridge is adjacent to a farm and agricultural land. Works are adjacent to an area of invasive species.	One level crossing (Ford CCTV XY010) is to be closed and one level crossing Water Rock CCTV XY009 is to be widened to accommodate the twin tracks.
Ballyadam House - Removal of Bridge	Ballyadam House, Ballyadam	The bridge is adjacent to a farm and agricultural land.	This overbridge is to be removed.

Proposed Development	Descriptor (and Townland)	Receiving Environment	Characteristics of the Development
Owennacurra River Bridge - Deck to be widened using existing river piers	Owennacurra River Bridge, Midleton, Knockgriffin, Townparks,	The existing bridge is within a vegetated area of woodland and scrub. The river provides a direct link to the Great Island Channel SAC. Invasive species identified adjacent to the bridge.	Works will be required at Owennacurra River Bridge (UBY11) to widen the deck of the bridge on the existing piers to allow for a double track and the abutments are to be widened. The proposed widening to Railway Underbridge UBY11 is a three span continuous deck with integral abutments. The span lengths from west to east are ca. 10.850m, 7.160m and 10.850m. The widening structure span arrangement, structural form and articulation will match the existing bridge. The widening deck consists of precast prestressed concrete beams with an insitu infill concrete deck which is to be stitched to the existing deck. The bankseat widenings are supported on continuous flight auger piles. The existing pier capping beams are to be widened to accommodate the proposed deck. The existing north walkway is to be removed and reinstated on the widened deck. The existing reinforced concrete northern wingwalls are to be demolished and rebuilt to accommodate the widened deck.
Additional sidings / turn back facilities are required at Midleton station.	Knockgriffin, Townparks,	The station is in an urban setting, with residential properties located to the south and a wooded/scrub area to the north. Large car park area with hard, impermeable surface. The area is not at risk from flooding and is of low ecological value.	Area to be created within the curtilage at Midleton Station, area to be railed and turn back facilities created. No works are proposed to Midleton Station.

Proposed Development	Descriptor (and Townland)	Receiving Environment	Characteristics of the Development
Earthworks Drainage (Cuttings and Embankments), Sub-Surface Drainage (Earth Drains)	Johnstown, Killahora, Killacloyne, Anngrove, Terry's-Land, Carrigtohill, Carrigane, Ballyadam, Ballyrichard More, Water-Rock, Knockgriffin, Townparks,	From Glounthaune for approximately 800m the track is adjacent to tidal flats to the south. The train line passes through an industrial area to the north and south, for about 1km. To the south of the proposed development is a residential area, followed by an area of agricultural and residential prior to Carrigtwohill Station. The proposed development passes to the north of a residential area prior to passing through approximately 3km of agricultural fields before approaching Midleton Station. The proposed development is within a low-lying area adjacent to the coastal plan. Initial section is directly adjacent to the Great Island Channel SAC and Cork Harbour SPA	Within the track bed reserve a system of filter drains or ditches or similar will be provided to intercept any runoff from the face of the cuttings and prevent this runoff from building up adjacent to or encroaching onto the running tracks. In the case of embankments the runoff will be allowed to enter the ditches located at the toe of the fill areas and re-directed or conveyed away from the railway line to the nearest outfall location. The ballast and sub-ballast provided as part of the permanent way normally consists of granular material with excellent drainage properties. The ballast and sub-ballast will be designed and graded to act as a drainage blanket in order to protect the formation and ensure the adequate performance and durability of the ballast layer and minimise maintenance requirements. All subsurface drainage will be designed on this basis in combination with the use of filter drains, geo-membranes and geo-textiles to provide adequate sub-surface drainage and control the build-up of fines and sediment which could affect the long term performance of the ballast and sub-surface drainage facilities.

18.4 Likely Significant Impacts of the Proposed Project

Table 18.2 considers the potential for significant adverse effects of the proposed development on the environment deriving from its vulnerability to risks of relevant major accidents and / or disasters. The potential for significant adverse effects of the proposed development on the environment deriving from its vulnerability to risks of relevant major accidents and / or disasters is described in Table 18.2.

Where sources / interactions and pathways have been established, an assessment is carried out as to whether or not embedded design measures, or legal requirements, codes and standards adequately control the potential major accident and / or disaster. Reference is made to other technical chapters of the EIAR as appropriate where further studies have been carried out, for example in the case of flood risk assessments.

The existing rail network and the proposed development will be designed, constructed, operated and maintained in accordance with the highest safety standards complying with the provisions of guidelines published by the World Health Organisation (WHO).

Table 18.2: Likely Significant Adverse Effects

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
Flooding						
Widening of existing track route and addition of 2nd track	The new railway track will be built along the existing track, i.e. at the same level with the same exposure to the coastal flooding as the existing track. As the new track is at the same level, it will not create new flood paths for coastal flooding.	The proposed development is located inside the moderate or high flood risk zone of coastal and fluvial flooding. Worst case is that the railway would flood.	Mitigation is detailed in Ch. 11 Surface Water and Flood Risk including for an early warning flood system to be put in place.	No	Yes	. The track may flood, however, with the early flood warning system in place, this is unlikely to result in a significant adverse effect.

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
Widening of Water Rock Level Crossing	It is not anticipated that the level crossing works will impact on the risk of flooding	Worst case would be the flooding of the level crossing, however this is considered unlikely.		Not applicable	Not applicable	No significant adverse effects are likely
Removal of OBY8 Bridge at Ballyadam House	It is not anticipated that the works will impact on the risk of flooding	Not applicable		Not applicable	Not applicable	No significant adverse effects are likely
Widening of Owennacurra River Bridge	Flood water levels predicted by the local CFRAM flood study for the 0.1% AEP (or 1 in 1000 year) fluvial flood event do not reach the soffit of the proposed bridge. As the bridge is proposed to use the existing piers, it is considered that there is no significant impact on flood levels upstream from the proposed bridge. The proposed abutment widening will potentially encroach into the existing flood plain upstream, however, the predicted impact is considered negligible due to the insignificant	The worst case would be that the bridge floods.	A Flood Risk Assessment has been conducted and concludes that the proposed widened bridge, constructed utilising the existing piers, will not impact the existing flood risk.	No	Yes	Flood Risk is discussed in detail in Chapter 11 Surface Water, and Flood Risk and in Appendix 11.2 and 11.3 - it is recognised that the existing railway track is at risk of flooding at various locations, the analysis determined that the proposed development will not increase flood risk to the railway track or elsewhere. Therefore no significant adverse effects are likely.

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
	volume lost by the widening (0.13%). The proposed embankment widening will take place above the predicted flood extent and therefore it is considered not to impact flood storage in the area. It can therefore be concluded that the proposed widened bridge, constructed utilising the existing piers, will not impact the existing flood risk.					
Additional sidings / turn back facilities are required at Midleton station.	Flooding not predicted at Midleton Station	None. Major accident / disaster unlikely	Not applicable	No	Yes	No likely significant adverse effects
Earthworks Drainage (Cuttings and Embankments) Sub-Surface Drainage (Earth Drains)	The proposed drainage will consist of filter drains, carrier drains, open V-ditches and subsurface drains. All existing outfalls will be retained and no new outfalls will be required. The drainage design will be in accordance with '*E25. I-PWY-1136*	None. Major accident / disaster due to flooding unlikely	Not applicable	No	Yes	No likely significant adverse effects

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
	Requirements for Design Installation and Maintenance of Lineside Drainage' and the rainfall intensities will be factored by 20% to account for the future effects of climate change					
Fire						
Widening of existing track route and addition of 2nd track	Track will be constructed to safety specifications and standards, including the storage of flammable materials	Risk of electrical fire during construction. Flammable materials associated with the construction works are ignited and a fire results.	Design of proposed development to comply with fire regulations to mitigate for risk of fire and suitable safe storage of flammable materials.	No	Yes	No likely significant adverse effects.
Widening of Water Rock Level Crossing						
Removal of OBY8 Bridge at Ballyadam House						
Widening of Owennacurra River Bridge						
Additional sidings / turn back facilities are required at Midleton station.						
Earthworks Drainage (Cuttings and Embankments)						
Sub-Surface Drainage (Earth Drains)						

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
Extreme temperature (heat wave, cold snap)/ high winds/storm						
All	Design standards will be followed for construction works and new track. Design Specifications mitigate against extreme temperature	None. Major accidents disasters are unlikely	Not applicable	Not applicable	Not applicable	No likely significant adverse effects.
Electricity failure						
Widening of existing track route and addition of 2nd track	Signalling could be adversely affected.	Loss of power supply to the rail network will result in disruption.	Crossings and signalling will have suitable safety backups and support to minimise any potential hazard or risk.	No	Yes	No likely significant adverse effects.
Widening of Water Rock Level Crossing	Other works do not pose fire risk.	None. Major accidents disasters are unlikely	Not Applicable.	No	Yes	No likely significant adverse effects.
Removal of OBY8 Bridge at Ballyadam House						
Widening of Owennacurra River Bridge						
Additional sidings / turn back facilities are required at Midleton station.						
Earthworks Drainage (Cuttings and Embankments)						

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
Sub-Surface Drainage (Earth Drains)						
Ground collapse/instability /subsidence/landslide						
Widening of existing track route and addition of 2nd track	There is a risk of ground collapse associated with karst cavities in bedrock. The construction of site compounds, access tracks and other construction activities, may result in temporary alterations to the distribution of groundwater recharge and/or surface flow pathways. In areas of outcropping karstic bedrock / karst features this could result in localised enhanced erosion, the creation of void features and/or subsidence.	As such a medium adverse impact (Moderate) to the soils and geology is anticipated in the absence of mititation. Worst case being ground collapse or contamination	Ground Investigation and pre-construction survey to be undertaken. Lined ditches and impermeable pipes will take water away from high risk areas. During the construction works the mitigation within the Construction Environmental Management Plan and Chapter 10 Land, Soils and Hydrogeology will be implemented.	Not applicable following implementation of mitigation.	Not applicable	Land, Soils and Hydrogeology is discussed in detail in Chapter 10. There are no likely significant adverse effects.
Widening of Water Rock Level Crossing	These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in	The extent of the works are considered to be small relative to the spatial extent of local soil and geological deposits.	Not applicable	Not applicable	Not applicable	No likely significant adverse effects.

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
	infiltration and recharge to the aquifer system.					
Removal of OBY8 Bridge at Ballyadam House	Negligible predicted impacts with regards to ground collapse/landslide.		Not applicable	Not applicable	Not applicable	No likely significant adverse effects. is discussed in detail in Chapter 10
Widening of Owennacurra River Bridge	No additional foundation works required to be undertaken		Not applicable	Not applicable	Not applicable	No likely significant adverse effects.
Additional sidings / turn back facilities are required at Midleton station. Earthworks Drainage (Cuttings and Embankments) Sub-Surface Drainage (Earth Drains)	There is a risk of ground collapse associated with karst cavities in bedrock. In areas of outcropping karstic bedrock / karst features this could result in localised enhanced erosion, the creation of void features and/or subsidence.	As such a medium adverse impact (Moderate) to the soils and geology is anticipated. Worst case being ground collapse or contamination Major accident / disaster unlikely	Ground Investigation and pre-construction survey to be undertaken. Lined ditches and impermeable pipes will take water away from high risk areas. During the construction works the mitigation within the Construction Environmental Management Plan and Chapter 10 Land Soils and Hydrogeology should be implemented.	Not applicable following implementation of mitigation.	Considered acceptable	No likely significant adverse effects.
Major road traffic accident						
All	Working on or adjacent to railway lines roads	Death and / or injury to a member of the public.	Controls to be implemented through Construction Traffic Management	Yes	Yes	Roads and Traffic are discussed in Chapter 15

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
	Movement of construction vehicles Debris striking traffic / member of public	Delays and congestion in surrounding area	Plan, construction planning, and method statements			
Industrial Accidents						
Widening of existing track route and addition of 2nd track	The rail line is located within a mix of urban /rural areas. Stations within urban area and much of the rail link in rural settings. There are no sites licensed under the Control of Major Accident Hazards (COMAH) regulation or industrial sites located in proximity.	None. Major accident / disaster unlikely	Not applicable	Not applicable	Not applicable	No likely significant adverse effects
Widening of Water Rock Level Crossing	Industrial accidents unlikely	None. Major accident / disaster unlikely	Not applicable	Not applicable	Not applicable	No likely significant adverse effects
Removal of OBY8 Bridge at Ballyadam House						
Widening of Owennacurra River Bridge						
Additional sidings / turn back facilities are required at Midleton station.						

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
Earthworks Drainage (Cuttings and Embankments)						
Sub-Surface Drainage (Earth Drains)						
Earthquake						
All	An earthquake of sufficient intensity to inflict severe damage is unlikely	None. Major accident / disaster unlikely	Not applicable	Not applicable	Not applicable	No likely significant adverse effects
Tsunami / tidal wave						
All	A tsunami/tidal wave of sufficient intensity to inflict severe damage is unlikely	None. Major accident / disaster unlikely	Not applicable	Not applicable	Not applicable	No likely significant adverse effects
Biological hazard – epidemic, pandemic						
All	The proposed development is located within and adjacent to some populated areas and will facilitate the use of the service by the public, Construction phase activities will be carried out in accordance with Government guidelines and the use of the train will follow Government guidelines in the event	None. Major accident / disaster unlikely	Not applicable	Not applicable	Not applicable	No likely significant adverse effects

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
	of an epidemic/pandemic.					
Malicious attacks/cyber-attack						
All	The proposed development will enhance Ireland's railway network and could be subject to malicious physical or cyber-attacks.	Damage would likely be limited to disruption of the rail network.	The existing rail network already has safeguards against such attacks and the new infrastructure and control systems will be designed to protect against malicious attack and will be in line with the latest standards for rail networks..	No	Yes	No likely significant adverse effects
Rail disaster (crash/derailment)						
Widening of existing track route and addition of 2nd track Widening of Water Rock Level Crossing Removal of OBY8 Bridge at Ballyadam House Widening of Owennacurra River Bridge Additional sidings / turn back facilities are required at Midleton station.	Work will be carried out on the railway track and directly adjacent to the track, there is a risk that debris could be left on the track causing derailment. This could also be considered at the works associated with the level crossing. Management of scheduling and mitigation will remove risk of rail disasters. There is the potential for accidents once	Derailment of operational trains and the chance of fatalities.	All works along the railway line, will be in accordance with Iarnród Éireann standards, procedures and protocols for works on a live railway, to ensure the safety of workers and the public. Adherence to the Contractor's CEMP.	Not with suitable mitigation measures and safety guidance.	Yes	No likely significant adverse effects are predicted

Type / Location	Source and / or Pathway / Receptor	Reasonable Worst-Case Consequence	Embedded Mitigation	Could this result in a major accident and / or disaster with mitigation in place?	Is the reasonable worst consequence managed to an acceptable level with existing mitigation in place?	Likely Significant Adverse Effects
Earthworks Drainage (Cuttings and Embankments)	operational, however, Iarnrod Eireann implement high safety standards.					
Sub-Surface Drainage (Earth Drains)						
Spillage or seepage of pollutants into watercourse/ground						
Widening of existing track route and addition of 2nd track	Oils and chemicals will be required during the operation of the proposed development. Unmanaged, this could lead to potential contamination of potable water sources and harm to human health or to groundwater.	Contamination of local water courses/groundwater.	CEMP, Chapter 10 Land, Soils and Hydrogeolgoy and Chapter 11 Surface Water and Flood Risk will provide suitable mitigation measures.	No	Yes	No likely significant adverse effects
Widening of Water Rock Level Crossing						
Removal of OBY8 Bridge at Ballyadam House						
Widening of Owennacurra River Bridge						
Additional sidings / turn back facilities are required at Midleton station.	Oils and chemicals will be required during the operation of the proposed development. Unmanaged, this could lead to potential contamination of potable water sources and harm to human health or to groundwater.					
Earthworks Drainage (Cuttings and Embankments)						
Sub-Surface Drainage (Earth Drains)						

18.5 Mitigation and Monitoring Measures

In the different stages of the project lifetime several best practice mitigation measures will be implemented, relevant to major accidents and disasters, as detailed through the Construction Environmental Management Plan (CEMP) to ensure minimal impacts relating to Major Accidents and/or emergencies. IE operate within a safety structure defined by the following requirements

- European Commission Directives and Regulations
- Commission for Railway Regulation (formerly Railway Safety Commission)
- National Legislation
- Irish/European Standards
- ISO Standards
- Iarnród Éireann Standards

18.6 Residual Impacts

Significant adverse effects as a result of the proposed development on the environment deriving from the vulnerability of the proposed development to risks of major accidents and / or disasters are not considered likely.

Chapter 19 – Cumulative Effects

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19 Cumulative Effects

19.1 Introduction

Section 39(2) of the Transport (Railway Infrastructure) Act 2001, as amended by the European Union (EU) (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 requires that the applicant shall ensure that: '...an environmental impact assessment report, in addition to and by way of explanation or amplification of the specified information referred to in subsection (1), contains any additional information specified in Annex IV to the EIA Directive relevant to the specific characteristics of the particular railway works, or type of railway works, proposed and to the environmental features likely to be affected...' The EIA Directive as amended by Directive 2014/52/EU requires that the EIAR shall contain: Annex III (3)(g) '*the cumulation of the impact of other existing and/or approved projects'*; Annex IV (5)(e) "*A description of the likely significant effects of the project on the environment resulting from, inter alia*: *e) 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;"* Annex IV of the EIA Directive sets out the information referred to Article 5(1)(e) of the EIA Directive). Accordingly, each technical chapter in this EIAR for this Railway Order application includes a cumulative assessment with the projects listed in Table 2.2 in Chapter 2 and reproduced in Table 19.1 below.

As outlined in the Guidelines on the information to be contained in Environmental Impact Assessment Reports, Environmental Protection Agency (EPA), 2022, while a single activity may itself result in a minor impact, it may, when combined with other impacts (minor or significant), result in a cumulative impact that is collectively significant. A single effect which may, on its own, have a significant effect, may also have a reduced and insignificant impact when combined with other effects.

For each technical topic, the nature and scale of the other developments have been evaluated and the potential for temporal overlap within the topic-specific zone of influence (ZoI) has been assessed, having regard to the potential for significant cumulative effects. A planning search was conducted on 8th July 2022 and large scale projects in the vicinity of the proposed development are detailed in Table 2.2 of Chapter 2. The search criteria omitted one-off housing, small housing developments, small commercial developments, farm sheds, extensions and similar, as these projects would not have the potential for significant cumulative environmental effects.

Subject to consents being granted, it is anticipated that the construction phase of the Midleton Twin Track development will commence in Q4 of 2023, with construction complete in 2026.

As just mentioned, in addition to this chapter, each technical chapter in this EIAR (for this proposed development) includes a cumulative assessment with the projects listed in Table 2.2 in Chapter 2 and reproduced in Table 19.1 below. Please refer to topic specific chapters for further information, assessment and mitigation measures.

Table 19.1: Other Developments

Development	Reference (planning or other)	Location	Summary of Details
Local Authority Development – Part 8 (Cork County Council)			
Burys Bridge, Kilcoolishal to Carrigtwohill via Glounthaune Pedestrian and Cycle scheme.	ABP confirmed associated CPO (Ref. CH04.310856) on 04/08/2021	Burys Bridge, Kilcoolishal to Carrigtwohill	From the approved drawings, it is noted that a new bridge is proposed at eastern edge of Carrigtwohill. The Scheme involves the construction of a dedicated pedestrian and cycle route on the northern side of the L3004 (the former N25) road and includes the following: · A general cross section of 3m wide shared pedestrian and cycle path with a 1m landscaped separation between the path and the public road where possible; · Formalised parking and controlled (i.e. traffic signals) pedestrian crossings; • New footpaths, ducting and LED public lighting Approved Part 8: 2020
Carrigtwohill to Midleton Inter-Urban Cycleway -	-	Carrigtwohill to Midleton	The construction of a dedicated pedestrian and cycle route from the western side of the L3616-0 west of Carrigtwohill to the south of L3617-0 the east of Carrigtwohill. Dedicated pedestrian and cycle links will be provided from this route to the Carrigtwohill Train Station, the planned Carrigtwohill School's Campus (planning reference 19/5707) and along the L3617-0. The proposed development includes the following: · A general cross section of 4m wide shared pedestrian and cycle path with public lighting and landscaping on both sides; · 2 no. pedestrian/ cyclist bridges including one over the Cork to Midleton railway line; · 1 no. railway underpass (at existing underpass structure) · 1 no. road underpass of the L3617-0; · At grade pedestrian/ cyclist crossings of existing roads (L3616-0, L3603-0, L3606-37, L7641-0 and L3617-0) The scope of the scheme includes a new cycle and footbridge over the existing rail line Traffic calming measures on existing roads (L3616-0, L3603-0, L3606-37, L7641-0 and L3617-0). Approved March 2022
Ballinacurra to Midleton pedestrian and cycle route		Ballinacurra to Midleton Train Station	The construction of a dedicated pedestrian and cycle route from Ballinacurra to Midleton Train Station and includes the following: · A mixture of segregated cycle facilities, shared use pedestrian and cycle paths and greenway. • A one-way system for traffic from the south of the Bailick Road to Charlestown Wharf. · A traffic light shuttle system at the N25 underbridge on the Bailick Road. • Works are proposed to Protected Structure Ref number 00517 on Bailick Road. • An underbridge under the existing Irish Rail railway line. • New footpaths, Controlled Crossings, Bus Stop Upgrades and LED public lighting. Approved Part 8: 2020
Water Rock Urban Expansion Area Infrastructure Works	Local Authority Own Development – Part 8 Approved with Modifications	Water-Rock (townland), west of Midleton	Various infrastructural works and services – • Traffic Management Measures for Water Rock Road (L3618) – Erection of bollards within the existing Water Rock public road (L3618) each side of the railway line to close the level crossing to vehicular traffic. Railway level crossing to remain operational and access across the level crossing will be maintained for pedestrians and cyclists; • Bridge over Railway and Extension to Services Corridor Link Road – New bridge over the Cork to Midleton railway line connecting the Services Corridor Link Road to lands to the south of the railway line and new serviced road corridor with footpaths and cycle tracks to access the proposed railway stop and bridge and ancillary works • Railway Stop – New railway stop along the Cork to Midleton railway line consisting of a platform and shelter, drop-off area, cycle parking, disabled parking and access, ticket machines and ancillary works Approved Part 8: March 2019
Youghal to Midleton Greenway	Local Authority Own Development – Part 8 Approved	Youghal - Mildteton	Cork County Council is constructing a Greenway on the disused railway corridor between Midleton and Youghal. The 23km long Greenway will be an off-road walking and cycling route through the heart of East Cork which will connect the towns and villages of Midleton, Mogeely, Killeagh and Youghal.

Development	Reference (planning or other)	Location	Summary of Details
Carrigtwohill Public Realm Improvements	Local Authority Own Development – Part 8 Approved on 27th June 2022		Carrigtwohill Urban Regeneration and Development Fund (URDF) Initiative – Public Realm Infrastructure Bundle, comprising works at the following locations: Main Street from the junction at Castlelake Avenue (Castle Square) to the junction with Carrigane Road; Station Road from the junction with Main Street to the junction at Carrigtwohill Train Station; Carrigane Road from the junction with Main Street to the junction with Castleview; Cluain Cairn, An Fána, Castle Close, Castle Avenue; Wises Road/Main Street junction; Wises Road/Oakbrook Link Road (Access Road to Castlelake)/IDA Industrial Estate Access Road junction; N25 Junction 3 and lands adjoining this junction.
PCI & Strategic Infrastructure Development and Strategic Housing Development Applications: Application made directly to ABP			
Dunkettle Interchange Improvement Motorway Scheme	ABP - MA0011 and HA0039	Cork City	A series of direct road links between the N8, the N25 and the N40 and links to the R623 Regional Road in Little Island and Burys Bridge in Dunkettle; • 1 grade separated junction arrangement at the existing N25 to the east of the existing Dunkettle Interchange; • 4 roundabouts – 2 at the grade separated junction and 2 at tie ins with the existing road network; • 43 major structures of various forms; • Several culverts where the scheme crosses watercourses or intertidal areas; and • Pedestrian and cyclist facilities
Celtic Interconnector	ABP Case Ref: VA04.310798	Townlands of Ballynanelagh, Ballyadam and other various townlands, County Cork	EirGrid - Proposed development of that portion of an electricity transmission interconnector (Celtic Interconnector) to be constructed onshore in Ireland to the mean high-water mark, including a connection to the Irish National Grid, an electricity converter station and all associated and ancillary works. Approved with conditions 19/05/22
Proposed new 110kV substation at Ballyadam, Carrigtwohill, Co. Cork	ABP Case ref: VC04.309585	Ballyadam (IDA site)	The Electricity Supply Board (ESB) proposes to construct a new 110 kV substation within the IDA owned Ballyadam site.
Harpers Creek	ABP-301197	Harpers Creek	174 No residential units (201 No houses and 88No. apartments); 35 place creche & doctor's surgery. Granted - 29/05/2018
Ballynaroon Housing development	ABP-312658	Ballynaroon, Glounthaune, Co. Cork.	Demolition of an existing buildings, construction of 112 no. residential units (72 no. houses, 40 no. apartments). Granted – 03/06/2022
A new vehicular access and pedestrian entrance onto Ballynaroon Road	ABP-309195		The provision of landscaping, community recreation space, and amenity areas to include a multi-use games area (MUGA), levelled grass amenity area, local play areas, local open green space/landscaped areas, and amenity woodland and trail including glade. The provision of new footpaths and upgrading of existing footpaths to provide a shared pedestrian/cycle path and new and upgraded public lighting extending from the application site to Glounthaune crossroads junction via the residential estate (The Highlands) to the south. This will comprise works along public roads L-2970-6, L-7086-1, L-7086-0 and L-2968-0 and the footpath within The Highlands estate connecting the L-2970-6 and L-7086-1. Proposed decommissioning of overhead 230V ESB line and associated poles traversing the north-eastern section of the site. Lodged with ABP: 07/02/2022 - Decision Due: 30/05/2022
BAM Property Limited - housing development	ABP-311855 SHD Pre-App Consultation (Consultation closed)	Castlelake, Terry's land and Carrigtohill (townlands).	BAM Property Limited - 706No residential units (239No houses, 467 No apartments, creche and associated site works.
Section 34 Planning Applications lodged with Cork County Council			
Bluescape Development	17/5699	Bluescape Development	Bluescape Ltd, 31 No 2-storey houses - 21/05/2018 - Granted on appeal by ABP (Ref. ABP-300128-17)
Castle Rock Homes (Midleton) Ltd - Bloomfield Village	166818	Broomfield Village, Broomfield East and Broomfield West, Midleton, Co. Cork	Construction of 100 no. dwellings, a crèche and all ancillary site development works. The proposed development will consist of 31 no. detached dwellings, 46 no. semi-detached dwellings, 2 no. 3 storey blocks consisting of 8 no. apartments and 15 no. ter. Granted - 11/11/2016

Development	Reference (planning or other)	Location	Summary of Details
Church Road Development, Murnane & O'Shea Ltd	174498	Church Road, Carrigtohill, Co. Cork	Residential development of 25 no. residential units and all ancillary site development works. The proposed development consists of 20 no. 3 bed semi-detached dwellings, 4 no. 2 bed semi-detached dwellings and 1 no. 3 bedroom detached dwelling. Granted 03/03/2017
Bluescape Ltd.	175315	Cluain Cairn, Station Road, Carrigtohill, Co. Cork	Construction of 19 no. 2 storey dwelling houses and all ancillary site development works. The proposed development consists of 7 no. 2 bed townhouses, 10 no. 3 bed townhouses, and 2 no 3 bed semi-detached dwellings. Ancillary site development work. Granted 26/05/2017
Cork Co-operative Marts Ltd	175516	Market Green, Knockgriffin, Midleton	Construction of a residential development of 42 no. residential units and a community room. The proposed development consists of the demolition of the existing Educate Together School and ancillary structures located on the eastern portion of the site, extinguishing the existing vehicular access to the north. New vehicular & pedestrian access to the west of the site onto Knockgriffin Rd; Granted 27/10/2017
Stryker Ireland Ltd	185546	Stryker Ireland Ltd, (Springhill), IDA Business Park, Anngrove, Carrigtwohill	Extension to Manufacturing facility: 6,235m2, Will be carried out on a phased basis – Phase 1 has been implemented, Phase 2 remains to be implemented. Granted 08/08/2018
Castle Rock Homes (Midleton) Ltd	186553	Midleton	Construction of 26 no. dwelling houses consisting of 8 no. 5 bedroom detached dwelling houses and 18 no. 3 bedroom semi –detached dwelling houses and all ancillary site works. The proposed development is a change of plan from that permitted under An Bo. Currently being implemented – part of overall development which includes Pl. Ref 18/7321. Granted 18/01/2019
Park Hill View Estates Ltd,	187236	Broomfield West, Midleton. NE of existing Carrigtwohill station	Demolition of existing sheds and construction of 41 no. residential units. The proposed development includes the demolition of existing sheds (2 no. agricultural sheds) and the construction of 2 and 3 storey detached and semi-detached houses and the provision of landscaping, car parking and all assoc. infrastructural abd site development works, incl widening of L-7630 Broomfield Road and provision of pedestrian footpath. Granted - 20/08/2019
Castle Rock Homes (Midleton) Ltd	187321	Midleton	The construction of 13 no. dwelling houses consisting of 12 no. 3 bedroom semi-detached dwelling houses and 1 no. 3 bedroom detached dormer dwelling house and all ancillary site works. The proposed development is a change of house type from that. Granted 12/02/2019
Murnane & O'Shea Ltd	194124	Carrigane Road, Carrigtohill	The construction of 94 no. dwelling houses and all ancillary site works. The proposed residential development represents a change of house type from that permitted under Cork County Council planning reference 06/10171 [as amended under planning ref. 14/4654]. Granted 13/01/2020
Ancelstierre Investments Ltd,	194216	Avoncore Mill Rd, Broomfield West, Midleton	Construction of 40 no. dwelling houses consisting of 2 no. 2 bedroom townhouses, 28 no. 3 bedroom townhouses, 8 no. 3 bedroom semi-detached dwelling houses and 2 no. 4 bedroom semi detached dwelling houses and all ancillary site works. Granted 02/08/2019
Smithkline Beecham (Cork) Ltd	204090	IDA Business & Technology Park, Killacloyne, Carrogtohill	The development will consist of (1) a single storey laboratory building to include plant and equipment area, office area, meeting rooms, canteen and kitchen, staff toilets, laboratories, IT room, electrical switch rooms and store rooms. The main laboratory bdg is 6.1m high, 44.5m long and 21.5m wide; incl. 19No new car pkg spaces. Granted 23/04/2020
The Cork Education and Training Board - Post Primary School accommodation:	204810	Fota Retail & Business Park, Killacloyne, Carrigtwohill.	8No prefabs – temporary permission for a period of no longer than 5 yrs. Granted 03/07/2020
Midleton Association Football Club Ltd	214154	Immediate south of Midleton Station	The construction of a full size all weather playing surface on pitch number two, floodlighting, surrounding fencing, ball catching nets and all associated site development works on the club grounds. Granted 22/03/2021
Murnane & O'Shea Ltd	214267	Carrigane Rd. Carrigtohill (townland), Carrigtwohill	The construction of 10 no. 4 bed semi-detached dwelling houses and all ancillary site development works. The proposed development is a change of plan from that previously permitted under Cork County Council planning application reference 19/4124. Granted 01/04/2021
Barlow Properties Ltd	215072	Ashbourne House, Johnstown, Glounthaune	94no. residential units (comprising 5no. 4-bed detached dwelling houses, 3no. 3-bed detached dwelling houses, 9no. 3-bed apartments, 4no. 3-bed duplex apartments, 65no. 2-bed apartments and 8no. 1-bed apartments in 8no blocks ranging in height from 2-4storey. Currently on FI (requested 16 June 2021) – FI submitted 04/02/2022
Murnane & O'Shea Ltd	215150	Carrigtohill (townland), Carrigtwohill	The construction of 67 no. dwelling houses and all ancillary site works. The proposed development consists of the construction of 34 no. 4 bedroom dwellings, 30 no. 3 bedroom dwellings and 3no. 2 bedroom dwellings. Access to the proposed development via estate entrance (2nd phase of 'Elmbury' development); Granted 08/12/2021

Development	Reference (planning or other)	Location	Summary of Details
Park Hill View Estates Ltd,	215664	at Broomfield West, Midleton, Co. Cork	A temporary waste water treatment system to serve the permitted housing consent 18/7236 (a consent for 41 houses), including ancillary links, connections to the public foul system, local servicing and access off the. Granted 16/09/2021
Compass Homes Ltd	216240	Station Road, Carrigtwohill, Carrigtwohill (townland), Co. Cork	Construction of 38 houses and a café; ABP decision due: 20/06/2022
Vella Homes Ltd	216874	Junction of Mill Rd & Northern Relief Rd, Broomfield West, Midleton.	The construction of a mixed-use residential development with café/community space and all ancillary site works. The proposed development provides for the construction of 57 no. residential units comprising 4 no. 3 bedroom two storey townhouses and 53 no apartment/ duplex units. CEMP indicates a potential construction start of April 2023 (site set up) and August 2023 (construction of units). Granted: 14/06/2022
Connaught Trust Limited	217130 ABP Case Ref: PL04.313907 (Grated 01/06/2022 3rd party appeal – decision due 27/10/2022)	Ballyadam and Carrigtohill (townland), Carrigtwohill.	63No Residential units (47No houses and 16No duplex apartment units); vehicular entrance from upgraded site entrance from the Bog Road; On Further Information – immediate south and alongside railway line – diag opposite proposed newly aligned entrance to IDA site (see Pl. ref 217374); Docs include an Ecological Assessment. FI request refers to the access road being within a flood zone; request for FRA; EclA to provide an assessment of the predicted implications of the proposed dev on habitats; use of natural drainage solutions on site where possible to enhance the biodiversity value. See also IDA road alignment: Pl. Ref 217374. F
EMR Projects Ltd	217264	Knockgriffin and Water Rock, Midleton	284No Residential units on 6.7Ha site; 7,525sqm is non-residential (childcare facility; retail unit; café unit; medical clinic; office units and associated ancillary accommodation). FI requested 07/02/2022
IDA Ireland	217374	Carrigane Road, lBallyadam, Hedgy Boreen Carrigtohill, Carrigtwohill	New site access, local road improvement works and site development works comprising; new vehicular site entrance from L-7642 (Hedgy Boreen) including approx. 34m of internal stub road; road improvement works to approx. 140m of the northern end of the L-7642 to widen approx. 80m of carriageway and provide a grass verge and new setback boundary to the north and south of proposed entrance; improvement of sightlines along L-3617. Granted 18/02/2022
Cruachan Investment Limited Partnership	217424	Titan Container Storage Facility, Fotapoint Enterprise Park, Killacloyne, Carrigtwohill, Co Cork	Construction of 13 no. warehouse/light industrial units in 3 no. buildings with ancillary two storey offices internally and associated site works (part of previous permitted development under planning reg no. 06/6741 and extension of permission Reg No. 1
Irish Water pumping station	225032	Lands to the west of the Mill Road and part of, Mill Road, The Owenacurra River,and the Northern, Relief Road, townlands Townparks, Broomfield West, & Knockgriffin	The Midleton North wastewater pumping station and network, which will consist of: 1) a new wastewater pumping station with below ground wet well and chambers, 2 no. above ground kiosks, vent stack (c.6.2m in height), telemetry pole (c. 6m in height), boundary fencing, retaining wall, and modifications to an existing entrance from Mill Road, including new gates, to facilitate vehicular and pedestrian access; (2) the construction of a below ground pipeline (c. 650m long) connecting the proposed wastewater pumping station to the previously approved Water-Rock pumping station (consented as per section 179 of the planning and development act, 2000, as amended(Water-Rock UEA Infrastructure Works)
New access road and temporary carpark	225378	Fota Retail and Business Park, Killacloyne, Carrigtwohill	Permission for the construction of an access road, a temporary unsurfaced carpark, temporary security hut, temporary bus shelter building, temporary portaloo toilets, temporary lighting, temporary fencing and ancillary works.
Single storey pre-fabricated office and general lab building	224567	Stryker Innovation Centre, IDA Business Park, Tullagreen, Anngrove, Carrigtwohill	To apply for a temporary permission for the provision of single storey pre-fabricated office and general lab building. The development also includes the provision of a temporary covered walkway connecting the proposed temporary office accommodation to the existing innovation centre, car parking, cycle parking and all ancillary site development works. Access to the proposed development will be from the existing entrance to the IDA Business Park.
South Midleton Wastewater Network Diversion Project	Future Irish Water application to Cork County Council	Townparks	This project seeks to transfer further loads to Carrigtohill WWTP via a wastewater pumping station located east of Ballick Road within the southern half of Midltown, via a rising main to Midleton North Pumping Station to cater for loads for future developments in Midleton town centre and wider area.
Compulsory Purchase Orders			
Irish Water Compulsory Purchase (Midleton LIHAF Wastewater Project) Order, 2021	ABP Case Ref: CH04.311549 Related to Irish Water planning application for North Midleton Wastewater pumping station (225032)	Various	Connecting wastewater pipeline connection from North Midleton Pumping Station to wastewater treatment plant in Carrigtwohill, requirement for pipeline to cross beneath the rail line

19.2 CACR Work packages

The overall CACR programme consists of a number of separate but interrelated projects:

- Project 1 – Kent Station Through Platform
- Project 2 – Signalling and Communications Upgrade
- Project 3 – Glounthaune - Midleton Twin Track (the proposed development)
- Project 4 – Per-way, Civils & Structures
- Project 5 – Depot
- Project 6 – Electrification
- Project 7 – Rolling Stock

In terms of cumulative assessment, only work Projects 1 and 2 are currently underway and are considered below in terms of potential cumulative effects with Project 3 (the subject of this EIAR).

Kent Station through platform – this project is being progressed and once operational has the potential for cumulative effects with the proposed development. The provision of a through platform at Kent station will facilitate passengers travelling onwards from Kent Station, as there will be no requirement to change trains at Kent station, this will have an imperceptible to slight positive effect for passengers.

Signalling and Communications Upgrade – this project is being progressed and once operational will ensure effective and improved signalling and communications which will have a positive effect on the operational railway line.

19.3 Population and Human Health

In relation to the population and human health there will be temporary to short-term impacts during the construction phase.

Table 2.2 in Chapter 2 details project in the vicinity (within 500m) of the proposed development which may act cumulatively. Before the commencement of construction and during the construction phase engagement with the proponents of these developments will be carried out and where there is potential for works to be carried out in parallel, appropriate mitigation measures will be implemented including the scheduling of works and regular liaison meetings between project teams to ensure that plans are co-ordinated and impacts on the local population are minimised.

During construction, there is likely to be a slight-moderate negative nuisance effect on the local population due to traffic disruption, noise and dust which may increase anxiety and stress. However, this will be temporary and coordination and planning of the works amongst the project proponents will minimise effects.

There will be temporary, slight, positive effect on local businesses as a result of the cumulation of developments in the area due to the presence of construction workers using local facilities and purchasing goods during the construction phase.

Of the projects listed in Table 2.2, the housing developments are relevant as the increase in housing will result in an increase in the population of the area. The proposed development will facilitate an increase in the capacity and frequency of trains along the line and provide an alternative mode of transport. The cumulation of increased trains and increased housing in the area will mean that travelling or commuting by train by the local population is a viable alternative to private transport. The improved train schedule will offer local people and tourists a reliable low carbon alternative which will result in a slight-moderate positive effect.

19.4 Air Quality

There is a risk of cumulative construction dust impacts associated with the construction phases of the proposed development occurring at the same time as the construction phases of nearby committed developments (see Table 2.2 in Chapter 2 of this EIAR for further details of these developments). It is therefore recommended, in line with IAQM guidance, that regular liaison meetings are held with construction sites within 500m of the site boundary to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. Provided this and other appropriate mitigation measures are implemented, such as those outlined in Section 8.7 of this chapter, the cumulative air quality impact associated with the construction phase will not be significant.

Chapter 15 (Roads and Traffic) describes the impacts of cumulative construction traffic from the proposed development and other committed developments. Traffic impacts from other developments which are unlikely to occur at the same time as the construction phase of the proposed development, or are already included in the traffic growth assumptions, have not been considered further. The construction traffic impacts from the proposed Celtic Interconnector project, which are planned to take place in the same period as the proposed development between January and August 2024, have been quantitatively assessed together with construction traffic from the proposed development. On routes where impacts from both developments could overlap, the total increase in HDV movements traffic is still unlikely to be higher than 100 AADT or 10% of existing traffic flows. Traffic emissions on those routes are therefore not likely to require further assessment.

19.5 Land, Soils and Hydrogeology

There are a number of projects that have the potential for cumulative effects, however, it is assumed that mitigation as detailed in chapter 10, would be similar for other projects and therefore overall, cumulative effects are considered to be negligible. The following projects (grouped if similar in terms of effects) were considered to have the potential for cumulative effects with the proposed development:

Burys Bridge, Kilcoolishal to Carrigtwohill via Glounthaune Pedestrian and Cycle scheme; Ballinacurra to Midleton pedestrian and cycle route; IDA Ireland

There will be an increase in impermeable surface area potentially affecting infiltration and recharge from these projects, however permanent impacts from the proposed development on aquifer recharge are not anticipated and therefore cumulative impacts are minimal.

Carrigtwohill to Midleton Inter-Urban Cycleway; Water Rock Urban Expansion Area Infrastructure Works

There will be an increase in impermeable surface area potentially affecting infiltration and recharge, however permanent impacts from the proposed development on aquifer recharge are not anticipated and therefore cumulative impacts are minimal. The construction of bridges/underpasses will result in excavation and disturbance of soils/geology, however, the extent is small and therefore there may be a slight cumulative adverse impact on soils/subsoils cumulatively.

North Midleton Wastewater pumping station; South Midleton Wastewater Network Diversion Project; Park Hill View Estates

The installation of rising mains and gravity sewers could result in disruption to the hydrogeological regime / groundwater flow. However, no impacts to flow are associated with the GMTT proposed development, as such cumulative impacts are considered negligible. There is an operational risk to water quality from leakage of the wastewater system, but this is considered low assuming an appropriate maintenance regime is followed.

Various residential and mixed-use developments; Stryker Ireland; Smithkline Beecham (Cork) Ltd; Cruachan Investment Limited Partnership

These works have the potential to impact hydrogeological receptors through an increase in impermeable surface area, resulting in a potential reduction in infiltration and recharge to the aquifer system. However, permanent impacts to aquifer recharge are not anticipated from the proposed development. As such, the cumulative impacts are considered minimal. Any sub-surface excavation required for construction may result in disruption to the soil / geological environment. However, the extent of the works are considered to be small relative to the spatial extent of local soil and geological deposits. There may be a slight cumulative adverse impact on soils/subsoils due to the cumulation of all projects.

19.6 Surface Water and Flood Risk

Cumulative effects may occur in the event that works in the vicinity of the same watercourse occur concurrently or immediately subsequently. Before the commencement of construction and during the construction phase, engagement with the proponents of other developments (refer to Table 2.2 in Chapter 2 of this EIAR) will continue and where there is potential for works to be carried out in parallel, appropriate mitigation measures will be implemented including the scheduling of works and regular liaison meetings between project teams to ensure that plans are co-ordinated and impacts on water are mitigated and minimised. Following the implementation of mitigation measures detailed in this EIAR and the measures to be implemented by other projects, significant adverse effects are not likely to occur. In terms of flooding, the OPW are progressing a flood relief scheme for the Midleton area, and this is currently at the emerging preferred option stage. In the event that this project proceeds through planning, it will have a beneficial effect for the area.

19.7 Biodiversity

Burys Bridge, Kilcoolishal to Carrigtwohill via Glounthaune Pedestrian and Cycle scheme - The scheme is located immediately adjacent to the proposed development extending out further to the west, and stopping at Carrigtwohill. The CPO for the project was confirmed in August 2021. Given the location and potential timing of these works (i.e. construction phase may run concurrently with that of the proposed development). Given the location and timing of the works, there is potential for cumulative impacts due to noise/ visual disturbance of wintering bird species.

Ballinacurra to Midleton pedestrian and cycle route - The project is located in close proximity to the proposed development, on the eastern end of the site. The Part 8 for the scheme was approved in 2020 and documentation supporting the project indicates it is anticipated to take 5 years for the installation of the scheme. As such, there is potential for works to take place concurrently with the proposed development. Given the location and timing of the works, there is potential for cumulative impacts due to noise/ visual disturbance of wintering bird species.

Cruachan Investment Limited Partnership - This development is located approximately 200m south of the proposed development. A request for further information has been made by the planning authority due to potential for loss of and damage of QI habitats, impact to supporting habitat for QI and SCI species, and risk of disturbance to SCI species. Following the submission of the required information, the project will be subject to the provisions of the Directive, i.e., environmental assessment in its own right. However, given the uncertainty surrounding the potential for impacts, there is potential identified for cumulative effects.

19.8 Landscape and Visual

Given the low level of construction effects for the proposed development, it is considered that any cumulative effects would be imperceptible. As the proposed development will have imperceptible operational effects in terms of landscape and visual effects, there is no potential for significant cumulative effects with other developments.

19.9 Archaeology, Architectural and Cultural Heritage

Given the presence of a pre-existing railway line, and the broadly coterminous nature of the present project with the pre-existing railway, no cumulative impacts are foreseen.

19.10 Roads and Traffic

Committed developments with known information have been considered within the assessment, however, some developments do not have full information per traffic generation or construction information available. Based on a review of the information available and applied professional judgement, aside from the Celtic Interconnector, there are assessed to be no other developments which have potential to combine cumulatively (and significantly) with the proposed development. Accordingly, it has been assumed that such traffic generation will be accounted for in the National Transport Model and therefor accounted for in the baseline traffic volumes derived.

It has been identified that HGV traffic generated by Celtic Interconnector are anticipated to use the roads listed in Table 15.33 in Chapter 15 between 2024 Q1 and Q3, inclusive. From the quantitative assessment it demonstrates that HGV traffic increase resulting in a ‘moderate (significant)’ effects of ‘major (significant)’ effects will occur. However, Table 15.33 shows the affected routes will have residual capacity to readily accommodate the expected additional traffic from Celtic Interconnector.

It should be noted that whilst construction traffic on these public road sections is assessed to exceed the 10% significance threshold, based on professional judgement, given that the total traffic volume assessed during construction, in all cases, will be at a level notably lower than the theoretical capacity the derived effect will at worst ‘minor’ and therefore ‘not significant’ in terms of the EPA 2022 EIAR Guidelines.

19.11 Noise and Vibration

The construction of the Proposed Development may occur at the same time as a number of other projects as set out in Chapter 2 Table 2.2. However, there is sufficient separation distance between the scheme and these other activities for no temporary significant cumulative noise effects to occur.

The operation of the Proposed Development will occur at the same time as a number of other projects as set out in Chapter 2 Table 2.2. Additional receptors could also be constructed before operation of the scheme commences. None of these new receptors would experience noise and vibration levels higher that that already assessed for the existing receptors. There is sufficient separation distance between the proposed development and these other activities and new receptors for no permanent significant cumulative noise effects to occur.

19.12 Material Assets

In terms of the operational phase, the provision of a new twin track along the railway line is a positive effect, a new asset in the area. Other projects in the area such as the pedestrian and cycle routes, Celtic Interconnector, upgrade of the N25, wastewater infrastructure and housing

will also result in new assets for the area once constructed, cumulatively having a moderate positive effect.

19.13 Conclusion

Within each technical chapter of this EIAR, mitigation measures are proposed to avoid, minimise and reduce adverse environmental effects, including the cumulative effects identified above. Following the successful implementation of the proposed mitigation measures, no significant adverse cumulative effects are likely.

Chapter 20 – Interactions

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20 Interactions Between the Topics

20.1 Introduction

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application (also referred to herein as “the proposed Project”) by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 (‘the 2001 Act’). An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed project (comprising inter alia railway works), including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors. This chapter outlines the interactions between the impacts of the proposed development identified in this EIAR.

Aspects of the existing environment likely to be affected by the proposed development, during both the construction and operational phases, have been considered in detail in the relevant chapters of this EIAR.

20.2 Interaction of Effects and Indirect Effects

The matrix presented in Table 20.1 has been developed to identify interactions and indirect impacts between environmental topics. The nature of the environment is such that interactions between all environmental topics are potentially possible and / or may occur to a certain extent for most projects. The purpose of the matrices is therefore to highlight key interactions that are recognised to be specific to this proposed development and warranting special consideration. In the matrices, a grey or a white square indicates no interaction, while a turquoise square indicates that a key interaction exists.

Key environmental interactions that have been identified are discussed further in Table 20.2.

Table 20.1: Interaction of Effects

	Population and Human Health	Air Quality	Climate	Land, Soils & Hydrogeology	Water and Flood Risk	Biodiversity	Landscape and Visual	Archaeology, Architectural and Cultural Heritage	Roads and Traffic	Noise & Vibration	Material Assets
Population and Human Health		■	■		■		■	■	■	■	
Air Quality	■		■			■			■		
Climate	■	■			■	■			■		
Land, Soils & Hydrogeology		■			■	■	■	■			
Water and Flood Risk	■		■	■		■			■		
Biodiversity		■	■	■	■					■	
Landscape and Visual	■			■				■			
Archaeology, Architectural and Cultural Heritage	■			■			■				■
Roads and Traffic	■	■	■		■					■	■
Noise & Vibration	■					■			■		
Material Assets							■		■		

Table 20.2: Description of Interactions of Disciplines

Interaction	Description
Population and Human Health interactions with: Air, Climate, Water and Flood Risk, Landscape & Visual, Archaeology, Architectural and Cultural Heritage, Rods and Traffic, Noise & Vibration	**Air Quality** changes on local community during the construction phase are likely due to increased dust emissions from increased construction traffic, however the effect will not be significant following mitigation. Localised impacts on air quality are found to be negligible with respect to traffic emissions. Once operational, air quality impacts associated with the proposed development are not considered to be significant and the impact of additional trains are considered to be negligible and not significant. **Climate**, The proposed development will potentially reduce air pollution as commuters and rail users move from reliance on vehicular transport to increased use of trains. The future potential of an increase in the electric fleet, will also have a beneficial impact on climate pollutants as well as air quality emissions as electricity can be powered by renewable sources rather than fossil fuels. **Water and Flood Risk**, There is potential for impacts during the construction phase, in the absence of mitigation. The use of oils and lubricants during the operational phase if leaked into watercourses could potentially have impacts for local communities in terms of poor water quality. With the implementation of mitigation measures presented within this EIAR the impacts are likely to be minimised. **Landscape & Visual,** Visual impacts associated with the proposed development have the potential to impact on population, for example, views of machinery and hoarding during construction. As there is an existing railway line in place there will be no significant change to views or the landscape when operational. **Archaeology, Architectural and Cultural Heritage**, There is potential for impacts on cultural heritage assets during the construction phase. As is not unusual with any construction works involving earthworks, there is the potential for previously unrecorded archaeology to be uncovered during excavation works. Any disturbance of ground and drainage patterns can also impact unrecorded archaeology and cultural heritage. Mitigation measures are detailed within Chapter 14 of this EIAR and the Construction Environmental Management Plan which will ensure that such impacts are minimised to negligible/moderate significance. **Roads and Traffic:** There will be an increase in construction traffic levels and potential impacts on the local community. The number of vehicles on roads associated with the proposed development is likely to increase during the construction phase due to the movement of workforce to the works areas. During operation, the increased level of train service may contribute to the change in journey characteristics for the population with increased capacity and frequency of commuter rail services, the journeys made by private vehicles may decrease. **Noise & Vibration**: It is considered that there will be an increase in noise levels and impacts on the local community generated from construction activities. Following the implementation of the proposed mitigation measures, these effects will be minimised. The area adjacent to the proposed development is already exposed to noise and vibration from the existing railway. The proposed development will lead to increases in noise and vibration to the closest receptors, with minor to moderate increases in noise. Noise and vibration levels will be below levels considered to result in significant adverse effects.
Air quality interactions with: climate, biodiversity, roads and traffic	**Climate**, The proposed development has the potential for negative impacts on climate. However, air quality impacts associated with the proposed development are not considered to be significant and the impact of additional trains is considered to be negligible and not significant in terms of emissions. **Biodiversity**, Air quality changes on flora and fauna such as dust during construction may affect flora and fauna. Run off from works areas can impact water quality and biodiversity, dust deposition and soiling can impact on biodiversity. Following the implementation of the mitigation measures dust impacts are not predicted to be significant. Consequently, no significant residual dust effects on surface water quality or biodiversity are predicted. **Roads and Traffifc**. During the construction phase, it is not expected that there will be any significant effects from construction road traffic on ambient air quality.

Interaction	Description
Climate interactions with: Water and Flood Risk, Biodiversity, Roads and Trafic	**Water and Flood Risk:** The impact of climate change on hydrology increases the potential for future flood risk, the latest climate change guidance has been considered when assessing the impact of the future climate change on flood risk and is included within Chapter 11 Surface Water and Flood Risk, of this EIAR. **Biodiversity**: The proposed development (along with other future developments) will facilitate a future reduction in emissions associated with the modal shift from private cars to trains which will result in reducing the effect of local emissions and associated effects on habitats, flora and fauna. **Roads and Traffic:** During the operational phase, the proposed development, along with other future developments, will facilitate an increase in the frequency of trains thereby encouraging a modal shift from private cars to trains. This will have a positive impact on climate due to lower emissions.
Land, Soils & Hydrogeology interactions with: Surface Water and Flood Risk, Biodiversity, Landscape & Visual, Archaeology, Architectural and Cultural Heritage.	**Water and Flood Risk:** The excavation of soils and rock for the proposed development, poses a potential risk to nearby watercourses as a result of sediment run off. Earthworks associated pose a risk to waterbody from sediment runoff. Best practice techniques, mitigation measures and guidelines have been outlined in Chapter 10 Land, Soils & Hydrogeology and Chapter 11 Water and Flood Risk and the Construction Environmental Management Plan of this EIAR. **Biodiversity:** Earthworks during the construction phase have the potential to impact on the Great Island Channel SAC and other nearby watercourses through construction site runoff. The potential impacts are likely to arise from soil excavation and from construction activities that require earthworks. A suite of best practice techniques, mitigation measures and guidelines have been outlined in Chapter 10 Land, Soils & Hydrogeology and Chapter 12 Biodiversity. All construction works involving the movement of soils will consider the identified locations of Invasive Alien Species. An updated invasive species survey will be carried out during the appropriate growing season (May–October). The findings of this invasive species survey will be incorporated into an updated Invasive Species Management Plan by the Contractor's Ecological Clerk of Works (ECoW). **Landscape & Visual**: The construction works are considered to have a moderate-slight magnitude effect, in the vicinity of the construction compound, in the short term. The overall operational phase landscape impact will be permanent in duration, but the significance is deemed to be Imperceptible. Therefore, significant landscape impacts are not anticipated during the construction or operational phases. The impact is assessed fully in Chapter 13 Landscape of this EIAR. **Archaeology, Architectural and Cultural Heritage:** The disturbance of soil during the construction phase of the proposed development has the potential to undercover archaeological finds. All sub-surface groundworks associated with the proposed development works at the Glounthaune Estuary AAP, Knockgriffin temporary compound AAP and Townparks temporary construction compound AAP shall be subject to a programme of archaeological monitoring. Further mitigation measures are detailed in Chapter 14 Archaeology and Cultural Heritage of this EIAR.
Water and Flood Risk interactions with: Biodiversity, Roads and Traffic and Transpot	**Biodiversity:**. Construction activities have the potential to pose a risk to watercourses, particularly if contaminated surface water from construction activities was to enter the receiving waterbodies. Chapter 12 Biodiversity and the Construction Environmental Management Plan set out measures to prevent the runoff of contaminants during construction. **Traffic and Transport**: The proposed development has potential to impact on local roads during construction, including run off from local roads utilised during the construction phase. The implementation of the mitigation measures proposed within Chapter 11 Surface Water and Flood Risk, Chapter 15 Traffic & Transport and the Construction Environmental Management Plan should minimise any residual effects.

Interaction	Description
Biodiversity interactions with: Noise & Vibration	**Noise & Vibration**, Noise and vibration can cause disturbance of protected species from noise and vibration generated from construction activities and during increased frequency of train operations. For activities which emit high levels of noise and for noise emitting works at night, sound reducing hoarding will be placed adjacent to works areas to protect fauna. Mitigation measures can include: the use of mufflers on pneumatic tools, effective exhaust silencers, sound reducing enclosures and machines in intermittent use shall be shut down during periods where they are not required. Further mitigation is included with the Chapter 12 Biodiversity, Chapter 16 Noise and Vibration and the Construction Environmental Management Plan.
Landscape and Visual interactions with:, Archaeology, Architectural and Cultural Heritage.	**Archaeology, Architectural and Cultural Heritage**: The impact on the settings of structures of architectural heritage significance represents an interaction with landscape and visual assessment, as does the siting of landscaping as a means of mitigating the visual impact of certain of the proposed works. There are no protected heritage sites located within the immediate study area, therefore significant landscape impacts are not anticipated during the construction or operational phases.
Archaeology, Architectural and Cultural Heritage interactions with: Material Assets	**Material Assets:** As with any civil construction works of this nature, there is potential for previously unrecorded archaeology to be encountered during excavation works. Disturbance of ground within newly acquired lands may impact unrecorded archaeology and cultural heritage. The implementation of the measures described in this EIAR will ensure that such impacts are minimised.
Traffic & Transport interactions with: Noise & Vibration, Material Assets	**Noise & Vibration:** Traffic noise is likely to arise from movement of construction traffic along routes to deliver materials to construction compounds adjacent to the proposed development. Works are likely to take place at day and night time, with no predicted significant adverse impacts during day works and significant adverse impacts during nigh-time works. Chapter 16 Noise and Vibration and the Construction Environmental Management Plan of this EIAR set out measures to reduce the effect of noise from HGV movements on sensitive noise receptors. **Material Assets:** There is potentially an interaction between resource and waste management and traffic and transport effects during the construction phase of the proposed development. The transportation of resources and waste to and from site has the potential to affect local traffic and transport patterns during the construction phase. Materials will require transport from the construction compounds to the various sections of the proposed development and there will also be material requiring transport for disposal. A Construction Traffic Management Plan has been produced and will be updated by the appointed contractor. This is included as an appendix to the CEMP.

Chapter 21 – Summary of Mitigation and Monitoring

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21 Summary of Mitigation

21.1 Introduction

In accordance with Section 39 of the 2001 Act the Environmental Impact Assessment Report for this Railway Order Application inter alia contains:- (i) a description of the proposed railway works comprising information on the site, design, size and other relevant features of the proposed works;(ii) a description of the likely significant effects of the proposed railway works on the environment;(iii) the data required to identify and assess the main effects which the proposed railway works are likely to have on the environment;(iv) a description of any features of the proposed railway works, and of any measures envisaged to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;(v) a description of the reasonable alternatives studied by CIÉ which are relevant to the proposed railway works and their specific characteristics and an indication of the main reasons for the option chosen, taking into account the effects of the railway works on the environment; and (vi) a summary in non-technical language of the above information.

The EIAR takes into account the available results of other relevant assessments under European Union or national legislation with a view to avoiding duplication of assessments. The assessments contained in the EIAR have also been co-ordinated with the assessment under Council Directive 92/43/EEC of 21 May 1997 (The Habitats Directive) and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 (Birds Directive) as transposed in the Planning and Development Act 2000 (as amended) and the NIS which has been prepared for this Railway Order application.

The EIAR, in addition to addressing the matters set out in section 39(1) of the Transport (Railway Infrastructure) Act 2001 (as amended), contains information specified in Annex IV to the EIA Directive relevant to the specific characteristics of a particular railway works and type of railway works proposed and to the environmental features likely to be affected.

Section 42B of the 2001 Act includes provisions in relation a “reasoned conclusion.” Accordingly, whenever an application is made under section 37, before deciding whether or not to grant a Railway Order An Bord Pleanála must take into account *inter alia* the following matters:

- The Environmental Impact Assessment Report submitted under S.37 and any revised Environmental Impact Assessment Report submitted under S.47 D;
- Any additional information furnished to the Board under S.41 and where applicable any information submitted on foot of a notice under S.47 D (4);
- Any submissions or observations made in relation to the likely significant effects on the environment of the activity to which the application relates duly made to it under: section 40(3) or 41(4) and not withdrawn; by an authority referred to in S.40(1)(c) or (e); on foot of a request under S.47 D(1) or a notice under S.47 D(6);
- consider any other evidence it has obtained under this Part in relation to the likely significant effects on the environment of the activity to which the application relates, and
- taking into account the results of the examination of matters referred to above and reach a reasonable conclusion on the significant effects on the environment of the activity to which the application relates.”

Prior to the Board making its decision it takes into account its “reasoned conclusion” under S.42B and concludes that it is up to date and remains up to date. The Board can, if it is of the opinion that the application should be granted, make an order authorising Córas Iompair

Éireann to construct, maintain, improve and operate the railway works specified in the Railway Order in such manner and subject to such conditions (including environmental conditions and conditions regarding monitoring measures, parameters to be monitored and the duration of monitoring, modifications, restrictions and requirements) and such other terms as the Board thinks proper and specifies in the Railway Order. Accordingly, section 43 of the 2001 Act has been amended to reflect the changes brought about by Statutory Instrument Number 743 of 2021. For example, section 43(2A) of the 2001 Act (as amended and substituted by the European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I.No. 743 of 2021)) provides that an RO shall *inter alia* include (a) the reasoned conclusion referred to in section 42B of the 2001 Act, (b) any environmental conditions, including conditions regarding monitoring measures, parameters to be monitored and the duration of monitoring, to which the authorisation is subject, and (c) a description of any features of the proposed railway works, or any measures envisaged, to avoid, prevent or reduce, or offset significant adverse effects on the environment.

Section 43A defines “environmental condition” as follows:

“An environmental condition in relation to a Railway Order means any condition, modification, restriction or requirement to which a Railway Order is subject that relates to:-

1. features of the railway works or measures envisaged to avoid, prevent, reduce or offset significant adverse effects on the environment, or
2. the monitoring of significant adverse effects on the environment, (including conditions regarding monitoring measures, parameters to be monitored and the duration of monitoring)”.

Section 43B of the deals with a duty to notify and comply with modification and conditions of the Railway Order approval.

Section 43C provides that the Minister for Transport shall take all reasonable steps to ensure that a railway undertaking complies with “environmental conditions.”

Section 43D gives the Minister for Transport power to request information regarding compliance with a modification or condition.

Section 43E gives the Minister for Transport power to carry out an assessment of the railway undertakings compliance with an “environmental condition”.

Section 43F provides the Minister for Transport with the power to direct action to ensure compliance with “environmental condition”.

In addition to the above, the following summary sets out the mitigation controls and other best practice measures identified in relation to the proposed development and identifies the means by which those controls and measures will be secured. The following are provided:

- a unique reference number for each item;
- the section of the EIAR where the mitigation measure is referenced; and
- the monitoring and mitigation measures, as set out in the EIAR.

A contractual obligation will be included within the tendering processes and implemented on appointment of the Contractor to ensure that the proposed works are developed in compliance with the requirements of the CEMP, and the methods, monitoring and mitigation included in this EIAR.

Table 21.1: Summary of Mitigation and Monitoring Measures

	Phase	Mitigation and Monitoring
Chapter 7 Population and Human Health		
7.1	**Construction**	A CEMP is included in Appendix 6.1 of this EIAR. The CEMP will be implemented by the contractor 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 that may cause harm or nuisance.
7.2		The appointed contractor (in collaboration with Iarnród Éireann) will be required to maintain close liaison with local community representatives, landowners and statutory consultees throughout the construction period .
7.3		The appointed Contractor will also implement the Traffic Management Plan included as Appendix 6.1 of this EIAR, which will be finally agreed upon with Cork County Council to mitigate any potential construction traffic impacts on the public road network. All construction activities, including construction traffic, will be managed through the site CEMP.
7.4		There are no specific mitigation measures required to ameliorate potential impacts on population and human health in addition to the measures specified in other chapters of this EIAR. Specific measures to mitigate likely significant impacts on human health during the construction phase (i.e. Noise and Vibration, Air Quality and Climate, Water, Traffic and Major Accidents and/or Disasters) are dealt with separately in the relevant chapters in this EIAR.
Chapter 8 Air Quality		
8.1	Construction	**Construction dust emissions**
8.2		Mitigation measures included in the CEMP (refer to Appendix 6.1) are set out below and have been adapted from best practice guidance from the IAQM, based on the dust risk identified in Section 8.6 and considering the duration of the construction period.
8.3		Different mitigation measures have been recommended for different areas, based on construction activities and level of risk. With the implementation of these measures, fugitive emissions of dust from the proposed development will be negligible and therefore not significant.
8.4		The CEMP will facilitate stakeholder communications and community engagement prior to the commencement of construction.
	Construction	**All areas**
8.5		All areas are predicted to have at least 'low risk' in terms of dust soiling and PM_{10} effects due to earthworks activities, with no mitigation in place. Best practice mitigation measures which will be implemented for these activities are presented below:
		Communication:
8.6		Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary
8.7		Display the head or regional office contact information.
		Site Management:
8.8		Record all dust and air quality complaints, identify causes and take appropriate measures to reduce emissions in a timely manner and record the measures taken;
8.9		Make the complaints log available to the local authority when asked; and
8.1		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:

	Phase	Mitigation and Monitoring
8.11		Carry out regular site inspections to monitor compliance with the CEMP and record inspection results, and make an inspection log available to the local authority when asked; and
8.12		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.
		Preparing and maintaining the site
8.13		Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
8.14		Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
8.15		Avoid site runoff of water or mud.
		Operating vehicles/ machinery and sustainable travel:
8.16		Ensure all vehicles switch off engines when stationary – no idling vehicles; and,
8.17		Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
		Operations:
8.18		Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction;
8.19		Ensure an adequate water supply on the site for effective dust / particulate matter suppression / mitigation using non-potable water where possible and appropriate;
8.2		Use enclosed chutes and conveyors and covered skips; and
8.21		Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
8.22		Waste management:
8.23		Avoid bonfires and burning of waste materials.
		Area 4 ('Low' risk from demolition activities)
8.24		In addition to all measures specified in Section 8.5 (All areas):
		Measures specific to demolition:
8.25	Construction	Ensure effective water suppression is used during demolition operations;
8.26		Avoid explosive blasting, using appropriate manual or mechanical alternatives; and
8.27		Bag and remove any biological debris or damp down such material before demolition.
		Areas 1, 3, 4 and 5 ('Medium' risk from earthworks activities)
8.28		In addition to all measures specified in Section 8.5 (All areas):
		Communication:
8.29		Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
	Construction	**Monitoring:**
8.3		Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary.
		Preparing and maintaining the site
8.31		Keep site fencing, barriers and scaffolding clean using wet methods;

	Phase	Mitigation and Monitoring
8.32		Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
8.33		Cover, seed or fence stockpiles to prevent wind whipping.
8.34		Operating vehicles/ machinery and sustainable travel:
8.35		Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
		Operations:
8.36		Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Chapter 9 Climate		
9.1		Ireland's Climate Action and Low Carbon Development (Amendment) Bill 2021 commits to net-zero carbon emissions by 2050. To support this, the development shall seek to reduce GHG emissions as far as practicable in all cases to contribute to a net reduction in carbon emissions. It is recommended that emissions reduction measures are put in place as part of the proposed development at design stage.
9.2		In the different stages of the development lifetime, several best practice mitigation measures will be implemented as detailed through the Construction Environmental Management Plan (CEMP):
9.3		Ensuring all vehicles are switched off when stationary;
9.4		Increasing the use of biofuel blends in petrol and diesel;
9.5		Avoid using diesel- or petrol-powered generators, using battery or powered or mains electricity where practicable;
9.6		Regular maintenance of construction plant to limit GHG emission intensity;
9.7		No bonfires or burning of waste materials;
9.8	**Construction**	Construction works should be carried out in accordance with the best practicable means, to reduce fumes or emissions which may result in additional GHG emissions. Plant equipment and vehicles to be used on the proposed project should be selected based on their relative environmental performance.
9.9		A Construction Transport Management Plan (Appendix 6.1, Appendix A) will include measures to minimise congestion during construction, and to coordinate efficient delivery to minimise the number of vehicle movements.
9.1		A Construction Resource Waste Management Plan (Appendix 6.1, Appendix B) has also been developed, detailing additional measures that will further help mitigate the impact of the project. This includes:
9.11		Reduce the use of virgin resources, e.g. concrete reuse/recovery target of 85%;
9.12		Keeping materials in the economy as long as possible;
9.13		Where suitable source materials locally and use more sustainable / lower carbon intensity materials;
9.14		Maintain the intrinsic value/quality of materials as high as possible.
9.15		During operation the following measures will be taken:
9.16		Regular maintenance of train engines to limit GHG emission intensity;
9.17		Electrical switchgear which contains SF6 is compliant with European F-Gas Regulations to reduce leakage rates. Where possible non-SF6 equipment is preferred from a GHG emissions perspective.
Chapter 10 Land, Soils and Hydrogeology		
	Construction	**Land and Land-Use**

Phase	Mitigation and Monitoring
10.1	No impact on land or land use is predicted. As such no mitigation, beyond the embedded mitigation, is proposed.
	Soils and Geology
10.2	Ground investigation will be carried out to establish the potential presence of any made ground or contamination along the route. This will target areas of soils identified as having a high risk of contamination.
10.3	The CEMP will include protocols to deal with unexpected contamination including:
10.4	An appropriately qualified person will be present on site during construction to identify visual and olfactory evidence of contamination during excavation; and
10.5	Any contaminated ground will be characterised according to Waste Acceptance Criteria and dealt with as soon as possible via a bespoke remediation strategy or a materials management plan. Any waste arising will be managed in accordance with the Waste Management Act 1996 (as amended) and associated Regulations.
10.6	To reduce the risk of contamination, stockpiling of contaminated material is prohibited.
10.7	If it is not possible to immediately remove contaminated material then it will be stored on, and covered by, polythene sheeting to prevent rain water infiltrating through the material.
10.8	In-situ remediation of contaminated soils will be used in preference to offsite disposal where practicable.
10.9	A pre-construction survey will be completed to confirm the presence of identified areas of landslip hazard, and identify further areas of risk absent from this desk-study. Additionally, a Geotechnical Risk Register will be created to ensure any landslide and slope stability risks are systematically captured. This register will quantify the risk of failure and propose location-specific mitigation. The location of any identified areas of hazard will be incorporated into construction site management plans. Excavation, the use of heavy machinery, and site traffic routes will be planned to avoid these areas.
10.10	A pre-construction survey of karstic features will be carried out to confirm the presence of listed features and identify features absent from this desk-study assessment. The design of drainage, and temporary construction features (e.g. site compounds and access tracks) will be as such to avoid discharge of surface run-off to any identified karst feature or area of karst bedrock. This will include the use of lined ditches or impermeable pipes to direct collected water away from such features.
10.11	If excavation exposes limestone bedrock, an impervious liner will be used to mitigate against the risks of surface water directly entering into the karstified rock. Karst features will be assessed by a suitably qualified professional to determine their extent across the proposed development. Any Karst features will be filled with an appropriate granular material (to preserve hydraulic connectivity) and sealed before the liner is used.
10.12	Extensive GI will be carried out at the location of the limestone cutting at Water Rock to confirm the location of subsurface karst features including caves . The cutting at Water Rock will use an experienced contractor who will avoid caves and karst features. A geotechnical expert will be appointed by the contractor to closely monitor vibrations during cutting. Vibrations will be kept to within TII specifications[1] which will ensure no disturbance to wider karst features including caves. In the unlikely event that vibration limits are exceeded, cutting will cease on site until the reason for the increased vibration is determined.
10.13	If GI or site work identifies potentially contaminated land at piling locations, an alternative (non-piling) method of embankment retention will be used. Where this is not possible, a Piling Risk Assessment will be carried out to select an appropriate piling method and identify any specific mitigation and monitoring measures required.

	Phase	Mitigation and Monitoring
10.14		Where GI identifies that bedrock is likely to be encountered at proposed piling locations an alternative to drive piling will be required. This is likely to be either:
10.15		An alternative embankment retention method (reinforced concreate or gabion baskets). These alternatives may require additional excavation and land take; or
10.16		An alternative to drive piling (e.g. concrete sockets into bedrock). Socket piling will not be used in areas where GI has identified contaminated land due to the risk of mobilising contamination to the sensitive limestone bedrock. If socket piling is proposed into limestone:
10.17		A detailed karst stability assessment will be carried out. The objective will be to assess the ground stability and the need for reinforcement;
10.18		Impermeable liners will be used during socket piling to prevent loss of concrete to the limestone.
10.19		As a basis for a worst-case assessment, the quantities of material to be excavated and imported during construction have been assessed. This assessment assumes that no material can be reused . To the greatest extent possible, excavated material will be appropriately stored and reused on site to minimise the volume required for offsite disposal. The Contractor will ensure acceptability of the material for re-use within the proposed development. GI will be carried out to assess the properties of the material to be excavated. A construction earthworks programme will be implemented as part of the CEMP, which will categorise the source of material for each fill section and ensure it is appropriate.
10.20		Where non-granular fill material is used for embankment construction (e.g. reuse of local material) measures (e.g. the use of geotextile separator) will be taken to minimise washout of fines and/or sediment runoff from the embankment.
10.21		Where offsite disposal of excavated material is required, it will be managed in accordance with the Waste Management Act 1996 (as amended) and associated Regulations.
		Hydrogeology
10.22		A pre-construction verification survey of the identified boreholes / wells within 150m of the new track or construction compounds will be carried out to confirm whether they remain in use, and the nature of use.
10.23		If they are used for drinking water purposes, water quality testing of the boreholes (for standard drinking water parameters including turbidity) will be carried out. Water quality testing will be carried out monthly for 12 months before construction, monthly during construction and for at least 12 months after construction to ensure no degradation of water quality as a result of the construction activities.
10.24		A pre-construction survey of karstic features will be carried out to confirm the presence of listed features and identify features absent from this desk-study assessment . Due to the sensitivity and connectivity of the karstic environment, including the risk of potential connections between karst features and sensitive receptors outside of the study area, additional mitigation measures to reduce the risk of impact will be used. These include that:
10.25		A buffer area (at least 20 m) will be provided surrounding each identified karst feature, whereby no construction activity, including storage of materials will occur.
10.26		Storage of materials (including excavated materials and fill and ballast) will avoid areas at risk of surface water or groundwater flooding or areas of convergence of flow ; and
10.27		The use of additional pollution prevention measures, such as double silt fencing, will be used where excavation occurs adjacent to an identified feature.
10.28		It is anticipated that all existing drainage outfalls will be retained and that no new outfalls will be required. Where new drainage will be installed (in areas where significant alterations are proposed to the track), the design of the drainage will avoid discharge of surface run-off to any identified karst feature or area

	Phase	Mitigation and Monitoring
		of karst bedrock. This will include the use of lined ditches or impermeable pipes to direct collected water away from such features.
10.29		Regular inspection and maintenance of trains (and other machinery) operating on the proposed development will occur. This will reduce the risk of accidental spillage of fuels, lubricants and chemicals, and subsequent pollution of run-off.
Chapter 11 Water and Flood Risk		
		General
11.1	**Construction**	The following mitigation measures will be implemented prior to commencement and throughout the duration of the proposed works.
11.2		A full-time on-site Environmental Clerk of Works (EnCoW) will be appointed prior to commencement of works.
11.3		Confirmatory pre-construction surveys will be carried out and seasonal constraints will be confirmed in agreement with IFI and National Parks and Wildlife Service (NPWS) and Cork County Council, as appropriate.
11.4		Works will be carried out in accordance with the guidelines set out by IFI in 'Guidelines on Protecting Fisheries During Construction Works in and Adjacent to Waters' (IFI, 2016).
11.5		The IFI Biosecurity Protocol for Field Survey Works will be complied with.
		Surface Water Quality Protection Measures
11.6		The following water quality mitigation measures will be implemented prior to commencement and throughout the duration of the works:
11.7		Water quality monitoring will be conducted upstream and downstream of the works prior to works commencing and at regular intervals during the works.
11.8		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 i.e. 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.
11.9		Tracking beside streams and tracks will be avoided to avoid damage to the bankside.
11.10		Geotextile or timber matting will be used on soft ground, and in all protected areas
11.11		A buffer zone of 10m will be maintained between storage and working areas and watercourses, taking account of the minimum working area required to facilitate the works.
11.12		The time period over which areas of clearance are left open will be reduced insofar as is reasonably practicable.
11.13		Re-instatement method statements will be subject to approval by the EnCoW.
11.14		Concrete will be brought to site by covered truck. Wet concrete operations adjacent to watercourses will be avoided where possible.
11.15		The Contractor will ensure that all concrete truck wash watering / cleaning is undertaken offsite where possible and remote from watercourses.
11.16		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:
11.17		· All collected waste will be managed in accordance with the Waste Management Act 1996, and associated Regulations:
11.18		· Fuels, chemicals, liquid and solid waste will be stored on impermeable surfaces;
11.19		· Refuelling of plant, equipment and vehicles will be carried out on impermeable surfaces;
11.2		· All tanks and drums will be bunded in accordance with established best practice guidelines; and

	Phase	Mitigation and Monitoring
11.21	**Construction**	· Spill kits will be provided at all compound locations and carried by all crews during underground cable installation works.
11.22		Works will not be carried out during extreme rainfall or high flow events. An early flood warning system will be set up to allow the removal of plant and material from construction compounds located in Flood Zones A and B in the events of flood warning.
11.23		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 to inform adaptive management as required. The locations of same will be determined by the EnCoW.
11.24		Site restoration post works will be carried out, in agreement with IFI with regard to the IDA culvert and works at the Owenacurra River Bridge. These works may include riverbank stabilization, gravel replacements etc. In all cases, the site will be restored post installation.
11.25		There are also two construction compounds proposed on the west side and east side of the Owenacurra River. The westerly compound is only for access to the bridge abutments and there will be no portacabin or storage in this area. The easterly compound will be used for storage of materials. Both compounds will be set back from the riverbank by a minimum of 15m.
11.26		The works to extend/reconfigure culverts will be conducted during the period July – September to avoid effects on fisheries.
11.27		Catch netting will be installed on the underside of the Owenacurra River Bridge to prevent any material from entering the watercourse.
		Silt Control Measures
11.28		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.
11.29		Silt control measures include silt traps which can be located in small drains where flow is small and silt fences where runoff from large areas needs to be controlled.
11.30		Silt fences must be installed in the working areas and not at the watercourse.
11.31		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.
11.32		Where distances between the works and watercourse allow, a minimum setback distance of 30m from the watercourse will be maintained.
11.33		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
11.34		Silt fences will be installed downslope of the area where silt is being generated on disturbed ground.
11.35		To be effective the silt curtain must contain the area where silt is generated and must terminate on high ground (i.e. an elevated area not in the watercourse).
11.36		Silt fences will be constructed using a permeable filter fabric (e.g. Hy Tex Terrastop Premium silt fence or similar) and not a mesh.
11.37		The base of the silt fence will be bedded at least 15-30 cm into the ground at 2 metre intervals.
11.38		Once installed the silt fence will be inspected regularly, daily during the proposed works, weekly on completion of the works for at least one month, but particularly after heavy rains.
11.39		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.
11.40		Two lines of silt curtain / fence will be installed, where considered necessary, by the EnCoW.

Phase	Mitigation and Monitoring
11.41	Any build-up of sediment along the fence boundary will be removed daily.
11.42	Silt fences will be maintained until vegetation on the disturbed ground has re-established. Re-instatement method statements will be subject to approval by the EnCoW.
11.43	The silt fencing must be left in place until the works are completed (which includes removal of any temporary ground treatment).
11.44	Silt fences will not be removed during heavy rainfall.
11.45	The silt fence will not be pulled from the ground but cutaway at ground level and posts removed.
11.46	A record of when it was installed, inspected and removed will be maintained by the EnCoW.
	Silt Traps
11.52	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:
11.53	Silt traps will only be placed in drains downstream of working areas where the volume of water flow is expected to be low.
11.54	Silt traps will be made of terram or similar material, not mesh.
11.55	The trap will be staked into the banks of the drain / watercourse such that no water can flow around the sides.
11.56	The material will be bedded into the drain bed/watercourse to prevent water flowing beneath it.
11.57	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.
11.58	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.
11.59	Any build-up of solids will be carefully removed without removing any vegetation growing on the bottom.
11.6	In sensitive areas a series of silt traps will be placed in the drain.
11.61	The silt trap will not be pulled from the ground but cutaway at ground level and posts removed.
11.62	A record of when it was installed, inspected and removed will be maintained by the EnCoW.
	Karst Measures
11.64	Due to the sensitivity and connectivity of the karstic environment, including the risk of potential connections between karst features and sensitive receptors outside of the study area, additional mitigation measures to reduce the risk of impact will be used. These include that:
11.65	A buffer area (at least 20 m) will be provided surrounding each identified karst feature, whereby no construction activity, including storage of materials will occur.
11.66	Storage of materials (including excavated materials and fill and ballast) will avoid areas at risk of surface water or groundwater flooding or areas of convergence of flow ; and
11.67	The use of additional pollution prevention measures, such as double silt fencing, will be used where excavation occurs adjacent to an identified karst feature.
11.68	The design of drainage will be as such to avoid discharge of surface run-off to any identified karst feature or area of karst bedrock. This will include the use of lined ditches or impermeable pipes to direct collected water away from such features.
	Flood Risk Protection Measures

	Phase	Mitigation and Monitoring
11.7		Any construction activities inside the watercourse or impeding flow area of the existing watercourse or inside the existing floodplain should be consulted with a Flood Risk Specialist. The Flood Risk Specialist will determine if a further assessment or mitigation measures are required. The mitigation measures may include the creation of a flood plan and putting an early flood warning system in place.
11.71		Appendix 11.3 (FRA Stage 3) of Chapter 11 Surface Water and Flood Risk, identified the potential risks and mitigation in relation to the construction works on culverts and the Ownennacurra Bridge. Should the construction method change, a new assessment will be required by the Flood Risk Specialist.
11.72	**Operational**	During the operational phase 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:
11.73		Trains will be regularly inspected for any leaks;
11.74		All collected waste will be managed in accordance with the Waste Management Act 1996, and associated Regulations:
11.75		Fuels, chemicals (including herbicide), liquid and solid waste will be stored on impermeable surfaces;
11.76		Refuelling of plant, equipment and vehicles will be carried out on impermeable surfaces;
11.77		All tanks and drums will be bunded in accordance with established best practice guidelines; and
11.78		Spill kits will be provided to all crews carrying out maintenance activities.
11.79		It is recognised that the existing track and the future dualled line will be at risk of fluvial and coastal flooding. Considering the future climate change the flood risk is likely to become more frequent. It is therefore recommended that an early flood warning system is incorporated into the operation phase of the new railway track.
Chapter 12 Biodiversity		
	Construction	**Mitigation and Monitoring Measures**
		Construction Phase Mitigation Measures
12.1		Mitigation measures were designed having regard to the Mitigation Hierarchy. This is a sequential order of mitigation actions whereby the preference for mitigation measures are as outlined below:
12.2		Avoidance: Steps to avoid harm to biodiversity.
12.3		Minimisation: Where adverse impacts cannot be avoided, action is taken to minimise these impacts.
12.4		Compensation: Only considered after all possibilities for avoidance and minimisation of impacts have been implemented.
12.5		Care has been taken throughout the design process to avoid impacts to sensitive ecological receptors. Additional mitigation measures to ameliorate the impacts as described in this chapter are outlined hereunder. These are incorporated into the CEMP for the proposed development as provided in Appendix xx of this EIAR.
		Ecological Clerk of Works
12.6		An ECoW will be employed by the Contractor to oversee implementation of mitigation. This will include monitoring and auditing the works and contractor programmes and works method statements, to ensure mitigation is correctly implemented. The Contractor's ECoW will also ensure any disturbance licenses are arranged based on relevant details outlined in this EIAR and any significant findings of further confirmatory pre-construction surveys outlined above. The Contractor's ECoW will advise on mitigation measures implementation including the scheduling of works and will be included in regular liaison meetings between project teams to ensure that plans are co-ordinated and impacts are minimised. An independent Environmental Clerk of Works (EnCoW) will be

	Phase	Mitigation and Monitoring
		employed on behalf of the Employers Representative team, who will review and comment on the monitoring and compliance reports generated by the Contractor's ECoW.
12.7		Key sensitive habitats, where works areas are adjacent, including saltmarsh and tidal mud will be monitored by the site EcoW on a full-time basis to ensure impacts to these sensitive adjacent habitats are avoided. Prior to enabling and construction works the site EcoW will review and confirm proposed access routes, demarcate sensitive habitats and confirm works areas in these locations.
		Mitigation to Prevent Spread of Invasive Species
12.8		It is an offence under Regulation 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) to plant, disperse, allow, or cause to disperse, spread or otherwise cause to grow any plant species specified in the Third Schedule of the Regulations.
12.9		Japanese knotweed, three cornered leek, Spanish bluebell, and Himalayan balsam (all listed under the above legislation) have been recorded within the footprint of the proposed development.
		General
12.10		It is noted that Japanese Knotweed is being actively treated along most of the proposed work's area currently (2022). Prior to works commencing a full preconstruction confirmatory invasive species[1] survey will be carried out. The confirmatory survey will be carried out within the works areas, including compound locations, and along proposed access routes to identify the presence of all invasive species within and adjacent to works areas.
12.11		The invasive species confirmatory survey will be carried out during the appropriate growing season (May–October). The findings of this confirmatory survey will be incorporated into an updated Invasive Species Management Plan by the Contractor's ECoW.
12.12		Any stands of invasive species recorded within the proposed development boundary, including within compounds and along access tracks, will be clearly marked out as restricted areas. This exclusion zone will incorporate a buffer surrounding stands of Japanese knotweed such that below ground growth is accounted for (7m in diameter and 3m depth and inclusive of both treated and untreated material at a worst-case scenario). No works will be carried out within the exclusion zones unless approved by the Contractor's ECoW.
12.13		'Biosecure zone' signage will be erected at each potentially contaminated site. This is to alert staff that invasive species have been recorded and to avoid accidental entering or interfering with these sites. Likewise, any stockpiles of soil that are or could be contaminated with any of the aforementioned invasive species will be clearly marked. Marked haulage routes protected by root barrier membranes will be established within the proposed development footprint to allow transport to bunds.
12.14		Designated and clearly marked cleaning stations will be strategically placed within the work site for use by staff, vehicles, and machinery. Where it is necessary to work in contaminated areas, every effort will be made not to use vehicles with caterpillar tracks.
12.15		The Contractor's ECoW will carry out a toolbox talk for all construction personnel which will provide information on how to identify and manage invasive species. The toolbox talk will take place prior to works commencing in any areas where Invasive Species have been recorded.
12.16		All vehicles and equipment that have been used in these control operations will be steam-cleaned in a designated wash-down area each time they leave the contaminated area, and once work in that area has been completed. This also includes footwear, personal protective equipment (PPE), tools, and other light

Phase	Mitigation and Monitoring
	equipment. This is essential to remove soil that may contain plant fragments (vector material), which otherwise could be transported along the proposed development as works are being undertaken. Any water required for this will be brought to site in a bowser.
12.17	Vehicles leaving contaminated area(s) will either be confined to marked haulage routes protected by root barrier membranes or be steam cleaned as outlined above before leaving the area. Only vehicles that are deemed to be Biosecure (i.e. sealed so that no soil can escape) will be used to transport contaminated soil and all must be thoroughly steam cleaned in the designated wash-down area before exiting the designated area.
	Chemical Control
12.18	Three cornered leek, Spanish bluebell and Himalayan balsam can all be controlled effectively using herbicide application. Applications will take place in Spring . Follow up monitoring of treatment sites will be undertaken annually, to ensure that regrowth of new plants does not take place.
12.19	The stands of Japanese knotweed identified within the proposed development footprint have been subject to a chemical treatment regime. In order to control established stands of Japanese knotweed, repeated treatments over successive years is necessary . Treatment will be carried out annually by Irish Rail.
12.20	TII (2020) outline that a site may be considered remediated after two consecutive growing seasons with no sign of regrowth from all of the previously identified stands. It is of note, however, there is always the possibility of further regrowth occurring, this happens most commonly through the reactivation of dormant rhizomes due to disturbance of soils but may also occur through re-infestation of the site from off-site.
12.21	Treatment of established stands of knotweed will be continued in order to prevent the spread of existing stands within the proposed development footprint.
	Physical Control
12.22	Pulling and digging of Himalayan balsam plants (before seed is mature), three cornered leek, and Spanish bluebell has been found to be an effective methodology to control and remove stands. This treatment will only be carried out under supervision of the EcoW or by an appropriately experienced knotweed contractor. All waste material associated with these stands will be treated in accordance with legislative requirements on disposal.
12.23	Physical control methods (cutting, digging, excavating etc) of Japanese knotweed will be avoided wherever possible as interference with stands may result in a resurgence of growth in dormant stands, and increase potential for spread of vector material should biosecurity measures not be adhered to.
12.24	Where excavation of Japanese knotweed material is required, it may be subject to burial at a suitable location agreed with the site EcOW, as follows:
12.25	Stands of Japanese knotweed identified for removal will be treated with a non-persistent herbicide prior to excavation.
12.26	Material with potential to contain Japanese knotweed, or vector material, will only be excavated under strict supervision and placed within a vehicle for transportation.
12.27	Only vehicles that are deemed to be Biosecure (i.e. sealed so that no soil can escape) will be used to transport contaminated soil and all must be thoroughly steam cleaned in the designated wash-down area before exiting the contaminated area.
12.28	Burial of material may be undertaken as follows:
12.29	Where deep burial of a minimum depth of 5m is feasible, the waste will be covered with a proprietary root barrier membrane. Any joins in the membrane will be overlapped and secured. No material will be placed over the membrane until it has been inspected by the EcoW. A layer of pea gravel will be placed on top of the barrier membrane to reduce the potential for

Phase	Mitigation and Monitoring
	perforation of the barrier membrane. The waste will then be infilled with a minimum 5m depth of uncontaminated soil.
12.30	Where a burial of 5m is not feasible, the waste will be completely encapsulated in a proprietary root barrier membrane cell. The lower surface of membrane will be covered in a layer of pea gravel to reduce the potential for perforation of the barrier membrane. Any joins in the barrier membranes will be overlapped and suitably sealed. The upper surface of the cell will be covered in a layer of pea gravel and buried to a minimum depth of 2m. No material will be placed over the membrane (both internally and over the upper surface until it has been inspected by the EcoW.
12.31	Where burial is not feasible due to site constraints, the material may be transported off-site (under license). It is a requirement to dispose of this material in a fully licenced wasted facility, capable of accepting such contaminated material. This disposal requirement applies to all Japanese knotweed contaminated material including untreated and treated plant material.
	Monitoring
12.32	As outlined previously, a single herbicide treatment is unlikely to control an established stand of Japanese knotweed. Any re-growth of treated Japanese knotweed will be accurately mapped.
12.33	Monitoring will be conducted post treatment to determine the level of control success that the treatments of all species have achieved. All stands identified within the proposed development, and any areas where burial or storage has taken place will be monitored. This will continue at a minimum until such time that after two consecutive growing seasons there is no sign of regrowth from all the previously identified stands within the proposed development site.
12.34	Following control of large areas Japanese knotweed, a subsequent disturbance of the soil may give rise to revitalised rhizome growth. To avoid this, bare soil will be mulched (covered with a natural or synthetic barrier, such as wood chip, straw, geo-textile, or other appropriate material) and planted at the earliest opportunity with appropriate native replacement vegetation to stabilize the soil and deter subsequent re-invasion.
	Reinstatement
12.35	Unless otherwise agreed with the Employer's Representative, the Contractor will re-instate hedgerows, and treelines, to a species-rich condition (i.e. five woody species per 30 m), comprising only native species suited to the locality.
12.36	The Contractor will seed all grassland verges with a native wildflower mix (to specification of EC12 Wild Flora for Earth Banks, Bunds and Ditches [1].
12.37	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 ECoW. Plant species of native provenance will be used in all replanting of semi natural habitats.
12.38	The Contractor will commit to a five year after-care plan for hedging, grassland, and agricultural reinstatement, or as otherwise agreed with the local authority.
12.39	The Contractor's agronomist will inspect, photograph and report in writing to the Employer's Representative on the establishment-phase of all vegetation.
12.40	The Contractor's agronomist will review, and advise on any corrective measures required to ensure good condition, immediately after reinstatement, and at least twice yearly thereafter for a five year period.
	Mitigation Against Impact to Rare and Protected Plant Species
12.41	As outlined previously, historical records of little robin, round leaved crane's bill and wood small reed were identified during the desktop study. These species were not recorded during site walkovers and are considered unlikely to occur. However, given

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	their habitat associations, the following mitigation measures will be incorporated at a minimum:
12.42	Prior to works commencing a confirmatory survey for the species within suitable habitat, where direct impacts will arise, will be carried out by an experienced botanist during the appropriate flowering season.
12.43	The botanist, to be appointed by the Contractor, will coordinate with the Contractors ECoW and, report findings to the ENCoW within the Client's Representative Team. The botanist will be contracted for a period lasting at least one year following the cessation of potentially damaging construction works at the plant location(s).
12.44	In the event where one or more plants are identified at risk of impact, an assessment of risk of impact will be carried out by the appointed botanist, in consultation with NPWS where relevant. The assessment will be specific to the species which identify any additional measures required to protect the species by either avoiding and protecting the plant species in situ, or (only as a last resort) through the translocation of the plant species to new receptor locations nearby, under licence from the NPWS where appropriate. Any additional measures as outlined under the terms of the license will also be included.
	Mitigation Against Impact to Breeding Birds
12.45	Woody vegetation clearance will take place outside the main bird breeding season (March – August inclusive). Where tree clearance is proposed during the bird breeding season an experienced ecologist will conduct a pre-construction confirmatory survey to confirm no bird breeding sites will be disturbed. This will be monitored by the site EcOW.
12.46	Habitat reinstatement (Section 12.7.3) will ensure replanting of suitable woody vegetation breeding habitat for birds post works.
	Mitigation Against Impact to Amphibians
12.47	A pre-construction confirmatory survey for frog will be undertaken prior to works commencing during the breeding season (February and March) at potential suitable breeding habitat (ditches, drains, and standing water impacted).
12.48	When surveying for the species biosecurity measures will be followed to ensure that there is no incidental spread of vector borne diseases between waterbodies. This includes the cleaning, disinfection and drying of all equipment and will have regard to guidelines from IFI .
12.49	Should frog be recorded, translocation of the species to areas outside of the proposed development footprint will be undertaken, in consultation with the NPWS. Any translocation of these species will be under license by the NPWS.
12.50	Any spawn or adult frogs recorded will be captured and removed from affected habitat by hand net and translocated to the nearest area of available suitable habitat.
	Mitigation for the Protection of Otter
12.51	The Contractor will ensure an initial confirmatory otter survey is undertaken in advance of the commencement of any works within 150m of the works areas as per Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes. This will allow for the identification of any additional holts which have been established prior to commencement of works and the confirmation of the activity status of the identified holt.
12.52	The confirmatory pre-construction survey will be conducted no more than 10-12 months prior to construction commencing.
12.53	The existing holt is located approximately 115m from the existing track. This is within the ZoI of noise effects associated with the proposed development. Should the holt be confirmed to be active during preconstruction confirmatory surveys, prior to works commencing between Ch 800 and Ch 925 sound reducing hoarding will be placed adjacent to works areas on the southern

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	boundary of the site. This will reduce further the noise impacts associated with the construction phase of the works.
12.54	In addition, all plant used during the construction phase will be the quietest of its type practical for achieving the works.
12.55	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.
12.56	At a minimum the following will be incorporated to reduce the impact further:
12.57	The use of mufflers on pneumatic tools.
12.58	Effective exhaust silencers.
12.59	Machines in intermittent use will be shut down during periods where they are not required.
12.60	Should any additional holts be identified within 150m of the proposed development the following will, at a minimum, be employed, unless otherwise agreed with the NPWS:
12.61	No works will be undertaken within 150m of holts where breeding females or cubs are present. Presence of breeding females will be assumed until confirmed otherwise.
12.62	Works within 150m of such a holt can only take place following consultation and in agreement with the NPWS
12.63	No wheeled or tracked vehicles of any kind will be used within 20m of active but non breeding holts
12.64	No light work such as digging by hand or scrub will take place within 15m of such holts except under license from NPWS
12.65	The identified exclusion zones will be fenced and clearly marked on site prior to any invasive works.
12.66	All contractors on site will be made fully aware or the procedures in relation to the holts by the EcoW
	Mitigation for the Protection of Badger
12.67	Prior to any works commencing a preconstruction confirmatory badger survey will be carried out. Surveys will be conducted having regard to Surveying Badgers (Harris et al.1989) and record signs of badgers including tracks, hair, latrines and setts. The extent of the confirmatory survey area will be defined with regard to Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (NRA, 2006) as 150m beyond all works areas within suitable habitat.
12.68	Prior to works commencing, sett activity at all identified setts (including sett identified as inactive during initial walkovers) within 150m will be confirmed. This may be confirmed through the use of camera monitoring, setting of footprint traps, soft blocking of the sett entrance or similar. Any risk of disturbance to badger will be subject to disturbance license requirements.
12.69	A description of the setts i.e. main sett, annex sett, or outlier sett will be provided by the EcoW along with the level of activity at the sett. This will allow for an understanding of the importance of the setts in the wider context of the local population.
12.70	As per the Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (NRA, 2006), where setts have been confirmed, no heavy machinery will be used within 30m of badger setts (unless carried out under licence from the NPWS). Lighter machinery (generally wheeled vehicles) will not be used within 20m of a sett entrance; light work, such as digging by hand or scrub clearance will not take place within 10m of sett entrances.
12.71	Unless otherwise agreed, and under license from the NPWS, during the breeding season (December to June inclusive), none of the above works will be undertaken within 50m of active setts nor blasting or pile driving within 150m of active setts. An assumption that the sett is active will apply unless proven otherwise during the course of investigation.
12.72	The three setts already identified are located in close proximity to the proposed works areas, with two requiring removals, and

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	the third potentially directly impacted by works depending on the direction of underground chambers.
12.73	Sett Evacuation and Destruction
12.74	Any exclusion and/or destruction of setts will be undertaken in consultation with, and under license by the NPWS.
12.75	Prior to works commencing all three of the setts, and any additional setts identified during pre-construction confirmatory surveys will be clearly marked and the extent of bounds of exclusion zones clearly marked by fencing and signage. The location and restrictions surrounding these setts will be clearly communicated to personnel on site.
12.76	No exclusion or destruction procedures will take place during the badger breeding season due to risk of young being trapped within the sett.
	Inactive Setts
12.77	All entrances will be lightly blocked with vegetation and soil. The sett will be left undisturbed for approximately five says. If all entrances remain undisturbed for the time period the sett will be destroyed immediately using a mechanical digger, under the supervision of the licensee.
12.78	Should there be a delay all entrances will be hard blocked. Immediately prior to destruction the licensee will inspect the sett to ensure there are no signs of activity. The sett may then be destroyed as outlined above.
	Active Sett
12.79	Sett exclusions of active setts will include setts within the footprint of the works, but also setts where the proximity of the feature is such that there is potential for impact to outer chambers.
12.80	All entrances will have one-way gates installed to allow badgers to exit but not to return. The gates will be tied open for three days prior to the exclusion procedure taking place. During the exclusion procedure, gates will be left installed, with regular inspections, over a period of a minimum of 21 days before the sett is deemed to be inactive.
12.81	Inspections will include areas between sett entrances to identify any areas where badgers may have attempted to dig around the gates, or created new entrances and tunnels into the sett. Provided the gates are effective, and no activity is observed for 21 days, the sett may be considered inactive.
12.82	In the case of setts identified within the footprint of the works, destruction of the sett will be required. Once the sett is considered inactive destruction may take place.
	Sett Destruction
12.83	Destruction of setts will be avoided wherever possible.
12.84	Destruction of inactive and evacuated setts may only be conducted under license from NPWS and supervision of qualified and experienced personnel. Preparation must be made, and equipment on hand, to deal with any badgers which may be trapped within the sett, or injured during destruction.
12.85	Destruction may be undertaken with a tracked digger, over the time period of no more than one day. The digger will commence at approximately 25m from the outer sett entrances and work towards the centre of the sett cutting small 0.5m sections in a trench to a depth of 2m. Any tunnels which are exposed may be checked for recent badger activity. The sett will be destroyed from several directions until only the centre core remains. Once it is ensured that no badgers are present, the core may be removed and the area backfilled and made safe.
	Artificial Setts
12.86	As the two setts identified for destruction are noted as being outliers, there are alternative natural setts present in the wider area to accommodate any displaced badgers. Should setts be identified for destruction where no suitable natural setts are

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	present, i.e. a breeding sett, an artificial sett will be constructed to replace the sett.
12.87	Any artificial sett will be constructed months in advance of the closure of the breeding sett. Closure and destruction of the existing sett will not take place until it is ensured that the affected badgers are utilising the artificial sett.
12.88	The sett will be constructed as close as possible to the existing sett, outside of the development footprint at a location that avoids significant residual impacts to habitats of ecological value.
12.89	The artificial sett will be located in well drained soils, landscaped, and planted, such that the sett is well covered to ensure lack of disturbance.
	Mitigation for the Protection of Bats
12.90	The Design and Construction of bat mitigation measures will be site specific, and comply with licensing requirements, having regard for relevant guidance including the NRA's "Guidelines for the Treatment of Bats During the Construction of National Road Schemes"[2], and the NPWS Bat Mitigation Guidelines for Ireland[3].
12.91	The following measures will, at a minimum, be undertaken:
12.92	Trees with suitability for roosting bats will not be felled in advance of surveying for bats, unless in agreement with the ECoW, and NPWS as relevant. This includes trees identified during baseline walkover surveys, and any additional trees with roosting features that may develop prior to works commencing.
12.93	Prior to felling of any trees, an initial bat survey of trees to be felled will be undertaken, by a licensed qualified specialist, to assess the suitability of the tree to contain bat roosts as per Bat Surveys for Professional Ecologists: Good Practice Guidelines.
12.94	Trees identified with potential roost features will be thoroughly examined, under licence from the NPWS, to ascertain the presence or absence of roosting bats. This will be conducted by an experienced bat expert. The trees will be examined for the presence or absence of bats / bat roosts immediately prior to felling. NPWS (2022) guidance notes that emergence/re-entry surveys of trees are limited in terms of effectiveness. As such, inspections via endoscope will be carried out, including of features at height.
12.95	Where felling does not occur within one day of the examination, the trees will be re-assessed.
12.96	Where evidence of a roost, or roosting bats has been determined, a license for destruction of a roost and/or exclusion of bats will be required from the NPWS. The procedures for the exclusion of bats and destruction of roost as detailed in the license document will be obeyed, at all times, by the Contractor.
12.97	Where bat exclusions are required, they will be undertaken in accordance with the requirements of the bat specialist, and any conditions under license. They will not be carried out during the breeding season, between the months of June to August inclusive, or during hibernation in the months of November to March inclusive, unless under license from the NPWS. Where the felling of trees found to be suitable as bat roosts cannot be avoided, appropriate mitigation will be agreed with the NPWS and put in place at least one month in advance of any felling or disturbance.
12.98	If any bat roost sites are removed by the Works, appropriate replacement bat roost sites will be provided following consultation with the NPWS, and in consultation with the local authority.
12.99	The Design and Construction of bat mitigation measures will be site specific, and comply with the requirements of the bat specialist, the Standards, the TII's "Guidelines for the Treatment of Bats During the Construction of National Road Schemes", the National Parks and Wildlife Services Bat Mitigation Guidelines for Ireland, the National Parks and Wildlife Service Circular 2/07 Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997.

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	Mitigation for the Protection of Wintering Birds
12.100	Prior to the commencement of the works, a sound reducing hoarding will be placed along works area from Ch 600 to 800. Sound hoarding will reduce the noise impacts associated with the construction phase of the works. It will also reduce visibility of workers.
12.101	The barrier material will have a mass per unit area exceeding 7kg/m2 in accordance with the recommendations of BS 5228 Part 1:2009+A1:2014 Part B.4.
12.102	Any temporary lighting used to facilitate the works will be cowled and angled away from the SPA and watercourses.
12.103	The EnCoW will undertake daily monitoring of the barrier to ensure installed correctly, and identify any defects for the contractor to remedy.
12.104	All plant will be operated and maintained in accordance with the manufacturer's recommendations including the use and maintenance of the specific noise reduction measures in the next bullet.
12.105	The following may be incorporated to reduce the impact further:
12.106	The use of mufflers on pneumatic tools
12.107	Effective exhaust silencers
12.108	Sound reducing enclosures
12.109	Machines in intermittent use will be shut down during periods where they are not required.
	Mitigation for the Protection of Breeding Birds
12.110	Retention and compensation for areas of habitat which may be used by Breeding Birds (i.e. scrub, hedgerows, and grassland habitats is outlined previously in Section xx.
12.111	As outlined in the description of the development the clearance of all vegetation (except for improved grassland, recognising bare ground, or other vegetation with no nesting potential as determined by the ECoW), will take place outside of the breeding season for birds where possible or as determined by risk of disturbance to a nest site.
12.112	Should clearance within the breeding season be required, a suitably qualified ecologist / EcOW will conduct pre-construction confirmatory surveys to assess risk of disturbance to nesting birds to inform vegetation clearance activity. In the event where pre-construction surveys confirm or presume nesting birds are present, an exclusion zone will be established around the nesting bird (to include the risk of abandonment due to indirect disturbance), and no vegetation clearance may proceed until young are presumed to have fledged, or nesting has failed. Repeat surveys will be required if vegetation has not been cleared within 72hours of the initial survey. This will prevent direct impact to nesting birds within the footprint of the works.
12.113	Pre-construction confirmatory surveys will be carried out for kingfisher and other riparian breeding bird species. These will incorporate a survey area of approximately 100m upstream and downstream of the works at all river crossings.
12.114	Features likely to be of note to kingfisher and other breeding riparian bird species will be recorded and watches of suitable nest areas undertaken. If actual nest sites (i.e. confirmed or presumed) are present at or within close proximity to works areas at water crossings, the NPWS will be consulted regarding the potential requirement to stop works. The loss of any potentially suitable nesting sites will be compensated through the addition of artificial nesting sites or suitable nest features within the reinstated riverbank. The provision of any new nesting sites (if required) for kingfisher or other riparian bird species will be undertaken in line with NPWS and IFI consultation.
	Mitigation for the Protection of Watercourses

	Phase	Mitigation and Monitoring
12.115		Mitigation for the protection of water quality in watercourses has been outlined previously in Chapter 11. Additional mitigation for the protection of aquatic species is outlined hereunder.
		General
12.116		Works will be carried out in accordance with the guidelines set out by IFI in 'Guidelines on Protecting Fisheries During Construction Works in and Adjacent to Waters' (IFI, 2016).
12.117		The IFI biosecurity protocol for works will be complied with for all instream works.
12.118		The open season (July-September) restriction for instream works will apply for all instream works.
12.119		Works method statements will be agreed with IFI for all instream works at watercourse crossings prior to works commencing. These method statements will be site and river specific.
12.120		The works method statement will include details on the works to take place, along with clear instructions relating to placement and monitoring of aquatic mitigation measures.
12.121		Works will not continue during adverse weather events, including during Met Eireann (Red, Orange, Yellow) warnings, and periods of high flow. High temperature will also be considered during instream works as this has the potential to cause increased stress on aquatic species.
		Instream Works
21.123		Instream works will be required to facilitate certain works. In the case of the Owenacurra River, the instream works will be restricted to the installation of scaffolding to support the addition of capping breams to the existing piers .
12.124		All instream works, including silt control measures, biosecurity measures, and fish salvage operations will be monitored by an appropriately experienced ECoW.
12.125		These instream works will be carried out between July and September, which is outside of the salmonid spawning season.
12.126		Instream works will take place within an isolated works area. Any isolated area will be kept to the minimum size required to facilitate the works. Works will take place span by span to ensure that there is no loss of flow during the works.
12.127		The riverbed will be isolated using either an aquadam, or sandbags, dependant on the water levels present when the works take place. Any sandbags used will be filled with clean, sediment free material to ensure that there is no downstream mobilisation of silt.
12.128		Prior to drying out of the works area, de-fishing will be undertaken under license. This will include for the translocation of fish out of the works footprint, should they be found within the isolated works area. The base of the realigned concrete channel will be lined with a layer of closely packed natural rock slabs. The rock slabs will be of approximate dimension 600mm(l) x 600mm(w) x 200mm(d).
12.129		Any pump used to dewater the works area will be fitted with a screen to prevent aquatic species from being sucked into the pump.
12.130		No dewatering will take place directly into the river itself. Any water pumped out of the works area will be treated to prevent downstream mobilisation of pollutants and sediment. Water will be discharged back to the river in such a way that scour is prevented.
		Operational Phase Mitigation
	Operational	**Mitigation for the Protection of Bats**
12.131		For the operational phase it is confirmed here that unless incompatible with asset security / operational requirements the detailed design of outdoor lighting will incorporate in full design recommendations from Bat Conservation Trust as follows:
12.132		LED lights only will be used where practicable, and no Ultra Violet (UV) elements will be incorporated;
12.133		Lighting with peak wavelengths of 550nm; and
12.134		Lighting to avoid blue colour, and ideally to be warm white (<2700 Kelvin)

	Phase	Mitigation and Monitoring
12.135		The lighting proposals will be reviewed at detailed design stage with the input of an experienced bat ecologist to ensure lighting levels are minimised for the site and excessive light spill to vegetated features is avoided.
12.136		Any removal of trees with potential bat roost features will be subject to mitigation as outlined in section 12.8.1.7.
		Mitigation for the Protection of Mammals
12.137		Prior to maintenance works relating to the clearance of vegetation, follow up confirmatory surveys will be undertaken to ascertain the status of the badger setts, and any otter breeding and resting places within the ZoI of the clearance works.
12.138		Should badger setts, or otter holts and couches be confirmed, mitigation as outlined in section 12.8.1.7 will be employed.
12.139		Mitigation for the Protection of Breeding birds
12.140		Woody vegetation clearance required as part of maintenance operations will take place outside the main bird breeding season (March – August inclusive). Where tree clearance is proposed during the bird breeding season an experienced ecologist will conduct a pre-construction confirmatory survey to confirm no bird breeding sites will be disturbed. This will be monitored by an EcOW.
Chapter 14 Archaeology, Architectural & Cultural Heritage		
14.1	**Construction Phase**	The mitigation strategies outlined in this section detail the techniques to be adopted in order to ameliorate the impacts that the proposed development may have on features of archaeological, architectural and / or cultural heritage within the study area during both the construction and operation phases of the scheme. The residual impacts that will remain once these mitigation measures have been implemented are set out in Section 14.1.8.
14.2		The following proposed mitigation measures are subject to approval by An Bord Pleanála and the National Monuments Service of DHLGH:
14.3		All sub-surface groundworks associated with the proposed development works at the Glounthaune Estuary AAP (Johnstown/Killahora; CH030) shall be subject to a programme of archaeological monitoring:
14.4		This should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.
14.5		If significant archaeological material is encountered during the course of archaeological monitoring, then resolution of any such significant material will be determined in consultation with the National Monuments Service (DHLGH).
14.6		Where possible, every reasonable effort should be made to preserve in situ or reduce the impact on any identified archaeological material. Where preservation in situ cannot be achieved, either in whole or in part, then a programme of full archaeological excavation should be implemented to ensure the preservation by record of the portion of the site that will be directly impacted upon. This work should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.
14.7		A written report will be prepared detailing the results of all archaeological work undertaken.
14.8		It is recommended that architectural heritage structures along the railway line are monitored for signs of stress/cracking during the construction phase. Recommendations for a 5-year maintenance inspections on architectural heritage structures have also been identified in Chapter 14 Appendix 14.2
14.9		In relation to the dismantling of OBY 8, Ballyadam House Bridge conservation by record will be carried out, including lazer-scanning; careful dismantling and storage for repair of similar structures; and consideration of off-setting the effect by restoring Carrigtwohill Station building to compensate for loss of fabric at agricultural overpass.

	Phase	Mitigation and Monitoring
14.1		When construction works are being carried out to widen the bridge deck of the Owenacurra river bridge (UBY 11), the historic buttresses that carry the bridge need to be protected during the works and assessed to ensure they can carry the structure without damaging them, during the operational phase.
14.11		Piling for a retaining wall to realign culvert UBY 2 in close proximity to Haly's Bridge (OBY2) should use CFA piles and the bridge should be monitored frequently by conservation engineer to assess it for signs of stress. It is considered to be a neutral, manageable effect of brief duration.
14.12		The extension of UBY 2 by 2m north and south will also necessitate the demolition and re-building of the NE wing-wall of Haly's Bridge (OBY 2), listed on the NIAH. The proposal to record, demolish and re-build using lime mortar and the original stone is considered to be a slight, localised and brief effect.
14.13		The proposed construction compounds at Glounthaune, Killacloyne, Ballyadam Knockgriffen and Townparks are not considered to have an effect from an architectural/ built heritage perspective and they are not in close proximity to any designated or undesignated architectural heritage structures and therefore no mitigation is required.
14.14		**Haly's Bridge (OBY 2) piling in close proximity:** Piling for retaining wall to realign culvert should use CFA piles and OBY 2 monitored frequently by conservation engineer to monitor signs of stress
14.15		**Haly's Bridge (OBY 2)** demolition & rebuilding of c. 1m² section of NE wing wall to allow for extension of culvert UBY 2: Obtain permission from Cork County Council; Photographic survey of NE wing wall to record arrangement of courses, pinning stones/ snecks etc. Inspection and photographic record by heritage consultant during demolition, to agree specification for re-building post culvert extension. Inspection of sample panel of re-building 0.5m² prior to complete re-building in original location and using original stone to match other wing-wall. Ensure soft joint between OBY2 and UBY2
14.16		**Ballyadam House Bridge/ OBY 8 Agricultural Overpass:** Conservation by record, including lazer-scanning; careful dismantling and storage for repair of similar structures; consideration of off-setting the effect by restoring Carrigtwohill Station building to compensate for loss of fabric at agricultural overpass
14.17		**River Bridge (Knockgriffen) buttresses (UBY 11) new bridge structure on historic buttresses:** Protect the historic buttresses that carry the bridge during the works and assess to ensure they can carry the structure without damaging them, during the operational phase.
Chapter 15 Road and Traffic		
15.1	**Construction Phase**	The temporary effects of construction (none of which have been assessed as 'significant') or otherwise) will be mitigated through adoption of a regulated and approved CTMP.
15.2		The assessment of post-mitigation effects has been undertaken on the assumption that key measures set out in the CTMP will be developed as appropriate by the appointed contractor and be implemented during the proposed development construction phase.
15.3		The appointed contractor will agree temporary traffic management measures then adopt and monitor an appropriate way of working in consultation with Cork County Council, the appointed contractor, TII and/or their Agents and An Garda Síochána as appropriate. Construction activity generated vehicles (with the exception of site personnel in cars and vans) will travel on pre-defined routes to and from the relevant sites to reduce effects on existing local traffic.
15.4		The CTMP has been developed for the purposes of this assessment and will be further developed as necessary in consultation with Cork County Council and the Gardai prior to construction commencing. The CTMP will document measures to promote the efficient transportation of components and materials to site, whilst reducing congestion and disruption which might impact negatively on local communities or general traffic and in

	Phase	Mitigation and Monitoring
		particular the emergency services. The CTMP will be considered a 'live' document and will be developed accordingly, within the parameters assessed in this EIAR.
15.5	**Construction Phase**	Signed diversion routes will be provided to mitigate journey disruption. Where practically achievable, diversion routes will not apply outside of the worksite hours of operation.
15.6		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.
15.7		To minimise inconvenience to the local community in terms of obstructive parking, adequate car parking for permanent site personnel, visitors and deliveries would be provided within the four worksite compounds. Adequate vehicle parking space will be provided on-site and car parking will not be permitted on any public road network adjacent to the site, so that sight lines will be maintained and to minimise potential for obstruction and delay for other road users.
15.8		Furthermore, only vehicles essentially required to facilitate construction will be allowed to attend worksites. Car sharing will be promoted to construction personnel by the contractor during the induction process.
15.9		In order to reduce the potential for mud and other debris being deposited onto the local road network in the vicinity of worksite accesses, the appointed contractor will ensure that all concrete truck wash watering / cleaning is undertaken onsite where practical and remote from watercourses, in accordance with Chapter 12 (Biodiversity). This will minimise the amount of deleterious material deposited on the road surface and the appointed contractor will ensure that the nearest public road (between the worksite and the N25) will be kept clear of debris by monitoring and then utilising a road sweeper where necessary
15.1		The appointed contractor could employ a number of sub-contractors and all will fall under the umbrella of the CTMP and will have an obligation to adhere to the Plan; this obligation will form part of the procurement process and will be written into any contract of employment.
15.11		Compliance will be monitored by the Project Manager, on behalf of the appointed contractor, via spot checks to ensure that vehicles follow the measures set out in the CTMP and recording of any complaints. The appointed contractor will be required to stipulate that all contractors disseminate these rules to their sub-contractors.
15.12		In liaison with Iarnród Éireann the appointed contractors will be required to maintain close liaison with local community representatives, landowners and statutory consultees throughout the construction period. This will include circulation of information about ongoing activities; particularly those that could potentially cause disturbance, including due to traffic.
15.13		The appointed contractor will nominate a person to be responsible for the co-ordination of all elements of Traffic and Transport during the construction process (Liaison Officer). This person will liaise with the local community so that the community has a direct point of contact within the developer organisation who they could contact for information purposes or to discuss matters pertaining to traffic management or site operation.
15.14		If the construction phase of any notably sized development(s) appears likely to overlap with the proposed development, the appointed contractor will seek to liaise with the appropriate developer organisation regarding the scheduling of deliveries to identify potential means of reducing the effects of combined construction.
		Construction Access Arrangements
15.15		Transportation, including deliveries to and from the construction areas will be taken from the existing public road network and in some cases the rail network (it is planned that sleepers and rails will be brought to site using rail haulage).

	Phase	Mitigation and Monitoring
15.16		The local area road network is shown on Chapter 15 Roads and Figure 15-1 Given the nature of construction of the railway, there will be multiple work sites along the route throughout the construction programme.
15.17		The construction methodology, including construction access arrangements are provided within Chapter 6. The proposed programme of worksite locations will be confirmed by the appointed contractor as an integral part of their adopted CTMP provided in Appendix 6.1. All construction vehicle drivers will be instructed to access their destination worksite via an approved route; this is to be determined by the approved contractor in conjunction with the administering local authority.
15.18	**Operational**	The operational phase assessment (in Section 15.5.2 Chapter 15 Roads and Traffi) ascertained that there are no significant changes to traffic flows arising directly from operation of the proposed development. Traffic and Transport impacts can, as a result, be stated as 'Minor (not significant)' or 'None (not significant)'.
15.19		Although not assessed to result in a significant impact, there is some potential that train timings could be co-ordinated and signalling adjusted to reduce closure periods of the level crossing barriers. Iarnród Éireann will investigate the potential to reduce the closure periods of the Mill Road (Midleton) level crossing barriers through optimising train times and through rationalisation of the train signalling system.
15.2		Vehicle queueing activity at the Mill Road (Midleton) level crossing could potentially be reduced through the optimisation of traffic signal timing and phasing at the existing signalised junctions to both the north and south of the level crossing location. Although not assessed to be significant in terms of Community Effects, the likelihood of pedestrians being held at a closed barrier at the Mill Road (Midleton) level crossing will certainly increase.
15.21		Sheltered waiting space for pedestrians on both sides of the level crossing would enhance the user experience in this locality and accordingly, Iarnród Éireann and Cork County Council may investigate the practicality of options to implement such infrastructure improvements.
Chapter 16 Noise & Vibration		
16.1	**Construction**	A CEMP including noise and vibration mitigation will be implemented during the construction phase in consultation with Cork County Council.
16.2		The contractor is obliged to comply with Local Authority controls on noise and vibration during construction. This will include (but is not limited to) the setting of limits for the control of noise and vibration from construction activities, the provision of mitigation measures required whilst adopting best practicable means, and any noise or vibration monitoring where significant adverse effects are required to be monitored. A comprehensive noise and vibration monitoring protocol will also be implemented.
16.3		As part of the CEMP, the Contractor will also develop and implement a stakeholder communications plan which will facilitate community engagement prior to the commencement of construction.
		Mitigation applicable to HGV deliveries
16.4		The number of vehicle movements and levels of noise are expected to be relatively low but have the potential to cause disturbance as being unusual, noise-emitting activity in a quiet, rural area. Measures will be implemented to control vehicle movements:
16.5		To avoid the need to perform reverse manoeuvres and therefore use of audible reverse alarms. However, in the interest of safety, the use of adjustable or directional audible vehicle-reversing alarms or use of alternative warning systems, e.g. white noise alarms rather than tonal alarms will be adopted.
16.6		To avoid the need to queue or wait to gain access to the site
16.7		To ensure vehicle engines are switched off when not in use

	Phase	Mitigation and Monitoring
16.8	**Construction**	To ensure unloading activities are undertaken during the daytime
16.9		Further to the mitigation measures set out within the CEMP, the Contractor will:
16.10		Manage the timing of activities so that noise-emitting works are conducted in the daytime only
16.11		Where it is required that noise-emitting activities are undertaken in the evening or at night, provide prior notification to the occupiers of nearby dwellings
		Mitigation applicable to construction works
16.12		Typical means by which noise and vibration may be minimised include the following:
16.13		Selecting quiet equipment;
16.14		Ensuring equipment is maintained, in good working order, and is used in accordance with the manufacturer's instructions
16.15		Members of the construction team should be trained and advised during toolbox briefings on quiet working methods
16.16		Equipment shall not be left running unnecessarily
16.17		Equipment shall be fitted with silencers or mufflers where possible
16.18		Use plant enclosures whenever feasible
16.19		Materials shall be lowered instead of dropped from height
16.20		Manage deliveries to prevent queuing of site traffic at access points
13.21		Use of adjustable or directional audible vehicle-reversing alarms and/or alternative warning systems (i.e. white noise alarms)
13.22		Utilising low vibration working methods
16.23		Provision of noise insulation measures and/or temporary rehousing of residents during periods of particularly intense noise construction work. Night works should be avoided where possible at predominantly residential areas to reduce the adverse noise impacts at receptors. Conversely, construction works should be avoided during daytime or school term at NSL 5 to prevent disruption at the Carrigtwohill Community College.
16.24		Good public relations are invaluable in securing public acceptance of construction noise. People are more tolerant of noise if they understand the reason behind it, the likely duration, start and completion dates, and mitigation measures used to minimise noise levels. Letter box drops explaining these shall be considered. A dedicated site contact will be nominated to liaise with residents and establish good rapport. A complaint handling procedure shall also be put in place.
		Mitigation applicable to site compound works
		Typical means by which noise impacts may be minimised include the following:
16.25		Selecting quiet equipment
16.26		Ensure equipment is maintained, in good working order, and is used in accordance with the manufacturer's instructions.
16.27		Trains will be at the opposite end of the site compounds when idling during material deliveries to ensure greater distances to the NSLs.
16.28		The provision of noise barriers or site hoarding is needed at site compounds 1, 3, 4 and 5 due to their close proximity to residential receptors. In accordance with BS 5228, as an approximation, a noise barrier that can partially block the line of sight between the noise source and receiver could achieve 5 dB attenuation. Where line of sight is completely broken a reduction of 10 dB may be achieved. Such screening will reduce the adverse noise impacts on the affected NSLs.

	Phase	Mitigation and Monitoring
	Operation	**Mitigation applicable to the operational railway**
16.29		The main component of the railway noise and vibration is generated by the interaction of wheel and rail. Reduction of the roughness at wheel and rail will minimise the potential for noise at source. This is recommended as track maintenance to be undertaken by rail operator.
16.30		Noise barriers are recommended for the areas predicted to exceed adverse effect levels for operational noise, in this case NSR2. However, the use of noise barriers would be subjected to some safety and practical concerns:
16.31		Obscure line of sight for the train driver if noise barriers located on bends in the track; and
16.32		The practicality of the barrier location with consideration of emergency trackside evacuation, maintenance and integration with other trackside infrastructure, such as signalling and drainage.
16.33		Receptor NSR2 would benefit from an enhancement to the current noise barrier in terms of length and height if this is feasible. Suitable mitigation will be agreed between Iarnrod Eireann/Community liaison officer and the landowner.
Chapter 17 Material Assets		
	Construction	**Utilities**
17.1		All reasonable measures will be taken to avoid unplanned disruptions to any services during the proposed works.
		Structures to be modified
17.2		Mitigation during the construction phase for the alteration to the culverts and the Owenacurra Rive Bridge is detailed in Chapters 10, 11 and 12 of the EIAR.
		Waste Management
17.3		A Construction Waste Management Plan (as part of this CEMP) is appended. The plan provides for the segregation of all construction wastes to facilitate optimum levels of re-use, recovery, and recycling operations.
17.4		All operations will be managed and programmed in such a manner as to prevent / minimise waste production and maximise upper tier waste management (i.e. re-use, recycle, and recovery) in line with the Waste Hierarchy where technically and economically feasible.
17.5		Waste arisings will be handled, stored, managed and re-used or recycled as close as practicable to the point of origin.
17.6		Wastes sent off site for recovery or disposal will only be conveyed by an authorised waste contractor and transported from the proposed development site to an authorised site of recovery / disposal in accordance with the Waste Management Act 1996 and associated amendments and regulations and in a manner which will not adversely affect the environment. All employees will be made aware of their obligations under the CEMP.
17.7		The CEMP will be available for inspection at all reasonable times for examination by the Local Authority.
		Waste Management
17.8	**Operational**	All waste generated during the operational phase will be managed in accordance with the relevant provisions of the Waste Management Act 1996 and associated amendments and regulations, particularly with regard to the use of appropriately permitted waste contractors and appropriately authorised destinations for waste materials.