



# Maynooth Eastern Ring Road

Part VIII Planning Report | May 2019



# Maynooth Eastern Ring Road

## Part VIII Planning Application Report

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## **EXECUTIVE SUMMARY**

The Maynooth Eastern Ring Road development will comprise the provision of a new single carriageway relief road to the east of Maynooth town, to facilitate the connection of the R405 Celbridge Road and the R148 Leixlip Road. The proposed new road will include a 41m long single span bridge crossing of the Royal Canal and the Dublin to Sligo railway line. At the northern extent of the development it will connect to the existing junction of the R148 Leixlip Road and the R157 Dunboyne Road. At the southern end of the development it will connect to the existing junction of the R405 Celbridge Road and the Griffin Rath Road. Pedestrian and cyclist facilities will be provided on each side of the new relief road, in both north and south directions, and an access to the Royal Canal towpath will be provided from the northern end of the proposed road for pedestrians and cyclists. The relief road will be approx. 1.55 km long, while approximately 800m of existing roads will be upgraded to accommodate the proposed adjustments to the existing junctions. Access to lands, both agricultural and those zoned as 'New Residential' will be provided to enable future development.

This Part VIII Planning Report has been prepared to provide a description of the nature and extent of the proposed development, and to assess and consider any potential environmental effects that may arise as a result the Maynooth Eastern Ring Road, referred to hereafter as the 'proposed development'. An environmental assessment has been undertaken across a range of environmental topics including: population and human health; biodiversity; soils, geology and hydrogeology; hydrology; landscape and visual; noise and vibration; air quality and climate; cultural heritage; and material assets and land. A summary of the likely environmental effects and recommended mitigation measures are detailed at the end of each environmental topic addressed in Section 4 of this report. The construction stage Contractor will be required to demonstrate how they address the likely environmental effects and will be required to include suitable mitigation measures to be detailed as part of a Construction Environmental Management Plan and Traffic Management Plan which will be agreed with Kildare County Council prior to the works commencing. This environmental assessment found that there will be no likely significant adverse environmental effects as a result of the proposed development.

## 1. INTRODUCTION

Roughan & O'Donovan Consulting Engineers (ROD) were commissioned by Kildare County Council (KCC) to lead the development of the Maynooth Eastern Ring Road and to undertake all required engineering, environmental, health & safety and quantity surveying services in order to deliver the project for Kildare County Council. As part of this, ROD has prepared this Part VIII Planning Report to support the Part VIII Planning Application for the Maynooth Eastern Ring Road (MERR) described in Section 3 below.

The planning for the proposed development is undertaken in accordance with the legislative requirement under Section 179 of the Planning & Development Act, 2000, as amended and the Planning and Development Regulations 2001, as amended. Part VIII procedure is required for specific developments by, on behalf of, or in partnership with local authorities.

The purpose of this Part VIII Planning Application Report is to report on the identified environmental effects from the proposed development that are likely to occur during the construction and operational phases and ensure mitigation measures, as appropriate will be put in place during both construction and operation.

A separate Appropriate Assessment (AA) Screening Report has been prepared for the proposed development, which concluded that the proposed development either individually or in combination with other plans or projects, will not give rise to any likely significant effects on the Qualifying Interests of the Rye Water Valley/Carton SAC and its Conservation Objectives in view of best scientific knowledge.

A separate Environmental Impact Assessment (EIA) Screening Report has also been prepared which concluded that the proposed development does not trigger the threshold for mandatory EIA/EIAR as set out in the Roads Act, 1993 (as amended) and/or in the Road Regulations of 1994. Having been considered and assessed using the appropriate criteria, it can be concluded that it is not likely to have any significant effects on the environment and therefore does not require an EIAR to be prepared or an EIA to be conducted.

### 1.1 Development Overview

The Maynooth Eastern Ring Road referred hereafter as the 'proposed development' will consist of approximately 1.55 km of new single carriageway in the townlands of Maynooth, Railpark and Moneycooly to the east of Maynooth town, including a crossing of the Dublin to Sligo rail line and the Royal Canal.

The proposed development will tie in to the R148 Leixlip Road and the R157 Dunboyne Road at the northern extent and the R405 Celbridge Road at the southern extent, therefore requiring the modification and realignment of the existing junctions to provide tie-ins. The two existing priority junctions will be upgraded to signalised junctions. Pedestrian and cyclist facilities will be provided along the extent of the development. A link to the Royal Canal towpath will provide access for pedestrian and cyclists from the new development and landscaping and boundary works will be included as part of ancillary works.

## 1.2 Need for the Proposed Development

The provision of a transport link between the R148 Maynooth to Leixlip Road and the R405 Maynooth to Celbridge Road through the Railpark townland to the east of Maynooth town has been a roads objective for Maynooth dating back to the Maynooth Town Plan 2002 and is currently an objective of the Maynooth Local Area Plan (LAP) 2013 – 2019 Incorporating Amendment No. 1.

Currently there is no suitable road that serves the purpose of providing a ring road to the east of Maynooth which would provide a connection between the R148 Leixlip Road and the R157 Dunboyne Road to the R405 Celbridge Road without travelling through Maynooth town centre. The proposed development will aim to reduce traffic congestion within Maynooth town centre through the provision of new road infrastructure, including sustainable transport facilities: pedestrian and cyclist facilities and bus stops. The need for the proposed development is supported by existing national/regional and local planning policy as discussed in the following subsections.

The need for the proposed development also stems from local needs to improve connectivity and provide improved road infrastructure to local road users.

The proposed road development will achieve the following objectives, and this evidences the need for the proposed development:

- Improve connectivity to road users travelling between the M4 Dublin to Sligo Road and the R157 Dunboyne Road to County Meath, removing the need to travel through Maynooth;
- Provide a safer alternative to minor roads within the locality which may currently be used to avoid traffic in Maynooth;
- Contribute to the goals contained in the *Smarter Travel – A Sustainable Transport Future* policy by including new walking and cycling facilities along the length of the proposed development;
- Provide access to the Royal Canal for pedestrians and cyclists, facilitating access for locals to Maynooth and the Maynooth Train Station via the Royal Canal Greenway and to enable walking and cycling loops within the local area as part of the proposed development;
- Provide new road infrastructure to manage the continued development of Maynooth and contribute to alleviate traffic demands through Maynooth town by providing an alternative route to locations such as schools on the R405 Celbridge Road and on the Moyglare Road, as well as to Maynooth University (NUIM) on the R148 Kilcock Road on the north-western side of the town;;
- Provide necessary road infrastructure which will allow for the future development of zoned lands to the east of Maynooth town. The Maynooth Eastern Ring Road has been approved for Local Infrastructure Housing Activation Fund (LIHAF) funding; and
- Provide improved connectivity and access to public transportation along the route as well as an extensive pedestrian and cyclist facilities to enable and promote the use of sustainable travel.

A Traffic Management Plan (TMP) for Maynooth was undertaken by AECOM for Kildare County Council in 2017 in order to assess the receiving traffic environment and review potential options that will accommodate future developments in Maynooth in a sustainable manner. This TMP accounted for future population increases and projected housing growths as included in a draft version of the Kildare County

Development Plan (2017 – 2023) and the Maynooth Local Area Plan (2013 – 2019) and concluded that the development of the MERR, would have a positive impact on the performance of the road network with a reduction in congestion and travel times across the network in both the AM and PM peak hours.

The need for the Maynooth Eastern Ring Road is outlined in a number of Local and Regional policy documents as outlined in the following sections. The proposed development will also support a number of national policy documents which have been developed to plan for the future growth of the country. The need for the proposed development as outlined in these documents is described below.

### 1.2.1 National Policy

#### **Project Ireland 2040: National Planning Framework**

The National Planning Framework (NPF) is the Government's long-term strategic planning framework which will guide national, regional and local planning and investment decisions over the next two decades to cater for an expected population increase of over 1 million people. Project Ireland 2040 was launched by the Government in February 2018 and sets out the investment priorities that will underpin the successful implementation of the new NPF and its companion document the National Development Plan 2018-2027. Their joint publication is intended to create, a unified and coherent plan for the country aligning the investment strategy with our strategic planning documents.

The NPF was published in 2018 succeeding the National Spatial Strategy and unlike its predecessor has a statutory basis. The ambition of the Framework is to create a single vision and a shared set of goals for every community across the country. These goals are expressed in the Framework as National Strategic Outcomes (NSOs) and a range of multi-sectoral National Policy Objectives. The NDP has been developed to support the NPF in the delivery of the National Strategic Outcomes.

The NDP identifies the challenge for the Mid-East counties of Kildare, Meath and Wicklow in the management of future growth. It outlines the need for more balanced and sustainable pattern of development with a greater focus on addressing employment creation and local infrastructure needs.

National Strategic Outcome 1: Compact Growth calls for urban infill development, integrated transport and the regeneration and revitalisation of urban areas, in pursuing a compact growth policy. The proposed development will contribute towards the following criteria outlined under this NSO:

- Enable urban infill development that would not otherwise occur;
- Improve 'liveability' and quality of life, enabling greater densities of development to be achieved;
- Improve accessibility to and between centres of mass and scale and better integration with their surrounding areas; and
- Ensure transition to more sustainable modes of travel (walking, cycling, public transport) and energy consumption (efficiency, renewables) within smaller towns and villages and rural areas.

The proposed development will provide improved connectivity and will enable the future development of lands zoned for development in local policy.

Under NSO 2: Enhanced Regional Accessibility, the NPF calls to enhance connectivity between centres of population, improve average journey times, enable more effective traffic management within and around cities and advance orbital traffic management



solutions. NSO 3: Strengthened Rural Economies and Communities also includes the following recommendation: *“Invest maintaining regional and local roads and strategic road improvement projects in rural areas to ensure access to critical services such as education, healthcare and employment”*.

While Maynooth town is not a rural area, the surrounding area is mainly used for agriculture. The proposed development will improve access to schools in the area for those travelling from more rural areas, reducing average journey times and providing traffic management solutions.

The proposed Maynooth Eastern Ring Road will support the growth of Maynooth within the Eastern and Midland Region of Ireland as outlined in the National Planning Framework where it seeks complementary development of large and county towns in the wider Greater Dublin Area and Midland areas on the key strategic and public transport routes, through relief of traffic congestion in the town and by provision of access to lands for delivery of additional housing.

### National Development Plan 2018-2027 – Project Ireland 2040

The National Development Plan 2018–2027 (NDP) is a ten-year strategy outlining the Government’s commitment to meeting Ireland’s infrastructure and investment needs through the total investment estimated at €116 Billion over the next decade.

The major challenges that form the context for the NDP include: demographic changes; the need for Ireland to move to a low-carbon climate-resilient society; Brexit (the departure of the United Kingdom of Great Britain and Northern Ireland from the European Union); and realising our sustainable growth potential through the opportunities generated by a significantly larger workforce projected by 2040.

The fundamental mission and purpose of the NDP is to set out the new configuration for public capital investment over the next ten years to secure the realisation of each of the ten National Strategic Outcomes (NSO) as outlined in the National Planning Framework (NPF). Figure 1.1 below lists the Strategic Investment Priorities outlined in the NDP to support these NSOs.



Figure 1.1 Strategic Investment Priorities of the NDP

The NDP also includes the following fundamental objectives:

- *“Carefully managing the sustainable growth of compact cities, towns and villages to achieve effective density and consolidation through a streamlined and co-ordinated approach to their development”;*
- *“Continuing to enhance Ireland’s public transport and the environmental sustainability of our mobility systems”;*
- *“Achieving a transition to a competitive, low-carbon, climate-resilient and environmentally sustainable economy by 2050”;* and
- *“Improving access to quality education and health and childcare resources”.*

The NDP also states that *“Investment in national, regional and local road infrastructure will be delivered in accordance with the NPF. It will be guided by the findings of the Department of Tourism, Transport and Sport’s SIFLT analysis”.* The Strategic Investment Framework for Land Transport (SIFLT) analysis will be based on the following:

- *Roads will be maintained to a high quality;*
- *Roads will be improved to reduce journey times, remove bottlenecks and improve safety; and,*
- *New roads will be built to connect communities and encourage economic activity.*

The NDP emphasises the importance of good transport infrastructure as being crucial to the promotion of national competitiveness and sustainable development and that this can be achieved by further investment in roads to improve traffic flows, reduce congestion and thus result in lower rates of traffic emissions.

Smarter travel projects along with new urban cycling and walking routes to allow transport infrastructure to function more effectively and relieve congestion has also been identified in the investment actions of the plan. The NDP also calls for *“Sustainable travel measures, including comprehensive Cycling and Walking Network for metropolitan areas of Ireland’s cities, and expanded Greenways”* under the NSO 8 Transition to a Low-Carbon and Climate Resilient Society.

For Maynooth as a significant proposed growth centre in the Dublin Region, the proposed Eastern Ring Road will improve local transport facilities which will enable the town to play its part in the implementation of the National Development Plan.

### **Investing in Our Transport Future – Strategic Investment Framework for Land Transport**

The Strategic Framework for Investment in Land Transport (SFILT) which was published by the Department of Transport, Tourism and Sport (DTTas) in April 2015 outlines the key principles against which national and regional, comprehensive and single mode-based plans and programmes will be drawn up and assessed. The following three priorities are noted in terms of investment:

- *Priority 1 – Achieve steady state maintenance;*
- *Priority 2 – Address urban congestion; and*
- *Priority 3 – Maximise the value of the road network.*

In terms of Priority 2, the report states that this *“priority is to address urban congestion and improve the efficiency and sustainability of the urban transport systems”.*

The key principals for land transport investment are to:

- *Improve the quality of life of citizens and be consistent with environmental, climate and biodiversity objectives, imperatives and obligations, including those arising from the EU Habitats Directive;*
- *measures to address current and future urban congestion and to improve the efficiency and sustainability of urban transport;*
- *investment should be targeted to maximise the contribution of the land transport networks by enhancing the efficiency of the existing network.*

The provision of the Maynooth Eastern Ring Road would help achieve the key principles, by improving the efficiency and sustainability of urban transport while avoiding impacts on Natura 2000 sites.

The provision of the Maynooth Eastern Ring Road (along with the eventual completion of the remainder of the proposed ring roads system around the town) will achieve the key principles, by improving the efficiency and sustainability of urban transport while avoiding impacts on the nearest SAC.

### **Smarter Travel – A Sustainable Transport Future (2009-2020)**

Smarter Travel, a Sustainable Transport Future is a new transport policy for Ireland introduced by the Government in 2009 to:

- *Enhance our communities;*
- *Improve our environment;*
- *Make our economy more efficient and competitive; and,*
- *Significantly add to the equality of life for all our citizens.*

The Key Goals of the smarter travel initiative include the following:

- *Improve quality of life and accessibility to transport for all and, in particular, for people with reduced mobility and those who may experience isolation due to lack of transport;*
- *Improve economic competitiveness through maximising the efficiency of the transport system and alleviating congestion and infrastructural bottlenecks;*
- *Minimise the negative impacts of transport on the local and global environment through reducing localised air pollutants and greenhouse gas emissions;*
- *Reduce overall travel demand and commuting distances travelled by the private car; and,*
- *Improve security of energy supply by reducing dependency on imported fossil fuels.*

The second Key Goal as defined within the policy document, in relation to maximising the efficiency of the transport system and alleviating congestion and infrastructure bottlenecks, aligns with the key objectives of the proposed development. The reduction of congestion within Maynooth and improved access to the railway station will result in improvements which align with the remainder of the key goals identified within the document.

The policy document sets out 49 actions identified to achieve these objectives. The development of the Maynooth Eastern Ring Road supports a number of these objectives and actions in that:

- The project will ease congestion and pressures on the local road network; and
- It will provide walking and cycling facilities and in turn will provide a safer environment for pedestrians and cyclists and thus allow for the promotion of local commuting via non-motorised transport means.

The policy document sets out 49 actions identified to achieve these objectives. Development of the Maynooth Eastern Ring Road supports a number of those objectives and actions, insofar as:

- The project will ease congestion and pressures on the local road network in Maynooth town centre and enable greater priority to be allocated to walking and cycling facilities.
- Connection from the MERR to the Royal Canal Greenway will provide high-quality connectivity for pedestrians and cyclists from the existing and planned new residential developments on the eastern side of Maynooth towards the town centre at Maynooth Harbour and railway station to the west, as well as eastward to Leixlip and the major employment site at Intel.
- The provision of walking and cycling facilities as part of this project will provide a safer environment for pedestrians and cyclists and thus allow for the promotion of local commuting via non-motorised transport means

### **Road Safety Authority Road Safety Strategy 2013 – 2020**

The Road Safety Authority (RSA) Road Safety Strategy 2013 – 2020, sets out targets to be achieved in terms of road safety in Ireland as well as policy to achieve these targets. The primary target of this strategy is:

*“A reduction of road collision fatalities on Irish roads to 25 per million population or less by 2020 is required to close the gap between Ireland and the safest countries. This means reducing deaths from 162 in 2012 to 124 or fewer by 2020”.*

The plan sets out strategies for engineering and infrastructure in terms of the benefits that they can have in terms of reducing collisions. The strategy also targets a focus on serious injuries. *“In addition to continuing to reduce fatalities, a number of actions will be taken within the Strategy to refine the definition of a serious injury with a target for doing so. With a target of 124 fatalities by 2020, a realistic target for serious injuries should be in the region of 330 by 2020 or 61 per million population. Reduced fatalities and serious injuries will realise benefits for public health policy objectives, as well as reduced demands on the emergency services. A safer road environment will encourage more road users to walk and cycle, thus improving their wellbeing, reducing congestion and improving the environment. Better driving will reduce fuel costs and transport related emissions which will benefit everyone, especially those involved in business and industry”.*

The Maynooth Eastern Ring Road will support the Road Safety strategy by alleviating the congestion currently experienced in Maynooth and through the provision of new pedestrian and cycling facilities as part of the proposed development. The provision of the new single carriageway road will discourage the use of smaller local roads to



avoid travelling through Maynooth town, by providing high-quality safe roads which are built to sustain the current and future capacity of the local road network and provide a new connection in the north-south direction to the east of Maynooth.

### **Local Infrastructure Housing Activation Fund (LIHAF)**

While the Local Infrastructure Housing Activation Fund (LIHAF) is not a policy, it is a key element of Pillar 3 of Rebuilding Ireland: An Action Plan for Housing & Homelessness, which provides a mechanism to achieve the planning policies described above. The objective of the fund is to provide public off-site infrastructure to relieve critical infrastructure blockages. This will enable the accelerated delivery of housing on key development sites in Dublin and in urban areas of high demand for housing.

The MERR project has been approved under the LIHAF Fund with the project to be delivered by the Local Authority, which will enable residential development on 35 Hectares of zoned land.

The MERR project has been approved under the LIHAF Fund with the following infrastructures to be delivered by the Local Authority:

- a) Maynooth Eastern Relief Road; and
- b) Bridge crossing railway and Royal Canal.

## **1.2.2 Regional Policy**

### **Draft Eastern and Midland Regional Spatial and Economic Strategy (RSES)**

The Draft Regional Spatial and Economic Strategy (RSES) sets out a 12-year strategic development framework for the Eastern and Midland region. The Strategy's aim is to support the national level 'Project Ireland 2040' and sets out a development framework to guide development in the region. The Eastern and Midland region is comprised of 9 counties; Longford, Westmeath, Offaly, Laois, Louth, Meath, Kildare, Wicklow and Dublin. Maynooth is also within the Dublin Metropolitan Area, for which a Metropolitan Area Strategic Plan (MASP) is included in the RSES. A key aim of the MASP is to unlock the development capacity of strategic development areas within the metropolitan area by identifying the sequencing of enabling infrastructure. This will be achieved through the effective integration of transport planning with spatial planning policies, from regional down to local level and the alignment of associated transport and infrastructure investment priorities. The proposed development will unlock the development potential of zoned lands within the Railpark area outlined for development in both Regional and Local policy.

Maynooth is identified as one of three key towns within the Eastern and Midlands Region. A Key Town is defined as a "*Large economically active service and / or county town which is able to provide employment for its surrounding area, having high-quality transport links, and with an ability to act as growth drivers to complement its Regional Growth Centres*".

The Eastern and Midland RSES identifies the Railpark lands as a growth area, with significant residential development potential and potential links along the Royal Canal towpath to the town centre. It also identified that the Railpark lands are subject to LIHAF funding for a new relief road and bridge over the railway line.

The following Regional Policy Objective outlines the objective for Maynooth as a Key Town (RPO):

*“RPO 4.27: Support the continued development of Maynooth, co-ordinated with the delivery of strategic infrastructure including DART expansion to support future population growth and build on synergies with Maynooth University to promote research and economic development opportunities”.*

The proposed development will provide a high-quality transport link to support the development of Maynooth into the future. The development will also provide infrastructure required to service the Railpark lands which are identified as a growth area. The need for the relief road and bridge over the railway line is outlined and will be enabled through the proposed development.

### **Transport Strategy for the Greater Dublin Area 2016-2035**

The Transport Strategy for the Greater Dublin Area outlines a suite of public transport and highway proposals to be implemented through the GDA over the period 2016 to 2035. The Strategy is intended to guide decisions on transport throughout the GDA and will contribute to the economic, social and cultural progress of the GDA by providing for the efficient, effective and sustainable movement of people and goods.

The NTA Transport Strategy comprises a longer-term analysis of the needs of the transport network within the GDA (including Maynooth as part of Corridor C, see Figure 1.2). The Strategy builds upon the previous 2011 Draft Transport Strategy which recognised the need to reduce car commuting mode share and aimed to reduce car commuting mode share to 45% by 2030. The Strategy therefore recognises the need to invest in public transport solutions for the long-term sustainable development of the GDA.

The aims of the Strategy include:

- *“Implement the DART Expansion Programme, which will provide DART services to Maynooth in the west which will deliver a very substantial increase in peak-hour capacity on this line”;*
- *“Develop orbital roads around town centres accompanied by and facilitating enhanced public transport, cycling and pedestrian facilities in the relevant centre.”;*
- *“Develop appropriate road links to service development areas”;* and
- *“Enhance pedestrian and cycle safety through the provision of safer road junctions, improved pedestrian crossing facilities and the incorporation of appropriate cycle measures including signalised crossings where necessary.”*

The proposed development will help achieve the above aims by providing a ring road to the east of Maynooth town including footpaths and cycleways which can connect to the town centre and railway station via the Royal Canal towpath. The new junctions will provide pedestrian crossing facilities ensuring the safety of pedestrians and cyclists, and segregated cycle tracks.

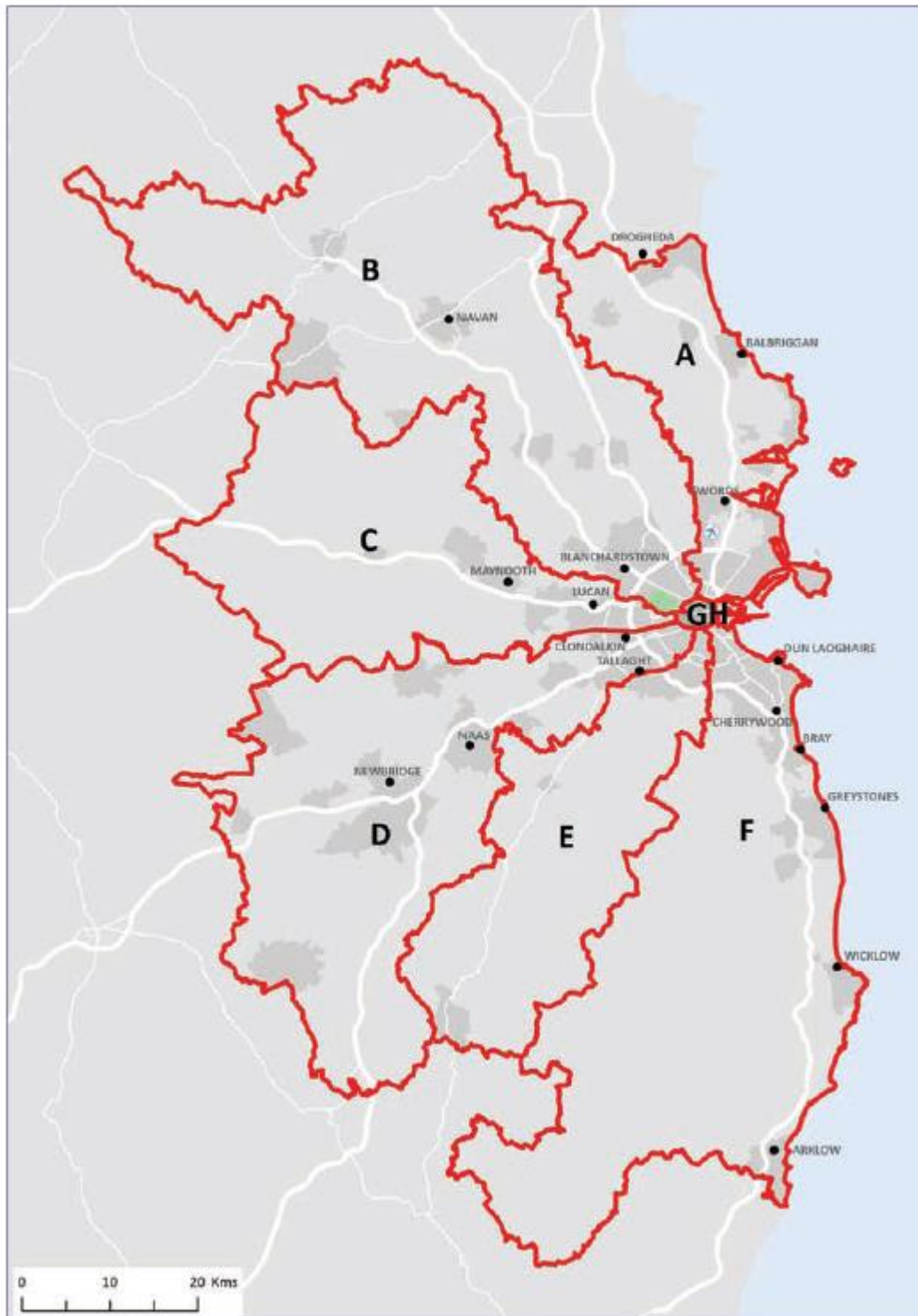


Figure 1.2 Transport Strategy for the Greater Dublin Area – Radial Corridors

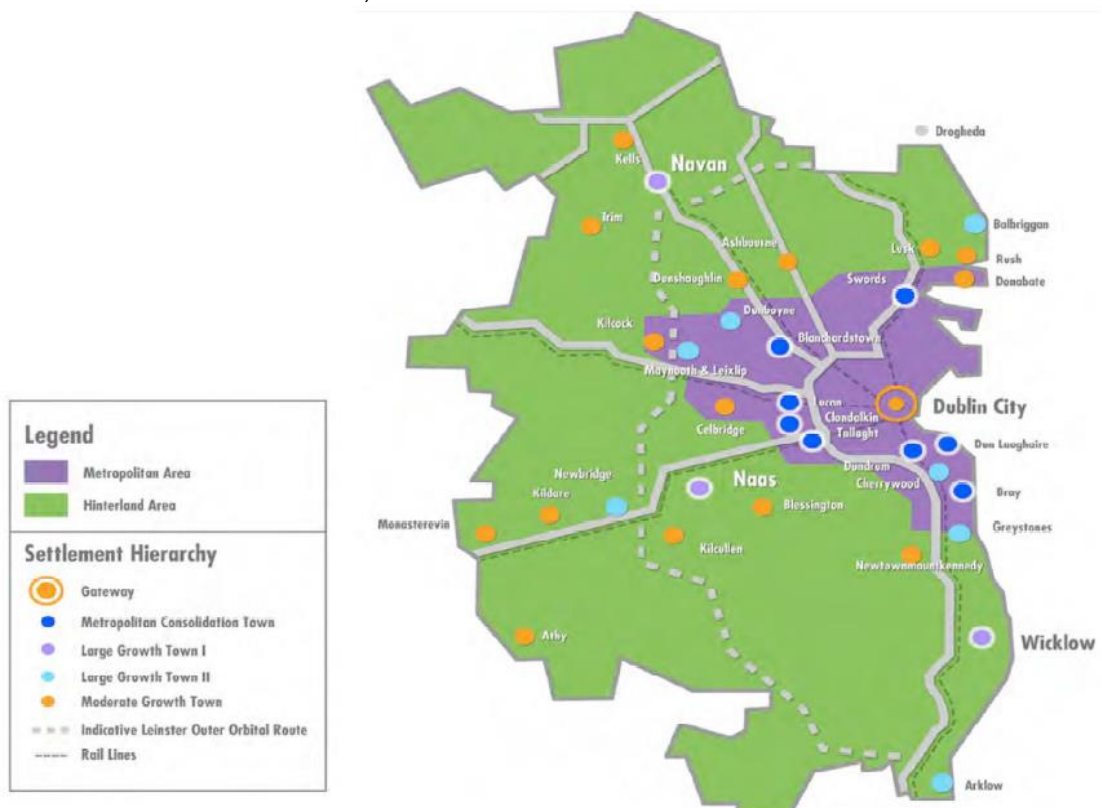
### Regional Planning Guidelines for the Greater Dublin Area 2010-2022

The Regional Planning Guidelines (RPGs) provide a planned direction for growth within the Greater Dublin Area up to 2022 by giving regional effect to national planning policy under the National Spatial Strategy. The RPGs will be replaced by the Regional Spatial and Economic Strategies for each region when they are finalised.

The proposed road development will improve access to the important urban economic cluster at Naas/Newbridge as identified in the National Spatial Strategy and confirmed in the Regional Planning Guidelines for the Greater Dublin Area (RPGGDA).

A 6-tier urban hierarchy is described in the regional planning context, as shown in Figure 1.3 below, with the relevant towns local to the subject development shown at the appropriate level:

- Gateway Core - Dublin City;
- Metropolitan Consolidation Towns;
- Large Growth 1 – Naas & Navan;
- Large Growth 2 – Maynooth & Leixlip;
- Moderate Sustainable Growth Town – Kilcock and Celbridge; and
- Small Towns – Sallins, Straffan and Enfield



**Figure 1.3 RPGGDA – Settlement Strategy**

Key planning and development issues in the Greater Dublin Area include the economic imperative to link future locations of growth with investment in public infrastructure, particularly through land use & transport integration.

It is policy to promote balanced economic development within the Region. Connectivity and investment in linkages between centres of economic activity, ports and airports is important and has benefits to outputs, costs and productivity, with radial routes and multi-modal corridors offering access to larger indigenous and foreign markets and allowing movement of goods, services and labour between Gateways and major employment centres.

Barriers to enterprise include urban sprawl, congestion and long travel times. Priority targets for investment in transport infrastructure are essential to the economic success



of the Region. Local congestion in the GDA represents the biggest road transport issue for the area. A range of possible solutions is suggested including maximising the use of existing road infrastructure.

The RPPGDA require a holistic approach in the design and retrofitting of the existing road network to:

- Cater for sustainable transport modes;
- Provide contingencies for such provisions as green bridges/eco-ducts, connections for communications infrastructure and services which may be required over the next 10 - 20 years; and
- Provide high quality layout, safety and design.

It is further stated that *'investment in public transport development is the main priority in the GDA, it is recognised that future transport demands cannot be delivered solely by the public transport rail system, and that the road network will continue to be critical to transport management and the efficient movement of buses, people, goods and other services in the GDA and beyond'*. The proposed development has provided space for the future development of bus stops within the land-take to accommodate bus services as they develop to serve future land uses and travel demand. The provision of pedestrian and cycle lanes along the development will also improve accessibility to the Maynooth Train Station via the Royal Canal towpath.

### 1.2.3 Local Policy

#### **Kildare County Development Plan 2017 - 2023**

The County Development plan has effect from the 1st March 2017. The aim of the Development Plan is to “promote ease of movement within and access to County Kildare, by integrating sustainable land use planning with a high quality integrated transport system; to support improvements to the road, rail and public transport network, together with cycleway and pedestrian facilities and to provide for the sustainable development of aviation travel within the county in a manner which is consistent with the proper planning and sustainable development of the county”.

The Kildare County Development Plan contains the following list of policies , for which the proposed development will contribute to as outlined below:

- “Prioritise the development of new urban distributor/link/arterial roads to provide access to new communities and employment development to support the economic development of the county. (MT 5)” (P.130)
  - The Maynooth Eastern Ring Road will provide a distributor/link/arterial road to the east of Maynooth to link the R405 and R148.
- “Seek to address urban congestion with particular emphasis on facilitating improved bus transport movement and reliability and improved links to bus and railway stations. (MT 8)” (P.130)
  - The proposed development will reduce congestion within Maynooth and on the wider network, while providing potential for new bus routes, and an improved link to the Maynooth Railway station for pedestrians and cyclists via the link to the Royal Canal towpath.
- “Co-operate with adjoining authorities and other public authorities to secure new and/ or improved road infrastructure at towns bordering the county boundary including Blessington, Kilcock, Maynooth and Leixlip (RS 9)” (P.136)

- The proposed development provides a junction with the R157 Dunboyne Road which will create a new link between the N4 Dublin to Sligo Road and the Dunboyne Road which travels north through to County Meath.

Walking and cycling policies also included in the County Development Plan as below, where the contribution which the proposed development will have to these policies is also outlined:

- *“Promote the development of safe and convenient walking and cycling routes (WC 2)”*
  - The proposed development will provide safe pedestrian and cycle facilities along the length of the development in addition to a link connecting into the Royal Canal toepath which provides an off road route towards both Maynooth and Dublin.
- *“Ensure that connectivity for pedestrians and cyclists is maximised in new communities and improved within the existing areas in order to maximise access to town centres, local shops, schools, public transport services and other amenities (WC 3)”*
  - Pedestrian and cycle facilities will be provided to enable residents of existing and new housing estates to connect to schools, public transport, the Maynooth Railway Station and Maynooth town centre via the Royal Canal toepath.
- *“Provide for safer routes to schools within the county and promote walking and cycling as suitable modes of transport as part of the Green Schools Programme and other local traffic management improvements. (WC 7)”*
  - The pedestrian and cycle facilities will link residential areas along the R148 and those in town, with the two schools on the R405 providing safe connectivity for adults and children alike.

### **Maynooth Local Area Plan 2013 – 2019 (Incorporating Amendment No.1)**

Maynooth Local Area Development Plan 2013-2019 has been developed in accordance with the Regional Planning Guidelines for the Greater Dublin Area 2010-2022. Its overall strategy for Maynooth is to set out proper planning and sustainable development.

The LAP states that *“Traffic congestion is a as a major problem in Maynooth Town”*. The delivery of policies and objectives of the LAP particularly roads infrastructure is recognised as *“vital for the economic development and quality of life of all Maynooth’s residents and visitors”*.

The Maynooth Eastern Ring Road is an objective of the Maynooth Local Area Plan as below under ‘Roads Infrastructure’ contained in Section 7.5.2 of the LAP:

*“TRO 2: To facilitate the future construction of the following roads and in the interim protect these routes from development”:*  
*“-Between the Celbridge Road (B) and the Leixlip Road (E)(i) or (E)(ii) (TRO 2)”*.

In addition, the proposed development supports a number of Policies and Objectives of the Plan, including the following:

*“TR0 1: To develop, maintain and improve as required, the local road network to ensure a high standard of road quality and safety in accordance with the requirements of this Plan and relevant legislation.”*

Amendment No.1 to the Maynooth Local Area Plan 2013-2019 was made in 2018 to align the Maynooth Local Area Plan with the Core Strategy of the Kildare County Development Plan 2017-2023 and to align the zoning matrix with other local area plans in Kildare and the Kildare County Development Plan.

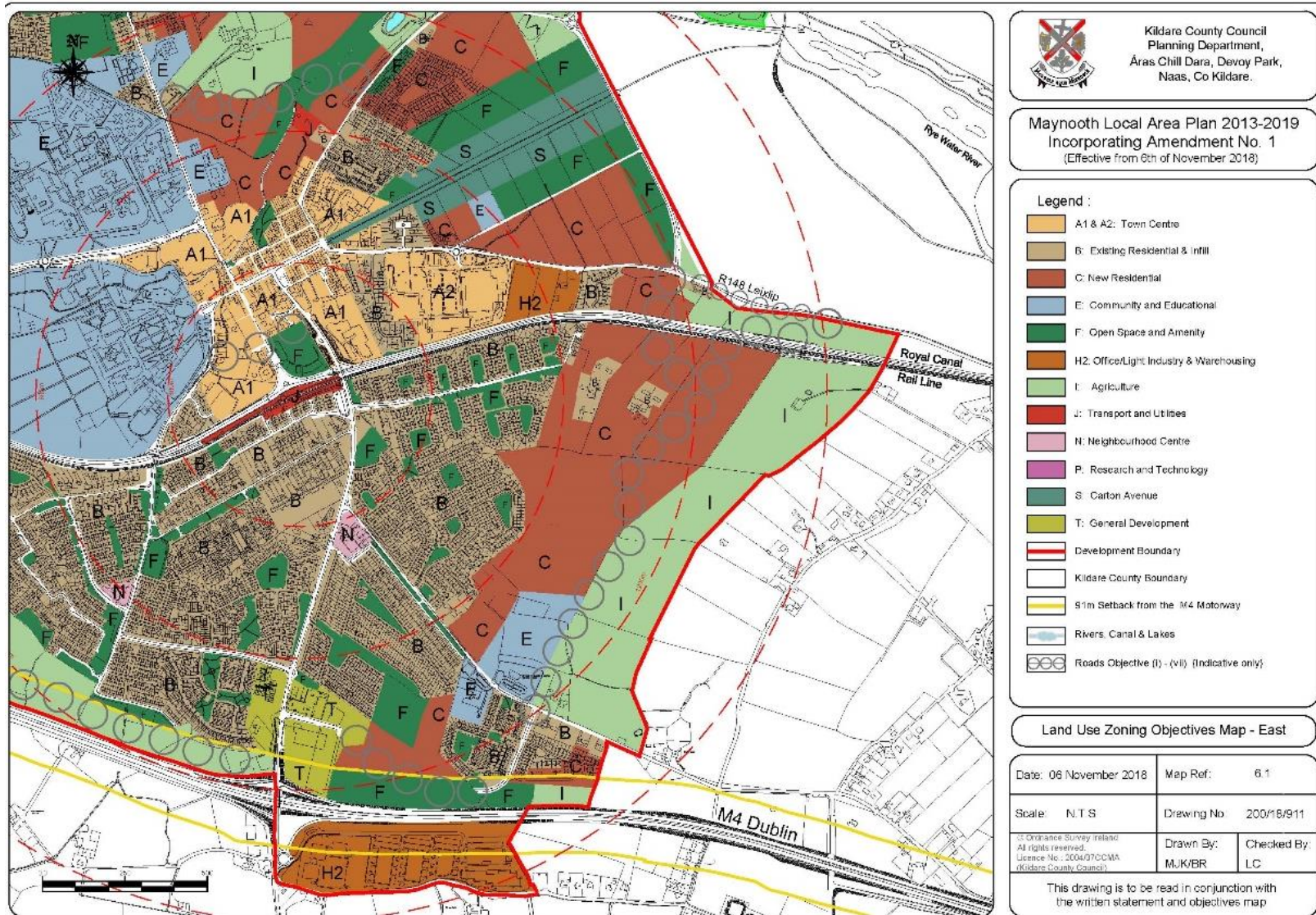
The Maynooth Eastern Ring Road is listed as a roads objective of the Maynooth Local Area Plan 2013-2019 (as amended) and has been listed as an objective as far back as 2002 in the Maynooth Development Plan 2002. This roads objective is included in the LAP as traffic congestion is a major problem in Maynooth town and the delivery of the Ring Road is *“vital for the economic development and quality of life of all Maynooth’s residents and visitors”*.

### *Housing*

HP 1: To facilitate sustainable development in Maynooth in line with its designation as a Major Growth Town II in the RPGs and the CDP and to ensure that this development reflects the character of the existing and historic town in terms of structure, pattern, scale, design and materials with adequate provision of open space, and which also protects the amenities of existing dwellings.

The Maynooth Eastern Ring Road will also support the construction of new housing to the east of the town. Kildare County Council amended the Maynooth Local Area Plan 2013-2019 in 2018 for the purposes of rezoning lands from Agricultural to New Residential use in the vicinity of Railpark to release the potential of lands to the east of Maynooth for expansion. Lands within the footprint of the proposed development have been changed from Agriculture “I” to New Residential “C” and from Office “H4” to New Residential “C”. This land will facilitate the development of the Railpark area as the new Key Development Area. The Land Use Zoning map for Maynooth is shown below in Figure 1.4.

Amendment No.1 to the Maynooth Local Area Plan also identified Railpark as a Key Development Area (Section 7.1.4). The Key Development Area (KDA) is bounded by Parklands and Rockfield estates to the west, the Royal Canal and the Dublin to Sligo rail line to the north, Celbridge Road to the south and agricultural lands to the east. The vision for the development of these lands is to *“provide for a new residential neighbourhood with a mixture of tenures and housing unit sizes and typologies. The new neighbourhood will be an exemplar of urban housing expansion, outward looking and integrating itself into the surrounding context, prioritising sustainable modes of travel, encouraging innovative design and technologies and driving towards a low carbon and climate resilient place. It will include a new neighbourhood park and network of open space, with community amenities and facilities and capitalising on its setting adjacent to the Royal Canal. It will be a place that engenders a sense of community involvement and ownership of place.”*



**Figure 1.4 Land Use Zoning, Maynooth LAP 2013-2019 Incorporating Amendment No.1**



## 2. ALTERNATIVES CONSIDERED

As described in the Route Selection Report, several options were considered to provide a link between the R148 Leixlip Road and the R405 Celbridge Road in line with the Maynooth LAP. Four options progressed from the Stage 1 assessment to the Stage 2 assessment and were referred to as Option A, Option B, Option C and Option D. The Stage 2 assessment was undertaken in accordance with the TII Project Management Guidelines and compared the four route corridor options using the six Common Appraisal Criteria of Environment, Economy, Safety, Accessibility & Social Inclusion, Integration and Physical Activity. This assessment identified Option B as the preferred route, and this is discussed in Section 3. The four options; Option A, Option B, Option C and Option D, are briefly outlined in Sections 2.1 to 2.4 below.

### 2.1 Option A (Blue)

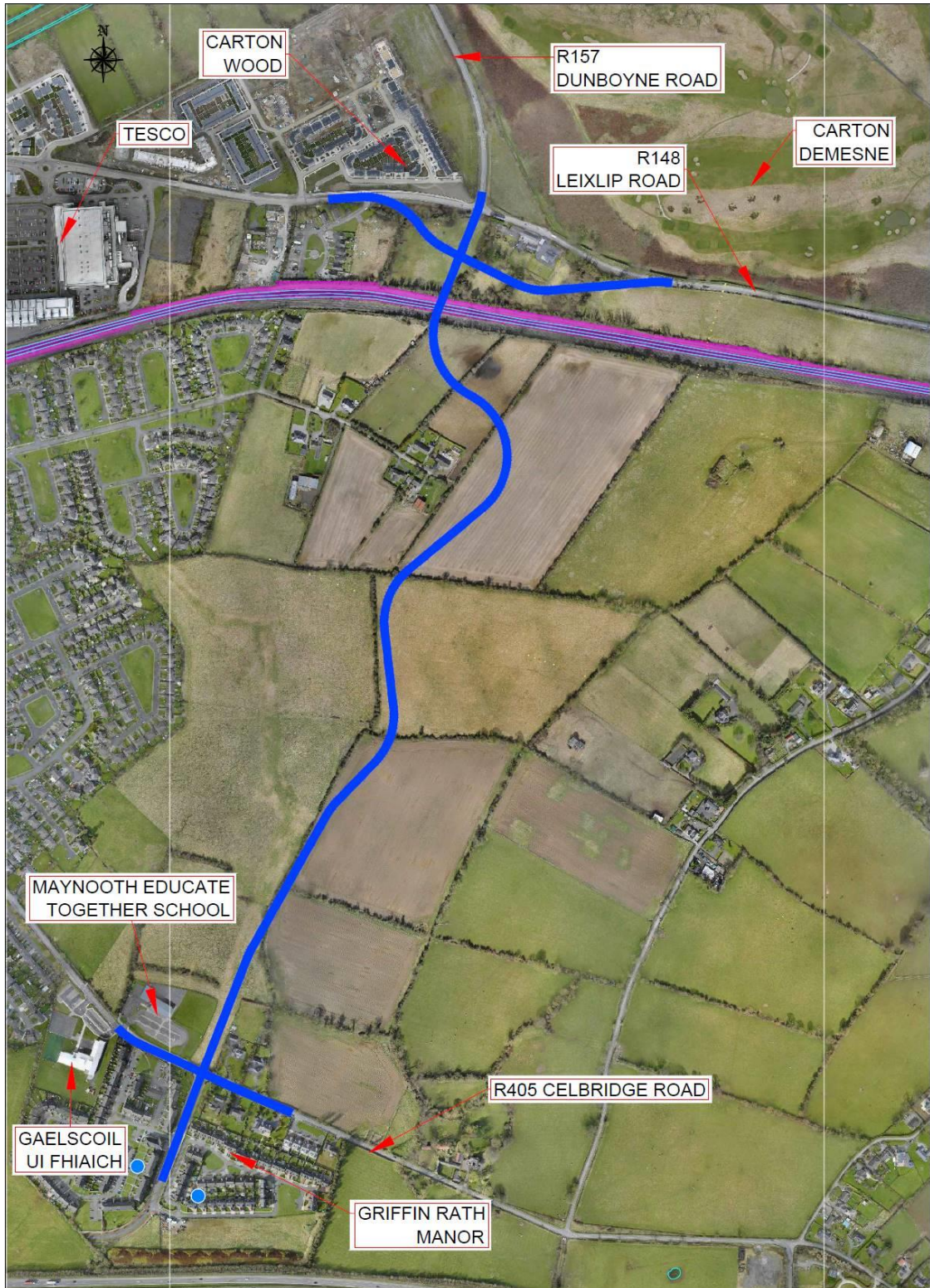
At the southern end Option A tied into the R405 Celbridge Road forming a fourth arm at the existing junction with Griffin Rath Road. South of the junction it was proposed to widen the Griffin Rath Road to accommodate turning lanes for the new signalised junction. New pedestrian and cyclist facilities would be provided along the road where the widening of the road impacted the existing provision. From the proposed southern junction the road would run in a north easterly direction through a gap between the Maynooth Educate Together School to the west and two residential properties to the east.

The route continued for approximately 1km through greenfield lands towards the houses at the eastern end of Parklands Grove before curving west around these houses and bridging over the Royal Canal and Dublin to Sligo rail line. From the railway and canal bridge the proposed road would descend steeply towards the R148 Leixlip Road but would not converge in level due to the short distance. It would therefore be necessary to raise the levels of the R148 Leixlip Road to connect to the new ring road. This would either be off-line to the south as proposed in Option A, or on-line as proposed in Option B.

On Option A for the development of a junction with the new ring road it was proposed to realign the R148 Leixlip Road to the south by approximately 100m and to replace the existing R148/R157 priority junction with a new signalised junction at a higher level into which the MERR would connect. The junction would be approximately 5.0m above the level of the existing junction and the realigned R148 would be raised and be located behind the existing residential properties to the east of the existing R148/R157 junction.

The existing R148 between the points of realignment would no longer be required as a through road, however the section of road east of the existing junction would be retained for access to the dwellings at this location. A connection for pedestrians and cyclists to the Royal Canal towpath would be provided from the new junction. The overall length of mainline of the MERR for this option was approximately 1.7km while the overall length of all roads proposed to be constructed and/or realigned was approximately 2.6km.

Figure 2.1, below, illustrates the proposed route of Option A and location of the new junction and tie-in roads north of the Royal Canal.



**Figure 2.1**      **Option A (Blue)**

## 2.2 Option B (Yellow)

Option B tied into the R405 and extended to the north towards the eastern extents of Parklands as described in Option A.

From the eastern end of Parklands Grove, the route curved west around these houses and bridged over the Royal Canal and Dublin to Sligo rail line. The route then continued to the west of the houses at the existing R148 Leixlip Road and R157 Dunboyne Road junction. The R148 and R157 were both proposed to be realigned vertically by approximately 1m higher in level at the approach to the junction to allow for MERR to tie-in to the upgraded signalised junction. The R148 and R157 would be widened to accommodate additional turning lanes at the approaches to the junction.

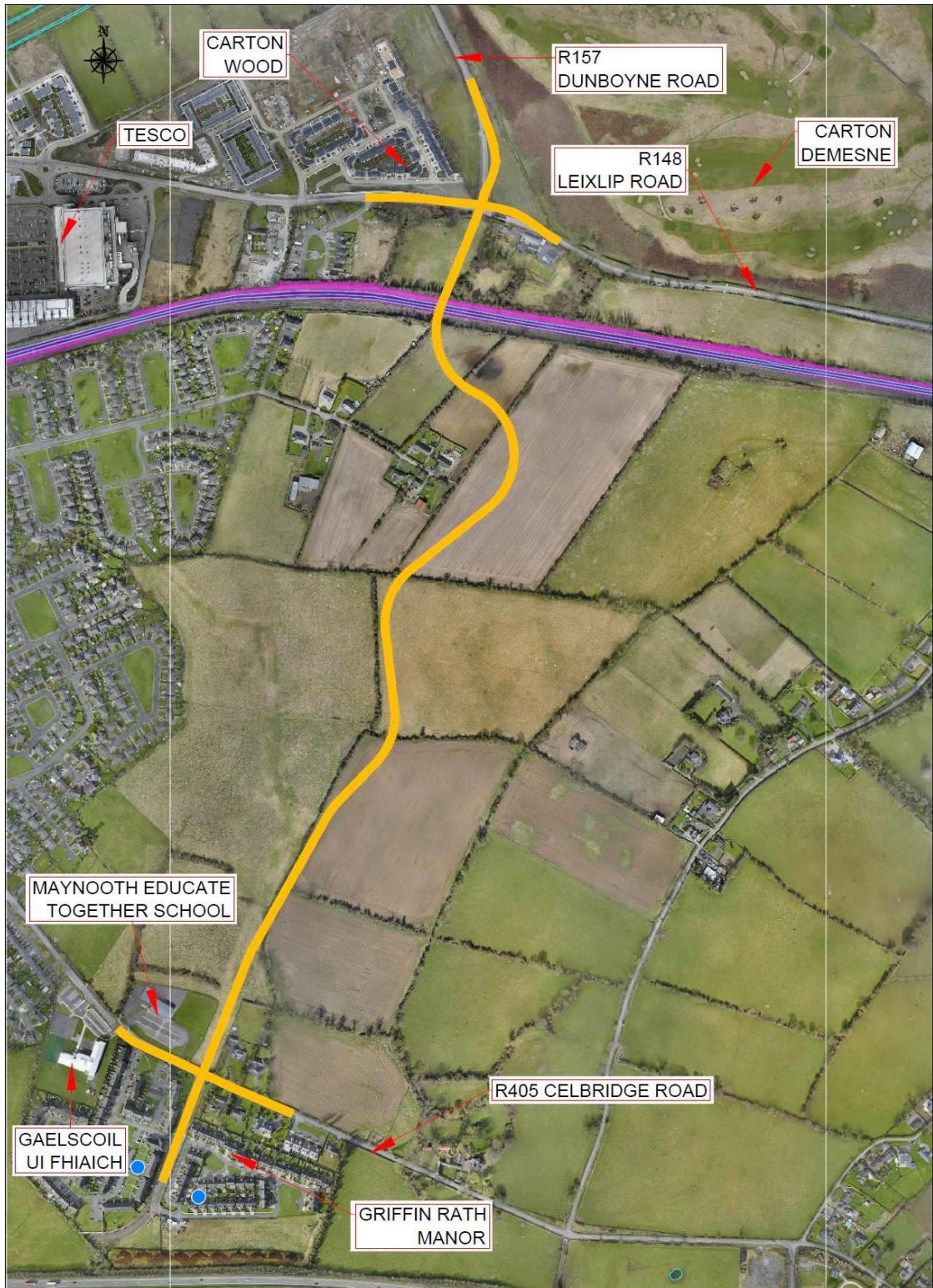
To the east of the junction, the realignment of the R148 would result in a section of the old road being retained as a short cul-de-sac for access to the adjoining group of houses.

A connection for pedestrians and cyclists to the Royal Canal towpath would be provided from the junction as well as signal-controlled crossing points on all arms of the junction.

The overall length of mainline of the MERR for this option was approximately 1.55km while the overall length of all roads proposed to be constructed and/or realigned was approximately 2.5km.

Figure 2.2, below, illustrates the proposed route of Option B where it differs from Option A and location of the new junction and tie-in roads north of the Royal Canal.





**Figure 2.2 Option B (Yellow)**

### 2.3 Option C (Green)

Option C tied in to the R405 Celbridge Road and extended north towards the eastern extents of Parklands Grove in the same way as Option A.

From the eastern end of Parklands Grove, the route curved to the north east and bridged over the Royal Canal and Dublin to Sligo rail line before curving around to the east to form a new roundabout junction with the R148 Leixlip Road south of the walls of Carton Demesne and approximately 600m west of Pike Bridge. This roundabout would be at a similar level to the existing road and would not impact on the wall of Carton Demesne.

West of the roundabout it was proposed to realign the R157 Dunboyne Road to tie into the realigned R148 Leixlip Road with the existing R148/R157 junction reconfigured to change the priority for traffic and the junction would be upgraded from a priority junction to a signalised junction. Pedestrian and cyclist facilities would be provided between the new roundabout and signalised junction with a connection for these users to the Royal Canal towpath.

The overall length of mainline of the MERR for this option was approximately 1.8km while the overall length of all roads proposed to be constructed and/or realigned was approximately 3.1km.

For Option C the overbridge over the railway line and Royal Canal would have a longer span and a substantially greater skew angle, than that for the other Options , which would require deeper beams and therefore a higher road level.

Figure 2.3, below, illustrates the proposed route of Option C where it differs from Option A and location of the new roundabout and realignment of roads north of the Royal Canal.





Figure 2.3 Option C (Green)



## 2.4 Option D (Red)

Option D ties in to the R405 Celbridge Road and extends north towards the eastern extents of Parklands Grove in the same way as Option A.

From the eastern end of Parklands Grove, the route curved to the north-east before turning north to bridge over the Royal Canal and Dublin to Sligo rail line. The route then tied into an elevated roundabout along the R148 Leixlip Road. The level of the roundabout would be approximately 4m above the existing road level which would result in a significant impact on the wall of Carton Demesne.

West of the roundabout it was proposed to realign the R157 Dunboyne Road to tie into the realigned R148 Leixlip Road with the existing R148/R157 junction reconfigured to change the priority for traffic. As with Option C, a new signalised junction would be required at reconfigured R148/R157 junction and pedestrian and cyclist facilities would be provided between the roundabout and signalised junction along the R148 as well as a connection into the Royal Canal towpath.

The overall length of mainline of the MERR for this option was approximately 1.7km while the overall length of all roads proposed to be constructed and/or realigned was approximately 2.9km.

Figure 2.4, below, illustrates the proposed route of Option D where it differs from Option A and location of the new roundabout and realignment of roads north of the Royal Canal.

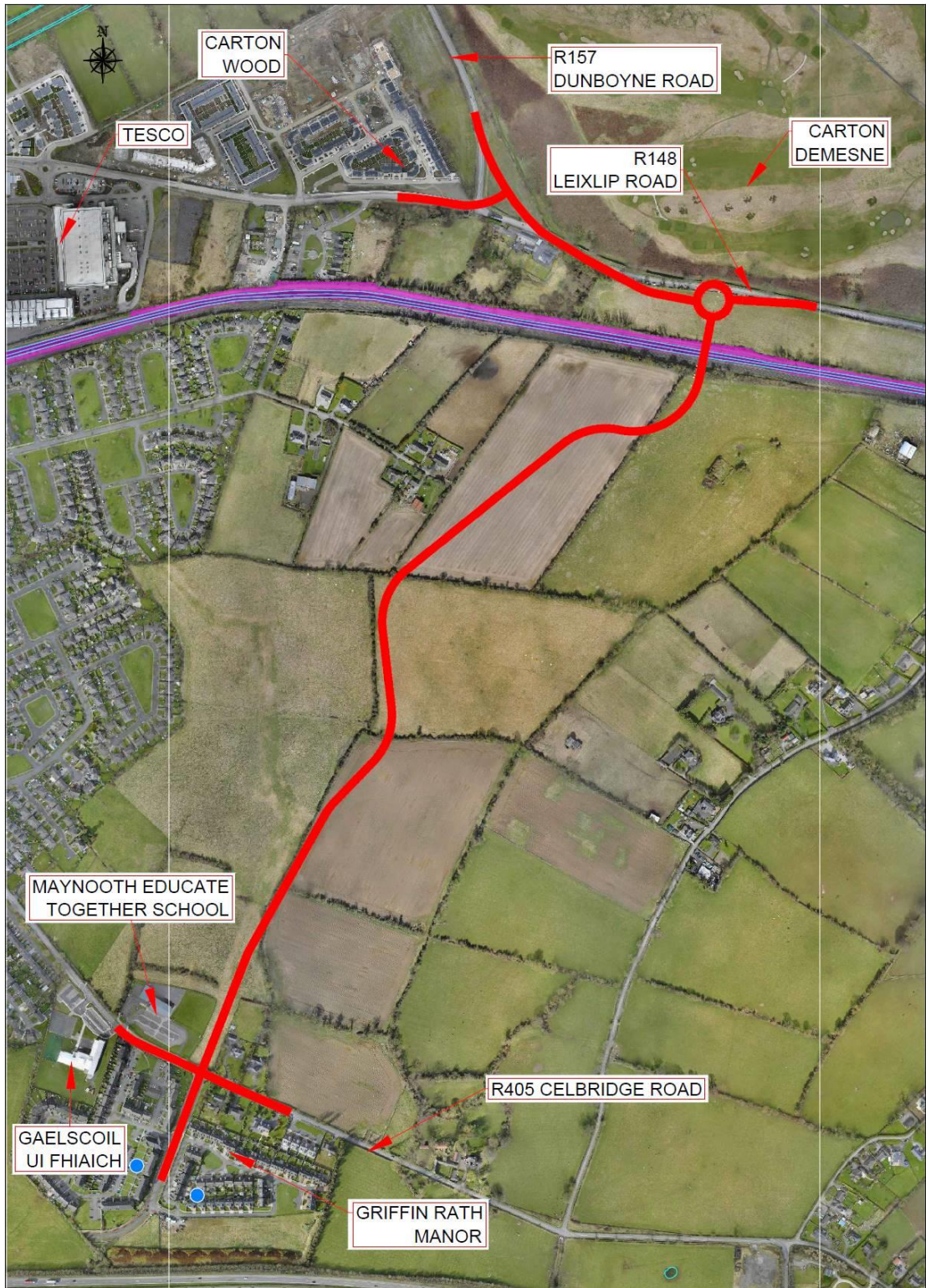


Figure 2.4 Option D (Red)

## 2.5 Summary of Alternatives Considered in the Route Selection Report

The route selection process assessed the various potential constraints that would have an impact, positive and negative, on the development and selection of a preferred route for the MERR. The assessment considered the following environmental constraints: Noise and Vibration; Air Quality; Landscape and Visual; Agriculture & Agronomy; Non-Agricultural Properties; Ecology; Archaeology, Built Heritage & Cultural Heritage; Hydrogeology; Hydrology; and Soils, Geology & Waste.

**Table 2-1 Environmental assessment summary from Route Selection Report**

Environment				
	Option A	Option B	Option C	Option D
Landscape and Visual	Intermediate	Preferred	Intermediate	Least Preferred
Soils and Geology	Similar	Similar	Similar	Similar
Hydrology	Similar	Similar	Similar	Similar
Hydrogeology	Similar	Similar	Similar	Similar
Air Quality and Climate	Intermediate	Least Preferred	Intermediate	Preferred
Agriculture	Preferred	Preferred	Least Preferred	Intermediate
Non-Agricultural Properties	Intermediate	Intermediate	Preferred	Least Preferred
Noise	Least Preferred	Least Preferred	Intermediate	Preferred
Ecology	Least Preferred	Intermediate	Preferred	Intermediate
Architectural, Archaeology & Cultural Heritage	Preferred	Preferred	Intermediate	Least Preferred
Waste	Similar	Similar	Similar	Similar
Environment Overall	Intermediate	Preferred	Intermediate	Least Preferred

**Table 2-2 Overall assessment summary from Route Selection Report.**

Overall Summary				
	Option A	Option B	Option C	Option D
Safety	Preferred	Preferred	Least Preferred	Least Preferred
Environment	Intermediate	Preferred	Intermediate	Least Preferred
Economy	Least Preferred	Preferred	Intermediate	Intermediate
Integration	Preferred	Preferred	Intermediate	Intermediate
Accessibility & Social Inclusion	Preferred	Preferred	Intermediate	Intermediate
Physical Activity	Preferred	Preferred	Intermediate	Intermediate

As can be seen in Table 2-1, the results of the assessment showed that all four route options were similar in terms of Soils & Geology, Hydrology and Waste. Option B was found to be preferred when compared to the other options regarding the impact on the Landscape and Visual, Agriculture and Built and Cultural Heritage. This is due to the

proximity of the eastern options to Carton Demesne and Pike Bridge and the area of landtake requirement. Option B was determined to be least preferred in terms of the Noise and Vibration and Air Quality & Climate criteria due to the proximity to residential properties.

Option B was found to have an intermediate impact when compared to the other options for the remaining criteria, Non-Agricultural Properties and Ecology, as per Table 2-2. The overall summary of assessment ratings are shown in Table 2-2 for the criteria assessed. Having considered the potential constraints of the route options on environment and in terms of the remaining aforementioned Common Appraisal Criteria, Option B is preferred to Option A overall. Under Environmental impacts Option B is preferred while the difference in safety is marginal between Options A and B. Option B was therefore determined to be the preferred route option for this development.

## 2.6 Alternative Bridge Options

The proposed structural form of the bridge is to be an integral single span precast concrete prestressed beam and in-situ concrete slab type structure. It is envisaged the bridge will have a skeletal type abutment, with reinforced earth and piles/columns socketed into limestone bedrock. The piles/columns will be structurally isolated from the reinforced earth by concrete collars surrounding the piles/columns.

In considering alternatives for the proposed bridge design for the crossing of the Royal Canal and Dublin to Sligo railway line, the design had to ensure compliance with the requirements from Irish Rail. The bridge has to provide a minimum vertical clearance of 5.3m over the extent of the railway clearance envelope and a minimum vertical clearance of 4.5m above the towpath on the north side of the canal. In addition, the bridge abutment located to the south of the railway lines has a horizontal clearance of 4.5m from the closest rail, in accordance with Iarnród Éireann requirements.

A two-span bridge option was not considered for the proposed development as it would have required an intermediate support to be located between the Royal Canal and the railway corridor. In addition, when compared against the proposed single span option it would have yielded a more visually intrusive structure. The longitudinal slope of the bridge is governed by both the road designs requirement to provide a safe junction and visibility slopes on approach to the northern junction while balancing the vertical and horizontal clearance requirements of the bridge. Therefore, taking on board the various design constraints, a single span option was deemed the most advantageous.

An all steel or steel composite bridge option was not considered beyond concept stage, as this type of bridge(s) would have more demanding maintenance requirements when compared against the currently proposed precast beam and slab type bridge. The steel corrosion protection system (paint system) would need to be maintained over the lifetime of the bridge and this would necessitate a series of track possessions over the lifetime of the bridge. Also, due to the nature of this type of bridge(s), it may also require bearings that would also require replacing over the lifetime of the bridge. In addition, due to the requirement for bearings this would lead to the requirement for larger bridge abutments in order to facilitate a bearing gallery.

For the proposed bridge the parapets will be formed by a series of solid 1.85m high precast concrete panels (containment level H4a) provided along the length of the structure and for 3m beyond the top of the embankment at both ends. It is proposed to vertically step the final 3m of the precast parapets at the top of the embankments,



in order for the top of the precast parapet to have the same height as the adjacent safety barrier.

A number of design decisions have been adopted for the proposed bridge in order to reduce its visual impact. These are summarised as follows:

- **Deck Cantilever:**  
The deck cantilever on both sides of the bridge will create a shadow on the beams underneath. To the observer, this will reduce the visual impact of the bridge by breaking up the elevation of the bridge. This is achieved by the shadow “hiding” the top of the beams underneath. To the observer, this gives the appearance that the deck is more slender than it actually is.
- **Local masonry stone finish to reinforced earth abutment walls:**  
As the reinforced earth abutment walls will be observed up close by people beneath the bridge, local masonry will be adopted for the face of the reinforced earth abutments. This finish is more complementary to its surroundings as opposed to concrete precast panels which would be the typical finish to these types of abutments. In addition, as masonry has a rough finish, it is more “difficult” to graffiti when compared to smooth planer finish of a precast concrete panel.
- **Curved reinforced earth abutment walls:**  
The walls of the reinforced earth abutment walls are curved horizontally and sloped vertically to follow to the slope of the road embankment. Visually, for those on approach to the bridge from beneath, this results in an open, more welcoming cross-section.
- **Height of reinforced earth abutment walls:**  
Where the reinforced earth abutment walls are underneath the bridge, the top of the wall will be at a maximum of 0.5m below the underside of the beams of the bridge. This is done to prevent, as much as is practicable, access to the faces of the bridge abutments. The philosophy behind this is to negate as much as possible people graffitiing the face of the bridge abutments.
- **Formed finish to bridge parapets:**  
A specific type of concrete formed finish will be applied to the external face of the bridge concrete parapets. The type of finish is to be confirmed. This is being adopted to reduce their visual impact when compared to a vertical wall of smooth concrete.
- **Bridge parapet tapered ends:**  
The ends of the bridge parapets are to be tapered down to tie into the safety barriers both on approach and departure to the bridge. This is done to reduce the visual impact of the concrete parapet to the road user. Where previously they may have seen a “vertical” face of concrete on approach to the bridge they will now see a taper from the safety barrier to the concrete parapet.

### **3. DESCRIPTION OF THE PROPOSED DEVELOPMENT**

#### **3.1 Outline Project Description**

The Proposed Development involves:

- Construction of approximately 1.55 km of Type 3 Single Carriageway;
- Provision of a new 4-way signalised junction at the location of the existing R405 Celbridge Road / Griffin Rath Road priority T-junction;
- Provision of a new 4-way signalised junction at the location of the existing R148 Leixlip Road / R157 Dunboyne Road priority T-junction;
- Realignment and modification of approximately 200m of the R157 Dunboyne Road and the provision of a filter lane for vehicles turning left onto the R148 Leixlip Road from the R157;
- Realignment and modification of approximately 300m of the R148 Leixlip Road;
- Realignment and modification of approximately 230m of the R405 Celbridge Road;
- Realignment and modification of approximately 170m of Griffin Rath Road;
- Provision of pedestrian and cyclist facilities along the full length of the MERR;
- Provision of pedestrian and cyclist facilities along the realigned and modified R405, R148, R157 and Griffin Rath Road;
- The provision of a pedestrian and cycleway connection from the MERR to the Royal Canal towpath north of the Royal Canal;
- Construction of a bridge structure spanning the Dublin to Sligo railway and the Royal Canal; and,
- Accommodation works for properties affected by the proposed development.

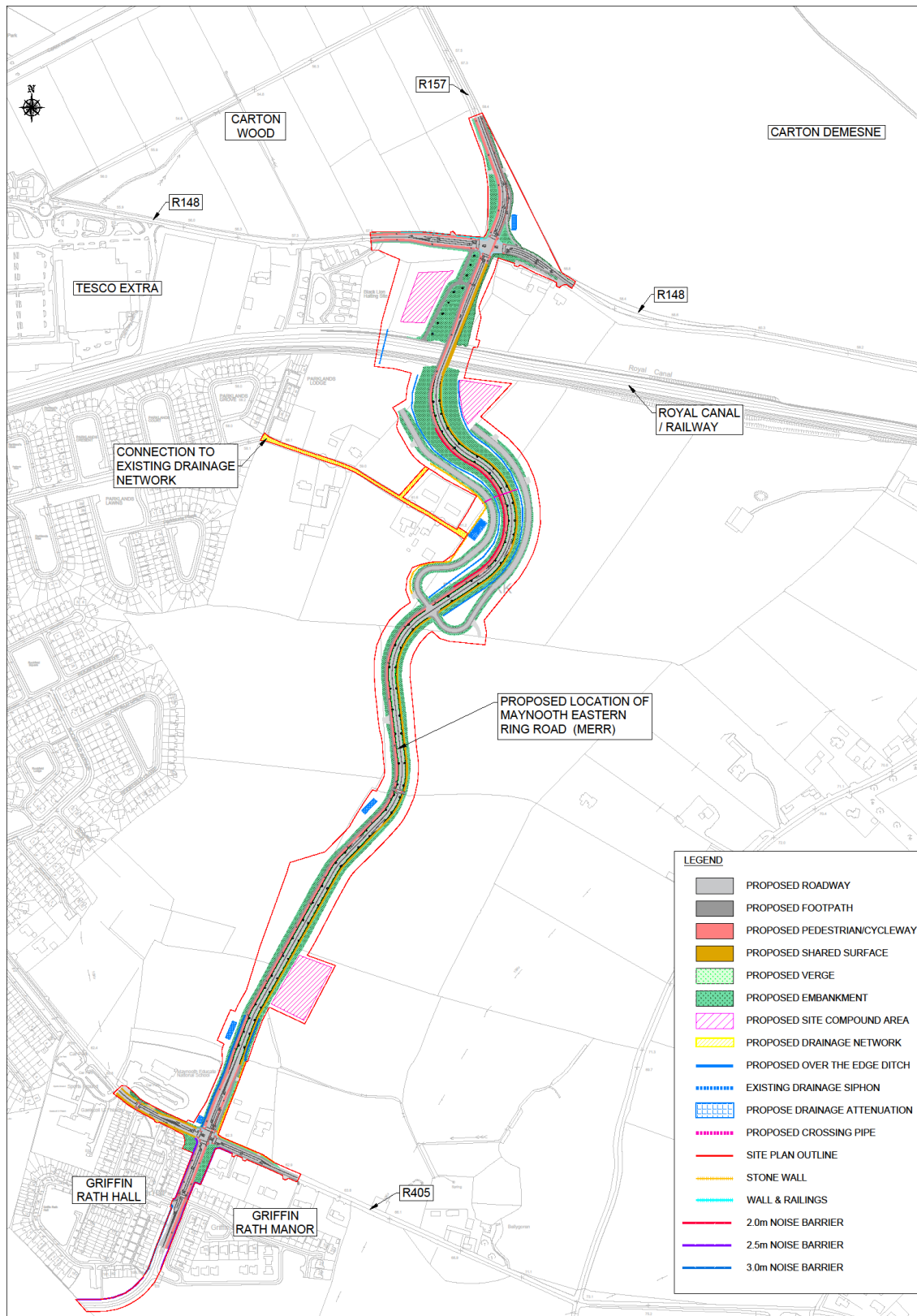
#### **3.2 Location of the Proposed Development**

The proposed development is located on the eastern side of Maynooth, c 1.2 km from the town centre in the townlands of Maynooth, Railpark and Moneycooly. The proposed development is located in an area that can be characterised as semi-urban with the southern-most tie in connecting into the Griffin Rath housing estates. The extents of the development are as shown in Figure 3.1 below. Refer also to the drawings provided in Appendix A.

The proposed development ties in to the existing R405 Maynooth to Celbridge Road at the southern extent where a new junction layout will be provided to accommodate the proposed development. The route then extends north towards the eastern extents of Parklands. The route curves west around residential dwellings on Parklands Grove and bridges over the Royal Canal and the Dublin to Sligo railway line. The proposed bridge crossing will be a clear-span structure which will provide sufficient vertical and horizontal clearance for the railway as required by Irish Rail and sufficient vertical and horizontal clearance over the Royal Canal and towpath as required by Waterways Ireland.

The route then continues in the northerly direction to the west of the residential dwellings to the existing R148 Leixlip Road and the R157 Dunboyne Road junction. The R148 Leixlip Road and the Dunboyne Road are both proposed to be realigned at this junction to facilitate the new junction and turning lanes.





**Figure 3.1 Site Layout – Location & Extent of Maynooth Eastern Ring Road**

### **3.3 Detailed Development Description**

#### **3.3.1 Main Alignment**

The Maynooth Eastern Ring Road is proposed to be a single carriageway comprising of two 3.5m wide lanes for the majority of the length with lanes narrowing to 3.0m at the approach to the junctions. It will have a posted speed limit of 50km/hr and the curved alignment of the road will assist in reducing speed, thus increasing safety.

The proposed road development will extend north from a tie-in junction at Griffin Rath Road. From Ch. 0+000 to Ch. 1+100 (refer to drawings in Appendix A), the MERR will typically be raised by between 1.0m to 2.0m above existing ground level. North of this, from approximately Ch. 1+120, the road will be raised by approximately 9.5m to a maximum level of approximately 70m AOD at approximate Ch. 1+310. To achieve this level, the alignment will rise at a constant gradient of 4%. The road alignment is required to be raised, in order to provide sufficient clearance overhead the railway line to facilitate the bridge, while still providing adequate headroom above the railway in accordance with Iarnród Éireann requirements. A description of the bridge is contained in Section 3.3.6 below. Refer to Appendix A for the Plan and Profile drawings of the proposed development.

#### **3.3.2 Pedestrian and Cycling Provisions**

Pedestrian and cyclists will be provided with dedicated cycle tracks and pedestrian footpaths on both sides of the road for the full length of the MERR in accordance with the National Cycle Manual. These facilities will be raised above the level of the road along the MERR and separated from the carriageways via a 2m wide grass verge from approximate Ch. 0+100 and Ch. 1+325. Both junctions, on the R405 Celbridge Road and the R148 Leixlip Road will also provide safe crossing points for pedestrians and cyclists.

On the western side of the route closest to the town in it is expected that the numbers of pedestrians and cyclists will be considerably higher than on the outer side of the route. The typical road cross section on the northbound carriageway will provide raised two-way cycle facilities with an overall width of 4m to accommodate 2.0m wide cycle lanes for each direction, separated from the road by a 2m wide grass verge. This arrangement will enable southbound cyclists to use the western side of the road in the opposite direction to traffic, rather than be required to cross the road twice to use the outer side of the route. Beside the cycle track will be a 2.0m footpath for pedestrians.

A raised 4.0m shared surface will be provided on the southbound carriageway to accommodate both pedestrians and cyclists and will be typically separated from the carriageway via a grass verge. Such an arrangement provides flexibility of use for two-way cycling where the numbers are likely to be low and full segregation unwarranted. This shared surface maintains a constant width throughout the length of the MERR. Typical cross sections of the route are included in Appendix A.

Located between the Leixlip Road junction and the Royal Canal at the northern end of the route, the proposed development will provide a greenway link to the Royal Canal Way along the towpath. This access will be provided by a shared surface. It is separately proposed for the Royal Canal Way to be upgraded and widened to a greenway route linking Maynooth to Leixlip and beyond towards Dublin.

The provision of segregated pedestrian and cyclist facilities will provide a link from the two schools (Gaelscoil Uí Fhiaich and Maynooth Educate Together National) on the R405 Celbridge Road to the Carton Wood housing estate north of the proposed

development. In addition, the new access to the Royal Canal Way will also provide a more direct connection for pedestrians and cyclists from Carton Wood on the R148 Leixlip Road and also for residents on the R405 Celbridge Road, to access Maynooth town centre and the railway station.

### 3.3.3 R148 Leixlip Road / R157 Dunboyne Road Junction

A significant junction upgrade is required on the R148 Leixlip Road at the location of the existing R148 / R157 junction. It is proposed to upgrade the existing priority T-junction to a 4-way signalised junction which will require the realignment and modification of the existing R148 and R157. Refer to Figure 3.2 and Appendix A for drawings illustrating the proposed junction.



**Figure 3.2 Proposed R148 Leixlip Road / R157 Dunboyne Road Junction**

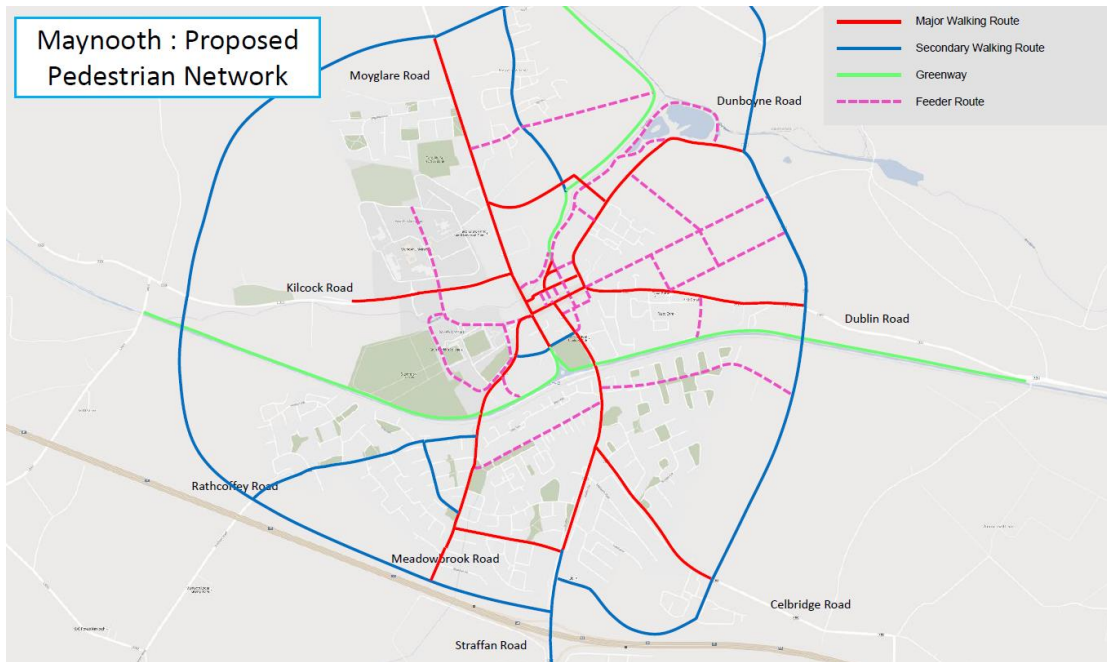
The existing R148 and R157 roads will require realignment and modification which is detailed in subsequent sections. The proposed junction layout on the MERR will have two approach lanes entering the junction, a dedicated right-turn lane and a combined straight-through and left-turn lane.

Pedestrians and cyclists will be catered for at the junction with toucan style signal-controlled crossing points on all approaches. As a result, pedestrians and cyclists will generally remain separated from the main carriageway. In addition to these crossing points, cyclists travelling from the R157 Dunboyne Road to the MERR will be given a cycle lane through the junction. At the northern tie-in to the R157 Dunboyne Road beyond the junction the cycle lane will be gradually tapered for a smoother transition into mixed traffic.

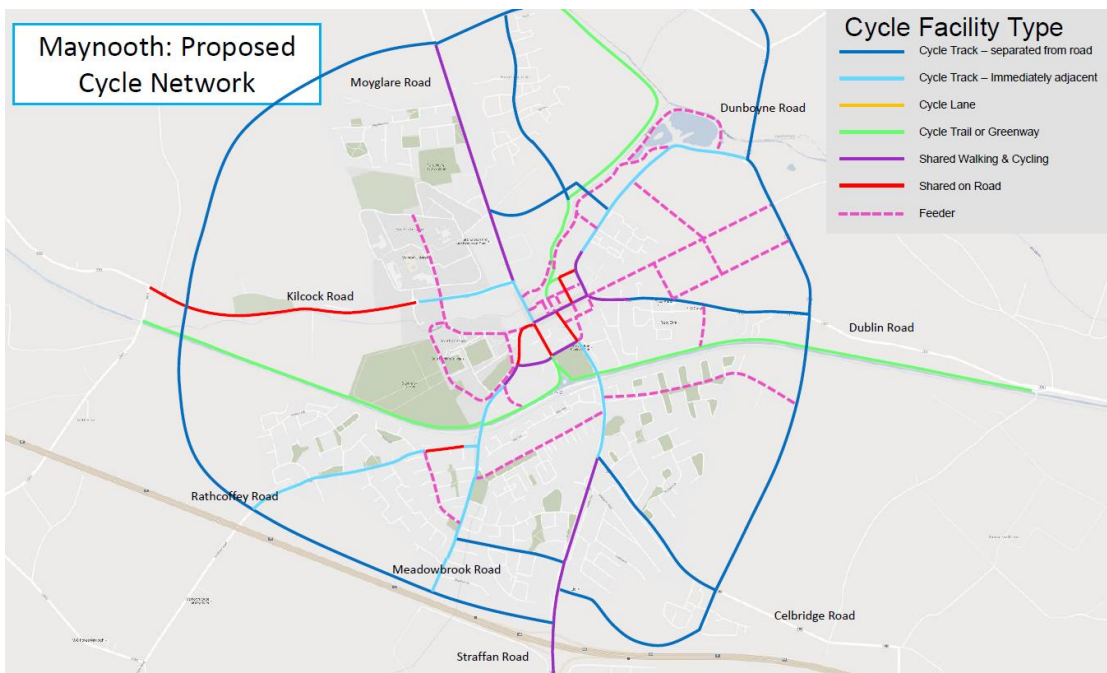
The strategy outlined in the Maynooth Pedestrian and Cycle Schemes section of the Maynooth Traffic Management Plan and Traffic Model, in which the MERR will form an outer town boundary for pedestrians and cyclists, dedicated cyclist facilities are not



proposed for the R148 towards Leixlip, as this facility will be provided along the Royal Canal Way. The footpaths will extend to accommodate the residential dwellings adjacent to the junction on the eastern side. Refer to Figure 3.3 and Figure 3.4 for extracts from the Maynooth Pedestrian and Cycle Schemes illustrating the envisaged pedestrian and cyclist network for Maynooth subject to the completion of various separate projects of which the MERR will be one.



**Figure 3.3 Proposed Pedestrian Network for the town as identified in the Maynooth Pedestrian and Cycle Schemes. (Source: Maynooth Traffic Management Plan)**



**Figure 3.4 Proposed Cycle Network for the town as identified in the Maynooth Pedestrian and Cycle Schemes. (Source: Maynooth Traffic Management Plan)**

### **3.3.4 R148 Leixlip Road**

The R148 Leixlip Road is currently a single lane carriageway with a posted speed limit of 60km/hr in the vicinity of the existing R148/R157 junction. This speed limit is increased to 80km/hr beyond the eastern extent of the proposed development boundary.

On the western approach to the junction, the R148 Leixlip Road will be widened to accommodate, in total, an additional two traffic lanes. There will be three lanes entering the junction from Maynooth; a left-turn, straight-through and right-turn lane. There will be one lane exiting the junction towards Maynooth in a western direction. Pedestrian and cycle facilities will be provided on both sides of the road, an upgrade over the current provision on one side of the road only. The road level will also be raised by approximately 1m at the approach to the junction.

On the eastern approach to the junction, the R148 will be similarly widened to accommodate three approach lanes as before and one lane exiting the junction. It is also proposed to realign this section of R148 to the north to connect into the upgraded junction. It is proposed to retain the existing road and reuse it as an access road to the cluster of houses and create a single access point on the new R148. Similar to the western section, the realigned road will be raised by approximately 1m at the junction. Refer to Figure 3.2 and Appendix A for drawings illustrating the proposed junction.

### **3.3.5 R157 Dunboyne Road**

The R157 Dunboyne Road is currently a single lane carriageway with a posted speed limit of 60km/hr. This road will require realignment and widening to accommodate the envisaged layout of two approach lanes with a separate left-turn lane and one lane exiting the junction. As with the R148, the R157 will need to be raised by approximately 1m at the junction.

The current provision of narrow footpaths, approximately 1.5m wide, on both sides of the road are proposed to be upgraded to 4.0m wide raised pedestrian/cycle tracks on both sides which will tie-in to the surrounding network and the signal-controlled crossing points at the junction.

### **3.3.6 Canal and Railway Bridge**

South of the northern junction a bridge is required to cross the Dublin to Sligo Railway line and the Royal Canal. The bridge will provide a minimum vertical clearance of 5.3m over the extent of the railway clearance envelope and a minimum vertical clearance of 4.5m above the towpath on the north side of the canal. In addition, the bridge abutment located to the south of the railway lines has a horizontal clearance of 4.5m from the closest rail, in accordance with Irish Rail requirements.

The longitudinal slope of the bridge is governed by both the road designs requirement to provide a safe junction and visibility slopes on approach to the northern junction while balancing the vertical and horizontal clearance requirements of the bridge. The parapets on the bridge will be formed by a series of solid 1.85m high precast concrete panels (containment level H4a) provided along the length of the structure and for 3m beyond the top of the embankment at both ends. It is proposed to vertically step the final 3m of the precast parapets at the top of the embankments, in order for the top of the precast parapet to have the same height as the adjacent safety barrier. Drawings of the proposed bridge are included in Appendix A and while a photomontage of the bridge has also been prepared, see Viewpoint VP4 in Appendix B.



### 3.3.7 Central Section

South of the bridge crossing over the canal and railway, the proposed road has a curved alignment to avoid residential properties. A number of proposed access roads are to be provided to severed lands, both agricultural and those that are zoned for future development. An indicative toucan crossing for pedestrians and cyclists is proposed to be provided at approximately Ch. 0+600.

The drainage system will include attenuation systems at various locations along the development as indicated in the drawings. These attenuation systems will provide storage for the 1 in 100 Year rainfall event, including a 10% increase in rainfall intensities to allow for the effects of climate change. These attenuation systems will solely serve the runoff from the ring road as separate systems will be required to serve the adjacent lands as they are developed. The attenuated road runoff will outfall to the existing 900mm diameter surface water pipe parallel to the western extents of the scheme and to the existing 300mm diameter surface water pipe located at Parklands. Refer to Figure 3.5 and Appendix A for drawings.

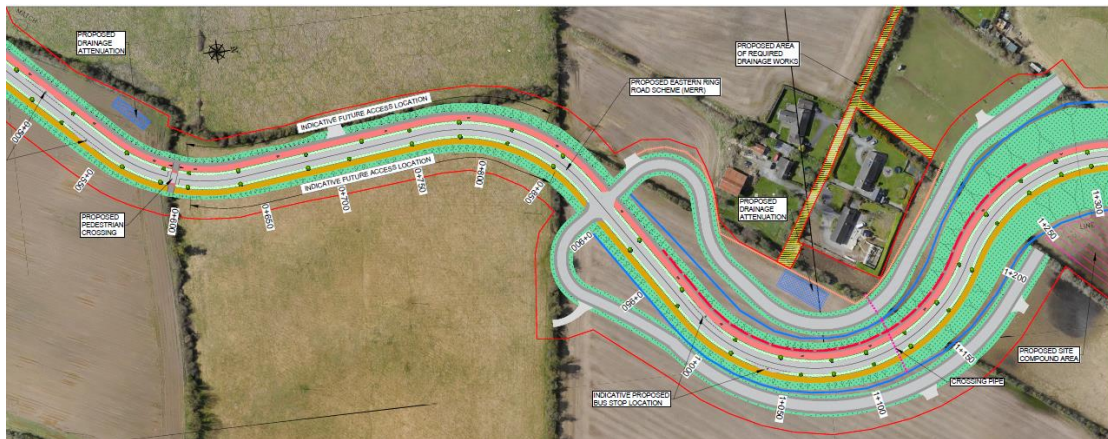
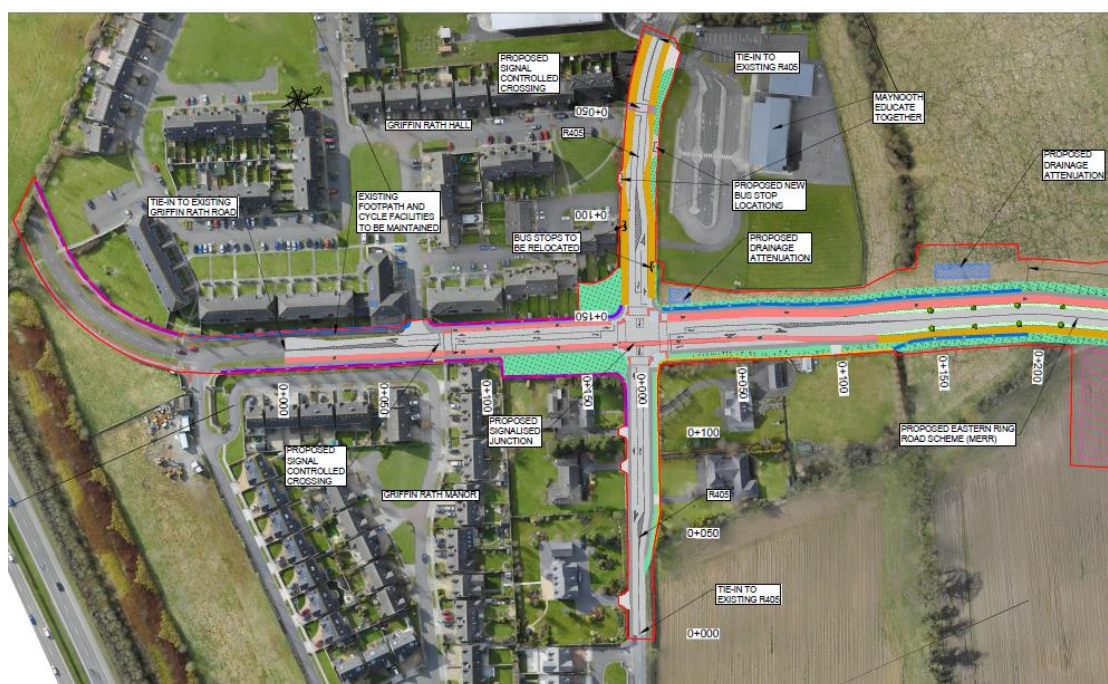


Figure 3.5 Plan of section south of the railway (see also Appendix A)

### 3.3.8 R405 Celbridge Road / Griffin Rath Road Junction

As with the R148 / R157 junction, the existing R405 / Griffin Rath Road junction will require a significant upgrade to accommodate the proposed development. Refer to Figure 3.6 and Appendix A for drawings. The existing priority T-junction is proposed to be upgraded to a 4-way signalised junction with toucan style signal-controlled crossing points for pedestrians and cyclists on all four arms.



**Figure 3.6 R405 Celbridge Road / Griffin Rath Road Junction (see also Appendix A)**

The MERR link will have 3 no. lanes approaching the junction in a southbound direction; a left-turn lane, a straight-through lane and a right-turn lane, while a single lane will exit the junction onto the MERR link in a northbound direction. In addition to the signalised crossing points, a cycle lane will be provided across the junction for cyclists travelling from the MERR to Griffin Rath Road. This will be developed in a similar fashion to that at the R148 / R157 junction.

It is proposed to maintain and, where necessary, improve all existing pedestrian and cyclist facilities in the vicinity of the junction within the boundaries of the proposed development. As before, the MERR will form an outer boundary of Maynooth's pedestrian and cycle network in accordance with the strategy outlined in the Traffic Management Plan. Therefore, cycle lanes will not be provided on the R405 Celbridge Road heading eastwards from the junction. In addition, pedestrian footpaths along the southern side of this road will be maintained while it is proposed to provide a new footpath on the northern side of the R405 in front of the two dwellings adjacent to the junction.

### 3.3.9 R405 Celbridge Road

The R405 is currently a single lane carriageway with a posted speed limit of 50km/hr in the vicinity of the new junction and this limit is increased to 80km/hr approximately 110m east of junction. This speed limit increase occurs within the extent of the proposed development boundary.

On the western approach to the junction, the R405 will be widened to accommodate an additional right-turn lane for traffic and the improved pedestrian and cyclist facilities.. The current provision of wide footpaths will be improved to a 4.0m shared surface proposed on both sides of the road extending to the main entrance of the Maynooth Educate Together and the secondary entrance to Gaelscoil Uí Fhiaich which is reserved for buses only. The existing bus stops, located approximately 50m to the west of the R405/Griffin Rath Road junction, will need to be relocated as part of the proposed development given their proximity to the proposed upgraded junction. The new

locations will be determined during the detailed design stage however it is not envisaged that they are moved so much that the current users are adversely affected.

The eastern approach will be upgraded in a similar fashion with road widened to accommodate a right-turn lane in addition to the existing lane. As previously discussed, it is not proposed to provide cyclist facilities along the eastern approach to the junction. On the southern side of this approach, the existing footpath will be maintained, while a section of footpath will also be provided on the northern side at the junction, extending eastwards to accommodate the two dwellings.

### **3.3.10 Griffin Rath Road**

Griffin Rath Road is currently used as an access to the Griffin Rath Manor and Griffin Rath Hall housing estates. It is proposed to widen this road to accommodate an additional traffic lane for northbound, right-turning vehicles at the upgraded junction. This will result in the loss of the grass verges along the eastern and western boundaries.

Griffin Rath Road is currently unfinished with temporary fencing erected near the end of the road. It is envisaged as part of the Maynooth LAP that this road will be connected to Straffan Road. The new link between Griffin Rath Road and Straffan Road has been granted planning permission (Ref.: 18/761 and 18/762) by a private developer unrelated to this proposed public road development. The proposed development will tie in to this new link to the Straffan Road once complete, allowing the through traffic from the Maynooth Eastern Ring Road to the Straffan Road.

### **3.3.11 Ancillary Works**

In order to complete the project, it will be necessary to carry out minor and ancillary works further to include:

- Boundary treatment, such as fencing, hedgerows and walls at adjoining land and residences;
- Individual accommodation works as considered necessary, and agreed during land negotiations;
- Provision of noise barriers where required;
- Landscaping of road verges and areas for screening;
- Maintenance of access and utility services, where possible, during the construction of the proposed development such that minimum disruption is caused.

### **3.3.12 Land Acquisition**

The land required for the construction of the proposed development includes land necessary for road construction, verges, embankments, cuttings, drainage, screening and other ancillary works. The total area of land required for the proposed development is identified in the site layout plan Figure 3.1 (refer also to Appendix A). A Compulsory Purchase Order (CPO) will be required to gain possession of lands required for the development of the MERR and will be undertaken by Kildare County Council. Accommodation works necessary to construct the project are likely to temporarily affect public lands outside of this CPO and will be subject to landowner agreements.

### 3.4 Construction Methodology

The construction methodology as outlined in the following section outlines the general construction methodology for the proposed development.

Preliminary Construction Sequence for the roadworks and bridgeworks will take place over approximately 18-months (phased period). The works are likely to take place in the following sequence:

1. Site Clearance

Site clearance will be undertaken during the permitted months and the site boundary will be fenced off.

2. The construction of the MERR roadworks will commence simultaneously with the bridge works construction.

a. Road construction of MERR north of the R405 extending northwards towards the Royal Canal

The construction of this main section of the route will entail a small volume of excavation to account for localised soft spots. Road drainage and utilities will be accounted for in the construction of embankments for the proposed development.

b. Construction of the bridge over the railway and Royal Canal

The construction of the proposed bridge will commence simultaneously with the roadworks construction. Prior to the construction of the bridge piles the large foul sewer rising main pipeline on the north side of the Royal Canal will need to be diverted. The construction of the bridge in general will require minor excavation of material, boring piles into rock, construction of a Reinforced Earth embankment, in-situ concrete abutments, lifting in large precast bridge beams, pouring an in-situ bridge deck and installing precast concrete parapets. It is envisaged that the large precast concrete beams will be delivered to site via either the R148 regional road to the north of the R405 regional road to the south and will be lifted into place by a large crane located adjacent to the railway or the Royal Canal.

At the roadworks/bridge interface, typically once the Reinforced Earth end-support walls are completed the road embankment is brought up to meet it. Once this is complete, the bridge beams can be landed into position and the bridge abutment finished. At this point, the abutment back of wall drainage and compacted fill is installed and the road embankment is brought into meet it. From here the bridge deck, parapets, finishes etc...are completed and finally the road/deck surfacing is installed on both the bridge and on the road embankment.

3. Upgrade of R405/Griffin Rath Road priority T-junction to signal-controlled junction, realignment/modification of R405 and Griffin Rath Road and tie-in to ongoing road construction of MERR.

4. Construction of the MERR north of the Royal Canal.

5. Realignment of R157 and R148, upgrade of R148/R157 priority T-junction to signal-controlled junction and tie-in to road construction north of the Royal Canal.

6. Construction of roadworks to tie-in to previously constructed sections of MERR.

7. All remaining landscaping, accommodation works and ancillary.

Access to residential properties will be maintained throughout the construction phase. Where short term restrictions may be required to some properties, and/or disruption to utilities during certain periods, these will be minimised, and residents will be notified in

advance. Construction traffic volumes will be in the order of 10,000 two-way heavy goods vehicle (HGV) movements, mainly over a 6-month period while the embankments are under construction with imported soil and rock materials, which is an average of 80 HGV's each way per day. Access to the site for these trucks will be from the adjoining regional roads the R148 Leixlip Road at the northern end and R405 Celbridge Road at the southern end, linking to the M4 motorway at either Junction 6 Celbridge, or Junction 7 Maynooth.

### **Demolition**

There will be no major demolition works included as part of the proposed development. The boundary of two properties to the east of the Maynooth Educate Together School will be affected. The front walls of these properties which are currently located on the northern side of the R405 will be reinstated at a setback location.

The second location where a property boundary will be affected is the boundary wall of Carton Wood housing estate which is located northwest of the R148 / R157 junction. While a section of the green land to the front of the housing development will be acquired as part of the CPO, a new similar boundary wall will be reinstated

A number of property boundaries may be affected in the installation of noise barriers. The form of the noise barriers will be agreed in consultation with the landowners through detailed design.

### **Outline Construction Environmental Management Plan**

Prior to any demolition, excavation or construction a Construction Environmental Management Plan (CEMP) will be produced by the successful contractor. The CEMP will set out the Contractor's overall management and administration of a construction project.

The CEMP will be developed by the Contractors during the pre-construction phase, to ensure commitments included in the statutory approvals are adhered to, and that it integrates the requirements of the Environmental Operating Plan (EOP). The Contractors will be required to include details under the following headings:

- Details of working hours and days;
- Details of emergency plan - in the event of fire, chemical spillage, cement spillage, collapse of structures or failure of equipment or road traffic incident within an area of traffic management. The plan must include contact names and telephone numbers for: Local Authority (all sections/departments); Ambulance; Gardaí and Fire Services;
- Details of chemical/fuel storage areas (including location and bunding to contain runoff of spillages and leakages);
- Details of construction plant storage, temporary offices;
- Traffic management plan (to be developed in conjunction with the Local Authority – Roads Section) including details of routing of network traffic; temporary road closures; temporary signal strategy; routing of construction traffic; programme of vehicular arrivals; on-site parking for vehicles and workers; road cleaning; other traffic management requirements;
- Truck wheel wash details (including measures to reduce and treat runoff);
- Dust management to prevent nuisance (demolition & construction);
- Site run-off management;



- Noise and vibration management to prevent nuisance (demolition & construction);
- Landscape management;
- Management of demolition of all structures and assessment of risks for same;
- Stockpiles;
- Project procedures & method statements for:
  - Diversion of services;
  - Excavation and blasting (through peat, soils & bedrock);
  - Piling;
  - Construction of pipelines;
  - Temporary hoarding & lighting;
  - Borrow Pits & location of crushing plant;
  - Storage and Treatment of peat and soft soils;
  - Disposal of surplus geological material (peat, soils, rock etc.);
  - Earthworks material improvement;
  - Protection of watercourses from contamination and silting during construction;
- Site Compounds.

The production of the CEMP will also detail areas of concern with regard to Health and Safety and any environmental issues that require attention during the construction phase. Adoption of good management practices on site during the construction and operation phases will also contribute to reducing environmental impacts. The mitigation measures outlined in this Part VIII will be outlined in the CEMP and will be the responsibility of the contractor to ensure they are carried out effectively.

### **Environmental Operating Plan**

The Environmental Operating Plan (EOP) is defined as a document that outlines procedures for the delivery of environmental mitigation measures and for addressing general day-to-day environmental issues that can arise during the construction phase of a construction project. Essentially the EOP is a project management tool. It is prepared, developed and updated by the Contractors during the project construction stage and will be limited to setting out the detailed procedures by which the mitigation measures proposed as part of this Part VIII will be achieved.

Before any works commence on site, the Contractor will be required to prepare an Environmental Operating Plan (EOP) in accordance with the TII *Guidelines for the Creation and Maintenance of an Environmental Operating Plan*. The EOP will set out the Contractors approach to managing environmental issues associated with the construction of the road and provide a documented account to the implementation of the environmental commitments set out in the Part VIII.

The TII Environmental and Construction Guidelines provide guidance with regard to environmental best practice methods to be employed in construction on National Road Schemes for the following:

- Guidelines for the Treatment of Badgers prior to the Construction of a National Road Schemes;
- Guidelines for the Treatment of Bats during the Construction of National Road Schemes;

- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes;
- Guidelines for the Testing and Mitigation of the Wetland Archaeological Heritage for National Road Schemes;
- Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post-Construction of National Road Schemes;
- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes;
- Guidelines on the Management of Noxious Weeds on National Roads;
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes;
- Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes;
- Guidelines for the Management of Waste from National Road Construction Projects; and
- Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.

This is a non-exhaustive list and relevant guidance current at the time of construction will be followed as a minimum. Updates of guideline documents are available at <https://www.tii.ie/technical-services/environment/construction/>. It is proposed to employ these guidelines, as and where relevant, on the proposed development.

## 4. ENVIRONMENTAL CONSIDERATIONS AND MITIGATION MEASURES

### 4.1 Environmental Assessment Methodology

A key document that has informed this assessment methodology includes the *Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (August 2017)* produced by the Environmental Protection Agency (EPA). Section 3.7 of these Guidelines and specifically Table 4-1 (below) forms the basis for describing the impacts as part of this assessment. The consideration of potential impacts includes direct, indirect, secondary and cumulative impacts as appropriate, with reference to the appropriate guidance.

Where specialists' topics have recognised guidance / standards relating to the description of effects and significance these are set out in the respective sections as part of that environmental topic as appropriate.

**Table 4-1 Description of Effects**

<b>Quality of Effects:</b>	
Positive	A change which improves the quality of the environment.
Neutral	No effects, or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Negative	A change which reduces the quality of the environment.
<b>Describing Significance of effect:</b>	
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
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 significantly alters a sensitive aspect of the environment.
Very significant Effects	An effect which, by its character, magnitude, duration or intensity significant alters most of a sensitive aspect of the environment.
Profound Effects	An effect which obliterates sensitive characteristics.
<b>Describing the Extent and Context of Effects:</b>	
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?)
<b>Describing the Probability of the Effects:</b>	
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 reasonably be expected not to occur because of the planned project if all mitigation measure are properly implemented.

<b>Describing the Duration and Frequency of Effects:</b>	
Momentary Effects	Effects lasting from seconds to minutes
Brief Effects	Effects last 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
<b>Describing the Duration and Frequency of Effects:</b>	
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 hour, daily, weekly, monthly, annually).

## 4.2 Traffic and Transport

The proposed road development will extend from the R405 Celbridge Road northwards, to the R148 Leixlip Road (Refer to Site Location Plan in Appendix A and Figure 3.1). At the southern junction, Griffin Rath Road provides access to the Griffin Rath Manor and Griffin Rath Hall housing estates while the M4 motorway is located further south of these estates, c.170m south of the proposed development. The junction is bound to the east by several detached houses along the R405 and to the west by the Maynooth Educate Together National School and Griffin Rath Hall. Another school, Gaelscoil Uí Fhiaich, is located approximately 150m west of the southern junction.

At the northern junction, the site is bound by the wall of Carton Demesne to the northeast, Carton Wood housing estate to the northwest and by the group of residential dwellings to the east of the junction, on the R148. The railway and Royal Canal are located to the south of this junction. Refer to Figure 4.1 below showing the receiving network.

### 4.2.1 Receiving Environment

#### Surrounding Road Network

The R405 Celbridge Road is a single carriageway road located at the southern extent of the development which extends from the R406 in Maynooth east to Celbridge and on to Newcastle. The R405 currently has a posted speed limit of 50km/hr at the location of the junction with Griffin Rath Road. Within the boundary of the site, the R405 Celbridge Road has 3.0m lane widths in both directions. On the southern side of the road to the east of the existing priority junction there is a continuous footpath that extends east. This footpath is typically between 1.75 and 2.0m in width. To the west of the junction on the southern side the footpath is typically 2.0m wide extending to Gaelscoil Uí Fhiaich with a varying width footpath extending beyond the school to Straffan Road. On the northern side of the road, there is a footpath of varying widths



that extends from Straffan Road to the Maynooth Educate Together School. East of the Maynooth Educate Together School, there is no footpath provided along the R405. There are currently no facilities for cyclists on any approach to the existing priority junction or along the R405 Celbridge Road.



**Figure 4.1 Map of Site and Surrounding Road Network (source: Open-Street map)**

The R148 Leixlip Road is a single carriageway road with a posted speed limit of 60km/hr at the northern extent of the proposed development. Within the extents of the proposed development, the R148 has approximately 3.5m lane widths in both directions. On the northern side of the R148 to the west of the existing priority junction, there is a continuous footpath that extends into Maynooth town. This footpath is typically between 1.75 and 2.0m in width. A raised cycle lane is also provided adjacent to the footpath although this facility does not extend into the town. On the northern side of the R148 to the east of the junction there is a footpath that extends approximately 100m beyond the junction with the R157. No footpath or cycle track is provided on the southern side of the road at this location. Carton Wood estate is located to the north of the R148 and west of the R157 and Carton Demesne is located to the east of the R157 with the boundary wall located adjacent to the R157 and R148. A number of residential dwellings are located on the southern side of the R148 to the east of the junction with the R157.

The R157 is a single carriageway road with a speed limit of 60km/hr in the vicinity of the proposed development. To the north of the junction with the R148 Leixlip Road, the R157 has 3.5m lane widths in both directions. The R157 is bounded to the east by Carton Demesne and to the west by Carton Wood housing estate. Footpaths are provided on both sides of the road with widths ranging from 1.0m to 2.0m.

Images of the layout and conditions of the R148 Leixlip Road, R157 Dunboyne Road, R405 Celbridge Road and the access road into Griffin Rath Road are provided below.



**Figure 4.2** R405 looking east from the junction with Griffin Rath Road



**Figure 4.3** R405 looking west from the junction with Griffin Rath Road





**Figure 4.4** Griffin Rath Road looking north towards the junction with R405



**Figure 4.5** R148 looking east from the junction with the R157





**Figure 4.6** R148 looking west towards the junction with the R157



**Figure 4.7** R157 looking north from the junction with the R148





**Figure 4.8** R148 looking east towards the junction of the R148 and the R157

#### **4.2.2 Existing Traffic**

Several traffic surveys were undertaken by AECOM in 2016 to aid in the development of the Maynooth Traffic Management Plan. These surveys included Automatic Traffic Counts (ATC) which are used to analyse traffic flows and develop the Annual Average Daily Traffic (AADT) figures for various classes of vehicles, Junction Turning Counts (JTC) which are used to assess the number of vehicles turning at a junction and in which direction they turn, and Automatic Number Plate Recognition (ANPR) surveys which are used to provide Origin-Destination data for the town.

The ATC survey was carried out over a two-week period between Tuesday 17<sup>th</sup> May 2016 to Monday 30<sup>th</sup> May 2016 at 21 sites across Maynooth including the R157, R148 and R405. The ATCs recorded traffic flows for 24 hours on each day. The recorded flows indicated that the peak hours for traffic in the vicinity of the development are as follows:

- Weekday AM Peak: 08:00 – 09:00
- Weekday PM Peak: 17:00 – 18:00

Network Flow Diagrams along the R148, R157 and R405 illustrating the 2016 traffic volumes are shown in Figure 4.10 to Figure 4.13 on the following pages. The Griffin Rath Road junction was not included in the survey given the relatively low flows of traffic occurring due it currently being used only as an access to housing estates.

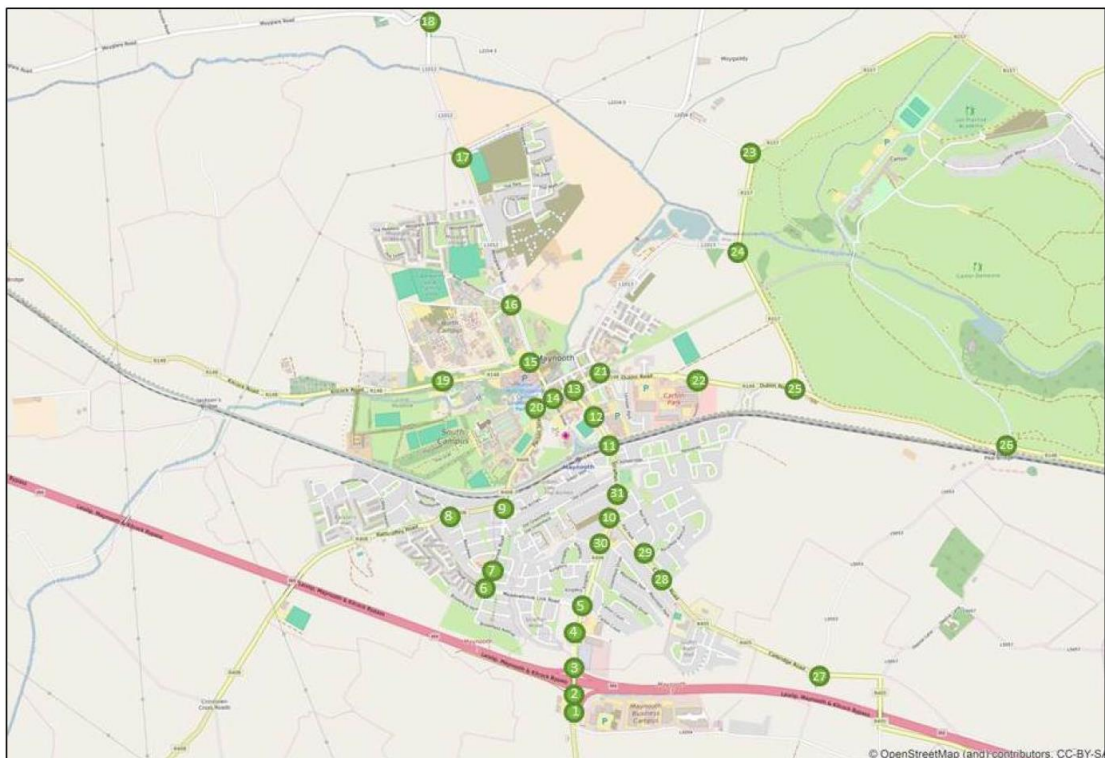
At the location of the junction with the R157 Dunboyne Road, the R148 Leixlip Road was recorded to carry approximately 1,000 pcu in the AM peak with 200 pcu turning onto the R157. In the PM peak, approximately 1,450 pcu was recorded along the R148 with 430 pcu turning onto the R157. The AADT along the R148 was determined to be approximately 10,500 vehicles per day.

The R157 was recorded to carry approximately 550 pcu in the AM peak and 725 pcu in the PM peak. The AADT on the R157 was determined to be approximately 7,650 vehicles per day.

The results for the R405 Celbridge Road show that the single carriageway carries approximately 600 pcu in AM peak and 530 pcu in the PM peak. The AADT on the R405 was determined to be approximately 5,850 vehicles per day.

Long queues and delays were reported during the site observations and recorded during the surveys undertaken as part of the Maynooth Traffic Management Plan on the R148 Leixlip Road, R157 Dunboyne Road and R405 Celbridge Road. The delays along these roads primarily occurred at junctions in the town centre during the AM and PM peak hours. The junctions along the R148 were also identified to be operating below optimum capacity.

The locations of the junctions surveyed are identified in Figure 4.9 below.



**Figure 4.9** Locations of junction numbers

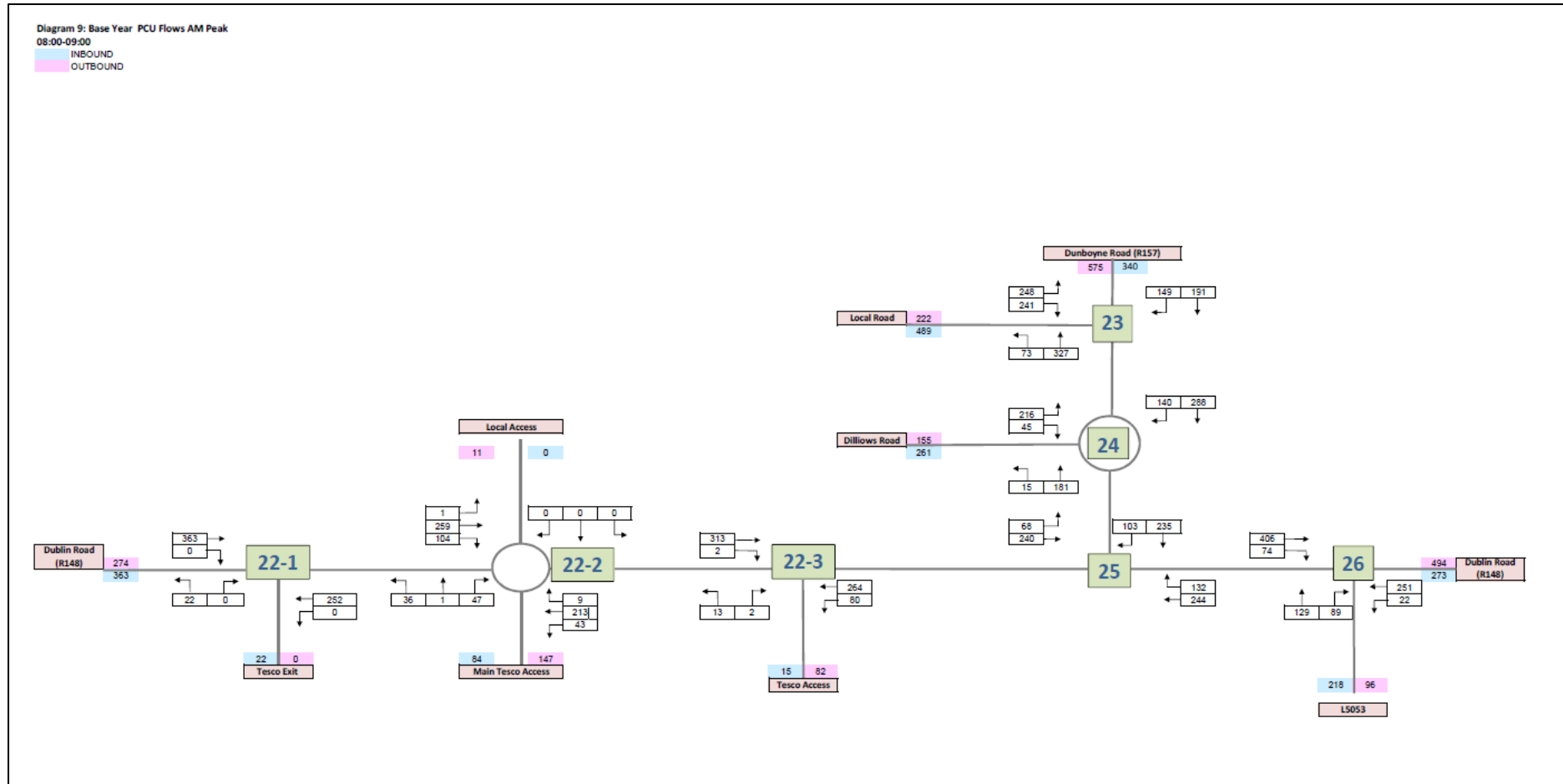


Figure 4.10 Existing 2016 AM Peak Hour Network Volumes for the R148. Junction No. 25 is the existing priority T-junction of the R148 Leixlip Road and R157 Dunboyne Road.

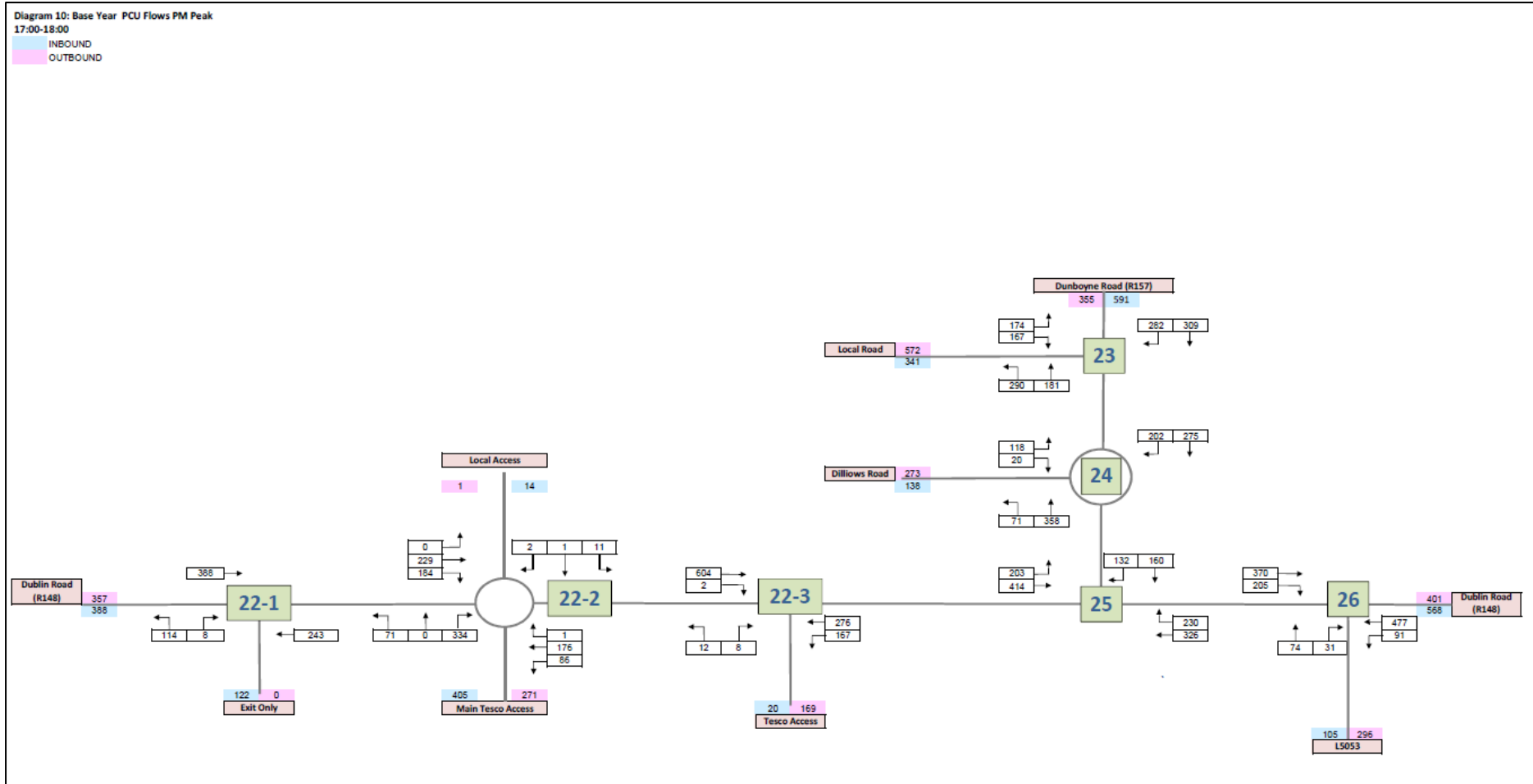
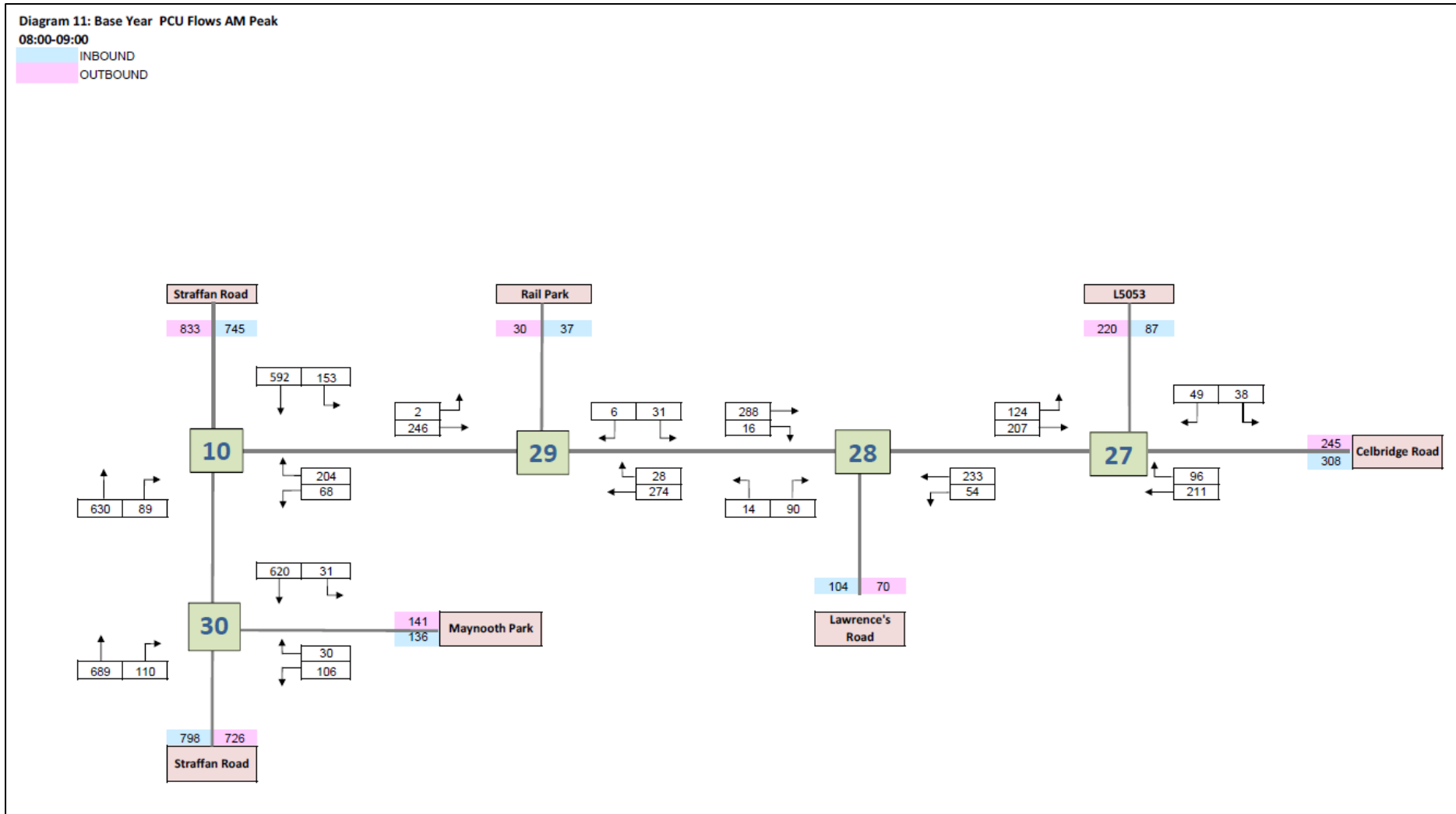


Figure 4.11 Existing 2016 PM Peak Hour Network Volumes for the R148. Junction No. 25 is the existing priority T-junction of the R148 Leixlip Road and R157 Dunboyne Road.





**Figure 4.12 Existing 2016 AM Peak Hour Network Volumes for the R405. The existing Priority T-junction of the R405 and Griffin Rath Road is located between Junction No. 27 and Junction No. 28.**

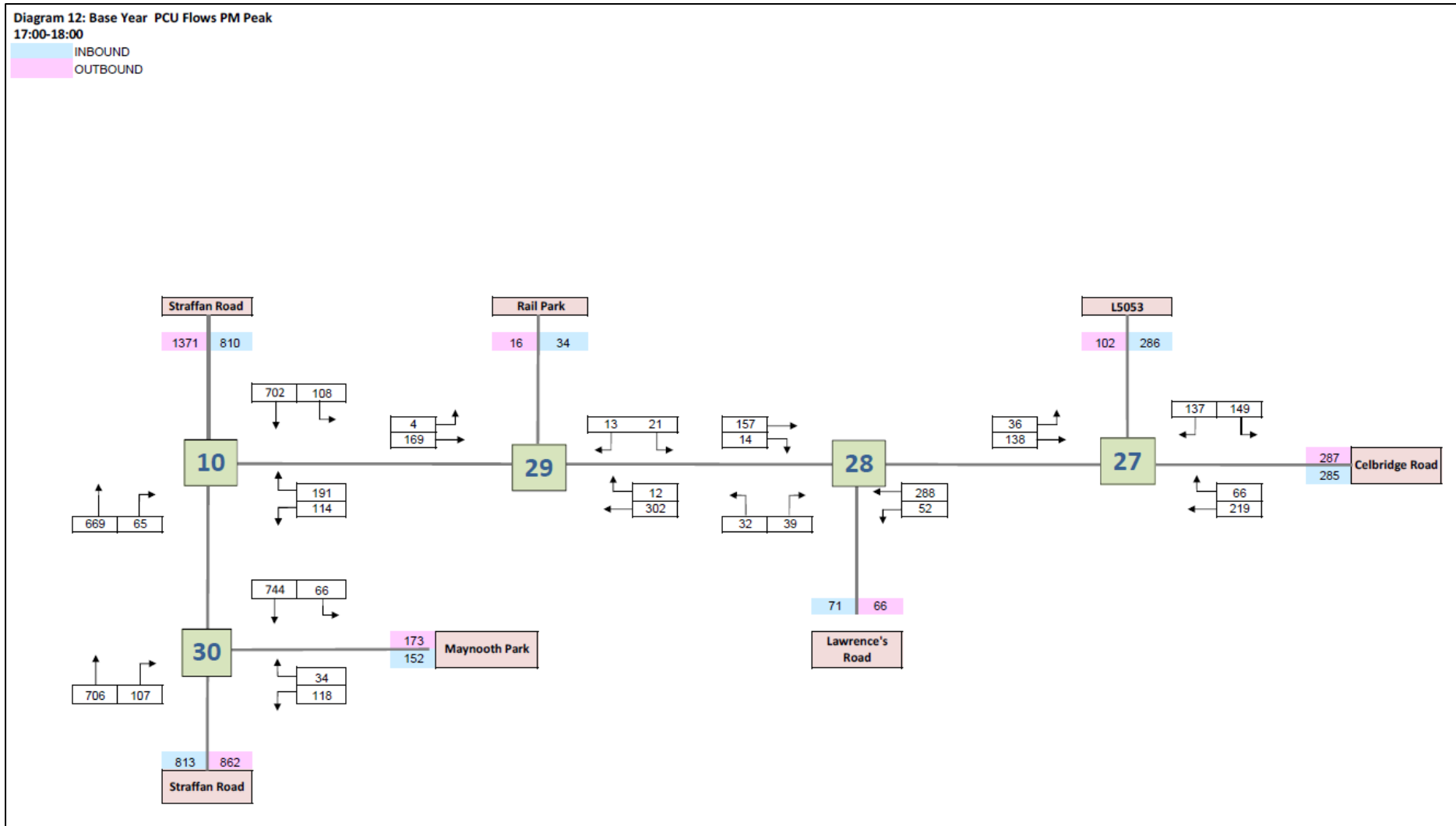


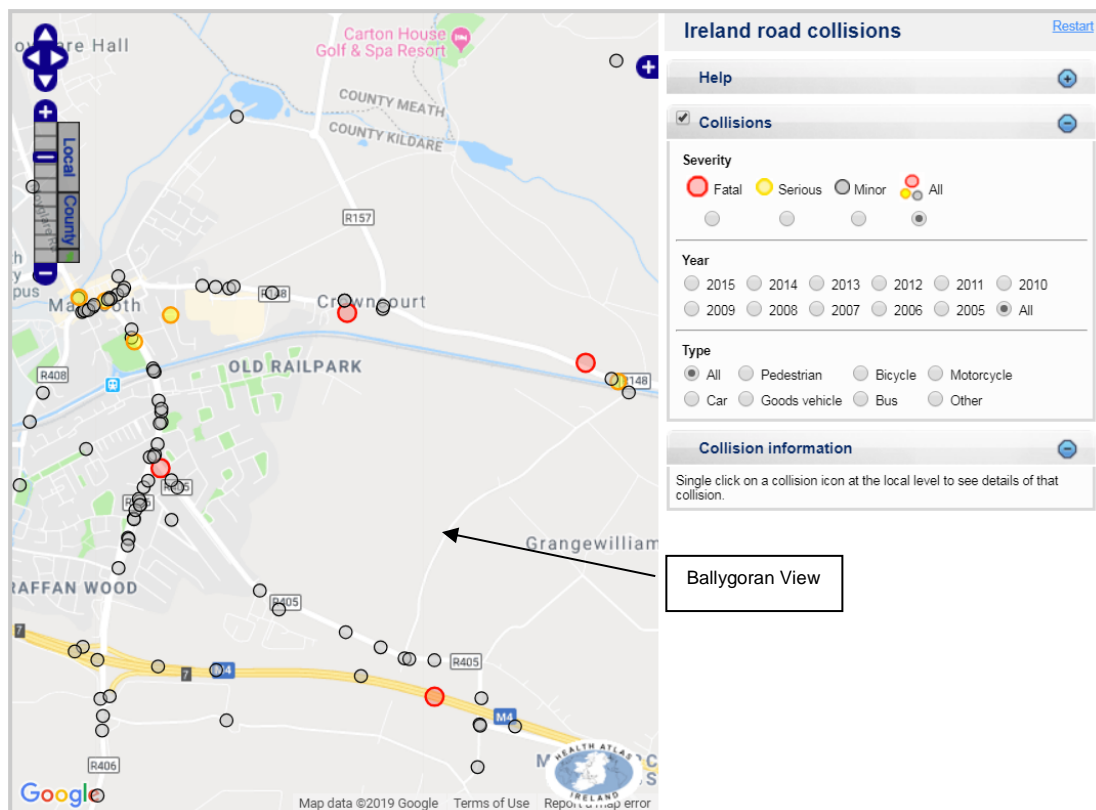
Figure 4.13 Existing 2016 PM Peak Hour Network Volumes for the R405. The existing Priority T-junction of the R405 and Griffin Rath Road is located between Junction No. 27 and Junction No. 28.

### 4.2.3 Road Safety

Data relating to collisions on the R405 Celbridge Road, R148 Leixlip Road, R157 Dunboyne Road and Griffin Rath Road in the vicinity of the development, during the 10-year period between 2005 and 2015 was collected from the Road Safety Authority online mapping tool and analysed.

The RSA online mapping tool outlines the pattern and location of road collisions in Ireland, where personal injury was involved. Details regarding the date, severity level (minor, serious and fatal), circumstances of each collision are provided, along with the type of vehicle involved.

The locations of collisions on the road networks in the vicinity of the development site are visible in Figure 4.14 below.



**Figure 4.14 Road Collisions Data from RSA**

On the R405 Celbridge Road, between the junction with Straffan Road and Ballygoran View, there has been 1 fatality, occurring in 2007, and 7 minor incidents recorded. Of those incidents, there have been two minor incidents in the vicinity of the proposed development occurring most recently in 2010. One additional minor incident was recorded in Griffin Rath Road in 2010. The latest incident within the extents described occurred in 2013.

On the R148 Leixlip Road, between Pike Bridge and the roundabout entrance to Tesco, west of the junction with the R157 Dunboyne Rd junction, there have been two fatalities recorded with both occurring in 2009, while one serious incident occurred in 2011 at Pike Bridge and six minor incidents along this stretch of road, the most recent of which occurred in 2014. Of these incidents, four have occurred within the vicinity of the proposed development including one of the fatalities. No incidents were reported on the R157 Dunboyne Road, although the priority junction with the R148 at the northern extent of the proposed development has had two minor incidents recorded.

#### 4.2.4 Assessment Methodology

The predicted volume of traffic that will be using the MERR and subsequently expanding out onto the existing road network has been estimated through modelling of the future traffic scenario for Maynooth using both a Do-Minimum and Do-Something scenario.

The predicted AADT and turning movements for future traffic levels at the northern and southern junctions were generated using a combination of the ATC and ANPR survey data for the AM and PM Peak hours.

#### Traffic Growth

The growth of traffic was modelled using growth factors developed by the Maynooth Traffic Management Plan (TMP), applied in agreement with Kildare County Council. Given the significant residential development envisaged on the residential zoned lands, the growth factors were greater than those in the National Traffic Model (NTM) and the National Transport Authority's (NTA) Eastern Regional Model (ERM). A comparison of the three approaches undertaken as part of the formulation of the growth factors in the TMP found that there was good correspondence with the NTM, ERM. Extracts from the TMP illustrating the percentage growth is presented in Table 4-2; note that the TMP accounted for the years between 2016 and 2031 and the data presented in the table relates to these years.

**Table 4-2 Extract from Maynooth TMP showing the percentage growth of light vehicles and heavy vehicles between 2016 and 2031. (Source: Maynooth Traffic Management Plan)**

Growth	Light Vehicles		Heavy Vehicles	
	AM	PM	AM	PM
KCC	11.8%	10.8%	77.3%	75.1%
NTM	9.4%	9.3%	75.4%	75.4%
ERM	7.2%	8.0%	131.1%	67.9%

The opening year and design year have been taken as follows:

- Opening year: 2021 (assumed earliest completion of the road works)
- Maynooth Traffic Management Plan (MTMP) Model Future Year 2031
- Design year: 2036 (15 years after opening year)

A separate Traffic Modelling Report was prepared by Aecom in May 2019 for the Maynooth Eastern Ring Road. For the additional 5-year period of growth from the MTMP Model Year of 2031 to the Design Year of the MERR of 2036, the TII traffic growth factors were applied to estimate the increased traffic flows.

Traffic growth is influenced by the geographical location of the site, as well as by the type of vehicles in question. Growth in heavy vehicles is dependent on different factors to that of growth of light vehicles and therefore regional growth rates need to be calculated separately for different vehicle types.

Several scenarios were assessed to predict the growth of traffic within Maynooth with variables including the quantity of new residential properties in the town and the extent of road development in Maynooth. It was determined that the worst-case scenario for traffic growth, i.e. the scenario that develops the highest traffic levels, was the scenario



in which only the MERR and the proposed road connecting Griffin Rath Road to Straffan Road were constructed, with the full amount of new residential developments occurring. Predicted turning counts at the two junctions were estimated for the 2021 Opening Year and 2036 Design Year and the capacity of the proposed junctions were subsequently analysed to ensure that the capacity exceeded the demand. The predicted AADT for the Do-Minimum and Do-Something scenarios in the Design Year for the relevant roads are given below in Table 4-3.

**Table 4-3 Predicted 2036 Design Year Do-Minimum and Do-Something AADT**

Road	2036 Do-Minimum AADT	2036 Do-Something AADT
MERR	-	21000
R148 Leixlip Road (East)	19500	17500
R148 Leixlip Road (West)	13900	13500
R157 Dunboyne Road	17500	20250
R405 Celbridge Road (East)	14000	11700
R405 Celbridge Road (West)	7250	8500
Griffin Rath Road	11500	15000

#### 4.2.5 Junction Capacity Analysis

The capacity of the proposed junctions was analysed using the LinSig software. Turning counts for the junctions during the AM and PM peak hour flows are inputted into the software which, upon completion of the analysis, presents its outputs in terms of Degree of Saturation (DoS) and queuing delay. It is considered good practice to attain, where possible, a DoS of less than 90% on any arm of the junction as turbulent factors above that threshold may inhibit the optimal performance of the junction. In urban environments this limit of 90% is not achievable in all scenarios due to constraints such as lack of space for a junction to be sized appropriately and unpredictable traffic flows due to the proximity to sensitive receptors which have short-term peak flows, for example schools as is the case with the proposed junction on the R405 Celbridge Road.

Ensuring that the DoS is less than 100% is preferred as exceeding this would result in queue lengths increasing over the period of time being analysed, typically one hour. Where 100% DoS is not exceeded, queues will form at the junction due to nature of signalised junctions but will dissipate at a faster rate than at which they are formed.

The approximate AM and PM peak hour flows that have been estimated are given below in Table 4-4.

**Table 4-4 Approximate two-way peak hour flows.**

Road	Two-Way AM Peak Flow	Two-Way PM Peak Flow
MERR	1600	1400

R148 Leixlip Road (East)	1500	1600
R148 Leixlip Road (West)	900	1250
R157 Dunboyne Road	1700	1600
R405 Celbridge Road (East)	1000	1000
R405 Celbridge Road (West)	750	650
Griffin Rath Road	1350	1350

Following analysis of the proposed signalised junction on the R148 Leixlip Road carried out for the predicted worst-case scenario traffic volumes in the 2036 Design Year, it was determined that the demand is catered for within the capacity of the proposed junction in the AM and PM peak hours. The output from the software reported that the highest DoS on an arm was less than 80%.

As with the R148 Leixlip Road junction, the proposed signalised junction along the R405 Celbridge Road was analysed in LinSig for the predicted worst-case scenario in the Design Year. The results from the analysis indicate a maximum DoS of 83.0% which is below the desirable figure of 90% that is considered good practice to allow for unknowns and is operating within capacity.

The results of the above LinSig analysis are provided in **Appendix C** of this report.

### Construction Traffic

The main construction activities, including the road construction, bridge structures, and earthworks will take place off the existing road network. The tie-in points and upgrades to the existing roads and junctions will involve the development of a Traffic Management Plan (TMP) to ensure all traffic movements are maintained.

There will be a requirement for a number of deliveries of materials to site and removal of materials from the site via the R405 and R148 and/or R157. Peak construction traffic will occur during the importing and exporting of earthworks material. It is estimated that the import and export of material will increase the existing AADT on the surrounding roads, assuming they take place over an approximate 18-month period, as outlined below in Table 4-5.

**Table 4-5 Increase in AADT due to construction traffic**

Road	Existing AADT	Existing %HGV	Construction Non-HGV AADT	Construction HGV AADT	Construction Stage AADT	Construction Stage %HGV
<b>R405</b>	6500	0.2	200	95	6795	1.6
<b>R148</b>	10300	1.8	80	20	10400	2.0
<b>R157</b>	10100	1.3	50	6	10156	1.4

The haulage of these materials will generally take place outside normal peak traffic times on the surrounding road network. Given the short-term nature of the works and the modest volume of construction traffic this will have an imperceptible short-term effect on traffic in proximity to the site.

### 4.2.6 Mitigation Measures

#### Construction Stage

- The contractor will be required to prepare a Construction Environmental Management Plan (CEMP) and associated TMP to maximise the safety of the workforce and the public and minimises traffic delays, disruption and maintain

access to residences and businesses, and must meet the approval of Kildare County Councils' Roads Department. The TMP will also address temporary disruption to traffic signals, footpath access and the management of pedestrian crossing points. The contractor shall provide an appropriate information campaign for the duration of the construction works.

The following restrictions will be adhered to in the TMP unless agreed otherwise with Kildare County Council's Roads Department:

- The R148 Leixlip Road, R157 Dunboyne Road, R405 Celbridge Road and Griffin Rath Road shall be kept open to traffic while the main upgrade works are being carried out. The tie-ins with the existing roads at the northern and southern extents of the proposed development will be managed to ensure access is maintained and to minimise the duration of any disruption. Where temporary closures are required, the contractor shall provide suitable diversion routes, agreed in advance with Kildare County Council, notified to the public and suitably signposted.
- The Contractor shall provide and maintain temporary traffic management in accordance with the Department of Transport, Tourism and Sport *Traffic Signs Manual*.
- Access to local properties shall be maintained at all times. Works to any accesses shall be planned in consultation with the property owners to minimise disruption.
- Existing footways and cycle tracks shall be maintained at all times except where such footways and cycle tracks are at the point of being removed for the completion of the works. In such circumstances, the Contractor shall provide temporary footpath or cycle track diversions, with sufficient advance signage informing people of the diversions.

### **Operational Stage**

The proposed road and junction upgrades that are necessary to accommodate the development of the Maynooth Eastern Ring Road have been determined to ensure that the surrounding road network is capable of accommodating the additional traffic. The traffic analysis shows the junctions on the R148 Leixlip Road and R405 Celbridge Road will operate satisfactorily and therefore no further mitigation measures are considered necessary.

## **4.3 Population and Human Health**

### **4.3.1 Introduction**

This section addresses the potential population and human health impacts of the construction and operation of the proposed road development. Actual and perceived impacts may arise on population and human health from various aspects of the proposed development. These impacts are dealt with throughout this Part VIII Planning Report in particular, the following Sections of this report: Landscape and Visual (Section 4.7), Noise and Vibration (Section 4.8), Air Quality and Climate (Section 4.9); and Material Assets and Land (Section 4.11).

### **4.3.2 Methodology**

A study of population and human health impacts generally addresses impacts at the community level rather than for individuals or identifiable properties. The assessment of impacts at a local level has focused on the communities adjacent to, or in the general environs of, the proposed development works. Particular emphasis has been given to

the impacts on local vehicle journeys, pedestrians, cyclists and local residents in terms of the following four headings:

- *Journey characteristics*: an assessment of the impact of the proposed route on journey time, journey time reliability and travel patterns.
- *Community severance*: an assessment of the impact of the proposed route with regard to community severance, including impacts on the use of community facilities, particularly those used by older people, children or other vulnerable groups. The category includes both new severance and relief from existing severance.
- *Amenity*: An assessment of the impact on journey amenity arising from traffic conditions and people's exposure to traffic (i.e. safety, noise, dirt, air quality). The category also includes impacts on sites used for amenity purposes and general impacts on local quality of life.
- *Economic impacts*: an evaluation of the proposed interchange in the context of economic prospects and employment.
- *Human Health*: considered with reference to and interactions with other environmental receptors contained in corresponding sections such as air, noise, traffic, as appropriate.

#### **4.3.3 Receiving Environment for Population & Human Health**

The receiving environment is currently a semi-urban environment to the east of Maynooth town and is bounded to the north by the R148 Leixlip Road and to the south by the R405 Celbridge Road. The lands within the study area of the proposed development are greenfield sites with the northern section zoned for 'New Residential'. The southern section of the proposed development will run along the boundary of lands zoned for 'New Residential', 'Community and Educational' and 'Agriculture' as zoned within the Maynooth LAP 2013-2019 Incorporating Amendment No.1. An indicative route overlays this zoning with a Roads Objective.

The adjacent lands along the R405 Celbridge Road are zoned as existing residential and infill, with community uses such as Maynooth Educate Together National School and Gaelscoil Uí Fhiaich to the south of the proposed development. The area is serviced by a road network comprising the R148 Leixlip Road, the R157 Dunboyne Road, the R405 Celbridge Road and the R406 Straffan Road as well as a Dublin to Sligo railway line. The M4 services Maynooth from the south and runs c.170m south of the proposed development.

The 2016 census indicated that Maynooth Electoral Division had a population of 15,998, which was an increase of 17.5% since 2011. In the Maynooth Local Area Plan it is projected that the town population will grow a further 11% to 19,000 people by 2023. The proposed development has a critical role to play in ensuring that the needs of future population growth are planned for in a sustainable manner. There are a number of residential properties within the vicinity of the proposed development. To the north of the development Carton Woods Estate is located north of the R148 Leixlip Road immediately west of the proposed development, while a small number of houses are located to the east of the proposed development, on the R148. The proposed development will curve around Parklands Grove where a small number of residential houses are also located. At the southern tie-in, there are a number of residential properties located on the R405 Celbridge Road east of the proposed development, while Maynooth Educate Together School is located to the west of the junction. Griffin Rath Manor and Griffin Rath Hall housing estates are located south of the R405 Celbridge Rd on the Griffin Rath Road, which the proposed development will tie into.



#### **4.3.4 Predicted Impacts for Population & Human Health**

##### **Journey Characteristics**

The works required during construction will be short-term in nature and will have a slight negative effect on journey characteristics on the R405 Celbridge Road and the R148 Leixlip Road, accessing the Maynooth town centre from the east during construction stage, when the realignment of the two roads with the new road development will occur. Short term slight negative effects may be experienced by commuters using the Dublin to Sligo railway line which will need to be possessed at various stages of the construction phase of the proposed bridge for short periods. However, the possessions of the railway line will be undertaken at night and/or at weekends where possible, and in agreement with Iarnród Eireann.

It is anticipated that the journey characteristics will improve for all modes of travel during operation phase as the Maynooth Eastern Ring Road (MERR) will remove the need to travel through the centre of Maynooth town from the north or north-east, to the south or south-east directions, improving journey time through the creation of new routes and reduction of congestion.

##### **Community Severance**

The construction of the proposed development is not likely to cause severance of communities, however during the construction of junction tie-ins, short-term traffic diversions may be required. This is likely to have a slight effect on local road users. Pedestrian and cycle access along the Royal Canal towpath may be restricted for certain periods during construction due to health and safety, however the effect is likely to be temporary and imperceptible.

The proposed development will reduce severance within the Maynooth area through the provision of the new connection, providing a link between developments on the R148 and the R405. The proposed development will provide improved pedestrian and cycling environment through the inclusion of cycle lanes and pedestrian crossings as part of its design.

The traffic along the R405 Celbridge Road and the R148 Leixlip Road into Maynooth town centre will be displaced as the proposed development will create a relief road, reducing the need to travel through Maynooth town from the north or north-east direction. Furthermore, the proposed development includes for the future provision of bus stops along the route, improving the public transportation network and promoting sustainable travel methods to local road users. The MERR will provide access to the Maynooth Educate Together School and Gaelscoil Uí Fhiaich from the northern direction and thus, will improve access to the school and reduce existing community severance. Access to the Royal Canal will also provide improved access to local amenities for developments along the R405 and R148 while it will also open up new loops which can be used by local pedestrians and cyclists. Overall, the access within the community will be positively affected through improved connections and access to amenities.

Lands will be acquired from local landowners in order to build the road. This will result in a small number of land plots being severed. The majority of the lands being severed are zoned for 'New Residential' and the proposed development will provide temporary accesses to these lands to allow for future development to take place, having a long-term positive effect on the planned growth of Maynooth town.

## Amenity

Access along the Royal Canal towpath will be restricted for short periods during the construction of the bridge across the Royal Canal and the Dublin to Sligo railway line to enable construction works. Short term traffic impacts are likely during the construction stage as a result of construction traffic on site. Temporary traffic control measures will be addressed in a Traffic Management Plan (TMP) that will be implemented by the successful contractor to minimise any effects on road users to short-term, slight, negative effects.

## Human Health

Road construction activities have the potential to cause congestion or risk of collision and hazards. Construction stages of developments may also result in increased nuisance and disruption caused by noise and dust arising from construction activities which are short-term. The impact of construction vehicles required to import materials during construction for the proposed development has been assessed in the noise and vibration, and air quality and climate sections of this report which are discussed in Sections 4.8 and 4.9 of this report. Temporary traffic measures during construction may also cause nuisances to local road users and are likely to cause short-term negative effects at peak hours.

During the operation phase, noise levels and air quality emissions will increase in the area. These changes will be experienced by of existing residential dwellings in close proximity of the road however these impacts are not expected to have a significant effect. The area is already semi-urban in nature and currently experiences high traffic flows along the R405 Celbridge Road and R148 Leixlip Road. The design speed of 50kph and the noise barriers proposed in Section 4.8 Noise and Vibration will limit noise and air quality emissions to a level that is not likely to have significant effects.

The World Health Organisation issued updated Environmental Noise Guidelines for the European Region in 2018. The specific guidelines for road noise include a recommended average day time level of 53dB and a night-time level of 45dB. Current baseline noise levels in the area of the proposed development are all currently range from 52 – 75dB  $L_{den}$ . The levels recommended by the WHO are outlined for communities rather than individual residences and in addition it is important to remember that the levels are not thresholds. The proposed development will also reduce existing road noise for a number of receptors which are subject to high traffic levels bringing an improvement in noise levels across the wider community. The WHO Environmental Noise Guidelines recommend:

*“to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure.”*

Furthermore, the operation phase of the proposed development will improve access and transport infrastructure network including vehicular, walking, cycling and public transport provision. The development will result in improved road safety and support an increase in walking and cycling activities within the area. The improved travel times associated with the new road development and amenity for commuters in the surrounding areas are likely to improve their well-being by reducing the likelihood of anxiety and changes in mood associated with traffic congestion. The provision of pedestrian and cycle facilities along the length of the road will have a permanent positive effect on the surrounding population of Maynooth. The development will improve access and connectivity between housing estates, schools, transport systems and local amenities in addition to creating new green loops which can be used for leisure and recreational activity. The provision of pedestrian/cycling links along the

Royal Canal are also likely to improve the physical health and mental wellbeing of the residents of Maynooth town by providing accessible and close routes for outdoor activities and exercise in semi-natural environments.

### **Economic and Employment**

During the construction phase the proposed development will benefit the local economy and populations and local expenditure by construction workers as well as the purchase of local materials and services, having positive effects. Additional indirect employment and economic activity is likely to occur due to the provision of goods and services during construction stages.

During the operation phase, it is likely that the proposed development will have significant positive long-term effects on population and health due to improvements in the transport network and the traffic volumes within Maynooth town. The construction of the proposed development will unlock lands within Railpark which have been zoned as 'New Residential' according to the amended Maynooth LAP 2013-2019 Incorporating Amendment No.1, which can be used for housing development as well as for creation of other investment opportunities that will benefit the community.

New access to zoned lands will also allow potential for future housing and community facilities to be developed that will benefit the Town. The operation of the proposed development will have positive effects on population and human health within the greater area as it will provide new infrastructure with the aim of reducing congestion, in addition to providing increased connectivity and high-quality sustainable travel modes to existing and future communities.

#### **4.3.5 Mitigation Measures for Population & Human Health**

##### **Construction**

- A Construction Environmental Management Plan (CEMP), Traffic Management Plan (TMP) and Stakeholder Management Plan (SMP) will be implemented as part of the construction stages to account for all works associated with the construction of the proposed development, including pre-construction site clearance works. These documents will address likely human health risks and ensure construction practices and measures are put in place to minimise any effects on road users. The overall aim being to minimise risk to human health during construction works.
- The appointed contractor will be required to prepare and implement a CEMP, to be approved by Kildare County Council prior to the commencement of construction. The contractor will identify an Environmental Manager/Site Representative who will be responsible for implementing the Plan and who will act as a liaison between the contractor, Kildare County Council and the public with regard to the environmental management of the development works. The Site Manager will prepare the CEMP and their duties will include maintaining an environmental record, providing guidance to the site team in relation to environmental matters as well as reviewing environmental management content of method statement.
- A TMP will be submitted for approval to Kildare County Council Road and Traffic Division by the appointed contractor prior to the commencement of any construction works as part of the Environmental Management Plan. This plan will ensure that temporary traffic works and road safety measures will be put in place during the construction of the two proposed junction tie-ins and that the required diversions and traffic management measures are put in place to

minimise the impact on local road users. The TMP will also inform the Contractor of the relevant guidance documentation which will need to be followed during construction phase.

- A Waste Management Plan will also be submitted to Kildare County Council for approval as part of the CEMP.
- A Stakeholder Management Plan (SMP) will also be submitted to Kildare County Council which will detail how the Contractor will keep the public, and in particular, adjoining residents, community uses (schools, etc) informed in advance of those elements of the construction works which can be expected to cause noise, air or traffic impacts.
- All construction areas, including the proposed temporary construction compounds, will be suitably fenced and screened, and access to the sites will be limited to authorised personnel in the interest of public health and safety;
- Safe working practices, in accordance with the relevant legislation, will be in place during the Construction Phase to protect the workers and visitors to the construction sites.
- Details of the general construction process/phasing will be communicated to the relevant stakeholders prior to implementation to ensure local residents and businesses are fully informed on the nature and duration of construction works.
- Residents and businesses situated in close proximity to proposed temporary construction compounds will receive notification in advance of their establishment. An open dialogue and positive engagement approach will be adopted by the contractor to ensure that the concerns of residents and business owners are considered and addressed as necessary. This will be in addition to the implementation of measures set out in the other sections of this Part VIII Planning Application Report (See Specific Mitigation as part of the respective Sections of this Report).
- Appropriate temporary signage will be put in place on local roads that will be temporarily affected by the construction works. This signage will guide local residents, commercial activities and visitors to the temporary access arrangements in place that will allow continuous access to properties.

### **Operational Phase for Population & Human Health**

Specific operational phase mitigation measures in relation to other impacts on the population and human health, such as noise, air quality, landscape and visual and material assets are dealt with in their respective sections of this Report. Mitigation measures specific to population and human health include:

- Design and maintain suitable landscaping and public realm as per the Landscape Master Plan included in Appendix A, to complement other environmental mitigation, e.g. lighting, pleasant surroundings to discourage anti-social behaviour, graffiti, etc.

#### **4.3.6 Residual Impacts for Population & Human Health**

Overall it is considered that there are significant long-term positive effects associated with the proposed development. The project will facilitate a significant improvement in access, road and transport infrastructure in the area. This development will be specifically valuable to the motorists who wish to bypass Maynooth town on their journeys. Additionally, the proposed development will facilitate pedestrian and cycling modes of transportation and provide a connection to the existing and future pedestrian and cycling infrastructure along the Royal Canal improving amenities available to the public.



There is likely to be short-term slight negative impacts to the community due to disruption during construction stage. The residual impacts for the construction stage as a result of Noise and Vibration, and Air Quality and Climate have been discussed in their respective chapters.

The proposed development will support and facilitate future residential and commercial development to proceed in the region in a line with national, regional and local policy ensuring the proper and sustainable development is achieved for the area and its population.

## 4.4 Biodiversity

### 4.4.1 Introduction

This section addresses the potential ecological impacts of the construction and operation of the proposed development. Ecological surveys were carried out for the project between March and June 2018. The purpose of the surveys were to identify, quantify and evaluate the potential impacts that the proposed development might have on the biodiversity and ecology in the local area. The survey methodologies followed best practice guidance including:

- TII/NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (TII/NRA, 2009);
- Best Practice Guidance for Habitat Survey and Mapping (Smith et al., 2011); and,
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). The Bat Conservation Trust, London (Collins, J. (Ed.), 2016).

The impact assessment was based on guidance provided in

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2018) and the TII/NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (TII/NRA, 2009); and,
- TII (2009b) Guidelines for Assessment of Ecological Impacts of National Road Schemes, National Roads Authority, Dublin.

### Appropriate Assessment

An Appropriate Assessment (AA) Screening Report has been prepared alongside this Part VIII Planning Report which examines whether or not the Project, either individually or in combination with other plans or projects, in view of best scientific knowledge, is likely to have a significant effect on Natura 2000 sites.

In its judgment in *People Over Wind*<sup>1</sup>, the CJEU concluded that the determination of whether or not AA is required in respect of a project must be completed without consideration of “*measures that are intended to avoid or reduce the harmful effects of the envisaged project on the site concerned*”.

In *Kelly vs An Bord Pleanála & anor*<sup>2</sup>, the High Court issued a judgment concluding that “*as a matter of fact and law, that SUDS [Sustainable urban drainage system] are not mitigation measures which a competent authority is precluded from considering at the stage 1 screening stage*”. The judgement further described the SUDS as not a measure that is intended to avoid or reduce the harmful effects of a particular

<sup>1</sup> People Over Wind and Peter Sweetman v. Coillte Teoranta (People Over Wind) [2018] C-323/17.

<sup>2</sup> Kelly -v- An Bord Pleanála & anor [2019] IEHC 84.

development on a European site and a measure that is not required to be incorporated by reason of the potential effect of a development on a European site, but rather SUDS are required to be incorporated in developments for the reasons set out in the relevant regional drainage policies in light of the objectives of the Water Framework Directive and associated water quality Directives and Regulations.

In the case of the MERR, it is considered that the systems for surface water attenuation and drainage fall into this category and are not required to reduce or avoid likely significant effects on any European site.

The conclusion of the AA Screening Report is as follows:

*“In accordance with Article 6(3) of the Habitats Directive, Part XAB of the Planning and Development Acts, the relevant case law, established best practice and the Precautionary Principle, this AA Screening Report has examined the details of the Project and the relevant European sites and has concluded, on the basis of objective information, that the Project, either individually or in combination with other plans or projects, in view of best scientific knowledge, is not likely to give rise to impacts which would constitute significant effects in view of the Conservation Objectives of the Rye Water Valley/ Carton SAC or any other European site.*

*In light of this conclusion, it is the considered opinion of ROD, as the author of this AA Screening Report, that Kildare County Council, as the Competent Authority, may find in completing its AA Screening in respect of the Maynooth Eastern Ring Road that the Project, either individually or in combination with other plans and projects, is not likely to have a significant effect on the Rye Water Valley/ Carton SAC or any other European site, in view of best scientific knowledge and the Conservation Objectives of the sites concerned. Therefore, it is the recommendation of the author of this AA Screening Report that the Competent Authority may determine that AA is not required in respect of the Project”.*

#### **4.4.2 Receiving Environment for Biodiversity**

The route consists primarily of agricultural lands with boundaries defined by mature hedgerows. The route crosses the Royal Canal and the Dublin to Sligo railway line east of Maynooth. The north bank of the canal is lined with a mature treeline. There are two other land drainage ditches along the route, one ditch approximately 120m north of the R405 Celbridge Road which is piped underground at the crossing point and another ditch in the field south of the R157 Dunboyne Road / R148 Leixlip Road junction.

The ecological walkover survey recorded habitats, plant species and protected species. The survey also recorded the likelihood of protected species, such as bats, to use the area for sheltering and/or feeding.

Following the walkover survey, two bat activity surveys and two amphibian surveys were undertaken, in accordance with best practice guidelines.

#### **Habitats Survey**

The habitat survey was undertaken as part of the walkover surveys on the 3<sup>rd</sup> of May and the 5<sup>th</sup> of June 2018. The habitats were categorised according *A Guide to Habitats in Ireland* (Fossitt, 2000). The following paragraphs describe the habitats found along the route.

#### **BC1**

This habitat refers to land on which crops are grown. They are typically species poor and of little biodiversity value. The large field south of the canal and railway was classified as BC1 and was stubble at the time of the surveys.

### GS2

The fields classed as GS2 contained tussocky grass. These fields are likely to be farmed in rotation and left fallow at the time of the survey. False oat grass (*Arrhenatherum elatius*) was the dominant species and in general this habitat was species poor.

### GA1

This category is used for intensively managed or highly modified agricultural grassland that has been reseeded and/or regularly fertilized and is now heavily grazed and/or used for silage making. It includes regularly-reseeded monoculture grasslands that are planted as part of an arable rotation. Improved agricultural grassland is typically species-poor. Improved agricultural grassland was recorded immediately north and south of the canal. These fields had standing water in places and were grazed by horses.

### WL1

Where the boundaries of the railway line or fields were higher than 5m, these were categorised as treelines. Treelines were recorded on the north bank of the canal, south of the railway line and west of the route. These linear habitats close to the canal and railway line were dominated by ash (*Fraxinus excelsior*), whereas the treeline west of the route consisted of Scot's pine (*Pinus sylvestris*).

### WL2

Hedgerows are linear strips of shrubs, often with occasional trees, which typically form the boundaries in the study area. In general, Hawthorn (*Crataegus monogyna*) is the most dominant species in the hedgerows with occasional elder and ash trees. The field layer contained Lords and Ladies (*Arum maculatum*), Herb Robert (*Geranium robertianum*), Dog Rose (*Rosa canina*), Dock (*Rumex obtusifolius*), Ribwort Plantain (*Plantago lanceolata*), Ivy (*Hedera helix*), Hogweed (*Heracleum sphondylium*), Nettle (*Urtica dioica*), Chickweed (*Stellaria media*), Cleavers (*Galium aparine*), Lesser Celandine (*Ficaria verna*) and Bramble (*Rubus fruticosus* ag.).

### FW3

The route crosses the Royal Canal east of Maynooth. The riparian vegetation included Bull Rush (*Typha latifolia*), Meadowsweet (*Filipendula ulmaria*), Bramble, Rush (*Juncus* spp.), Reed Canary Grass (*Phalaris arundinacea*), Flag Iris (*Iris pseudacorus*) and Purple Loosestrife (*Lythrum salicaria*). This habitat supports a range of species of fish, amphibians, birds and mammals and is designated as a proposed Natural Heritage Area (pNHA). The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species.

### FW4

Two ditches are found along the route. Species recorded along these ditches included duckweed, lesser water parsnip (*Berula erecta*) and Starwort (*Callitriche stagnalis*). Newts (*Lissotriton vulgaris*) and frog (*Rana temporaria*) were also recorded in the ditch to the west of the route, north of the canal.

## Protected Mammals

### Badger

The route **including** a 50m buffer either side was surveyed to identify the presence of badger. This included a search along all of the hedgerows for setts and signs such as latrines, prints and hair. No evidence of badger was identified and therefore this species is not considered further.

### Otter

The otter survey area included the Royal Canal including a 150m buffer either side of the bridge crossing. The survey aimed to detect signs of otter which include spraints, slides and prints. Although no evidence of otter was found, this species is likely to be present in the area at least occasionally.

### Other Mammals

Other protected mammals such as hare, pine marten and hedgehog are likely to be present in the area however significant impacts on these species are not anticipated.

### Bats

The walkover survey aimed to identify potential bat roosts in trees along the route. No trees with features suitable for roosting bats were identified.

Two bat activity surveys were conducted on the 3<sup>rd</sup> May and the 5<sup>th</sup> June 2018. Both surveys were undertaken from sunset for approximately three hours which allowed the entire route to be walked slowly. The weather was optimal on both occasions. Three species were recorded foraging along the route, namely, Leisler's Bat (*Nyctalus leisleri*), Soprano Pipistrelle (*Pipistrellus pygmaeus*) and Common Pipistrelle (*Pipistrellus pipistrellus*). Daubenton's Bat (*Myotis daubentonii*) was not recorded foraging along the canal, however this species has been recorded close to the proposed bridge as part of the All Ireland Daubenton's Bat Waterways Survey, and therefore impacts on this species are considered in this assessment.

## Amphibians

Amphibian surveys were conducted on the 3<sup>rd</sup> May and the 28<sup>th</sup> June 2018. The surveys were carried out after dark using a powerful torch to identify newts and frogs in the drainage ditches. On both surveys a single newt and frog spawn were recorded in the ditch north of the canal.

## Birds

All bird species seen and heard during the walkover surveys in March and June were recorded. Table 4-6 below lists the species recorded.

**Table 4-6 Bird Species Recorded**

Common Name	Scientific Name
Wood Pigeon	<i>Columba palumbus</i>
Magpie	<i>Pica pica</i>
Redwing	<i>Turdus iliacus</i>
Robin	<i>Erithacus rubecula</i>
Blackbird	<i>Turdus merula</i>
Rook	<i>Corvus frugilegus</i>
Buzzard	<i>Buteo buteo</i>



Hooded Crow	<i>Corvus cornix</i>
Jackdaw	<i>Corvus monedula</i>
Chaffinch	<i>Fringilla coelebs</i>
Pheasant	<i>Phasianus colchicus</i>
Snipe	<i>Gallinago gallinago</i>
Meadow Pipit	<i>Anthus pratensis</i>
Collard Dove	<i>Streptopelia decaocto</i>
Mallard	<i>Anas platyrhynchos</i>
Grey Heron	<i>Ardea cinerea</i>

#### 4.4.3 Predicted Impacts for Biodiversity

The impacts of the proposed development will be limited because the areas affected are primarily improved agricultural lands. The Royal Canal is the most significant watercourse along the route and contains protected species sensitive to disturbance and pollution including Daubenton's Bat and Otter. The risk of pollution of the canal during construction, which could impact directly on fish and invertebrates, constitutes a potential Short-term moderate effect. Light-spill from the bridge onto the canal has the potential to lead to habitat degradation and fragmentation, eventually leading to habitat loss. Habitat degradation due to light spill occurs when species, generally nocturnal such as bats tend to avoid areas which are lit, constricting their foraging area and commuting routes. The lighting design, if designed in an insensitive manner, could lead to a Permanent Moderate Negative effect.

The drainage ditch in the field on the north side of the canal contains frogs and newts. Construction activities may lead to pollution of the ditch. There is also potential for amphibians to enter the construction compound where there is a risk they would be killed. The risk of habitat degradation and direct mortality of amphibians is considered to be a potential short-term significant effect, where the population could be lost.

The removal of hedgerow and treeline habitat is required in order to facilitate construction of the road. Approximately 952m hedgerow and 168m of treeline will be removed. The loss of vegetation including treelines and scrub is considered a Permanent Slight Negative effect within the study area. Vegetation clearance during the nesting bird season could result in the loss of active nests. This would constitute a Short-term Significant effect within the study area.

#### 4.4.4 Mitigation Measures for Biodiversity

##### Construction

- In order to protect nesting birds, no vegetation should be removed between the 1<sup>st</sup> March and the 31<sup>st</sup> August. This also applies to stockpiling of vegetation, which must be chipped or mulched on site or alternatively removed from the site. If vegetation must be removed during the nesting season, a suitably experienced ecologist will inspect the area and determine if nesting birds are present. If nesting birds are found to be present, no works will take place until the chicks have fledged.
- The ditch containing the newts and frogs will be retained. During construction, a distance of 3m will be maintained between the ditch and the construction compound. Temporary newt fencing will prevent newts (and frogs) entering the compound. Measures will be taken to ensure that run-off containing pollutants does not enter the ditch.

- Routine practice and procedures to prevent pollution of the environment and in particular the aquatic environment will apply. These include:
  - All material including oils, solvents and paints will be stored within temporary bunded areas or dedicated bunded containers;
  - Refuelling will take place in a designated bunded area away from surface water gullies, drains and water bodies, in the event of refuelling outside of this area, fuel will be transported in a mobile double skinned tank;
  - All machinery and plant used will be regularly maintained and serviced and will comply with appropriate standards to ensure that leakage of diesel, oil and lubricants is prevented;
  - Spill kits and hydrocarbon absorbent packs will be available and drip trays will be used during refuelling;
  - Elements of the bridge will be prefabricated to reduce the need for pouring wet concrete on site.

### **Operation**

- Surface water from the project will be directed to the existing drainage network and will pass through attenuation tanks and a hydrocarbon interceptor prior to reaching the existing surface water drainage network and eventually the Rye Water. This will prevent impacts on water quality, both in terms of sedimentation, pollutants and the sudden increase inflows following a rainfall event, as a result of the project.
- In order to compensate for the loss hedgerow habitat, the road verges will be planted with hedgerows consisting of native species such as hawthorn, willow and hazel.
- Green areas will not be seeded with grass. The embankments leading to the bridge and any other areas which would ordinarily be seeded with grass will be planted with a locally sourced wildflower mix containing native species. This area will be mown twice per year, once in early spring and once in late summer. These areas include the embankments leading to the bridge and the areas where the attenuation tanks are located.
- The lighting design will ensure that all luminaries will be LED which lack UV elements and will have peak wavelengths greater than 550nm (~3000°K). This will produce a warm white colour, and, in tandem with maintaining the minimum allowable lux levels, will reduce the impacts of lighting on wildlife.
- Street lights will be designed to minimise light spill outside the intended area. This will include the use to light shields or cowls to prevent light spill onto habitats outside the site, particularly the Royal Canal.
- The contractor will develop a Construction Environmental Management Plan (CEMP) which will ensure that the construction does not lead to any unanticipated negative effects on the environment.

### **Ecological Enhancements**

- Four triple cavity swift boxes will be installed on the canal bridge. The position of the swift boxes will be determined by a suitably qualified ecologist and will follow best practice guidance.
- Two crevice-type bat boxes will be installed on the canal bridge. The position of the bat boxes will be determined by a qualified ecologist and will follow best practice guidance.

#### **4.4.5 Residual Impacts for Biodiversity**

Provided that the proposed development is constructed and operated in accordance with the design, best practice and mitigation that is described above, the impact of the project on biodiversity will not result in significant effects in the short, medium or long term.

### **4.5 Soils, Geology and Hydrogeology**

#### **4.5.1 Introduction**

This section describes the natural characteristics of the site of the proposed development and its immediate surroundings, in terms of geology, geomorphology and hydrogeology. The likely significant impacts of the proposed development on these resources are assessed and where required, mitigating measures are put in place to avoid, reduce or minimise the impact of the proposed development.

This section outlines the existing ground conditions, with the predicted impacts assessed on the basis of the relevant construction methodology and particular soil characteristics.

The mitigation measures and the residual impacts are provided in separate subsections.

#### **4.5.2 Summary of Available Information**

##### **Mapping and Aerial Photography**

Geological mapping from the Geological Survey of Ireland (GSI), covering the subsoils and solid geology of the location of the proposed bridge was reviewed using the online viewer at [www.gsi.ie/mapping](http://www.gsi.ie/mapping). The GSI digital mapping details the quaternary geology along with aquifer vulnerability, groundwater resources and recharge, known groundwater wells and existing ground investigation information.

Open source (Google Earth, Bing Maps) and Ordnance Survey Ireland (OSI) aerial photography was analysed in order to identify large scale ground characteristics.

##### **Ground Investigations**

The ground investigation surveys available for this area include:

- Geophysical Survey Draft Report, Maynooth Eastern Ring Road Ground Investigation (Priority GL, 2018); and,
- Draft Geotechnical Factual Report, Maynooth Eastern Ring Road Ground Investigation (Priority GL, 2019).

The geophysical survey consisted of six seismic refraction and electrical resistivity profiles, primarily done along the Royal Canal and the Dublin to Sligo rail line.

The intrusive ground investigation consisted of 16 cable percussion boreholes with rotary follow-on, 17 trial pits, eight dynamic probes, 23 slit trenches and six pavement cores. In addition to this, the in-situ tests such as SPT were done in the exploratory holes, and samples for laboratory soil and rock tests (including environmental tests) were collected.

The amount of the GI is deemed sufficient for the development of this size and complexity.

### 4.5.3 Receiving Environment for Soils, Geology and Hydrogeology

The description of existing conditions is based on desk study information and ground investigations undertaken in the development area.

The area is largely flat with very gently undulating features. The existing ground levels range from approximately +58mOD to +64mOD (Ordnance Survey). The majority of the development area is used for agricultural purposes, with the only exceptions being the tie-ins with the existing roads, and the Royal Canal and Dublin to Sligo rail line corridor which the proposed development bridges over perpendicularly.

The bedrock geology consists of Waulsortian Limestones (massive unbedded lime-mudstones) in the southern half of the development and Tober Colleen Formation (calcareous shales and limestone conglomerate), according to GSI's 1:100,000 Bedrock Geology map. Good quality limestone was also confirmed in all rotary boreholes.

The overburden is typically 3 to 4 m deep, with the greatest thickness of 4.5 m recorded just north of the Royal Canal. The overburden is of homogenous composition, described as till derived from limestones in GSI's 1:100,000 Quaternary Sediments map. The borehole logs confirm this, consistently describing the overburden as firm to stiff sandy gravelly clay. In addition to this, trial pits occasionally describe the uppermost layer as topsoil (sandy gravelly silt/clay), with typical depths up to 1m. A trial pit carried out at the southern verge of the R148 road west of the proposed tie-in identified 1.25m of Made Ground (sandy gravelly silt with rubbish).

There are no Geological Heritage Features, quarries or commercial mineral deposits within the boundaries of the site, or which will be impacted by the proposed development.

There are two known karst features (caves) in the nearby Carton Demesne, 1.8km east of the northern extent of the proposed development. Unlike in the west of Ireland, the limestones in the eastern regions of Ireland are generally associated with a very small number of karst features. The boreholes and geophysical survey show no indication of karst features within the development area. Some evidence of clay infilled voids and fractures was encountered during drilling but was largely confined to boreholes located to the south of Carton Demesne in the vicinity of the Royal Canal, between approximately 150m and 250m to the east of the proposed development. These voids and fractures were typically encountered between 5 – 8m below ground level (BGL) within the upper weathered zone of the limestone bedrock and were either absent or infrequent further west along the route of the proposed alignment.

Soil contamination testing was carried out along the route of the proposed alignment targeted to areas where contamination could potentially be present. A total of 9 samples were sent to an accredited laboratory for analysis. No evidence of ground contamination was identified in any of the sample results.

The proposed development is located within the Dublin Groundwater Body (IE\_EA\_G\_008) which is generally classified as a Poorly Productive (PP) bedrock aquifer. The proposed route crosses between the Waulsortian Limestone formation, which is generally of low permeability and deemed to be a Locally Important Aquifer, and the Tober Colleen Formation which is generally a Poorly Production Aquifer. Most groundwater flow will take place close to the bedrock surface in the weathered zone with reduction in the permeabilities of these rocks with depth, except in isolated zones where fractures and fissures are present. Subsoil deposits in the area are clays with sand and gravels present and were found to be 2 – 5m thick during trial pitting and coring. These clays are well drained and relatively permeable with infiltration rates of



1.76x10<sup>-6</sup> – 5.1x10<sup>-5</sup> ms<sup>-1</sup> observed during in-situ testing within trial pits excavated during site investigations. Consequently, recharge coefficients of up to 60% have been applied in this area by the GSI, however actual annual recharge is estimated at between 100 – 200mm due to the low permeability bedrock which is present in the area. Given the presence of relatively permeable subsoil typically less than 5m in depth groundwater vulnerability in the area is high.

There are no recorded public groundwater supply schemes or group water schemes in the vicinity of the proposed development. There are a number of private boreholes recorded in the GSI database in the vicinity of the proposed development, however the majority of residences and businesses are serviced by the public Local Authority water supply.

The depth to the water table within the bedrock has been proven during the drilling of the rotary cores. Groundwater is generally at or near the bedrock subsoil interface as the weathered bedrock zone is more permeable. Confined or semi-confined conditions may be present within this weathered zone due to the clay subsoil present however no artesian conditions were encountered. The piezometric surface is approximately 3m below the ground surface following the bedrock topography with a flat gradient in a gentle north-east direction towards the Carton Demesne and the Rye Water.

There is one Groundwater Dependant habitat located to the north-east of the proposed development which is listed as a Natura 2000 Site - Rye Water Valley/Carton SAC [001398]. Groundwater related features are a qualifying interest for this SAC; specifically petrifying springs and tufa formations. The springs are located in the immediate vicinity of the Rye Water and two caves are also recorded in the GSI karst database to the north-east of the Carton Demesne.

#### **4.5.4 Predicted Impacts for Soils, Geology and Hydrogeology**

The majority of the proposed development is in embankment, except for the tie-ins with the existing roads. The height of the embankment is typically around 1 - 2m above ground level for the southern section, building up to approximately 9.5m above ground level on the southern approach to the bridge. Large quantities of fill will consequently be required for the proposed development.

As there is no cutting along the development from where the fill could be obtained, all embankment fill material will have to be imported from off-site. Approximately 115,000m<sup>3</sup> typical road embankment fill material, Class 2C as defined by Specification for Road Works, will be required for the proposed development and this type of material is readily obtainable from the glacial till soil which is abundant throughout the wider development area. Approximately 20,000m<sup>3</sup> imported good quality granular fill (Class 6) will be required for capping and pavement. This material is readily available in all quarries in the vicinity of the site.

Some excavation of in-situ soil will be required to remove the potential soft spots, for the temporary excavation for bridge abutments, and a minor volume as arising from bridge foundation pile bores. This is predicted to be in the range of 4,000m<sup>3</sup>. Owing to the good stiffness and strength parameters of the in-situ soil, the soft spot excavations are expected to be minimal and very localised. Excavations connected with bridge construction will also be negligible compared to the size of the development.

The in-situ soil is well suited for withstanding the embankment load due to favourable geotechnical soil parameters and the presence of bedrock at shallow depth. No significant settlements of the in-situ soil are expected under the embankment footprint.

The highest settlements, under the bridge approaches, are expected to be less than 60mm, with negligible secondary compression (creep). There will be no need for ground improvement, piled embankments, or other settlement control measures.

The existing rail line is sensitive to small amount of settlement while the masonry canal walls are sensitive to the horizontal displacement. The bridge abutments and the approach embankments are designed in a way that the loading and the associated ground displacements/settlements will not impact the rails or the canal wall.

The existing topsoil under the footprint of the embankment can either be left in place; or excavated, temporarily stored and used to cover the embankment slopes.

The bridge will be founded on bored concrete piles socketed into strong limestone. Loading, stresses and deformations applied to the bedrock will be well within the capacity of the rock mass and tolerance required for the bridge structure. Piling and rock excavation will therefore have a negligible impact on the existing rock conditions.

There is a potential risk of localised contamination from construction materials leeching into the underlying soils by exposure, dewatering or construction related spillages resulting in a permanent negative impact on the soils. In the case of soils, the impact is slight as the requirement of good construction practices will necessitate the immediate excavation/remediation of any such spillage resulting in a very low risk of pollution to the soils and consequently the underlying aquifers.

There is a potential risk of localised contamination of groundwater bodies due to construction activities i.e. construction spillages, leaks from construction plant and material etc. resulting in a temporary negative impact on these water bodies.

The excavation of material at the site will have the effect of locally increasing the vulnerability rating of the underlying aquifer; however, the vast majority of the proposed works will require no excavation and will actually require fill of imported material increasing the subsoil cover over the bedrock which will reduce the potential for contaminants to enter the underlying aquifer from the surface. As such the potential effect is deemed to be imperceptible.

Piling of bridge abutments will require temporary coring and excavation into the bedrock which could open a direct pathway for ingress of contamination into the bedrock aquifer. The number and scales of these piles is very small when compared to the size of the aquifer and the open holes will be filled with concrete relatively quickly once opened and therefore the risk is of a temporary nature and is insignificant once good construction practises are implemented.

The construction of the proposed carriageway will permanently reduce the surface area available for infiltration of recharge to the bedrock aquifer. Bedrock in the area is low permeability and is thought to reject recharge. The proposed impermeable area of the road carriageway is very small when compared to the size of the aquifer and will cause an imperceptible reduction in groundwater resources.

The construction of the proposed development is either at-grade or in embankment and no cuttings into bedrock are proposed. A small number of abutments for the proposed bridge over the canal will require piling into the bedrock potentially encountering groundwater. Given the limited scale and extent of such works, any associated impacts will be localised and of a temporary nature being sealed with concrete once complete. There is therefore no potential for significant effects on the local groundwater flow regime and subsequently on any associated qualifying interest of the Rye Water Valley/Carton SAC [001398].

Construction runoff from the site has the potential to pose a risk to groundwater due to infiltration of contaminated water from the ground surface. Standard construction practices require soiled construction and spillages to be collected and treated prior to discharge.

Once the road construction is complete, it is proposed to collect road drainage and discharge it to existing surface water sewers in the vicinity of Maynooth town; infiltration to groundwater is not proposed. There will therefore be no effect on soils, geology or groundwater quality during the operational phase of the proposed development.

#### **4.5.5 Mitigation Measures for Soils, Geology and Hydrogeology**

The construction works will be carried out with the least feasible disturbance of soils. The amount of the excavated material will be limited to the potential localised soft spots beneath the embankment footprint and the temporary excavations for bridge abutment construction.

All excavated soil and rock will be reused within the embankments and landscaping fill. The contractor will be required to submit a C&D Waste Management Plan to the local authority for approval which should address all types of material to be disposed of.

All imported material will be sourced from the nearest possible locations. The suitable borrow areas for the road embankment fill materials can be found in the immediate vicinity of the development.

The potential impacts (ground displacement/settlement) on the Dublin to Sligo railway line and the canal's quay wall have been mitigated by design, whereby the bridge abutments are designed at a significant distance from both structures and the bridge load is carried directly into the bedrock via piles. The approach embankments are profiled as subvertical reinforced soil walls in order to prevent the encroaching of the embankment footprint on the railway line and/or the canal wall.

A project-specific Construction Environmental Operating Plan (CEMP) will be prepared for the development. It will be maintained by the Contractor for the duration of the construction phase. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures. As a minimum, the CEMP for the proposed development will be formulated in consideration of the standard best practice. The CEMP will include a range of site-specific measures which include:

- Earthworks shall be carried out such that surfaces promote runoff and prevent ponding and flooding.
- Runoff will be controlled and treated to minimise impacts to groundwater.
- Temporary storage of any contaminated material on-site shall be carefully managed so as to limit any risk of contaminated surface water runoff leaving the site or infiltrating to groundwater. Runoff from the material shall be directed to a lined pond or temporary sewer/tank and the water shall be disposed of off-site for treatment at an appropriate licenced facility in accordance with the relevant waste management legislation. Alternatively, the material shall be covered while stored to remove the risk of surface water contamination.
- All hazardous materials will be stored within secondary containment designed to retain at least 110% of the storage contents. Temporary bunds for oil/diesel storage tanks will be used on the site during the construction phase.

- Safe materials handling of all potentially hazardous materials will be emphasised to all construction personnel employed during construction.

#### **4.5.6 Residual Impacts for Soils, Geology and Hydrogeology**

There are no residual impacts to the soils, geology or hydrogeology as a result of either the construction or operational phase.

### **4.6 Hydrology**

#### **4.6.1 Introduction**

Since 2000, Water Management in the EU has been directed by the Water Framework Directive (WFD) 2000/60/EC which was transposed into Irish law under the European Communities (Water Policy) Regulations 2003 (S.I. No. 722/2003). The WFD requires all Member States to protect and manage their water resources based on the natural geographic boundaries, i.e. the river catchment or basin. The WFD establishes a common framework for the sustainable and integrated management of all waters covering groundwater, inland surface waters, transitional waters and coastal water.

The WFD is now in its draft second cycle. The proposed development is within the new National River Basin District (NRBD), which was formed from the merger of the Eastern, South Eastern, South Western, Western and Shannon River Basin Districts from the 1st Cycle of the WFD. The draft second cycle RBMPs sets out the status of waters in the River Basin District (RBD); the proposed environmental objectives and the draft programme of measures to achieve those objectives by 2021.

#### **4.6.2 Receiving Environment for Hydrology**

The proposed development is within the catchment of the River Rye Water which is located 750m north east of the proposed development in Carton Demesne. It rises in County Meath and flows south-east for approx. 30km. Its main tributary is the Lyreen River which flows through Maynooth University and Maynooth town centre in a northerly direction. According to the Eastern River Basin District Management Plan in order to meet the requirements of the WFD, water quality in River Rye Water needs to be restored to 'good' by 2021. It states groundwater quality in the "Dublin" Groundwater body needs to be restored to "good" by 2027. The Royal Canal is within the footprint of the proposed development and will be crossed via a clear-span bridge structure.

There are two other land drainage ditches along the route, one ditch approximately 120m north of the R405 Celbridge Road which is piped underground where it crosses the proposed alignment and another ditch in the field south of the R157 Dunboyne Road / R148 Leixlip Road junction.

The Environmental Protection Agency (EPA) monitors river water quality as part of the Water Framework Directive (WFD). The water quality status of the 'Rye Water Mid' and the 'Lyreen Lower' for 2010-2015 is designated as "poor" and "at risk" of deteriorating respectively. The "Dublin" groundwater body which has a "good" water quality status for the 2010-2015 monitoring period.

By 'risk' it is meant that there is an overall risk that a waterbody will not achieve good ecological or good chemical status/potential at least by 2021. The WFD requirements are to ensure that waters achieve at least good status/potential and that their status does not deteriorate. Extended timescales have been set for certain waters due to technical, economic, environmental or recovery constraints.

Having identified the status of waters as part of the RBMPs, the next stage is to set objectives for waters. Objectives consider waters that require protection from deterioration as well as waters that require restoration and the timescales needed for recovery. Four default objectives have been set initially: -

- Prevent Deterioration
- Restore Good Status
- Reduce Chemical Pollution
- Achieve Protected Areas Objectives

These objectives are refined based on the measures available to achieve them, the latter's likely effectiveness, and consideration of cost-effective combinations of measures.

The treatment of sewage and industrial waste water (water that is discharged to sewers) continues to be one of the principal pressures on water quality in Ireland. Despite ongoing improvements in urban waste water treatment plants and the effluent discharged is not up to standard in many locations (EPA, 2016).

The EPA has identified that the River Rye Water has significant pollution pressures which are exacerbated by low dry weather baseflows. A river with these characteristics is also vulnerable to the impacts of increased catchment urbanisation on run-off and pollution loading.

### **Flooding**

The Office of Public Works (OPW) Preliminary Flood Risk Assessment Mapping indicates that the area of the proposed development is not subject to Fluvial or Tidal flooding in the 1 in 100 year or 1 in 1000 year flood events as illustrated in Figure 4.15. The flood risk for the proposed development has been assessed as part of a separate Flood Risk Assessment undertaken, as attached in Appendix F.

In the appended Flood Risk Assessment (FRA), the Maynooth Eastern Ring Road has been assessed for existing and future sources of flood risk. The primary source of flood risk identified for the site is pluvial flooding. The consulted sources indicate that the proposed alignment of the Maynooth Eastern Ring Road is within Flood Zone C as per the 2009 OPW Flood Risk Guidelines for Planning Authorities. The Guidelines state that all types of developments are suitable within flood zone C, therefore the proposed development is suitable for the associated flood risk. The drainage network for the proposed development will incorporate Sustainable Drainage Systems (SuDS) for the purpose for managing surface water in terms of both flow and quality.





**Figure 4.15 The OPW Preliminary Flood Risk Assessment Mapping**

### 4.6.3 Predicted Impacts for Hydrology

#### Construction

The construction stage of the proposed development has the potential to result in run off entering the canal and surrounding watercourses due to construction works. The risk of pollution during construction, which could impact directly on water quality, constitutes a potential Short-term moderate effect.

The construction of the bridge structure over the Royal Canal could impact on water quality during construction and constitutes a potential short-term effect if a pollution incident occurs. The drainage ditch located approximately 120m north (in the field on the north side of the canal) may also be impacted during construction activities due to run off or pollution. Construction activities may lead to pollution of this ditch due to run off. During all construction activities there is risk of pollution occurring, however with the implementation of standard mitigation measures these risks can be avoided or reduced.

#### Operation

As a result of the proposed development, runoff from hardstanding areas such as the road, footpaths and cycleways will be generated. Unmitigated, this would increase the rate of runoff and level of contamination to the surrounding surface water drainage network and as a result, the associated effect is deemed to be slight.

The existing topography of the lands indicate that the site generally drains north towards an existing siphon which appears to pass under the Royal Canal before ultimately discharging to the River Rye Water. For siphons to operate effectively, a constant regular flow of water is required in order to minimise the risk of blockages. Given that the road runoff will be sporadic in nature, it is not intended to discharge to the existing siphon. It is also recommended that the existing drainage ditches on approach to the siphon remain un-disturbed.

Given the proposed topography of the ring road, a number of outfall locations will be used when discharging to the surrounding surface water drainage network. It is proposed that the road drainage will outfall by gravity at a number of locations to the existing 900mm diameter surface water pipe located along the western extents of the

development and to the 300mm diameter surface water pipes located at Parklands and on the R157. These outfall locations will be positioned at low points along the proposed alignment. The 900mm diameter surface water pipe and 300mm diameter surface water pipe at Parklands currently outfall to the Lyreen River. Attenuated flows from the proposed development will outfall to the Lyreen River, however this slight increase in runoff to the downstream end of the Lyreen Catchment will not be significant as it will ultimately outfall to its natural drainage catchment of the River Rye Water.

#### **4.6.4 Mitigation Measures for Hydrology**

The main focus of hydrological mitigation is for protection of the sensitive waters during construction phase the control and management of activities that may give rise to siltation from sediment laden runoff.

##### **Construction Phase**

Prior to construction the Contractor will be required to:

- Prepare a CEMP which will be agreed with Kildare County Council prior to the works commencing detailing control, treatment and disposal of potentially contaminated surface water. This will also set out robust and comprehensive procedures, including monitoring systems and oversight throughout the construction phase.
- Prepare an Emergency Incident Response Plan detailing the procedures to be undertaken in the event of a spill of chemical, fuel or other hazardous wastes, a fire, or non-compliance incident with any permit of license issues.
- In addition, pollution of aquatic systems during the construction phase will be reduced by the implementation of a suite of protective measures as outlined in the Biodiversity section 4.4 of this Report.
- Implement industry best practice pollution prevention measures in accordance with guidance documents (for example CIRIA Guideline Document C532 Control of Water Pollution from Construction Sites and C648 Control of water pollution from linear construction projects), during both construction and operation in order to control the risk of pollution to surface waters.

##### **Operational Phase**

- Treatment and spillage containment facilities are proposed by means of silt traps in the road drainage gullies discharging to the drainage system with Class 1 By-Pass petrol interceptors located immediately upstream of the road drainage outfall locations prior to discharging to the existing surface water network. These measures will treat the road run-off before entering the receiving waters. Therefore, no perceptible impact to water quality will remain.
- The proposed road drainage will be designed to incorporate attenuation storage for the 1 in 100 Year rainfall event, including a 10% increase in rainfall intensities to allow for the effects of climate change. Runoff from the proposed road will be attenuated to greenfield runoff rates, in accordance with the Greater Dublin Strategic Drainage Study and Local Authority requirements. Attenuation storage will be provided in the form of detention systems throughout the development prior to discharging to the existing surface water drainage network. The outfall peak flows will not be increased significantly post construction. This slight increase in runoff will not be significant as the flows will be attenuated and will ultimately discharge to the natural drainage catchment of the River Rye Water.

#### **4.6.5 Residual Impacts for Hydrology**

The mitigation measures outlined for Hydrology in addition to those in the Biodiversity section of this report will result in imperceptible effects on water quality.

The use of SuDS features and the attenuation of storm water will mitigate any potential impacts relating to changes in runoff rates and volumes whilst also maintaining the quality of water to the surrounding surface water network, including the Rye Water Valley/Cartron SAC.

### **4.7 Landscape and Visual**

#### **4.7.1 Introduction**

The Landscape and Visual Impact Assessment (LVIA) prepared by CSR was informed by a desktop study and a survey of the site and receiving environment in September 2018. The assessment is in accordance with the methodology prescribed in the Guidelines for Landscape and Visual Impact Assessment, 3rd edition, 2013 (GLVIA) published by the UK Landscape Institute and the Institute for Environmental Management and Assessment.

#### **4.7.2 Methodology**

Ireland is a signatory to the European Landscape Convention (ELC). The ELC defines landscape as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'. This definition is important in that it expands beyond the idea that landscape is only a matter of aesthetics and visual amenity. It encourages a focus on landscape as a resource in its own right - a shared resource providing a complex range of cultural, environmental and economic benefits to individuals and society.

As a cultural resource, the landscape functions as the setting for our day-to-day lives, also providing opportunities for recreation and aesthetic enjoyment and inspiration. It contributes to the sense of place experienced by individuals and communities and provides a link to the past as a record of historic socio-economic and environmental conditions. As an environmental resource, the landscape provides habitat for fauna and flora. It receives, stores, conveys and cleans water, and vegetation in the landscape stores carbon and produces oxygen. As an economic resource, the landscape provides the raw materials and space for the production of food, materials (e.g. timber, aggregates) and energy (e.g. carbon-based fuels, wind, solar), living space and for recreation and tourism activities.

#### **Forces for Landscape Change**

Landscape is not unchanging. Many different pressures have progressively altered familiar landscapes over time and will continue to do so in the future, creating new landscapes. For example, within the receiving environment, the environs of the proposed development have altered over the last thousand years, from wilderness to agriculture and settlement.

Many of the drivers for change arise from the requirement for development to meet the needs of a growing population and economy. The concept of sustainable development recognises that change must and will occur to meet the needs of the present, but that it should not compromise the ability of future generations to meet their needs. This involves finding an appropriate balance between economic, social and environmental forces and values.

The reversibility of change is an important consideration. If change must occur to meet a current need, can it be reversed to return the resource (in this case, the landscape) to its previous state to allow for development or management for future needs.

Climate change is one of the major factors likely to bring about future change in the landscape, and it is accepted to be the most serious long-term threat to the natural environment, as well as economic activity (particularly primary production) and society. The need for climate change mitigation and adaptation, which includes the management of water and more extreme weather and rainfall patterns, is part of this.

### **Guidance**

Landscape and Visual Impact Assessment (LVIA) is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and on people's views and visual amenity.

The methodology for assessment of the landscape and visual effects is informed by the following key guidance documents, namely:

- Guidelines for Landscape and Visual Impact Assessment, 3rd Edition 2013, published by the UK Landscape Institute and the Institute of Environmental Management and Assessment (hereafter referred to as the GLVIA).

References are also made to the '*Landscape and Landscape Assessment – Consultation Draft of Guidelines for Planning Authorities*' document, published in 2000 by the Department of Environment, Heritage and Local Government.

### **Use of the Term 'Effect' vs 'Impact'**

The GLVIA advises that the terms 'impact' and 'effect' should be clearly distinguished and consistently used in the preparation of an LVIA.

'*Impact*' is defined as the action being taken. In the case of the proposed works, the impact would include the construction of the proposed development.

'*Effect*' is defined as the change or changes resulting from those actions, e.g. a change in landscape character, or changes to the composition, character and quality of views in the receiving environment. This report focusses on these effects.

### **Assessment of Both 'Landscape' and 'Visual' Effects**

Another key distinction to make in a LVIA is that between landscape effects and the visual effects of development.

'Landscape' results from the interplay between the physical, natural and cultural components of our surroundings. Different combinations of these elements and their spatial distribution create distinctive character of landscape in different places. 'Landscape character assessment' is the method used in LVIA to describe landscape, and by which to understand the potential effects of a development on the landscape as 'a resource'. Character is not just about the physical elements and features that make up a landscape, but also embraces the aesthetic, perceptual and experiential aspects of landscape that make a place distinctive.

Views and 'visual amenity' refer to the interrelationship between people and the landscape. The GLVIA prescribes that effects on views and visual amenity should be assessed separately from landscape, although the two topics are inherently linked. Visual assessment is concerned with changes that arise in the composition of available

views, the response of people to these changes and the overall effects on the area's visual amenity.

The assessment of landscape and visual effects included a desktop study, review of the proposed development drawings and visualisations, and a number of site visits which were carried out in November 2018 and January 2019.

### Methodology for Landscape Assessment

In Section 4.7.7 of this report the landscape effects of the development are assessed. Landscape impact assessment considers the likely nature and scale of changes to the main landscape elements and characteristics, and the consequential effect on landscape character and value. Existing trends of change in the landscape are taken into account. The potential effect is assessed based on measurement of the landscape sensitivity against the magnitude of change which would result from the development.

### Sensitivity of the Landscape Resource

Landscape Sensitivity: Landscape sensitivity is a function of its land use, landscape patterns and scale, visual enclosure and distribution of visual receptors, scope for mitigation, and the value placed on the landscape. It also relates to the nature and scale of development proposed. It includes consideration of landscape values as well as the susceptibility of the landscape to the proposed change.

*Landscape values* can be identified by the presence of landscape designations or policies which indicate particular values, either on a national or local level. In addition, a number of criteria are used to assess the value of a landscape. Landscape policies are described in Section 4.7.4.

Landscape susceptibility is defined in the GLVIA as *the ability of the landscape receptor to accommodate the proposed development without undue consequences for the maintenance of the baseline scenario and/or the achievement of landscape planning policies and strategies.*

Susceptibility also relates to the type of development – a landscape may be highly susceptible to certain types of development but have a low susceptibility to other types of development.

Landscape Values are discussed in Section 4.7.4, while Landscape Sensitivity is discussed in Section 4.7.4 and 4.7.7

For the purpose of assessment, five categories are used to classify the landscape sensitivity of the receiving environment.

**Table 4-7 Categories of Landscape Sensitivity**

Sensitivity	Description
<b>Very High</b>	Areas where the landscape exhibits a very strong, positive character with valued elements, features and characteristics that combine to give an experience of unity, richness and harmony. The character of the landscape is such that its capacity for accommodating change in the form of development is very low. These attributes are recognised in landscape policy or designations as being of national or international value and the principle management objective for the area is protection of the existing character from change.
<b>High</b>	Areas where the landscape exhibits strong, positive character with valued elements, features and characteristics. The character of the landscape is



Sensitivity	Description
	such that it has limited/low capacity for accommodating change in the form of development. These attributes are recognised in landscape policy or designations as being of national, regional or county value and the principle management objective for the area is conservation of the existing character.
<b>Medium</b>	Areas where the landscape has certain valued elements, features or characteristics but where the character is mixed or not particularly strong. The character of the landscape is such that there is some capacity for change in the form of development. These areas may be recognised in landscape policy at local or county level and the principle management objective may be to consolidate landscape character or facilitate appropriate, necessary change
<b>Low</b>	Areas where the landscape has few valued elements, features or characteristics and the character is weak. The character of the landscape is such that it has capacity for change; where development would make no significant change or would make a positive change. Such landscapes are generally unrecognised in policy and where the principle management objective is to facilitate change through development, repair, restoration or enhancement.
<b>Negligible</b>	Areas where the landscape exhibits negative character, with no valued elements, features or characteristics. The character of the landscape is such that its capacity for accommodating change is high; where development would make no significant change or would make a positive change. Such landscapes include derelict industrial lands or extraction sites, as well as sites or areas that are designated for a particular type of development. The principle management objective for the area is to facilitate change in the landscape through development, repair or restoration.

**Magnitude of Landscape Change:** The magnitude of change is a factor of the scale, extent and degree of change imposed on the landscape with reference to its key elements, features and characteristics (also known as ‘landscape receptors’). Five categories are used to classify magnitude of landscape change.

**Table 4-8 Magnitude of Landscape Change**

Magnitude of Change	Description
<b>Very High</b>	Change that is large in extent, resulting in the loss of or major alteration to key elements, features or characteristics of the landscape (i.e. landscape receptors), and/or introduction of large elements considered totally uncharacteristic in the context. Such development results in fundamental change in the character of the landscape with loss of landscape quality and perceived value.
<b>High</b>	Change that is moderate to large in extent, resulting in major alteration or compromise of important landscape receptors, and/or introduction of large elements considered uncharacteristic in the context. Such development results in change to the character of the landscape with loss of landscape quality and perceived value.
<b>Medium</b>	Change that is moderate in extent, resulting in partial loss or alteration of landscape receptors, and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic in the context. Such development results in change to the character of the landscape but not necessarily reduction in landscape quality and perceived value.
<b>Low</b>	Change that is moderate or limited in scale, resulting in minor alteration of landscape receptors, and/or introduction of elements that are not uncharacteristic in the context. Such development results in minor change

	to the character of the landscape and no reduction in landscape quality and perceived value.
<b>Negligible</b>	Change that is limited in scale, resulting in no alteration to landscape receptors, and/or introduction of elements that are characteristic of the context. Such development results in no change to the landscape character, quality or perceived value.

### Significance of Effects

In order to classify the significance of effects, the predicted magnitude of change is measured against the sensitivity of the landscape/viewpoint, using the following guide, from the EPA Draft Guidance (2017).

There are seven classifications of significance, namely: (1) imperceptible, (2) not significant, (3) slight, (4) moderate, (5) significant, (6) very significant, (7) profound.

		Sensitivity of the Landscape Resource				
		Very High	High	Medium	Low	Negligible
Magnitude of Change	Very High	Profound	Profound-Very Significant	Very Significant-Significant	Moderate	Slight
	High	Profound-Very Significant	Very Significant	Significant	Moderate-Slight	Slight-Not Significant
	Medium	Very Significant-Significant	Significant	Moderate	Slight	Not Significant
	Low	Moderate	Moderate-Slight	Slight	Not significant	Imperceptible
	Negligible	Slight	Slight-Not Significant	Not significant	Imperceptible	Imperceptible
	Negligible	Slight	Slight-Not Significant	Not significant	Imperceptible	Imperceptible

The matrix above is used as a guide only. The assessor also uses professional judgement informed by their expertise, experience and common sense, to arrive at a classification of significance that is reasonable and justifiable.

Landscape effects are also classified as positive, neutral or negative/adverse. Development has the potential to improve the environment as well as damage it. In certain situations, there might be policy encouraging a type of change in the landscape, and if a development achieves the objective of the policy the resulting effect might be positive, even if the landscape character is profoundly changed.

### Methodology for Visual Assessment

In Section 4.7.7 of this report the visual effects of the development are assessed. Visual assessment considers the changes to the composition character of views and the visual amenity experienced by visual receptors (groups of people). The assessment is made for a number of viewpoints selected to represent the range of visual receptors in the receiving environment. The significance of the visual effects experienced at these locations is assessed by measuring the visual receptor sensitivity against the magnitude of change to the view resulting from the development.

### Sensitivity of the Viewpoint/Visual Receptor

Viewpoint sensitivity is a function of two main considerations:

- *Susceptibility of the visual receptor to change.* This depends on the occupation or activity of the people experiencing the view, and the extent to which their attention or interest is focussed on the views or visual amenity they experience at that location.

Visual receptors most susceptible to change include residents at home, people engaged in outdoor recreation focused on the landscape (e.g. trail users), and visitors to heritage or other attractions and places of community congregation where the setting contributes to the experience.

Visual receptors less sensitive to change include travellers on road, rail and other transport routes (unless on recognised scenic routes), people engaged in outdoor recreation or sports where the surrounding landscape does not influence the experience, and people in their place of work or shopping where the setting does not influence their experience.

- *Value attached to the view.* This depends to a large extent on the subjective opinion of the visual receptor but also on factors such as policy and designations (e.g. scenic routes, protected views), or the view or setting being associated with a heritage asset, visitor attraction or having some other cultural status (e.g. by appearing in arts).

Visual receptor susceptibility and value of the viewpoints which are assessed, are discussed further in Sections 4.7.7. For the purpose of assessment, five categories are used to classify a viewpoint's sensitivity:

**Table 4-9 Categories of Visual Receptor Sensitivity**

Sensitivity	Description
<b>Very High</b>	Iconic viewpoints - towards or from a landscape feature or area - that are recognised in policy or otherwise designated as being of national value. The composition, character and quality of the view are such that its capacity for accommodating change in the form of development is very low. The principle management objective for the view is its protection from change.
<b>High</b>	Viewpoints that that are recognised in policy or otherwise designated as being of value, or viewpoints that are highly valued by people that experience them regularly (such as views from houses or outdoor recreation features focussed on the landscape). The composition, character and quality of the view may be such that its capacity for accommodating compositional change in the form of development may or may not be low. The principle management objective for the view is its protection from change that reduces visual amenity.
<b>Medium</b>	Viewpoints representing people travelling through or past the affected landscape in cars or on public transport, i.e. viewing but not focused on the landscape which is regarded as moderately scenic. The views are generally not designated, but which include panoramic views or views judged to be of some scenic quality, which demonstrate some sense of naturalness, tranquillity or some rare element in the view
<b>Low</b>	Viewpoints reflecting people involved in activities not focused on the landscape e.g. people at their place of work or engaged in similar activities such as shopping, or on heavily trafficked routes etc. The view may present an attractive backdrop to these activities but is not regarded as particularly scenic or an important element of these activities.

<b>Negligible</b>	Viewpoints reflecting people involved in activities not focused on the landscape e.g. people at their place of work or engaged in similar activities such as shopping where the view has no relevance or is of poor quality.
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### Magnitude of Change to the View

Classification of the magnitude of change takes into account the size or scale of the intrusion of development into the view (relative to the other elements and features in the composition, i.e. its relative visual dominance), the degree to which it contrasts or integrates with the other elements and the general character of the view, and the way in which the change will be experienced (e.g. in full view, partial or peripheral, or glimpses). It also takes into account the geographical extent of the change, the duration and the reversibility of the visual effects. Five categories are used to classify magnitude of change to a view.

**Table 4-10 Categories of Visual Change**

Magnitude of Change	Description
<b>Very High</b>	Full or extensive intrusion of the development in the view, or partial intrusion that obstructs valued features or characteristics, or introduction of elements that are completely out of character in the context, to the extent that the development becomes the dominant the composition and defines the character of the view and the visual amenity
<b>High</b>	Extensive intrusion of the development in the view, or partial intrusion that obstructs valued features, or introduction of elements that may be considered uncharacteristic in the context, to the extent that the development becomes co-dominant with other elements in the composition and affects the character of the view and the visual amenity.
<b>Medium</b>	Partial intrusion of the development in the view, or introduction of elements that may be prominent but not necessarily uncharacteristic in the context, resulting in change to the composition but not necessarily the character of the view or the visual amenity.
<b>Low</b>	Minor intrusion of the development into the view, or introduction of elements that are not uncharacteristic in the context, resulting in minor alteration to the composition and character of the view but no change to visual amenity
<b>Negligible</b>	Barely discernible intrusion of the development into the view, or introduction of elements that are characteristic in the context, resulting in slight change to the composition of the view and no change in visual amenity.

### Significance of Visual Effects

As for landscape effects, in order to classify the importance of visual effects, the magnitude of change to the view is measured against the sensitivity of the viewpoint.

Visual effects are also classified as positive, neutral or negative. This is an inherently subjective exercise. Visual receptors' attitudes to development of various types varies and this affects their perception of the visual effects of development.

### Quality and Timescale

The predicted impacts are also classified as beneficial, neutral or adverse. This is not an absolute exercise; in particular, visual receptors' attitudes to development, and thus their response to the impact of a development, will vary. However, the methodology applied is designed to provide robust justification for the conclusions drawn. These qualitative impacts/effects are defined as:

- Adverse – Scheme at variance with landform, scale, pattern. Would degrade, diminish or destroy the integrity of valued features, elements or their setting or cause the quality of the landscape(townscape)/view to be diminished;
- Neutral - Scheme complements the scale, landform and pattern of the landscape(townscape)/view and maintains landscape quality;
- Beneficial – improves landscape(townscape)/view quality and character, fits with the scale, landform and pattern and enables the restoration of valued characteristic features or repairs / removes damage caused by existing land uses.

Impacts/effects are also categorised according to their longevity or timescale:

- 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;
- Permanent – Lasting over sixty years.

#### 4.7.3 Study Area

The study area for both landscape and visual effects was determined through desktop study and site visits. Site visits were carried out in November 2018 and February 2019. While the majority of the visual effects will be apparent in close proximity to the site, and the main landscape effects also occurring around the site, there are potential wider landscape and visual effects which are taken into account also.

In this instance, the study area includes the immediate vicinity of the proposed road development, but also includes the area of the Royal Canal towpath between Pike Bridge and the Straffan Road Bridge/Mullen Bridge. Part of Maynooth town was also included, namely the ACA, Carton Avenue, and the southern parts of Carton Demesne itself.

#### 4.7.4 Receiving Environment for Landscape & Visual

The Kildare County Development Plan 2017-2023 contains a number of policies and objectives relating to landscape and green infrastructure, protected views, Carton Demesne, and Areas of High Amenity which include the Royal Canal. Policies also refer to the Architectural Conservation Area (ACA) in Maynooth.

The Core Strategy includes the following policy:

**CS 9:** *Promote and facilitate the development of sustainable communities through land use planning, by providing for land uses capable of accommodating employment, community, leisure, recreational and cultural facilities having regard to the quality of the environment, including the natural environment, landscape character and the archaeological and architectural heritage.*

Policies of the Council's General Green Infrastructure include:

**GI 1:** *Ensure the protection, enhancement and maintenance of Green Infrastructure and recognise the health benefits as well as the economic, social, environmental and physical value of green spaces through the integration of Green Infrastructure (GI) planning and development in the planning process.*



**GI 3:** *Identify Green Infrastructure resources within and on the edge of the settlement boundaries by expanding the existing programme of Green Infrastructure mapping and to include, during the review process of Local Area Plans, Green Infrastructure policies and objectives.*

**GI 8:** *Contribute towards the protection of and manage existing networks of woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character, and to strengthen local networks.*

**GI 9:** *Ensure that proper provision is made for the consideration, protection and management of existing networks of woodlands, trees and hedgerows when undertaking, approving or authorising development.*

**GI 10:** *Ensure a Tree Management Plan is provided to ensure that trees are adequately protected during development and incorporated into the design of new developments.*

**GI 11** *Ensure that hedgerow removal to facilitate development is kept to an absolute minimum and, where unavoidable, a requirement for mitigation planting will be required comprising a hedge of similar length and species composition to the original, established as close as is practicable to the original and where possible linking in to existing adjacent hedges. Native plants of a local provenance should be used for any such planting.*

**GI 14** *Contribute towards the protection where possible of the trees which are considered an important component of demesne landscapes.*

**GI 18** *Contribute towards the protection of and manage the natural, historical and amenity value of, the county's waterways and to strengthen a network of waterways at a regional level.*

#### **Protected Views:**

A number of protected views are relevant to the proposed development, as listed in the Kildare County Development Plan 2017-2023. These include views to and from the County's waterways, including the Royal Canal, where the Plan notes that urban and rural development has taken place along some sections of the canals and rivers, interrupting the integrity of the linear landscape features and in some cases significantly affecting their scenic amenity value. It states the importance of development not further interrupting the integrity of river and canal corridors. The following views to and from bridges along the Royal Canal are protected:

- RC5 Pike Bridge Railpark/Donoughmore
- RC6 Mullen Bridge Railpark/Maynooth

The Plan states that several bridges within the Carton Demesne over the Rye Water, also have protected views (both to and from the bridge):

- RW2 Carton Bridge
- RW3 Sandford's Bridge Carton Demesne
- Kildare Bridge Carton Demesne

It should be noted that the bridges are named differently in the map available from Carton House Estate. The main bridge to the west of Carton house over the Rye Water is named the 'White Bridge' on this map. It is likely that this is the bridge referred to as RW2 Carton Bridge, as named in historic maps. Two other bridges over the Rye Water in Carton Demesne are named on the estate map as the Black Bridges. Sandford's Bridge is located along the L1014 to the east of Carton Demesne. It is unlikely that there will be any views of the proposed development from this bridge as there is heavy screening in the vicinity.

Water course and canal corridor views are protected in policy as follows:

It is the policy of the Council to:

**WV 1** Curtail any further development along the canal and river banks that could cumulatively affect the quality of a designated view.

**WV 2** Preserve and enhance the scenic amenity of the river valleys and canal corridors and the quality of the vistas available from designated views.

**WV 3** Prevent inappropriate development along canal and river banks and to preserve these areas in the interests of biodiversity, built and natural heritage and amenity by creating or maintaining buffer zones, where development should be avoided.

### Carton Demesne

In addition to the views to and from the bridges in Carton Demesne, a number of other views in the Carton Demesne are included in a map in Chapter 12 Architectural and Archaeological Heritage, below, which describes these in the legend as 'Views to be Preserved'. The illustration below indicates views towards the house from the riverside paths, and from the central parkland area, as well as views from the house looking over the demesne.

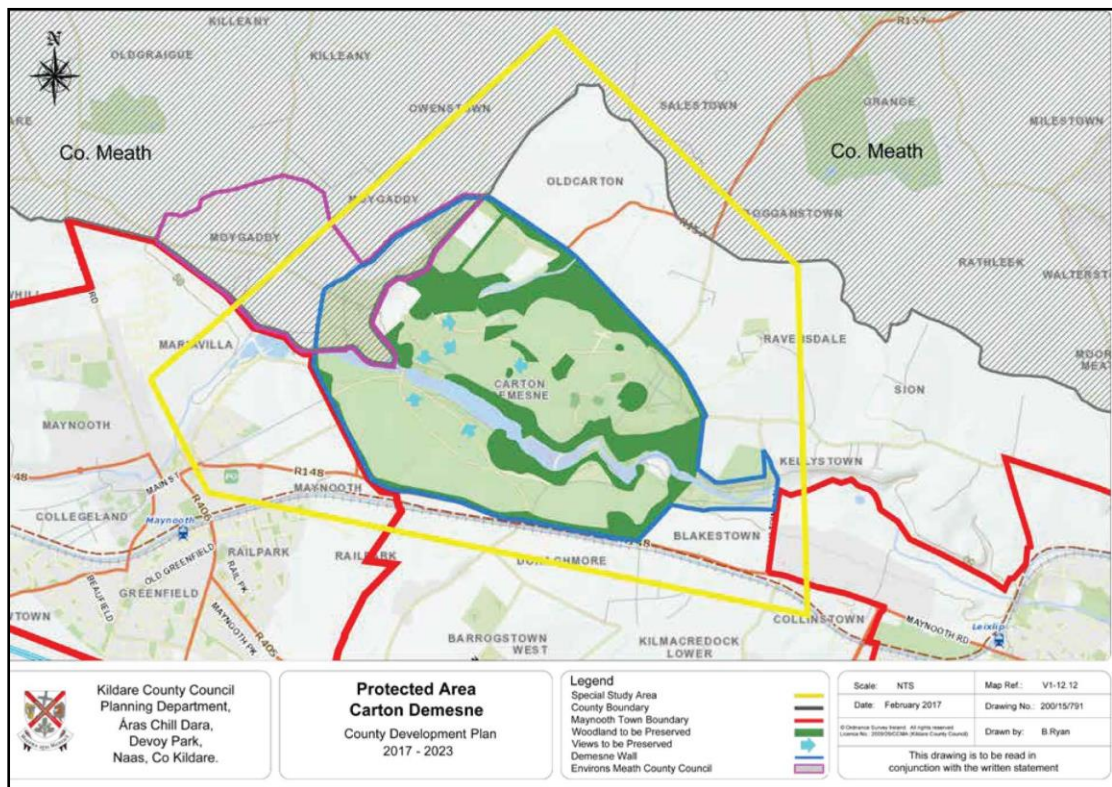


Figure 4.16 Carton Demesne MapSource: Kildare County Council

### Scenic Routes

The road within Carton Demesne is also a Scenic Route, described as follows, in Appendix 4 Scenic Routes:

**Scenic Route 30:** Within Carton Demesne Walls: Views to and from Carton House, the Lake and Woodland Areas.

“Views to the Carton House and Demesne are not available from the R148 Leixlip to Maynooth Regional Road (classified as part of the North Kildare Tourist Route) nor from any other local roads due to the height of the stonewall boundary. The existing lake and deciduous woodlands within the estate and the open landscape character of the environs contained within the Demesne can be described as having high landscape

*and scenic amenity value. Due to the hilltop location of Carton House, views to the surrounding open countryside are available.”*

It should be noted that this refers to *views within* the Carton demesne walls. Further relevant policies are as follows:

**SR1** *Protect views from designated scenic routes by avoiding any development that could disrupt the vistas or disproportionately impact on the landscape character of the area, thereby affecting the scenic and amenity value of the views.*

**SR 2** *Review and update all Scenic Routes and Views in the county during the lifetime*

Carton Demesne is listed as a protected structure including the gardens, in Appendix III of the Development Plan. It is also included in the National Inventory of Architectural Heritage (NIAH). The Maynooth Local Area Plan, though it does not include Carton within the boundary, notes the importance of the demesne and its relationship to the town via Carton Avenue, which links the centre of Maynooth with the Carton Estate, across the Dunboyne Road. The County Development Plan notes the importance of Carton Demesne as a tourist attraction.

Related policies include the following:

**CH1:** *Promote appreciation of the landscape and historical importance of traditional and historic gardens, demesnes and parks within Kildare in general and particularly where they constitute an important setting to a protected structure.*

**CH 2** *Preserve and protect the historic gardens and designed landscapes identified in the National Inventory of Architectural Heritage.*

**PS 6** *Maintain the views to and from Carton House and within Carton Demesne.*

**Scenic Route 31:** A further scenic route, 31, is described within Castletown demesne, another important demesne landscape, though at a greater distance (approximately 4 kilometres) than Carton Demesne. This is described as:

*Views within Castletown - Donaghcumper rural area; Views to the south and north from Castletown House, including axial view to Obelisk.*

*Location: Castletown, Barrogstown, Barnhall, Rinawade, Crodaun*

*Views within Castletown Demesne have a high scenic value as a result of the landscape quality of the demesne lands. i.e. open green areas and existing mature vegetation add to the visual amenity value. Views onto the River Liffey are also available.*

The view to the Obelisk is relevant here as it is in the direction of the proposed development.

### **Landscape and Amenity Designations**

The Royal Canal is designated as an Area of High Amenity (AHA) in the Plan. Areas of High Amenity are described as certain special landscape areas within the County, classified because of their outstanding natural beauty and/or unique interest value and are generally sensitive to the impacts of development.

The Plan describes the Grand and Royal Canal Corridors and adjacent lands as having been landscaped and enhanced along sections which flow through urban areas. It notes that the smooth terrain, generally gentle landform and low canal bank grassland characterise the canal corridors, allowing vistas over long distances without disruption, where the canal flows in a straight-line direction. The Plan notes that as a consequence, development can have a disproportionate visual impact along the water corridor, and it can prove difficult for the existing topography to visually absorb development. The Plan notes that the occurrence of natural vegetation and plantations

adjacent to the water corridor can have shielding and absorbing qualities in landscape terms, providing visual barriers. Canal corridors are described as potentially vulnerable linear landscape features, as they are often highly distinctive in the context of the general landscape.

Relevant policies are as follows:

**WC 1:** *Seek to locate new development in the water corridor landscape character areas towards existing structures and mature vegetation.*

**WC 2** *Facilitate appropriate development that can utilise existing structures, settlement areas and infrastructure, whilst taking account of the visual absorption opportunities provided by existing topography and vegetation*

**WC 3** *Control development that will adversely affect the visual integrity of distinctive linear sections of water corridors and river valleys and open floodplains.*

**WC 7** *Explore the establishment of the Barrow Valley and the Royal and Grand Canals as Areas of Special Amenity, as per section 202 of the Planning and Development Act 2000(as amended).*

### **Tourism policies**

Both Carton House and the Royal canal are also referred to in tourism related policies in the Development Plan.

**EO 55:** *Recognise the sensitive and unique quality of Carton House as a tourism facility of national and international significance and to ensure that its integrity is protected. The Council will support and encourage further appropriate development of the tourism and recreational facilities at Carton House, having regard to its status as a house and demesne of international heritage importance.*

**ECD 46** *Maximise opportunities for the use of canals and other waterways including the River Liffey and River Barrow as tourism and recreational amenities. In this regard the Council will co-operate with Waterways Ireland, National Parks and Wildlife Service and community groups to develop the infrastructure, quality and amenity of these waterways.*

### **Landscape Character and Sensitivity**

The Kildare County Development Plan includes a list of Landscape Character Areas in the County, and also a Landscape Sensitivity Classification. These are based on the Landscape Character Assessment carried out in 2004. This describes the site as located in the Northern Lowlands LCA, which is described as of Class 1, Low sensitivity, defined as 'Areas with the capacity to generally accommodate a wide range of uses without significant adverse effects on the appearance or character of the area. However as noted above, the study areas contains sensitive features including Carton Demesne and the Royal Canal AHA.

It should be noted that this assessment is at a broad scale, and also that sensitivity will vary depending of the type of development proposed, as outlined in the GLVIA (2013) Guidelines. In this regard, Table 14.4 of the Plan compares likely compatibility between a range of land uses and proximity to what are referred to as Principal Landscape Sensitivity Factors. Those of relevance to the proposed development include sensitive areas such as Canals, and Scenic Views. The table shows that most types of development, within 300m of such areas, except for agriculture, forestry and tourism developments, have low compatibility with these areas. However it also notes that each site should be assessed on its merits.

**Table 14.4**  
Likely compatibility between a range of land-uses and proximity to Principal Landscape Sensitivity Factors.

5 - Likely to be very compatible in most circumstances. 4 - Likely to be compatible with reasonable care. 3 - Likely to be compatible with great care. 2 - Compatible only in certain circumstances. 1 - Compatible only in exceptional circumstances. 0 - Very unlikely to be compatible.	Agriculture and Forestry		Housing		Urbanisation		Infrastructure		Extraction		Energy	
	Agriculture	Forestry	Rural Housing	Urban Expansion	Industrial Projects	Tourism Projects	Major Powerlines	Sand and Gravel	Rock	Windfarm	Solar	
Proximity within 300m of Principal Landscape Sensitivity Factors.												
Major Rivers and Water bodies	5	5	2	2	2	3	2	1	0	1	0	
Canals	5	5	2	2	2	3	2	1	0	1	1	
Ridgelines	5	5	1	1	1	1	1	0	0	2	0	
Green Urban Areas	4	5	2	0	0	4	3	3	3	2	2	
Broad-Leaved Forestry	3	5	2	2	2	4	3	2	3	1	2	
Mixed Forestry	3	5	2	2	2	4	3	2	3	1	2	
Natural Grasslands	5	2	2	1	1	4	2	1	1	2	2	
Moors and Heathlands	2	2	1	0	0	1	2	1	0	2	1	
Agricultural Land with Natural Vegetation	5	5	2	2	2	3	3	3	3	4	2	
Peat Bogs	0	0	0	0	0	0	2	0	0	3	1	
Scenic View	5	5	2	1	1	5	1	3	0	0	2	
Scenic Route	5	5	2	1	1	5	1	3	0	0	2	

**Figure 4.17 Compatibility of a range of land uses and sensitive areas (Source: Kildare County Development Plan)**

### General Landscape Policies and Objectives

A number of general landscape policies and objectives are also included in the Chapter 14 of the Plan. These are as follows:

**LA1** Ensure that consideration of landscape sensitivity is an important factor in determining development uses. In areas of high landscape sensitivity, the design, type and the choice of location of proposed development in the landscape will also be critical considerations.

**LA 2** Protect and enhance the county’s landscape, by ensuring that development retains, protects and, where necessary, enhances the appearance and character of the existing local landscape.

**LA 3** Require a Landscape/Visual Impact Assessment to accompany significant proposals that are likely to significantly affect:

- Landscape Sensitivity Factors;
- A Class 4 or 5 Sensitivity Landscape (i.e. within 500m of the boundary);
- A route or view identified in maps 14.2 and 14.3 (i.e. within 500m of the boundary).

**LA 4** Seek to ensure that local landscape features, including historic features and buildings, hedgerows, shelter belts and stone walls, are retained, protected and enhanced where appropriate, so as to preserve the local landscape and character of an area, whilst providing for future development.



The following objectives are included:

**LO1:** *Have regard to the Landscape Sensitivity Factors in the vicinity of sites in the consideration of any significant development proposals.*

**LO 2** *Ensure landscape assessment will be an important factor in all land-use proposals.*

**LO4:** *Protect the visual and scenic amenities of County Kildare's built and natural environment.*

**LO 5** *Preserve the character of all important views and prospects, particularly upland, river, canal views, views across the Curragh, views of historical or cultural significance (including buildings and townscapes) and views of natural beauty.*

**LO 6** *Preserve and protect the character of those views and prospects obtainable from scenic routes identified in this Plan, listed in Table 14.5 and identified on Map 14.3.*

**LO 7** *Encourage appropriate landscaping and screen planting of developments along scenic routes. Where scenic routes run through settlements, street trees and ornamental landscaping may also be required.*

### **Maynooth Local Area Plan (LAP) 2013-2019**

The Maynooth LAP mentions the Royal Canal as one of the town's prime recreational and environmental assets, and notes that the maintenance of the environmental quality of the canal and the development of walking and cycling facilities is vital. This, along with the maintenance of Carton Avenue is seen as of great benefit to the town as a whole.

A number of key challenges are identified in the LAP, and these include:

*(vii) Protecting the unique character of Maynooth as a University town steeped in history and heritage.*

*(viii) Retaining its separate physical identity, and avoiding coalescence with nearby towns and villages.*

### **Carton Demesne**

Though Carton Demesne is not within the LAP boundary, the Plan text recognises the importance of Carton Demesne and Carton Avenue, which provides access to Carton House and contributes to the image and character of the town, as well as providing passive recreation.

### **Royal Canal**

The LAP recognises the importance of the Royal Canal towpath in providing passive recreation. Policies PC03 and PC04 relating to footpaths and public lighting pedestrian and cycle networks proposed to provide footpaths lighting as well as to facilitate cycling along the Royal Canal.

*It is the policy of the Council:*

**AR 1:** *To develop the canal side in conjunction with all relevant statutory and non-statutory bodies. This development shall include*

- *A linear park(s)*
- *High quality formal and informal seating arrangements*
- *Where appropriate the provision of high quality, well – lit cycling and pedestrian route.*

**AR 5:** *To seek the development of a park to the south east of the town, off the new road linking the Straffan road and the Celbridge road.*

**AR 10:** *To protect the following views and prospects;*

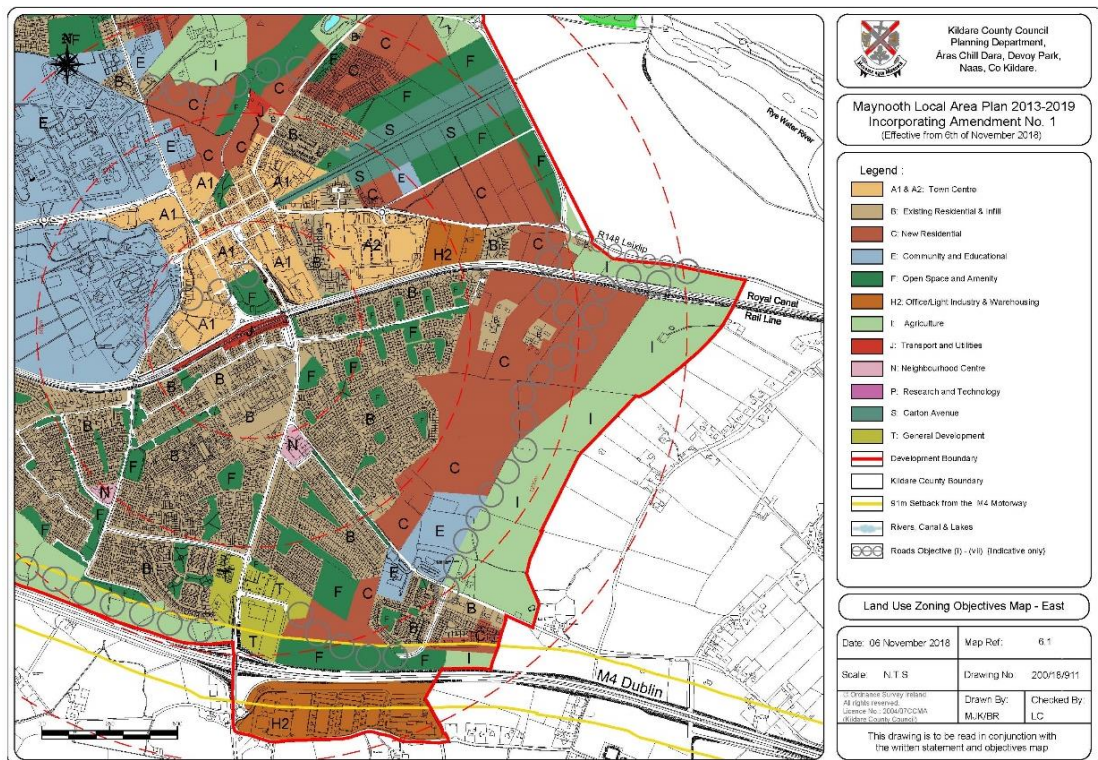
- *Of the College Gates and Castle*
- *Of the Royal Canal from all bridges*
- *Pike Bridge*
- *Bond Bridge*
- *Along the Carton Avenue / Main Street Axis*
- *Off the Harbour along Leinster Street*
- *The College Spire from Main Street*

It should be noted that Mullen Bridge, referred to as RC6 in the Kildare County Development Plan, is not included in the above list or in Map 4 or 4a. However the description 'of the Royal Canal from all bridges' would therefore include the views from Mullen Bridge also, as well as from the newer Straffan Road Bridge.

### Land Use Zoning

The amended land use zoning map is shown in Figure 4.18. The study area in the vicinity of the proposed route includes agricultural land, along the LAP boundary to the east, 'New Residential' zoned land to the west of this, in the Railpark area. The lands between the Royal Canal and R148 east of the R157 junction are zoned 'agriculture'. A strip of land between the Carton Woods estate and the R157 is zoned as 'Open Space and Amenity'.

The zoning map below also illustrates the Eastern Ring Road, and within the Section 7.5.3 of the Maynooth LAP 2013 to 2019 a suite of Roads Objectives are referenced, including the Eastern Ring Road listed under objective TRO 2.



**Figure 4.18 Maynooth Land Use Zoning Map – East**

### Policy Summary

- The Development Plan includes an objective for the proposed road in the Local Area Plan.

- Protected views in the vicinity of the proposed development include RC5 Pike Bridge and RC6 Mullen Bridge in the County Development Plan. These include views to and from the bridges and would include the view from the Straffan Road bridge, east of Mullen Bridge. The LAP also includes a protected view along Carton Avenue/Main Street Axis.
- Several views are mapped within Carton Demesne, and the main road through the demesne is a scenic route, with an emphasis on the views within the demesne.
- Carton Demesne is recognised as both locally and nationally important and contains a number of protected structures. A number of policies relate to the views and the overall demesne landscape at Carton. The House and grounds are included in the NIAH Survey of Historic Gardens and Designed Landscapes and are considered among the most notable houses and demesnes in the county as well as in Ireland. Carton House is also a notable tourist attraction.
- The Royal Canal is designated as an Area of High Amenity and policies refer to considerations regarding development in and around the canal corridor.
- Land use zoning in the vicinity of the proposed route includes agriculture, new residential and existing residential and infill.

### **Site Context and Character**

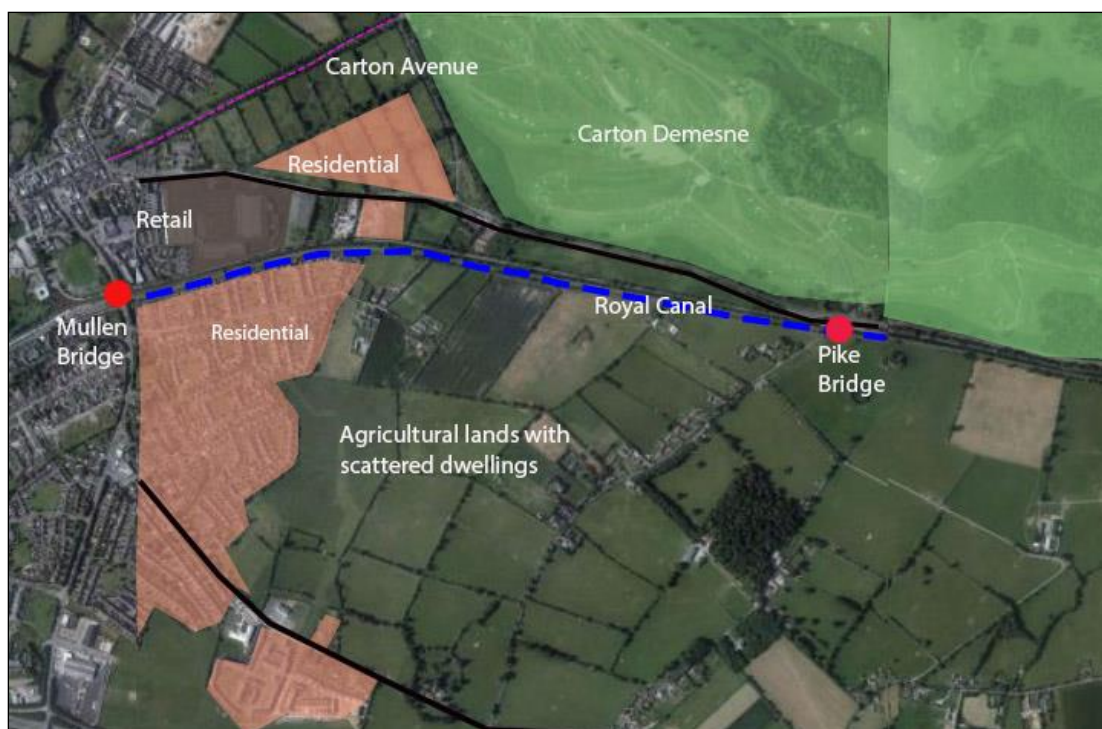
Two site visits were conducted - in November 2018 and January 2019. The study area for the various options in terms of landscape and visual assessment, is included in Figure 4.19 below. The site is described in terms of -

- Location
- Topography and drainage;
- Landcover - Vegetation and natural heritage; Built and cultural heritage;
- Overall Character;
- Landscape and visual amenity.

### **Site/Study Area Location**

The site of the proposed Maynooth Eastern Ring Road is located to the east of the town, and therefore the main study area for landscape and visual purposes takes in the eastern periphery of the town, the land between the R405 and R148, and also a section of Carton Demesne due to its proximity to the proposed route. However the wider areas, including the town of Maynooth, and the wider Carton Demesne, are also referred to in setting the wider context.

The Royal Canal is also within the study area. The main study area for the likely landscape and visual effects is shown below in Figure 4.19, though some views may be proposed from the wider areas within the town of Maynooth and Carton Demesne, such as Castletown House and Connolly's Folly.



**Figure 4.19 Key features of study area**

The proposed road is to connect the R405 Celbridge Road with the R148 Leixlip Road, both of which are located to the east of the town. This would involve crossing the Royal Canal and the railway, which lie between these roads. To the west of these lands lies the outskirts of Maynooth, while to the northeast lies Carton Demesne. While the proposed development lies to the east of the town, a brief review of the historic development of the town gives some context for the town's development over time.

The Local Area Plan describes the historic development of Maynooth, with the original town dating from the settlement around Maynooth Castle in the 12<sup>th</sup> century. The layout of the Main Street by the Duke of Leinster, which connects the town on an axis from St. Patrick's college, to the gate lodge at Carton Demesne, is described as one of the finest examples of 18<sup>th</sup> century landscape and urban design in the country. The historic evolution of the town is also described as evident in the canal and railway, which historically formed the southern boundary of the town which was breached in the late 20<sup>th</sup> century.

#### Landform and Topography

The land in the vicinity of the proposed development is flat or gently undulating. The railway and Royal Canal are manmade elements which are generally level. The agricultural lands which lie between the roads are undulating in places. Several bridges (notably Mullen Bridge/Straffan Road Bridge and Pike Bridge) bring an element of height into the landscape.

#### Landcover – Vegetation and Built Form

The landcover of the proposed development is largely composed of agricultural fields, the Royal Canal, trees on both north and south of the canal and the Dublin to Sligo railway line. These fields are enclosed by hedgerows and tree lines. Mature trees are found along the road, particularly along the R148. Tree clumps are also found in the vicinity of the R148/R157 junction, in particular to the south of the junction as shown in Figure 4.20 below:





**Figure 4.20** Trees in vicinity of R148/R157 junction.

Trees and tree lines are also found along the Royal canal corridor, and railway line, which is discussed in more detail below.

The lands north of the canal and south of the R148 Leixlip Road as shown in in Figure 4.21 below:



**Figure 4.21** Fields between Royal Canal and R148 Celbridge Road

South of the canal, fields and hedgerows are evident, as well as some dwellings at Railpark and Parklands, nearer to the town. Agricultural fields with well-defined field boundaries lie between the R405 Celbridge road and the canal as shown in Figure 4.22.



**Figure 4.22** Fields, hedgerows and scattered dwellings south of Royal Canal



### Built form – Residential

At the southern end of the study area, along the R405 Celbridge Road, Griffin Rath Manor and Griffin Rath Hall housing estates lie to the south of the R405, and a school lies to the west with individual dwellings to the east. The main access road in the estate is a tree lined road; Griffin Rath Road, overlooked by the dwellings mainly to the west of the road, some of which are set back slightly further. Dwellings to the east of the road near the junction are mainly screened by vegetation.

Further north, there are some scattered dwellings to the south of the canal at Railpark, and at Parklands Grove (Old Railpark Lane), a narrow cul-de-sac road with a small number of houses on both sides. Residential areas are found north of the canal near the existing R148/R157 junction. A larger residential estate is found at Carton Wood, northwest of the proposed junction, separated by a metal railing from the road. These are shown in Figure 4.23 and Figure 4.24 below. The Blacklion residential area also lies to the west of this junction.



**Figure 4.23 Carton Wood housing development northwest of R148/R157 junction**



**Figure 4.24 Houses to the east of R148/R157 junction with Carton Wood in background**

Other elements of built heritage include the canal and rail bridges, and Carton Demesne itself as described below.

### Royal Canal

The Royal Canal itself runs east-west through the study area, and south of the R148 Leixlip Road, and is bordered to the south by the railway line while a narrow towpath lies to the north. Hedgerow screening which is relatively dense is found along this path. Some screening is evident on the southern side of the canal and railway and some

relatively mature trees are found on both sides. This is part of the Royal Canal trail and is a popular amenity for walkers, runners and cyclists.

In general, the canal corridor is more open in close proximity to the town, near to Mullen Bridge. Dwellings to the south are visible, as shown in Figure 4.25 below. Some of the buildings which lie close to the canal to the north, are glimpsed through the hedgerow. Glimpses of the dwellings along the R148 to the north are also available through relatively narrow gaps in the vegetation.



**Figure 4.25 Open and more urban character along Royal Canal near Maynooth**

As one travels east towards Pike Bridge, there is a curve in the canal corridor and it becomes more rural and tranquil in character, with more mature trees along both sides. There are fewer buildings visible from the corridor, and there is a view of Pike Bridge from some distance as shown in Figure 4.26 below. There are some glimpses of buildings and of the lands to the north, as well as some glimpses to the wall of Carton Demesne while traffic sounds are the main indication of the proximity to the road.



**Figure 4.26 More rural character along Royal Canal towards Pike Bridge**

There are several canal bridges within the vicinity of the study area, Mullen Bridge, to the west in Maynooth, and Pike Bridge, to the east.

A newer bridge was built to the east of Mullen Bridge, referred to as the Straffan Road, which is visible from the canal. The bridges, both old and new, are distinctive features, and punctuate the view along the canal, and bridge both the railway line and canal with a double arch. These bridges add to the character of the canal corridor. A small amenity area is located at Pike Bridge while there is open space to the north of Mullen Bridge in the town.





**Figures 4.27 & 4.28 Mullen Bridge from the west, and Pike Bridge**

### Carton Demesne

The study area includes the important historic landscape of Carton Demesne, and the Palladian style house built by the Dukes of Leinster in the mid-1700s. As referred to in the policy section, Carton is an important historic house and designed landscape, and this design includes Carton Avenue, which directly connects the demesne (though it is now necessary to cross the Dunboyne Road) with Maynooth town, providing an important physical and visual link. The close proximity of the demesne to the town and its direct connection is a unique aspect of the area. Figure 4.29 below shows Carton Avenue to the left, while Figure 4.29Figure 4.29 shows Carton House set in considerable mature trees, which screen the house to the southwest and to the northeast. The house faces southeast over the formal gardens and golf course, and not in the direction of the proposed bridge or road.



**Figure 4.29 & 4.30 Carton Avenue, and Carton House**

The Carton Demesne lies to the west of the town, where the distinctive boundary wall is seen along the R157 Dunboyne Road and R148 Leixlip Road. The wall restricts views, and extensive tree planting inside sections of the boundary wall, especially along the R148. The Rye Water flows through the Demesne and under several bridges. A substantial golf course lies within the grounds, where mature tree planting and areas of woodland are also features of the Demesne, along with Carton House itself and several other buildings and gate lodges. Some recent residential developments are visible to the north of the Demesne, but these are at some distance from the proposed route. The topography within the Demesne slopes towards the Rye Water and is gently undulating in many areas.



**Figure 4.31 Carton Demesne wall set back along Dunboyne Road**



**Figure 4.32 Carton Bridge/White Bridge, and the Demesne landscape.**

The Tyrconnell monument is located at a high point in the Demesne, and affords extensive views over the landscape. The spire of Connolly's Folly, in Castletown Estate is visible from the Demesne and the sections of the surrounding roads.

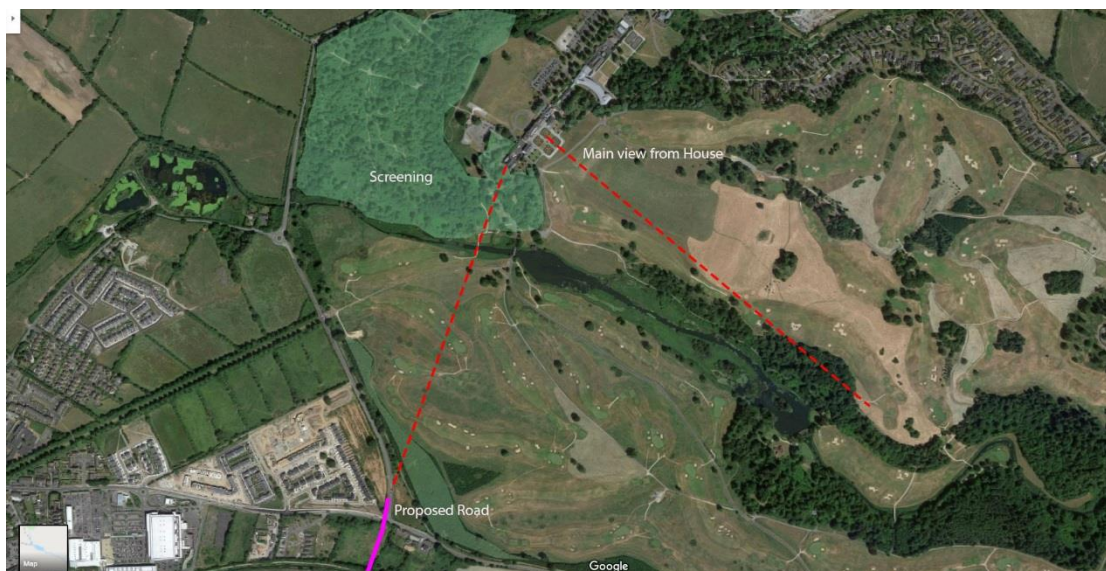
Views from the front of Carton House are in a south easterly direction which look over the formal gardens and golf course. Figure 4.33 below shows the house facing onto the formal gardens and lawn, with the dense screening to the southwest of the house.



**Figure 4.33 Carton House façade and gardens with screening to southwest**

The image below indicates the house is facing to the southeast, (also a view illustrated in the Protected Areas of Carton Demesne from the Development Plan) which is not in the direction of the proposed development.





**Figure 4.34 View direction from Carton House**

### Castletown House and Demesne

Castletown House and Demesne is another nationally important demesne, located a distance of approximately 4km from the proposed development. While outside the main landscape and visual study area, its inclusion in the assessment is to ensure consideration of any potential sensitive receptors, as there is a possibility that views may be available from the upper storeys of the House towards the proposed bridge. The view from the House to Connolly's Folly is listed under Scenic Route 31, and any visibility of the bridge within this line of view will be considered in the assessment. Visual Receptors would be of very High sensitivity.

### **Summary of Landscape Characteristics**

The study area is on the eastern periphery of Maynooth town, which has historic qualities and is linked to the Carton Demesne which lies to the east of Maynooth. The character of the study area therefore has both urban and rural elements.

The study area includes larger residential estates (Carton Wood and Griffin Rath Hall and Griffin Rath Manor) and other smaller areas of scattered dwellings to the east of the town, while agricultural land forms the main land use in the vicinity of the proposed development. Well defined field boundaries, some with relatively mature trees and hedgerows are evident.

The study area contains several important landscape elements which have a more distinct character. These include the Royal Canal and towpath, which is a waymarked trail, and is a well-used amenity area. The canal corridor is more open closer to the town, and to Mullen Bridge/Straffan Road Bridge, allowing more views out to the surrounds, but which becomes progressively more rural and tranquil and screened by vegetation on both sides, as one travels east away from the town towards Pike Bridge. Mullen Bridge, the Straffan Road Bridge and Pike Bridge are features of the canal corridor. Mature hedgerows and trees are a distinctive feature of the corridor and these provide a feeling of enclosure and restrict views to and from the corridor.

Carton Demesne lies to the north and east of the proposed development and is directly linked by Carton Avenue to the centre of Maynooth, along an axis to St Patrick's College. The Demesne is close to the R148/157 junction and borders the R148 Leixlip Road, where the demesne wall and trees are visible.



## Visual Amenity

In general, the visual amenity in the study area is high. Several areas have a clear aesthetic quality, including the Royal Canal corridor (Area of High Amenity) with the canal itself, the high proportion of vegetation and mature trees which frame the views to and from the bridges. The protected views from the canal bridges (Mullen Bridge and Pike Bridge) have scenic qualities recognised in policy.

The town centre, (including the ACA) and Carton Avenue, though on the periphery of the study area, have aesthetic qualities, and Carton Demesne itself has very high scenic qualities, mainly the views within the Demesne to the river, parkland and trees and house, as well as distant views available from the higher parts of the grounds and to Connolly's Folly spire, and the church spire in Maynooth town.

Tree lines in some of the field boundaries, along the canal and railway, in particular those relatively mature trees in the vicinity of the junction with the R148/R157 and with the Carton Demesne wall, have a pleasant aesthetic quality.

## Summary of Landscape Values

Values can be described as values or elements to be conserved, and 'enhancement values' indicate elements which can be improved.

Values to be conserved include:

- The Royal Canal corridor and towpath is a highly valued landscape feature for the town and environs and has policy backing. It is also a scenic area, and is valuable as an area for walking and cycling and can be seen as an important piece of green infrastructure.
- Carton Demesne is also a highly valued landscape as evidenced in the planning policies. The aesthetic qualities of the Demesne are remarkable, and it contributes to the green infrastructure and pedestrian connectivity of the town and environs. The value of Carton Avenue as an area for passive recreation and an area of scenic amenity is evident, and it is a well-used link between Carton Demesne and the town.
- The relatively compact and well connected nature of the townscape can be seen as a value to be conserved.
- Well defined hedgerows and mature trees are a feature of some of the field boundaries, the canal, and the R148 and should be retained where possible.

Values to be enhanced include

- The Royal Canal may benefit from greater access to increase usage and connectivity to the surrounding landscape. The Royal Canal may benefit from greater access to increase usage and connectivity to the surrounding landscape.

### 4.7.5 Potential Visibility and Visual Receptors

Potential visibility of the site was assessed during the site visits. Sensitive visual receptors with potential visibility of the proposed development include viewers in the vicinity of the ACA and Carton Avenue in Maynooth town, viewers along the Royal Canal corridor and bridges, viewers from Carton Demesne, and residents in close proximity to the proposed relief road. Views from locations in the wider landscape of cultural importance including Castletown House and Connolly's Folly were also visited to assess potential visibility.

While the majority of the proposed development is not likely to be visible over a wide extent, the proposed bridge crossing over the canal and railway is likely to be prominent in some views, due to the height needed to be achieved for the specified clearance over the railway line of 5.3m. Therefore, views representing sensitive receptors in Carton Demesne and the Maynooth ACA, were included due to potential visibility of the bridge and the traffic on the bridge from wider areas. The bridge crossing is also likely to be particularly visible along the canal corridor, and from Pike Bridge and the Straffan Road Bridge.

A number of viewpoints were selected for the production of photomontages, as listed in **Table 4-11** below, and the photomontages are discussed in Section 4.7.7. These include relatively distant views and more localised views and represent a range of sensitive visual receptors. The location of the photomontage views are illustrated in the photomontage booklet. The photomontages and accompanying technical information are contained in an accompanying booklet to this Report, as Appendix B.

**Table 4-11: Photomontage Locations**

Viewpoint	Description
1	View from Straffan Road Bridge
2	View from Pike Bridge (protected view, Area of High Amenity)
3	View from ACA at entrance to Carton Avenue
4	View from Royal Canal path
5	View from White Bridge, Carton Demesne
6	View from Tyrconnell Monument, Carton Demesne
9	View from gardens to front of Carton House
10	View from path to front of Carton House
11	View from R157
12	View from end of Parklands Grove
13	View from Carton Woods estate

#### 4.7.6 Characteristics of the Proposed Development

The development is described fully in Section 3 of this Part VIII Planning Report. The main elements relevant to the Landscape and Visual Assessment include:

- Construction of a Ring Road connecting the R405 Celbridge Road to the R148 Leixlip Road, with pedestrian and cycle paths on both sides. This includes realignment and widening of roads in proximity to both junctions.
- A proposed bridge to cross the railway and Royal canal
- Proposed access roads connecting to several properties and a pedestrian access path connecting to the Royal Canal
- Associated works including proposed noise barriers in the vicinity of Parklands, and also along Griffin Rath Road and along the R405 junction.
- The proposed development traverses agricultural land between the junctions, resulting in the removal of approximately 952 metres of hedgerows and 168 metres of treeline, as well as the loss of open agricultural land. There will be removal of relatively small areas of green space and vegetation in proximity to the residential areas at Griffin Rath Manor, Griffin Rath Hall and Carton Wood.
- Several sections of vegetation adjacent to the road corridor are to be retained.

- There is proposed planting of native hedgerows, street trees, shrubs and wildflower meadow as part of the proposal.

#### 4.7.7 Predicted Impacts for Landscape & Visual

##### Construction Phase – Landscape Effects

The construction phase will involve the removal of approximately 925 metres of hedgerow, as it traverses several agricultural fields, and approximately 168 metres of tree line (this mainly in the vicinity of the canal). Tree and vegetation removal is also proposed in the vicinity of the Griffin Rath estates and at the proposed junction with the R405. This is considered a **permanent, Slight, negative** landscape effect.

The proposed works will include site clearing, earthworks, and movement of construction machinery in and out of the site, and will result in a **Temporary, Slight to Moderate negative** landscape effect. The effect is likely to be more pronounced in locations near to the proposed road corridor and the proposed bridge and residential areas.

##### Construction Phase – Visual Effects

Visual effects will include vegetation removal as noted above, and the operation of machinery in and out of the site. These works are likely to be visible from a number of locations, and will result in **Temporary, Slight adverse** effect from the majority of areas in the vicinity, however there are likely to be **Temporary Slight to Moderate** adverse visual effects for those receptors in proximity to the proposed development including those using the Royal Canal path and residents in close proximity to the proposed bridge, in the vicinity of the R148 Leixlip Road junction at Carton Woods, and also to the south in the vicinity of Griffin Rath Road and the residences along the R405 in proximity to the junction.

##### Operational Phase – Landscape Effects

###### Landscape Sensitivity

Landscape sensitivity is considered Medium to High and is considered High for the majority of the study area. High sensitivity is defined as:

*Areas where the landscape exhibits strong, positive character with valued elements, features and characteristics. These attributes are recognised in landscape policy or designations as being of national, regional or county value and the principle management objective for the area is conservation of the existing character.*

The study area contains the Royal Canal which is designated as an Area of High Amenity, and Carton Demesne, a nationally important Demesne landscape. The town of Maynooth has a strong historic character and contains an ACA and key features including Carton Avenue. The agricultural fields and surrounding built up areas to the eastern extents of Maynooth are not designated but are considered of Medium sensitivity.

###### Magnitude of Change

The magnitude of change varies throughout the study area. Changes include the removal of landscape elements (trees and hedgerows) in the agricultural fields along the route of the proposed road, and the removal of vegetation along the canal in the vicinity of the proposed bridge, as well as some vegetation removal in the vicinity of the junctions and residential areas. The proposed development will add new elements, including the new road, and areas of road widening, and two junctions are to be revised to accommodate the new road which are in proximity to residential areas, including

noise barriers at certain locations. The proposed bridge is to cross the canal and railway, and road lighting is proposed. A proposed path also connects the canal path to the road, and a number of access roads are also proposed. It is considered the magnitude of change ranges from Low to Medium in the majority of cases, with a High magnitude of change in the immediate vicinity of the proposed bridge and in the vicinity of Griffin Rath Road and the R405 junction.

**Low magnitude of change:** *Change that is moderate or limited in scale, resulting in minor alteration of landscape receptors, and/or introduction of elements that are not uncharacteristic in the context.*

**Medium magnitude of change:** *Change that is moderate in extent, resulting in partial loss or alteration of landscape receptors, and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic in the context.*

Low magnitude of change is expected where the proposed development introduces elements that will have minor landscape changes, where road widening is carried out at grade with minor landscape changes.

A number of areas are expected to experience a Slight to Medium magnitude of change, including the agricultural fields that will be altered and where hedgerows removed, to facilitate the road. The character will also change from rural, agricultural fields to a road corridor and will create a suburban character. It is noted this change is proposed in policy and is consistent with Development Plan objectives. It is considered that the built-up area to the east of Maynooth town, close to the route of the proposed corridor, will undergo Medium magnitude of change. It is considered that the Royal Canal in the vicinity of the proposed bridge will undergo a Medium magnitude of change.

The Carton Demesne will not be directly affected by the proposed development, as no landscape receptors are affected. The proposed development is in close proximity to the demesne wall at the R148 Leixlip Road/R157 junction, but the demesne wall will be unaffected.

A medium magnitude of change is likely in the vicinity of the Griffin Rath Road where the removal of trees, proposed road widening, and noise barriers will alter the character of the area.

### **Significance of Landscape Effects**

Significance of effects ranges, from Imperceptible to Moderate, but some of these effects will decrease as a result of implementation of landscape proposals.

#### Maynooth Town

The landscape effects on the town of Maynooth as a whole are considered to be Not Significant to Slight, and mainly affect the eastern extents of the town, close to the development. The development in the vicinity of the existing junctions is within an existing urban edge context, and while change will occur, it is not considered uncharacteristic on the periphery of built up areas. The ACA will not be affected by the proposed development.

Landscape effects are expected to be Slight to Moderate in the agricultural fields in the vicinity of the road corridor, and in the built-up areas to the east of the town, where the character will change from rural area to a more suburban character with the introduction of the ring road and the bridge.

This change is likely to be more pronounced over time, as the lands west of the ring road are development as residential land uses, as outlined in policy. However the proposed landscape treatment of the new road will include hedgerows of native species, species rich grassland, shrub and tree planting which will assist in setting the proposed road into the landscape as well as providing replacement habitats. A number of areas of trees and vegetation identified in the Biodiversity chapter are retained as outlined (indicative) on the Landscape Masterplan (refer to Appendix A).

The development in the vicinity of the existing junctions is within an existing urban edge context. Landscape receptors at several locations will experience change, particularly along Griffin Rath Road and the junction with the R405, where vegetation removal, proposed noise barriers and road widening all contribute to a change in character. The R148 Leixlip Road/R157 junction will also undergo change due to tree removal, and road widening. In these areas, effects are considered Moderate.

### Royal Canal

The Royal Canal AHA will experience a Moderate adverse landscape effect, which is more pronounced in the vicinity of the proposed bridge. It is noted that the bridge is located closer to the more urban and open end of the canal corridor, closer to Maynooth, and the more enclosed, and rural nature of the eastern part of the canal corridor approaching Pike Bridge, will experience lesser degree of effect. (It is noted also that a proposed development of the canal towpath has also been permitted.) Proposed planting on the embankments and at the level of the canal will improve the character of the area over time.

### Carton Demesne

Carton Demesne will not experience any change to its landscape receptors. The main changes will be minor changes to the more elevated views in the Demesne where the bridge is likely to be visible, or partly visible. The character of the R157 between the Carton gate lodge and the R148 Leixlip Road junction will undergo change, but this will not affect the Demesne itself. It is considered that the partial visibility from some parts of the estate will result in an **Imperceptible** landscape effect as several elements, including large scale buildings, are also visible from elevated locations, however these are outside the estate landscape and at some distance away and do not affect the overall landscape character of the Demesne.

### Quality of the Effects

The quality of the effects range from adverse to beneficial, permanent effects. Adverse effects will result along the Royal Canal, in particular in the vicinity of the bridge, where the character will be adversely affected, but these effects will be lessened over time as planting establishes on the embankment. Adverse effects will result in the vicinity of the proposed junctions, where vegetation or green areas, hedgerows and street trees are removed, and the sense of character is changed. New elements such as noise barriers combined with road widening will have an adverse effect in areas, such as in the Griffin Rath Road. The road itself will be widened and raised in areas and increasing the amount of hard surfacing will be an adverse effect. Beneficial effects include the increased pedestrian and cycle connectivity, including the new access path to the canal, and the proposed planting.

### **Operational Phase –Visual Effects**

Visual Effects are assessed based on the relevant policy, site visits, nature of the proposed development as well as the sensitivity of the visual receptors. A number of photomontages were produced to assist in assessing the visual effects and are described below.



The proposed Maynooth Eastern Ring Road includes some vegetation and tree removal, both in rural (agricultural land) and suburban contexts, and proposes a wider road with pedestrian and cycleways. The proposed bridge over the canal and railway, is a prominent element, while the widening of the road, provision of access roads, and junctions works all contribute to visual effects. Visual effects are also caused by the proposed noise barriers which range in height from 2.5-3m.

The views 1-13 below represent a number of sensitive visual receptors in a variety of locations the vicinity, including receptors in Carton Demesne, along the Royal Canal, the Maynooth ACA, as well as residential receptors on the outskirts of Maynooth and those travelling on the road in the vicinity of the proposed development. A number of these locations are protected views/scenic routes.

Each view is described in terms of the existing view, and proposed view. The sensitivity of the receptor, which includes a judgement on the value of the view and the susceptibility of the receptor, as set out in Table 4.9 above, are also outlined. The magnitude of change is described, and this is combined with the visual receptor sensitivity in order to arrive at the importance or significance of the visual effect.

### **Viewpoint 1 - Proposed View**

#### Visual Receptor Sensitivity

Visual Receptor Sensitivity is considered Medium to High. Viewers would be those walking over the bridge, as well as motorists driving over the bridge. Mullen Bridge to the west is a protected view, however Mullen Bridge is at a slightly lower level and visibility would be partly obscured by traffic. Views to and from the canal from bridges, however, are protected.

#### Magnitude of Change

The proposed view will undergo a Negligible to Low magnitude of change, as the proposed bridge is partly visible but at some distance. It appears above the roofscape of houses and the embankments are not prominent. The lighting columns can be seen and would be noticeable at night. Proposed tree planting along the embankment will over time, partly screen the views of the road.

Overall the visual effect is considered **Imperceptible to Not Significant, neutral** effect, reducing slightly as tree planting along the embankments matures.

### **Viewpoint 2 Pike Bridge - Existing View**

This view is taken from Pike Bridge, a protected view, which lies to the east of the proposed development. The view shows the parapet and railings of Pike Bridge in the foreground, and the railway line and Royal Canal and towpath are visible below, with tree lines along the railway line and the canal bank, and some trees between the canal and the railway. To the left of the railway, agricultural fields and a shed are visible, while to the right of the image, a grassed amenity area lies adjacent to the canal path. The R148 road is also visible, as is the Carton Demesne wall, and trees along the R148 and inside the Demesne wall.

### **Viewpoint 2 – Proposed View**

#### Visual Receptor Sensitivity

The visual receptor sensitivity is considered High. These would be viewers either walking over the bridge, or who have come up from the amenity area or canal path to see the views and are of High susceptibility. Some viewers would be those in cars driving over the bridge who are considered less sensitive. The bridge is a protected

view in the Development Plan, and the canal corridor is an Area of High Amenity, thus the area is considered of High value.

#### Magnitude of Change

The proposed view shows the bridge is the only element of the proposed development that is visible, and this is visible in the distance and occupies a limited proportion of the view. The canal and railway lines draw the eye, and the bridge is visible in the line of the protected view, it does not impart a high degree of change to the overall view, and is at a distance.

The magnitude of change is considered Negligible to Low –

*Minor intrusion of the development into the view, or introduction of elements that are not uncharacteristic in the context, resulting in minor alteration to the composition and character of the view but no change to visual amenity*

The overall visual effect is considered to be **Not Significant adverse** visual effect.

### **Viewpoint 3 Maynooth ACA– Existing View**

This view is taken from the eastern edge of the ACA, and opposite the entrance to Carton Avenue, in Maynooth. The view shows a pedestrian plaza in the foreground, with the walls and gate denoting the entrance to Carton Avenue. The mature trees which line the avenue are a key feature of the view, and to the right a hedge and gate lodge building is visible. Buildings to the right of the image along both sides of Leixlip Road are also visible or partly visible.

### **Viewpoint 3 - Proposed View.**

#### Visual Receptor Sensitivity

The visual receptor sensitivity is considered High. These would be viewers walking around the town, to work, shopping or leisure, and also viewers who are entering Carton Avenue for recreation purposes, considered of high susceptibility. The view is considered of High value – the viewpoint is located within the ACA, and the view along Carton Avenue is a protected view. The overall visual receptor sensitivity is considered High.

#### Magnitude of Change

The photomontage shows that the proposed development cannot be seen from this view, as it is screened by the walls, gate pillars, vegetation and buildings. Therefore there is **no visual effect** on this viewpoint.

### **Viewpoint 4 Royal Canal – Existing View**

The existing view is taken from the Royal Canal path, approximately 150m east of the proposed development and approximately 1 km from the entrance to the towpath at the Straffan Road bridge. The arch of Pike bridge is just visible in the distance (the view is clearer in the winter time when trees are without leaves).

The view shows the canal corridor, with relatively dense vegetation including mature trees to the left of the image, adjacent to the path, and the canal and path separated by a narrow strip of grass. A train is seen which denotes the location of the railway line on the opposite canal bank. There are mature trees visible in the field on the opposite bank, and glimpses of open fields between the trees.

### **Viewpoint 4 - Proposed View**

#### Visual Receptor Sensitivity

The Visual Receptors are considered of High sensitivity. They include those walking, cycling and running along the towpath, and enjoying the amenity of the area. The value of the view is considered of High, as the views to and from the bridges along the Royal Canal are protected views in the Development Plan and Local Area Plan. The canal corridor has high scenic qualities and is an Area of High Amenity.

#### Magnitude of Change

The proposed development is clearly visible in this view. The proposed bridge, a long single span concrete structure with a solid parapet, is a prominent element in the view along with a large embankment on the right-hand side of the image. The removal of mature trees and vegetation is noticeable. The proposed bridge slopes over the canal and railway, from the embankment on the right to a lower embankment to the left of the image. The slopes of the embankment are grassed, with some deciduous trees planted. Lighting columns are also visible on the bridge. It should be noted that proposed landscaping will, over time, help to frame the view to the bridge and partly screen the embankments, and tree planting at a lower level will also assist to create a partial screening effect.

The distant view to Pike Bridge remains, due to the height of the proposed bridge. The magnitude of change is considered to be Medium to High. High is defined as:

*The introduction of elements that may be considered uncharacteristic in the context to the extent that the development becomes co-dominant with other elements in the composition*

The visual effect is considered to be a **Moderate adverse** effect. Over time, once the proposed planting establishes, this is expected to reduce to **Slight, adverse to neutral** effect.

#### **Viewpoint 5 Carton Bridge (White Bridge) - Existing View**

Viewpoint 5 is taken from Carton Bridge, a protected view. The bridge parapet is visible in the foreground, and the undulating topography of the golf course, with scattered trees visible, in the foreground and middle ground. In the distance, some dense deciduous planting, which lie just outside the Demesne wall, is visible. The topography prevents long distance views.

#### **Viewpoint 5 – Proposed View**

##### Visual Receptor Sensitivity

Visual receptors at this location, include those engaged in leisure or recreation, at a protected view within a nationally important Demesne landscape which is also on the Record of Protected Structures, and a highly scenic location. Visual Receptor Sensitivity is considered Very High.

##### Magnitude of Change

The proposed development is not visible from this location, as it is screened by the intervening topography. There is no visual effect.

#### **Viewpoint 6 –Tyrconnell Monument, Carton Demesne - Existing View**

This view is taken from the vicinity of the Tyrconnell monument, in Carton Demesne. While not identified as one of the protected views in the Demesne, the monument is located on a hill at an elevated location, with extensive views over the Demesne landscape of open grassland interspersed with trees. The view shows a golf course in the foreground and background, sloping towards a belt of deciduous trees in the middle ground. In the distance, the generally flat landscape outside the demesne is visible,

with a high proportion of tree cover and several large-scale buildings partly visible. The Maynooth Church spire is a landmark in the view, and some of the town is visible to the right of the image.

### **Viewpoint 6 – Proposed View**

#### Visual Receptor Sensitivity

Visual receptors at this location, include those engaged in leisure or recreation, within a nationally important Demesne landscape which is also on the Record of Protected Structures, and a highly scenic location. Visual Receptor Sensitivity is considered Very High.

#### Magnitude of Change

The proposed development, in particular the bridge, is at some distance (approximately 1.6km) from the viewpoint. The majority of the road is at a lower level and is not visible, however a glimpse of the proposed bridge and embankments are partly visible through the intervening vegetation, with the top of the embankment and the bridge glimpsed through the trees. Some lighting may be visible at night.

Though this is elevated, it does not break the skyline and has little effect on the overall panorama. However, the presence of high sided vehicles on the bridge are likely to be visible. It should be noted this montage represents the worst-case scenario as the trees are without leaves. The magnitude of change is considered Negligible, which is defined as -

*Barely discernible intrusion of the development into the view*

The visual effect is considered **Not Significant to Slight, adverse**. Any glimpses of the proposed embankment are likely to reduce over time to Not Significant and neutral, as the landscape measures including planting on the embankment, reduce any visual effects.

### **Viewpoint 7 – Gardens at front of Carton House – Existing View**

This view is from the formal gardens at Carton House, to represent the protected view indicated from this area.

The view is taken from the formal gardens, with a path and topiary hedging in the foreground, while Carton House is visible to the right of the image. A clump of trees lies to the right of the house, screening views to the land beyond. The golf course and open grass areas with trees, is visible to the left of the image. Tree clumps are visible in the distance to the left of the image, with Connolly's Folly also visible.

### **Viewpoint 7 – Proposed View**

#### Visual Receptor Sensitivity

Visual receptors at this location, include those engaged in leisure or recreation, at a protected view, within a nationally important Demesne landscape which is also on the Record of Protected Structures, and a highly scenic location. Visual Receptor Sensitivity is considered Very High.

#### Magnitude of Change

The proposed development is screened from view by the intervening vegetation. There is no visual effect.

### **Viewpoint 8 – Path at Carton House**

This viewpoint is located on the path to the front of Carton House. This view shows open grassed area with some trees, and the ha-ha wall containing the elevated lawn and formal gardens to the front of Carton House are visible to the right. A clump of mature trees lie to the right of the image. In the middle ground, the land slopes towards the Rye Water, and hides it from view, while the golf course is visible in the distance, with distant tree planting which lies inside the Demesne wall. Larger mature trees are seen against the skyline in the background.

### **Viewpoint 8 - Proposed View**

#### Visual Receptor Sensitivity

Visual receptors at this location, include those engaged in leisure or recreation, within a nationally important Demesne landscape which is also on the Record of Protected Structures, and a highly scenic location. Visual Receptor Sensitivity is considered Very High.

#### Magnitude of Change

The proposed view shows the road and bridge is screened due to the intervening vegetation with the proposed lighting the most visible element. Due to the height of the bridge, high vehicles may be visible from this view but will be partly screened by embankment planting once established. The overall view will experience very little change. The viewpoint is at some distance from the proposed development. The magnitude of the change is considered Negligible -

*Barely discernible intrusion of the development into the view.*

The visual effect is considered to be **Not Significant, adverse** effect.

### **Viewpoint 9 –View south from R157 - Existing View**

The existing view shows the view from the Dunboyne road, which runs along the Carton Demesne boundary. The view shows a road with paths on either side, bounded by concrete fencing. To the left an open area of rough grassland lies adjacent the Demesne wall, with some mature trees visible. In the centre of the view, two houses are seen to the left of the existing junction. A large tree clump in the centre of the view prevents distant views, but some glimpses of fields are available. To the right of the road, further tree clumps are visible.

### **Viewpoint 9 – Proposed View**

#### Visual Receptor Sensitivity

Visual receptors at this location, include those engaged in leisure or recreation, as well as those driving along the road. The road is adjacent to a nationally important Demesne landscape which is also on the Record of Protected Structures. Visual Receptor Sensitivity is considered to be Medium to High.

#### Magnitude of Change

The proposed view shows the proposed realigned road and junction, with the road rising towards the proposed bridge. Some vegetation clearance to the right of the view is proposed, while the rough grassed area to the left of the view remains, though reduced in size, and the Demesne wall is not affected. The road is considerably wider, and along with the cycle lanes and footpaths takes in a considerable proportion of the view and the removal of vegetation to allow for the proposed road considerably opens up the view. The proposed lighting, surfacing and removal of grass verges in between the road and pathways, adds to a more urban character to the view. However proposed landscaping measures including tree planting on both sides of the road and wildflower meadow at the road verge will reduce the visual effects over time and assist



in setting the development into the landscape. The Carton Demesne wall will remain visible, with the fence replaced and the majority of the adjacent existing grassy verge, (except where excavation is required for the attenuation tank) and scattered existing trees retained also. The attenuation tanks will be grassed over with wildflower grassland also.

The magnitude of change is considered Medium -

*Partial intrusion of the development in the view, or introduction of elements that may be prominent but not necessarily uncharacteristic in the context.*

The visual effect is considered **Moderate, adverse** effect, reducing to **Slight, adverse** effect over time.

### **View 10 – Parklands Grove – Existing View**

This view is taken from the end of the Parklands cul-de-sac and is taken to represent a group of houses at the end of this road, in close proximity to the proposed development. The view shows the house at the end of the road, bounded by a concrete block wall, and an adjacent field bounded by a hedgerow with mature trees. There is no view to the wider landscape.

### **View 10 – Proposed View**

#### Visual Receptor Sensitivity

This view represents those walking, driving along the road to access the houses, and as in close proximity to residences, viewers are considered of Medium to High sensitivity.

#### Magnitude of Change

The proposed view shows the hedgerow and trees in the distance are removed and the road and embankments are visible to the right of the dwelling. The most noticeable elements include the lighting columns and the proposed noise barrier. A 2.5m wall has been included at the request of landowners to provide privacy, this has been screened by planting on the inside. The vegetation to the right of the image is retained and provides some screening, while proposed landscaping will, over time, lessen the visual effect. The proposed wall will be provided around the vegetation to be retained which will link up with the proposed landscape planting. The magnitude of change is considered Low -

*Minor intrusion of the development into the view, or introduction of elements that are not uncharacteristic in the context.*

The visual effect is considered **Slight and adverse** and is expected when the proposed landscaping is established. The planting will reduce visibility and reduce the visual effects To Slight, adverse to neutral. The lighting will remain visible. (Note: Visibility from the rear of the houses will be affected by the presence of the boundary screening).

### **Viewpoint 11 – Carton Woods Estate- Existing View**

The existing view taken from the footpath inside **Carton** Woods estate, represents viewers and residents in this estate on the edge of Maynooth. The view shows the mounded grassed area with paths and some trees which is bordered by a low wall and railing. Beyond this, a line of mature trees borders the opposite side of the R148, and some road signage is visible.

## **Viewpoint 11 – Proposed View**

### Visual Receptor Sensitivity

Visual receptors at this location include residents in the rows of houses adjacent to this view, as well as residents and others walking and driving in the estate. Residents are considered to be of High susceptibility to change. The value of the view is considered to be Medium, while it has some scenic qualities and elements of naturalness, it is a view in a suburban area which is not a protected view or scenic route. Visual receptor sensitivity is therefore considered Medium to High.

### Magnitude of Change

The proposed view shows the fence between the green space and the road has been moved, and the gate posts reinstated at a set-back location. Some vegetation including mature trees have been removed at the existing junction to facilitate the road and connecting footpath, while existing trees to the right of the new pathway are retained. The mature trees on the southern side of the road will assist in screening the proposed bridge, which will be intermittently visible when the trees are without leaves, and less so when vegetation is in leaf. There will be a change in the surroundings with the widening of the road and introduction of the Eastern Ring Road, but it should be noted this is a suburban context and the development does not appear uncharacteristic. The magnitude of change is considered Low:

*Low - Minor intrusion of the development into the view, or introduction of elements that are not uncharacteristic in the context.*

The visual effect is considered **Slight, adverse** effect.

Proposed measures include reinstating the fence and gateway as well as some planting on the embankment and around the pedestrian path. This will further improve the appearance of the road.

## **Viewpoint 12 – View from Connolly's Folly – Existing View**

This viewpoint is taken from the base of Connolly's Folly, looking towards the monument entrance in the direction of the proposed development. The monument (and protected structure) lie to the northwest of Castletown House and southeast of the proposed development. The view shows the entrance to the Folly with stone gate pillars and a gravel drive leading to the monument, with grass on both sides. A fence separates the area from the road, which is bounded by a hedgerow with some mature trees to the right and left of the image. There are some views across the road to several trees and a hedgerow which restrict long distance views, with only a narrow glimpse of the countryside beyond.

## **Viewpoint 12 – Proposed View**

### Visual Receptor Sensitivity

Visual Receptor Sensitivity at this location, though not a protected view, is considered High as viewers would be those visiting the monument which has cultural and historical value and they would be likely to be aware of their surrounds.

### Magnitude of Change

The proposed view shows the proposed development is not visible in this view (the outline in yellow indicates its position).

Therefore, there is no change to the view and **no visual effect**.

### **Viewpoint 13 – Castletown House - Existing View**

The existing view is taken from the upper storey of Castletown House. This is to represent the Protected View noted in Scenic Route 31. This view shows a view over parkland of open grass with extensive tree cover in the background. The view of Connolly's Folly is visible in the centre of the view, with the view defined by an opening in the trees.

### **Viewpoint 13 – Proposed View**

#### Visual Receptor Sensitivity

Visual Receptor Sensitivity would be considered High to Very High, as this is a view from a protected structure, important demesne landscape and a protected view to Connolly's Folly.

#### Magnitude of Change

The proposed view shows that there is no visibility of the proposed development.

### **Summary of Visual Effects**

The photomontages above represent a number of areas of potential visual effects.

The views represent viewers from Maynooth town and the residents on the eastern outskirts, the Royal Canal path, Carton Demesne, Castletown House and Connolly's Folly as well as road users.

#### Views from Carton Demesne

Viewpoints 5,6,7 and 8 represent Carton Demesne.

The photomontages show that though the majority of the road will be screened from Carton Demesne, there will be some slight visibility of the proposed bridge. The most elevated view, View 6 from the Tyrconnell monument, shows some minor visibility of the proposed bridge, though this is at some distance. Other views closer to Carton House show the bridge will be mainly screened but the lighting visible, while View 7, closer to the house, shows no visibility. A view was also taken from Carton Bridge, View 5, and this shows that the bridge will be screened from the protected view and scenic route.

Due to the nature of the undulating topography of the Demesne, it is likely that there will not be visibility from the Rye Water and only at elevated locations will views be possible. The screening inside the Demesne wall assists considerably in reducing the visibility from these elevated locations, the Tyrconnell monument in View 6 represents the most elevated location.

While there will be glimpses from the elevated parts of the Demesne, these are at some distance and the development will occupy a very small proportion of the overall view. It should be noted that the Scenic Route 30 is focussed on the views through the demesne, *within* the Carton Demesne walls. The overall visual effect is considered to be Not Significant. Views will over time, change as the screening vegetation along the embankment reduces visibility, and further reducing visual effects.

Views from Carton House itself were also considered, and it should be noted that views from Carton House are in a south-easterly direction, and not in the direction of the proposed development. The considerable screening to the southwest of the house (as shown in Figure 4.35 below) is likely to screen any potential views from the upper storeys, towards the proposed bridge.



**Figure 4.35 Screening adjacent to Carton House preventing views towards the development**

### Views along Royal Canal

Views 1,2 and 4 represent the views to and from the canal corridor an Area of High Amenity, which is an area where views to and from the bridges are protected in policy.

Views 1 and 2 represent views to the canal corridor from Straffan Road bridge and Pike Bridge. There show that the bridge is visible but visual effects are not pronounced from the bridges, and the visual effect from both bridges is Not Significant, neutral effect.

View 4 shows that viewers along the Royal canal corridor, between Maynooth town (Straffan Road Bridge) and Pike Bridge will experience changes to the views and visual amenity, where the bridge is seen in close proximity. The visual effect of Viewpoint 4 is considered to be Moderate, adverse effect when in close proximity, as a result of the proposed concrete bridge combined with high embankments, tree removal, as well as the road lighting columns.

The visual effects will however decrease as one moves further along the canal, away from the bridge.

Proposed planting on the embankment and at a lower level will assist in setting the bridge into the landscape of the canal corridor. Over time, once vegetation establishes, visual effects are expected to reduce to Slight, adverse in the immediate vicinity of the bridge.

### Maynooth ACA and Carton Avenue

The proposed development will not be visible from the area around Carton Avenue, on the edge of the ACA, as illustrated by Viewpoint 3. The protected view from Carton Avenue is not likely to have any views of the proposed development due to screening and built form.

### Maynooth Town - Residential views

Several residences are in close proximity to the proposed development including the Griffin Rath housing estates at the southern junction and residents at Parklands to the west of the proposed road. They also include residents at Blacklion and Carton Woods estate near the R148/R157 junction to the north, and several houses along the R148 Leixlip Road just east of the junction. Visual effects range from Slight to Moderate adverse visual effects, with localised Moderate-Significant effects. These effects will lessen over time as planting is established.

Viewpoints 10,11 represent two of these locations.

Viewpoint 10 represents residents along Parklands Grove, in particular those at the northern end of the cul-de-sac which will experience some adverse visual effects as a result of the proposed road, noise barriers and lighting. The character will alter from a rural cul de sac to one in proximity to a main road and an access road. Retention of adjacent vegetation and proposed planting will reduce effects which are considered Slight adverse visual effect.

Residents at the Carton Wood estate are represented by View 11, where a number of houses face the R148 Leixlip Road and will have some visibility of the road. The proposed bridge will largely be screened by intervening vegetation, but they will experience some adverse visual effects, due to the removal of part of the green area in the housing estate, and some vegetation at the junction and visibility of the embankment and additional junction lighting. However once embankment planting establishes this will reduce the visual effect. Residences to the east of this junction will experience visual effects, as some of the vegetation to the southwest is removed and the road and embankment may be visible to the rear of the property. The vegetation to the west of the houses will be retained. Proposed planting will over time, reduce effects and help to screen the proposed development, but Slight adverse effects are likely to remain. Residents at Black lion will be largely screened by vegetation to the west of the proposed R148 junction, so while some visibility is possible, it is likely to be seen through vegetation, and therefore partially screened.

Residents along Griffin Rath Road will experience visual effects which are considered to range from Slight to Moderate and in certain areas Moderate/Significant.

Along Griffin Rath Road, the development will cause the removal of some of the street trees. Proposed noise barriers approaching the R405 junction are a height of 2.5m with a 3m barrier located to the south. In most cases these will replace existing metal railings or a stone wall. These changes are considered to have a Moderate adverse visual effect, with locally Moderate-Significant adverse effects likely where the noise barrier is combined with tree removal and road widening. Mitigation measures include integrating noise barriers with existing stone walls and planting where possible to reduce visual effects. These are likely to reduce visual effects over time.

Receptors in two dwellings along the R405 will also experience Moderate adverse effects due to the proposed noise barriers, and removal of vegetation associated with widening of the road. Mitigation includes planting along the boundary, which will, over time, reduce the visual effect.

Viewers on roads, including the Celbridge Road (R405), Dunboyne Road (R157), Leixlip Road, (R148) and Straffan Road, are likely to experience visual effects which are expected to be Slight adverse effects due to vegetation removal, road widening and a change in the primarily rural nature of the views, to a more urban character. However once proposed vegetation including hedgerows, grass verges and tree planting are established, some visual effects will reduce.

#### Castletown House and Connolly's Folly

The Views 12 and 13 show that there is no visibility from these locations.

#### Quality of visual effects

Quality of visual effects ranges from neutral where the development is barely perceptible or partly screened, to adverse - in particular from the views along the Royal Canal path as well as views from residences in close proximity to the proposed road. Adverse effects are predicted where the bridge is glimpsed from Carton Demesne, in views close to the proposed bridge along the Royal Canal and from some residential



receptors. These are expected to reduce or to become neutral once planting establishes. Proposed landscape is discussed below and illustrated on the landscape plan.

#### **4.7.8 Mitigation Measures for Landscape & Visual**

The following recommendations were developed in conjunction with the design proposals, to reduce landscape and visual effects. A Landscape Plan has been prepared to reduce landscape and visual effects where possible, to assist in setting the development into the landscape.

##### **Construction Phase**

During the construction phase, site hoarding/ fencing will be erected and agreed by the local authority prior to construction with the aim of reducing the visibility of the ongoing construction works and will also reduce the noise and dust emissions from the development site, as appropriate.

Tree protection measures to protect existing trees are to be included to prevent damage to existing trees.

##### **Operational Phase**

The following design features of the proposed development are integral to the design and were included as part of the refinement method of design where potential impacts were identified and offset in the design phase.

- Retention of trees and hedgerows is proposed where possible.
- In order to compensate for the loss of hedgerow habitat, where possible, the road verges will be planted with hedgerows consisting of native species such as hawthorn, willow and hazel. Proposed hedgerow planting is illustrated on the Landscape Masterplan (drawing 18400-1-100) in Appendix A which will assist in assimilating the road into the landscape, provide screening and be beneficial to wildlife.
- The embankments leading to the bridge and any other areas which would ordinarily be seeded with grass will be planted with a locally sourced wildflower mix containing native species. This area will be mown twice per year, once in early spring and once in late autumn. Scattered tree planting is proposed on the higher embankments.
- Native tree planting is also proposed and street trees, located in a grass verge, are proposed along the length of the proposed ring road. Shrub planting is also proposed.
- Planting is proposed to screen noise barriers where possible. Additional planting may also be agreed with landowners. Where possible, noise barriers are proposed along existing walls. Landscape proposals include planting climbers to soften the appearance of the noise barriers which are likely to be walls similar to existing, as well as tree /shrub planting to partly screen the noise barriers where space allows. The visual effects are expected to reduce slightly over time as the noise barriers become less obvious due to vegetation and screening, but visual effects will remain adverse.
- Underground attenuation tanks will be seeded with wildflower meadow and silt compounds will be returned to grassland.

The proposed planting once established will assist in reducing landscape and visual effects and to reduce and offset any impacts generated due to the proposed development, where possible. The planting of substantial numbers of new hedgerows,

trees and other planting, both native and ornamental varieties, will assist in compensating for the removal of hedgerows and trees as well as assimilating the road into the landscape.

#### **4.7.9 Residual Impacts for Landscape & Visual**

##### **Operational Phase**

###### Residual Landscape Impact

The residual landscape impacts are those that will persist following implementation and establishment of the proposed landscape measures. These are described in Sections 4.7.7 and 4.7.8.

###### Residual Visual Impact

The residual visual impacts are those that will persist following implementation and establishment of the proposed landscape measures. These are described in Sections 4.7.7 and 4.7.8.

#### **4.8 Noise and Vibration**

##### **4.8.1 Introduction**

This report assesses the potential noise impacts associated with the construction and operational phases relating to the emerging preferred route option for the proposed Maynooth Eastern Ring Road, Co. Kildare and assesses the opportunities for noise mitigation.

The proposed development covers a length of approximately 1.8km and connects the R157 and R148 Roads at the north end of the proposed development to the R405 and the Straffan Road. The proposed alignment passes to the east the Blacklion, Parklands and Rockfield housing areas in addition to the Maynooth Educate Together National School and Gaelscoil Ui Fhiaich. To the south of the R405, the Griffin Rath Road is upgraded and will connect to the Straffan Road which forms part of a future committed project.

##### **4.8.2 Methodology**

In order to assess the noise impact of the proposed road development, the following methodology has been adopted:

- Baseline noise monitoring has been undertaken in the vicinity of the proposed road development in order to characterise the existing noise environment;
- A review of the most applicable standards and guidelines will be reviewed in order to set a range of acceptable noise criteria for the construction and operational phases of the proposed road development;
- Predictive calculations relating to construction phase impacts have been undertaken at the nearest sensitive locations to the development site British Standard BS5228 *Code of Practice for Noise and Vibration Control on Construction and Open Sites. Part 1 – Noise* (2009 +A1 2014);
- Operational noise levels at the closest noise sensitive locations to the proposed road development during the future assessment year have been predicted in accordance with guidance set out in Calculation of Road Traffic Noise (CRTN), giving results in the form of  $L_{A10(18\text{hour})}$  values. These are then converted to  $L_{den}$

values which is the main parameter used for the assessment of road traffic noise in Ireland;

- Impacts associated with the construction and operational phases have been reviewed against relevant standards and guidelines for noise to determine the potential impacts with both phases;
- A schedule of mitigation measures will be incorporated where required or practicable, to reduce the identified potential noise impacts associated with the proposed development.

### 4.8.3 Assessment Criteria

#### Operational Phase

##### Criteria for National Road Projects

There are no statutory guidelines or standards for noise in Ireland applicable for Road Schemes. For new national roads in Ireland, it is standard practice to adopt the traffic noise design goal contained within the TII document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes 2004* and Guidance contained within the TII's *Good Practice Guide for the Treatment of Noise during the Planning on National Road Schemes* (2014). Both documents note the use of a traffic noise design goal of 60dB  $L_{den}$  (free field residential façade criterion i.e. without the influence of building reflections) for new national roads.

The following three conditions must be satisfied under the TII guidelines in order for noise mitigation to be provided:

- the combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed development together with other traffic in the vicinity is greater than the design goal of 60dB  $L_{den}$ ;
- the relevant noise level is at least 1dB more than the expected traffic noise level without the proposed development in place, and;
- the contribution to the increase in the relevant noise level from the proposed development is at least 1dB.

The 2014 Good Practice Guide recognises that “*in some cases the attainment of the design goal may not be possible by sustainable means*”. The guidance also notes that the benefit gained by the insertion of a barrier is limited and notes that for caution should be exercised specifying substantial screening where small benefits (<3dB) are only achieved, given a change of 3dB(A) “*is the smallest change that would give a reliable difference in public response*”.

Given the proposed MERR road is not a national road scheme but an urban link road, it does not fall under the requirements for noise design goals set within the TII's guidance document. It may not always be sustainable to achieve an operational noise level of 60dB  $L_{den}$  or less due to a variety of constraints, particularly where access to properties are required directly onto roads, and/or where the alignment is in close proximity to residential buildings which bound the upgraded sections of existing regional roads i.e. R157, R148, R405 and Griffin Rath Road. These will be considered and discussed in the following sections.

##### Kildare Noise Action Plan (Second Round)

The Kildare Noise Action Plan (NAP) 2013 – 2018 relates to the management of environmental noise in accordance with the Environmental Noise Directive (END) (2002/49/EC). The purpose of the Action Plan is to manage and reduce, where

necessary, environmental noise through the adoption of the action plans. A third round report 2018 to 2023 is due for publication but has not yet been finalised.

In the case of the Kildare, A Noise Plan was derived for all major roads with a traffic flow threshold above 3 million vehicle trips per annum which includes sections of the M4, Straffan Road / R406 Celbridge Road and R 406 Celbridge Road / R148 Leixlip Road. As part of the action plan process, the proposed onset levels, for assessment of noise management and or mitigation measures due to exposure to road traffic noise are set as follows:

- >55dB L<sub>night</sub>
- >70dB L<sub>day</sub>

Where locations are identified to be exposed to traffic noise levels above these thresholds during the noise mapping process, they will form part of a priority decision support matrix which takes into account factors such as the noise exposure level, type of noise receptor, the type of noise source and the number of people affected. It enables a number of different factors to be examined and facilitates the assessment of the relative importance of each. Noise mitigation or management is then considered where necessary, feasible and cost effective.

#### Evaluation of Impacts

In terms of the change in noise experienced at properties assessed, reference is made to the UK's Design Manual for Road and Bridges (DMRB), Volume 11, Section 3 which prescribes a magnitude of impact relating to changes in road traffic noise. Table 4-12 summarises the classification of magnitude of impacts relating to traffic noise during the design year of a project which is assessed against the 'long-term' impact criteria within the DMRB guidance.

**Table 4-12 Classification of Magnitude of Long-term Noise Impacts**

Noise Change, dB	Magnitude of Impact
0	No Change
0.1 – 2.9	Negligible
3 – 4.9	Minor
5 – 9.9	Moderate
10+	Major

#### **Construction Phase**

The Kildare Noise Action Plan (2013 – 2018) includes guidelines on recommended construction noise limits noting that contract documents generally specify the following maximum noise limits during the construction phase of infrastructure projects.

**Table 4-13 Maximum Recommended Noise Levels at the Façade of Nearby Dwellings during Construction**

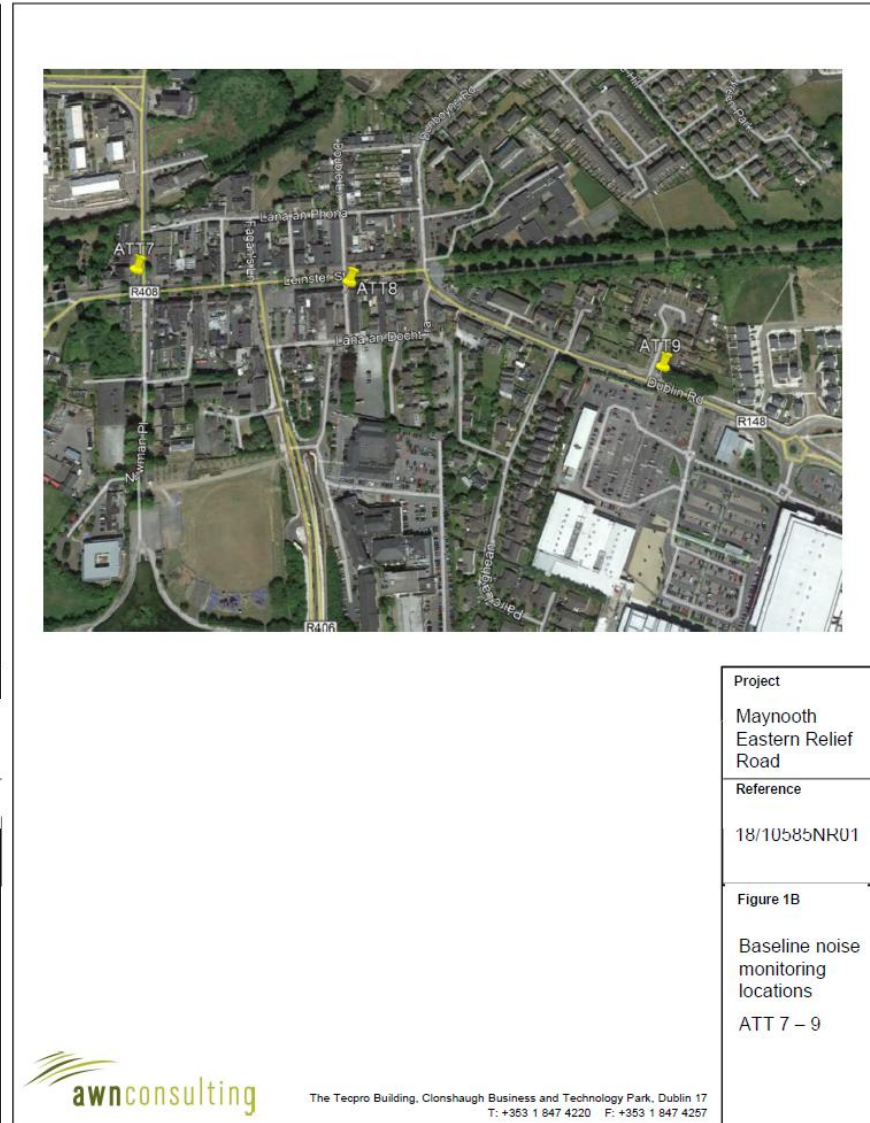
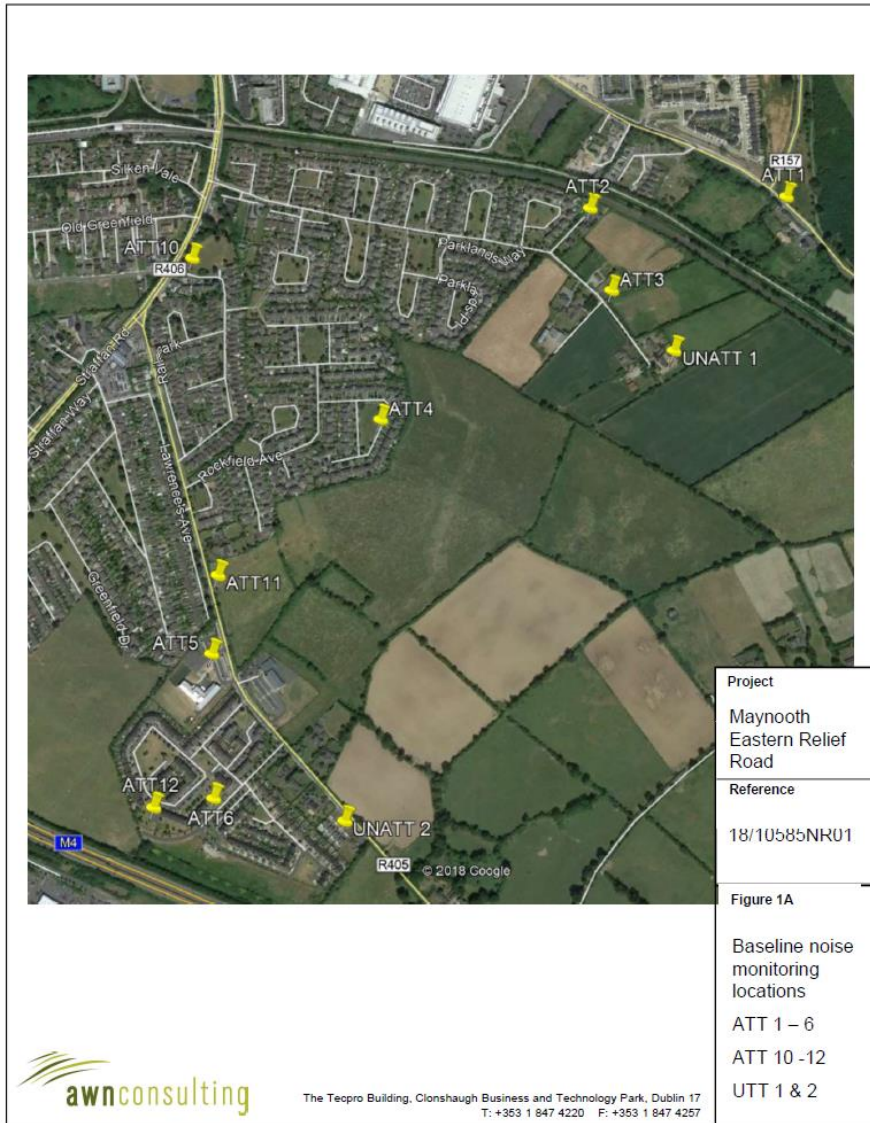
Days & Times	L <sub>Aeq</sub> (1hr) dB	L <sub>Amax</sub> dB(A)
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60	65
Saturday 08:00 to 16:30hrs	65	75

<p>Sundays and Bank Holidays                  08:00 to 16:30hrs</p>	<p>60</p>	<p>65</p>
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**4.8.4 Description of Existing Conditions for Noise**

An environmental noise survey was conducted at 12 locations along the length of the proposed development and along existing roads in the vicinity of the proposed development as listed in Table 4-14. Refer to Figure 4.36Figure 4.37 for survey locations.





Figures 4.36 and 4.37 Baseline Noise Monitoring Locations

**Table 4-14 Noise Survey Locations**

Location	Survey Type	Description of Survey Location
ATT1	Attended – MERR Route	Outside residential property along R157 to east of proposed MERR junction
ATT2		Outside residential properties within Parklands Lodge – west of proposed MERR
ATT3		Outside residential property along location road at Parklands Grove – west of proposed MERR
ATT4		Outside residential properties within Rockfield Green – west of proposed MERR
ATT5		Within Gaelscoil grounds, on green area fronting school building
ATT6		Along Griffin Rath Road
ATT7	Attended – existing roads Maynooth	Junction of Parsons St (R408) and Moyglare Road (R148)
ATT8		Along Double Lane, approximately 10m off Leinster St (R406)
ATT9		On green fronting O Neill's Park along the R148
ATT10		On green area fronting Rail Park, off Straffan Road (R406)
ATT11		At field access opposite Lawrence's Avenue along R405 Road
ATT12		On green area within Griffin Rath Hall residential estate
UTT1	Unattended	Within rear garden of residential property at Parklands Grove – west of proposed MERR
UTT2		Within front garden of residential property at Ard na Greine off R405 Road

### Survey Periods

Attended survey periods were as follows:

- ATT1 to ATT3 on 20 March 2019 between 12:00 to 16:00hrs.
- ATT7 to ATT9 on 12 April 2019 between 10:30 to 14:15hrs.
- ATT10 to ATT12 on 19 April 2019 between 10:20 to 13:36hrs.

Unattended monitoring was conducted as follows:

- UTT1 between 15:35hrs on 01 April to 15:05hrs on 02 April 2019.
- UTT2 between 12:22hrs on 20 March to 12:52hrs on 21 March 2019.

### Personnel and Instrumentation

AWN Consulting conducted the noise level measurements. The shortened measurements were performed using Brüel & Kjær Type 2250 Sound Level Meter. The continuous measurements were performed using an NTi Audio XL2 and a Rion NL 52 Sound Level Meter. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

### Weather Conditions

Weather conditions during the surveys were dry and calm with temperatures of 8 to 10°C and wind speeds of less than 1m/s.

### Procedure

#### Unattended Noise Measurements

Unattended continuous measurements were performed over a 24 period at two locations. Sample periods were 15 minutes long and the results were saved to the instrument memory for later analysis.  $L_{den}$  values are derived directly from the measured data using the following formula:

$$L_{den} = 10 \log \left( \frac{1}{24} \right) \left( 12 * \left( 10^{\frac{L_{day}}{10}} \right) + 4 * \left( 10^{\frac{Levening+5}{10}} \right) + 8 * \left( 10^{\frac{Lnight+10}{10}} \right) \right)$$

### Attended Noise Measurements (Derived Value)

Shortened measurements were conducted at twelve survey locations on a cyclical basis. Sample periods were 15 minutes. The results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise build-up. The survey work was conducted in accordance with the shortened measurement procedure described within the CRTN document.

When surveying traffic noise, the acoustical parameters of interest are  $L_{A10(1hour)}$  and  $L_{A10(18hour)}$ . The value of  $L_{A10(1hour)}$  is the noise level exceeded for just 10% of the time over the period of one hour.  $L_{A10(18hour)}$  is the arithmetic average of the values of  $L_{A10(1hour)}$  for each of the one-hour periods between 06:00 and 24:00hrs.

The shortened measurement procedure involves a method whereby  $L_{A10(18hour)}$  values are obtained through a combination of measurement and calculation as follows:

- noise level measurements are undertaken at the chosen location over three consecutive hours between 10:00 and 17:00hrs;
- the duration of the sample period during each hour is selected to encompass sufficient traffic flows to ensure reliable results;
- the  $L_{A10(18hour)}$  for the location is derived by subtracting 1dB from the arithmetic average of the three hourly sample values,

$$\text{i.e. } L_{A10(18hour)} = ((\sum L_{A10(1hour)}) \div 3) - 1 \text{ dB.}$$

- Derived  $L_{den}$  values are calculated using the following equation:

$$L_{den} = 0.86 \times L_{A10(18hour)} + 9.86$$

### **Survey Parameters**

The survey results are presented in terms of the following three parameters.

**$L_{Aeq}$**  is the A-weighted equivalent continuous steady sound level during the sample period and effectively represents an average value.

**$L_{A90}$**  is the A-weighted sound level that is exceeded for 90% of the sample period; generally used to quantify background noise.

**$L_{A10}$**  is the A-weighted sound level that is exceeded for 10% of the sample period; this parameter gives an indication of the upper limit of fluctuating noise such as that from road traffic.

### **Results of Noise Surveys**

Tables 4.15 and 4.16 summarise the results of the baseline noise survey. Full survey results for the unattended survey conducted at Locations UTT1 and UTT2 are included in Appendix E.

The results of the survey have indicated the existing noise environment at locations in the vicinity of the proposed MERR and set back from existing regional and national roads were measured in the range of 53 to 56dB  $L_{den}$ . Monitoring locations along existing roads to the north and south of the proposed MERR were measured in the

range of 61 to 75dB  $L_{den}$  with highest levels being recorded at closest proximity to the road edge (ATT1).

At monitoring locations recorded along existing roads to the west of the proposed road development along Maynooth main street at within existing residential areas were measured in the range of 61 to 72dB  $L_{den}$ . Road traffic, local estate activities and general urban ambient sources all contributing to the ambient noise levels. The range of noise levels measured is considered typical of the environment under assessment.

**Table 4-15 Baseline Attended Noise Survey Results**

Survey Location Reference	Start Time	Measured Noise Levels (dB re.2x10 <sup>-5</sup> Pa)			Derived L <sub>A10,18hr</sub> dB	Derived L <sub>den</sub> , dB	Description of Noise Environment
		L <sub>Aeq</sub>	L <sub>A10</sub>	L <sub>A90</sub>			
ATT1	13:17	72	76	53	76	75	Road traffic along R148 dominates
	14:47	72	77	53			
	15:58	73	77	54			
ATT2	12:29	54	57	45	54	56	Road traffic in addition to local activities within residential area
	14:02	49	50	46			
	15:15	56	59	51			
ATT3	12:47	48	49	45	48	52	Distant road traffic, occasional local activities, vehicular activities nearby.
	14:20	48	48	45			
	15:33	49	51	46			
ATT4	11:47	49	50	47	50	53	Distant road traffic noise dominates
	13:14	52	53	49			
	14:04	50	51	48			
ATT5	12:07	60	62	56	60	61	School activities, car park activities, children playing, local road traffic
	12:55	58	60	56			
	14:25	58	60	56			
ATT6	12:32	62	64	59	63	64	Road traffic from M4 main source. Intermittent nearby traffic accessing residential areas
	13:37	61	63	59			
	14:45	62	64	59			
ATT7	10:36	69	70	61	70	70	Road traffic, traffic at junctions, heavy footfall passing monitoring location
	11:55	68	71	62			
	13:14	69	71	62			
ATT8	10:55	65	68	58	67	68	Road traffic dominant, footfall along Leixlip Road
	12:21	68	69	61			
	13:38	64	68	58			



Survey Location Reference	Start Time	Measured Noise Levels (dB re.2x10 <sup>-5</sup> Pa)			Derived L <sub>A10,18hr</sub> dB	Derived L <sub>den</sub> , dB	Description of Noise Environment
		L <sub>Aeq</sub>	L <sub>A10</sub>	L <sub>A90</sub>			
ATT9	11:15	68	71	61	70	70	Road traffic along R148 dominant source
	12:47	67	71	58			
	13:58	67	71	58			
ATT10	10:26	59	61	51	60	61	Local road traffic along R406 dominates, birdsong
	11:32	57	60	50			
	12:43	59	61	52			
ATT11	10:49	70	75	48	72	72	Local road traffic along R405 dominates, birdsong. Distant aircraft audible intermittently during lulls in road traffic
	12:00	68	72	47			
	13:02	69	74	51			
ATT12	11:09	64	65	61	65	66	Road traffic from M4 dominant source. Birdsong. Intermittent distant aircraft overhead.
	12:21	64	66	61			
	13:21	64	66	62			

**Table 4-16 Baseline Unattended Noise Survey Results**

Survey Location Reference	Date	Measured Noise Levels (dB re.2x10 <sup>-5</sup> Pa)			Measured L <sub>den</sub> , dB	Description of Noise Environment
		L <sub>day</sub>	L <sub>evening</sub>	L <sub>night</sub>		
UTT1	01-Apr-19	53	48	50	57	Distant road traffic and local activities
UTT1	20-Mar-19	58	56	49	59	Road traffic along R405

## 4.8.5 Noise Impact Assessment

### Operational Phase

#### Noise Model

A computer-based prediction model has been prepared in order to quantify the traffic noise level associated with the operational phase of the proposed development. This section discusses the methodology behind the noise modelling process and presents the results of the modelling exercise.

#### *Brüel & Kjær Type 7810 Predictor*

Proprietary noise calculation software was used for the purposes of this impact assessment. The selected software, Brüel & Kjær Type 7810 *Predictor*, calculates traffic noise levels in accordance with CRTN and TII guidance.

#### *Prediction of Traffic Noise*

Noise emissions during the operational phase of the project have been modelled using *Predictor* in accordance with CRTN and with the application of the relevant conversion factors as detailed in the TII Guidance. The CRTN method of predicting noise from a road scheme consists of the following five elements:

- divide the road scheme into segments so that the variation of noise within this segment is small;
- calculate the basic noise level at a reference distance of 10 metres from the nearside carriageway edge for each segment;
- assess for each segment the noise level at the reception point taking into account distance attenuation and screening of the source line;
- correct the noise level at the reception point to take account of site layout features including reflections from buildings and facades, and the size of source segment, and;
- combine the contributions from all segments to give the predicted noise level at the receiver location for the whole road scheme.

#### *Input to the Noise Model*

The noise model was prepared using 3D road alignments drawings, topographical data, Ordnance Survey mapping and traffic flow data supplied by Roughan & O'Donovan. **Table 4-17** summarises the traffic flow volumes used for the design year impact assessment of 2036 for the following two scenarios.

- Year 2036 – Do Minimum Scenario – MERR not built, Straffan Link Road Operational;
- Year 2036 – Do Something with MERR in operation

The speed limit along the length of the proposed MERR is 50km/hr.

**Table 4-17 Traffic Volumes used for Noise Impact Assessment**

Road Link	Do Minimum 2036		Do Something 2036	
	AADT	% HGV	AADT	% HGV
R148 (east of R148/R157 Junction)	24190	5	22061	6
R148 (west of R148/R157 Junction)	16096	4	14598	2
R405 (east of R405/Griffin Rath Junction)	15423	3	14249	7

Road Link	Do Minimum 2036		Do Something 2036	
	AADT	% HGV	AADT	% HGV
R405 (west of R405/Griffin Rath Junction)	11,637	3	9324	2
R157 North of R148	20181	7	23616	16
Griffin Rath Road	12400	4	16800	21
M4 Motorway	75,000	8	75,000	8
MERR	--	--	22775	16

The AADT values have been broken into 24 hourly periods using the TII Diurnal profiles. The hourly noise predictions were conducted in accordance with Method A of the TII guidelines.

#### Output of the Noise Model

*Predictor* calculates noise levels for a set of receiver locations specified by the user. The results include an overall level in dB  $L_{den}$ .

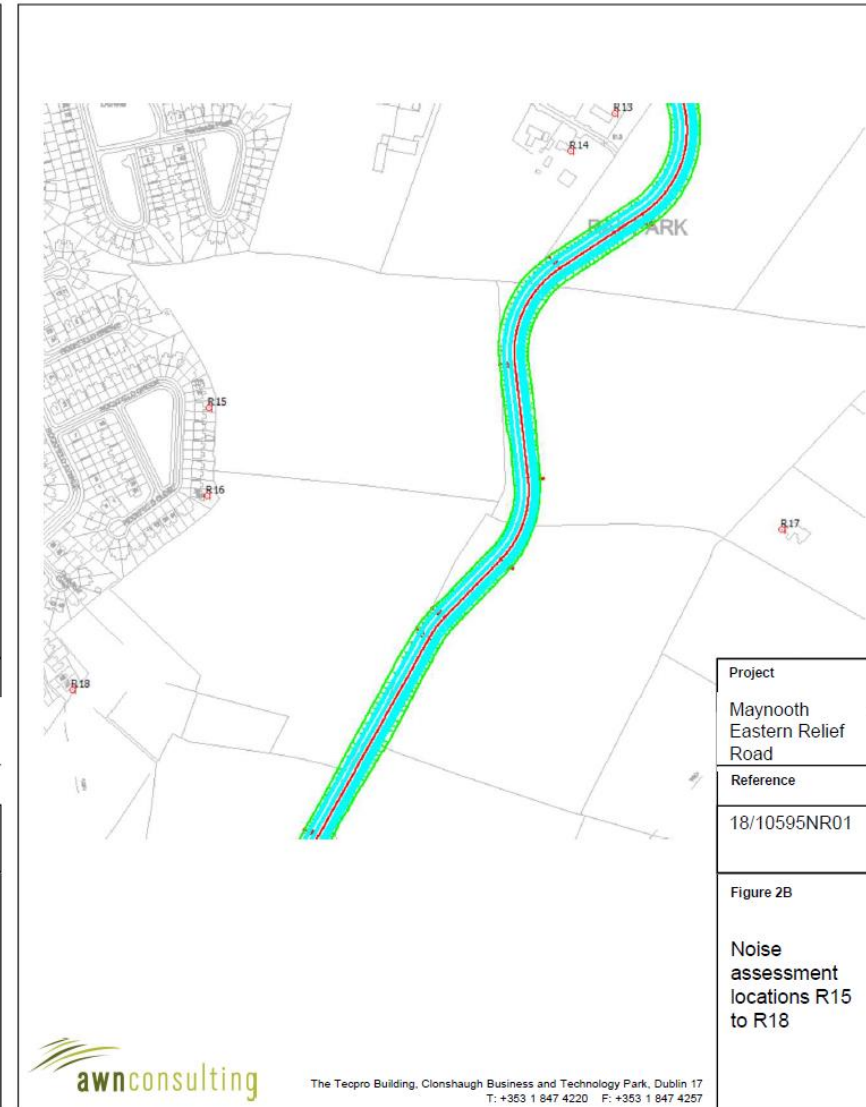
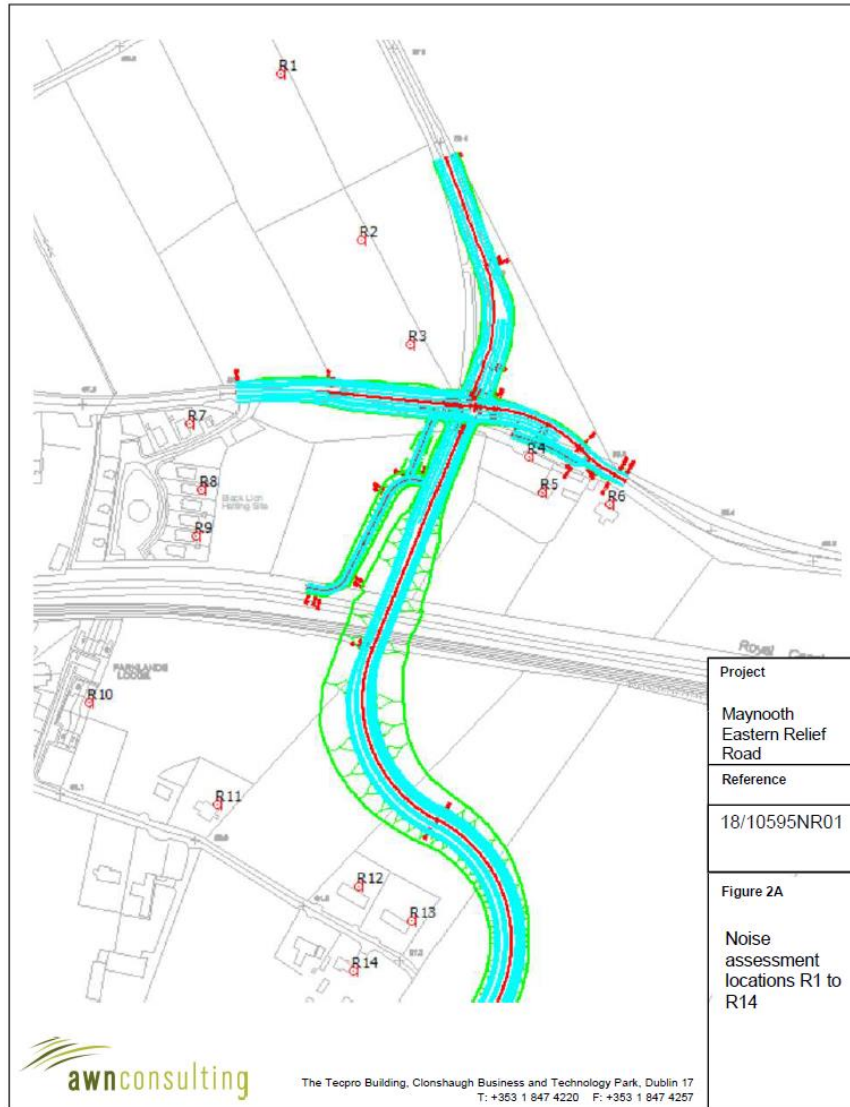
#### Choice of Receiver Locations

Free-field traffic noise levels have been predicted at a 45 assessment locations in the vicinity of the proposed development. For single story properties, calculations have been made at ground floor height whilst for two story properties, calculations have been made at first floor height.

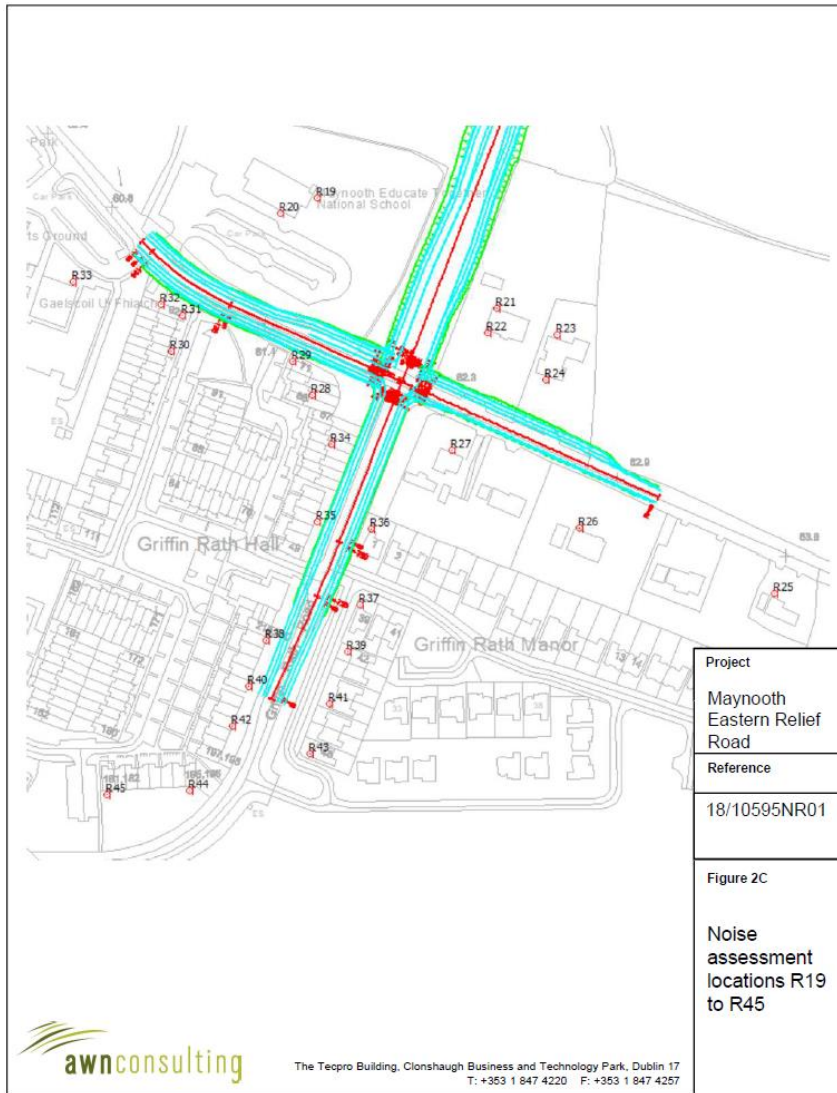
A description of the modelled locations is summarised in **Table 4-18** below. The assessment locations are displayed in **Figures 4.38 to 4.40**.

**Table 4-18 Details of Receiver Locations**

Receiver	Description	Assessment Height
R1 – R3	Carton Grove West of R157	First Floor
R4 – R6	Residential properties along R148, east of MERR	First Floor
R7 – R9	Residential properties along R148, west of MERR / Blacklion halting site	Ground Floor
R10 – R14	Residential properties west of MERR at Railpark/ Parklands Lodge	Ground & First Floor
R15, R16, R18	Rockfield Residential Areas west of MERR	First Floor
R17	Residential property east of MERR AT Barrogstown West	First Floor
R19 – R20	Maynooth Educate Together National School	First Floor
R21 – R27	Residential properties east of MERR / R405 Junction	First Floor
R28 – R33	Residential properties & Gaelscoil west of MERR / R405 Junction	First Floor
R34 – R45	Residential properties along Griffin Rath Road	First Floor



**Figures 4.38 and 4.39 Noise Assessment Locations**



**Figure 4.40 Noise Assessment Locations**

Model Results

The results of the traffic noise predictions are presented in **Table 4-19** with the relative impact assessment as per DMRB long term magnitude tables included.

**Table 4-19 Predicted Noise Levels for Year 2036**

Receiver Location Reference	Description	Do Minimum 2036	Do Something 2036	Above 60dB L <sub>den</sub> ?	Magnitude of Change (DMRB – Long term)
		L <sub>den</sub> (dB)	L <sub>den</sub> (dB)		
R1	Carton Grove	63	65	Yes	Negligible
R2	Carton Grove	64	66	Yes	Negligible
R3	Carton Grove	69	70	Yes	Negligible



Receiver Location Reference	Description	Do Minimum 2036	Do Something 2036	Above 60dB L <sub>den</sub> ?	Magnitude of Change (DMRB – Long term)
		L <sub>den</sub> (dB)	L <sub>den</sub> (dB)		
R4	R148, east of MERR	71	69	Yes	No Change / Reduction
R5	R148, east of MERR	61	64	Yes	Negligible
R6	R148, east of MERR	69	69	Yes	Negligible
R7	R148, west of MERR	66	64	Yes	No Change / Reduction
R8	Blacklion halting site	56	58	No	Negligible
R9	Blacklion halting site	54	57	No	Minor
R10	Parklands Lodge	53	56	No	Minor
R11	Rail Park	51	57	No	Moderate
R12	Rail Park	52	61	Yes	Moderate
R13	Rail Park	52	63	Yes	Major
R14	Rail Park	49	60	No	Major
R15	Rockfield Green	51	56	No	Moderate
R16	Rockfield Close	52	58	No	Moderate
R17	Barrogstown West	55	60	No	Moderate
R18	Rockfield Park	55	57	No	Negligible
R19	Maynooth Educate Together NS	59	65	Yes	Moderate
R20	Maynooth Educate Together NS	61	63	Yes	Negligible
R21	Residence R405 east of MERR	51	68	Yes	Major
R22		63	68	Yes	Moderate
R23		48	61	Yes	Major
R24		63	64	Yes	Negligible
R25		66	67	Yes	Negligible
R26		62	64	Yes	Negligible
R27		65	68	Yes	Minor
R28	Residence R405 east of MERR	64	68	Yes	Minor
R29		67	67	Yes	No Change / Reduction
R30		59	62	Yes	Negligible
R31		65	65	Yes	Negligible
R32		63	63	Yes	No Change / Reduction
R33	Gaelscoil Ui Fhiach	60	60	No	No Change / Reduction

Receiver Location Reference	Description	Do Minimum 2036	Do Something 2036	Above 60dB L <sub>den</sub> ?	Magnitude of Change (DMRB – Long term)
		L <sub>den</sub> (dB)	L <sub>den</sub> (dB)		
R34	Griffith Rath Hall	66	71	Yes	Moderate
R35		69	73	Yes	Minor
R36	Griffith Rath Manor	67	72	Yes	Moderate
R37		66	70	Yes	Minor
R38	Griffith Rath Hall	68	73	Yes	Minor
R39	Griffith Rath Manor	66	70	Yes	Minor
R40	Griffith Rath Hall	68	73	Yes	Minor
R41	Griffith Rath Manor	66	70	Yes	Minor
R42	Griffith Rath Hall	68	73	Yes	Minor
R43	Griffith Rath Manor	66	70	Yes	Minor
R44	Griffith Rath Hall	68	72	Yes	Minor
R45	Griffith Rath Hall	65	68	Yes	Negligible

The results of the assessment indicate that calculated traffic noise levels at the vast majority of assessment locations are above 60dB L<sub>den</sub> during both the Do Minimum and Do Something scenarios.

To the north of the proposed development at assessment locations R1 to R7, noise levels are above 60dB L<sub>den</sub> during the Do Minimum scenario. At Carlton Grove noise levels are increased by up to 2dB with an overall impact rating of negligible. At properties along the R148, a neutral or reduced traffic noise level will be experienced due to a reduction in traffic flow along this road during the Do Something scenario. Noise mitigation is not deemed necessary at these locations.

Properties along the alignment of the MERR are for the majority below 60dB L<sub>den</sub> with the exception of those within Rail Park Closest to the road alignment where a moderate to major increase in noise levels are predicted. Given the increase to the noise environment calculated at these properties, noise mitigation measures are recommended.

To the south of the alignment at the junction with the R405, noise levels are calculated above 60dB L<sub>den</sub> and result in a major noise impact to the rear of properties (R21 and R23) and a moderate impact to the rear/side façade of the National School (R19). In order to reduce the overall impact at these locations, noise mitigation measures are recommended. At properties located further east and west along the R405, a neutral to minor change in traffic noise levels is calculated. Noise mitigation is not deemed necessary at these locations.

To the south of the MERR along Griffin Rath Road, calculated noise levels are increased to levels in the range of 68 to 73dB L<sub>den</sub> during the Do Something scenario. The change in noise levels calculated between the Do Minimum and Do Something scenarios at residential properties along this road are in the range of 2.5 to 5dB resulting in a noise impact rating of negligible to moderate. Given the operational noise

level at these properties are at or above the proposed onset levels for assessment of noise mitigation measures within the Kildare Noise Action Plan, noise mitigation should also be considered for these locations.

The mitigation measures proposed to reduce operational noise levels at those locations discussed above are set out in Section 4.8.6.

### Construction Phase

Noise levels associated with construction may be calculated in accordance with methodology set out in BS5228 2009 + A1 2014: Part 1. This standard sets out sound power levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels at selected locations. It is often not possible, however, to conduct detailed prediction calculations for the construction phase of a project. This is due to the fact that the programme for construction works has not been established in detail. Under such circumstances, best practice involves the consideration of appropriate mitigation measures to ensure construction activities do not exceed the recommended noise criteria as set out in Table 4-13 in Section 4.8.3.

A variety of items of plant will be in use, such as excavators, loaders, dumper trucks, generators in addition to vehicular movements to and from the site that will make use of existing roads. Due to the nature of the activities undertaken on a road construction site, there is potential for generation of high levels of noise in close proximity to the works.

BS5228:2009 +A1 2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise* sets out typical noise levels for items of construction plant. Table 4-20 lists the sound power levels of the plant used for calculation of the expected noise level at various distances from the roadway. Construction noise calculations have been conducted at distances of 10 to 80m from the works for the main work phases. The calculations assume that plant items are operating for 66% of the time and that all plant items associated with the individual phases are operating simultaneously and at the same distance for any one scenario. A screening correction of 5dB has been included in the calculations, assuming a partial screening from site hoarding along the site works.

**Table 4-20 Typical Construction Plant Sound Power Noise Levels**

Plant Item (BS5228 Ref.)	Sound Power Level, dB(A) re 10 <sup>-12</sup> W
Wheeled loader C2.26	107
Tracked excavator (loading dump truck) C1.10	113
Dozer C.2.10	108
Dump Truck Tipping fill (C2.30)	107
Articulated dump truck (dumping rubble) C1-11	108
Tracked excavator (C2.21)	99
vibration rollers (C5.20)	103
Asphalt Paver & Tipping Lorry (C.5.31)	105
Diesel Generator (C4.76)	89
Road Rollers (C5.19)	108

**Table 4-21, Table 4-22 and Table 4-23** set out the predicted noise levels during various phases of road construction at distances of 10 to 80m from the works.

**Table 4-21 Indicative Construction Noise Calculations During Site Clearance Preparation, and Excavation Works**

Site Clearance & Preparation	Calculated $L_{Aeq, T}$ at distance from road (m)			
	10m	25m	50m	80m
Wheeled loader (C2.26)	72	64	58	54
Tracked excavator (loading dump truck) (C1.10)	78	70	64	60
Dozer (C.2.10)	73	65	59	55
Dump Truck (C2.30)	72	64	58	54
Combined $L_{Aeq}$	81	73	67	63

**Table 4-22 Indicative Construction Noise Calculations During Excavation and Fill Works**

Excavation / Fill / Grading Works	Calculated $L_{Aeq, T}$ at distance from road (m)			
	10m	25m	50m	80m
Tracked excavator (loading dump truck) (C1.10)	78	70	64	60
Articulated dump truck (dumping rubble) (C1.11)	73	65	59	55
Wheeled loader (C2.26)	72	64	58	54
Dozer C.2.10	73	65	59	55
Dump Truck Tipping fill (C2.30)	72	64	58	54
Combined $L_{Aeq}$	81	74	68	63

**Table 4-23 Indicative Construction Noise Calculations During Road Works**

Road Works	Calculated $L_{Aeq, T}$ at distance from road (m)			
	10m	25m	50m	80m
Tracked excavator (C2.21)	64	56	50	45
Dump Truck (C2.30)	72	64	58	49
vibration rollers (C5.20)	68	60	54	42
Asphalt Paver & Tipping Lorry (C.5.31)	70	62	56	36
Diesel Generator (C4.76)	54	46	40	55
Road Rollers (C5.19)	73	65	59	57
Combined $L_{Aeq}$	76	72	71	70

The results of the assessment have indicated that at distances of beyond 50m from the works, the construction day time noise limit of 70dB  $L_{Aeq}$  can typically be complied with for the scenarios assessed. At distances of up to 25m from the works, there is potential for the noise criterion to be exceeded in the absence of noise mitigation over and above the use of site hoarding. A number of properties along the length of the proposed road development are within 25m of the proposed works, hence the use of localised screening and the range of best practice mitigation measures set out in Section 4.8.6 will be employed to ensure the construction noise limits are not exceeded along the length of the proposed development.

#### 4.8.6 Mitigation Measures for Noise

##### Operational Phase

In order to reduce operational noise levels along the length of the proposed road development in addition to properties along sections of the realigned R157, R148, R405 and Griffin Rath Road, a low noise road surface will be included as part of the road surface. On a conservative basis, a correction of 1.5dB in traffic noise levels over hot rolled asphalt has been used along this road taking into account the lower design speed of this road and junctions to the north and south.

In addition to the road surface, mitigation measures through screening have been included along either the road edge or at property boundaries. The mitigation measures detailed here are based on the current proposed development design.

Barriers can take the form of proprietary acoustic screens, solid block walls, earth berms or other solid structures. The barriers chosen should be solid, with no gaps at the base or between vertical joints and should have a minimum surface mass of 10kg/m<sup>2</sup>. All barriers shall achieve the performance specified in I.S. EN 1793 – 1:1998, I.S. EN 1793-2:1998, I.S. EN 1973-3:1998, I.S. 1794-1:2003 and I.S. EN 1794-2:2003.

**Table 4-24** summarises the location and extent of screening requirements for noise mitigation. The extent of noise mitigation proposed is illustrated in Appendix A Development Drawings.

**Table 4-24 Extent of Noise Mitigation Required During Operational Phase**

Receiver No	Barrier Details	Side of Road	Barrier Height (m)
R12 -R13	New barrier to MERR (300m approximately)	West	2m above road level
R19	New barrier to MERR (185m approximately)	West	3m above road level
R21 – R24	New barrier to MERR (185m approximately)	East	3m above road level
R22	Existing boundary along R405 upgraded to include 2.5m wall from MERR junction to property entrance.	South	2.5m above road level
R27/ R36	Existing boundary to Griffin Rath Road (GRR) upgraded to 2.5m barrier	East of GRR	2.5m above road level
R35 – R35	Existing boundary to Griffin Rath Road (GRR) upgraded to 2.5m barrier	West of GRR	2.5m above road level
R37, R39, R41, R43 –	Existing boundary to Griffin Rath Road (GRR) upgraded to 2.5m barrier	East of GRR	2.5m above road level
R37, R40, R42	Existing boundary to Griffin Rath Road (GRR) upgraded to 3m barrier	West of GRR	3m above road level
R44 – R45	Existing boundary to Griffin Rath Road (GRR) upgraded to 2.5m barrier	West of GRR	2.5m above road level

##### Construction Phase

The contract documents will clearly specify the construction noise criteria included in this chapter which the construction works must operate within. The Contractor undertaking the construction of the works will be obliged to take specific noise



abatement measures and comply with the recommendations of *BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise* and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001. These measures will ensure that:

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use
- Any plant, such as generators or pumps that is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen

During the course of the construction programme, the contractor will be required to manage the works to comply with the limits detailed in Table 4-13 using methods outlined in *BS 5228-1:2009+A1 2014. Part 1 – Noise* *BS 5228 -1: 2009+A1 2014 Part 2* which include guidance on several aspects of construction site practices, which include, but are not limited to the measures discussed below.

#### Selection of Quiet Plant

The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item of plant will be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action will be to identify whether or not said item can be replaced with a quieter alternative.

For static plant such as compressors and generators used at work areas such as construction compounds etc., the units will be supplied with manufacturers' proprietary acoustic enclosures where possible.

The contractor will evaluate the choice of excavation, breaking or other working method taking into account various ground conditions and site constraints. Where possible, where alternative lower noise generating equipment that would economically achieve, in the given ground conditions, equivalent structural/ excavation/ breaking results, these will be selected to minimise potential disturbance.

#### General Comments on Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant, or the application of improved sound reduction methods in consultation with the supplier or the best practice use of equipment and materials handling to reduce noise.

In practice, a balance may need to be struck between the use of all available techniques and the resulting costs of doing so. It is therefore proposed to adopt the concept of "*Best Available Techniques*". as defined in EC Directive 96/61. In this context "*best*" means "*the most effective in achieving a high general level of protection of the environment as a whole*".

The expression “*available techniques*” means “*those techniques developed on a scale which allows implementation...., under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced within the State, as long as they are reasonable*”

Thus, the concept of Best Available Techniques requires a degree of balance between the attainment of environmental benefits and the likely cost implications. In the identification of Best Available Techniques, regard will be had to a wide range of factors, however, emphasis will be given to “*practical suitability*” and the need “*to reduce an emission and its impact on the environment as a whole*”.

Proposed techniques will also be evaluated in light of their potential effect on occupational health and safety. The following outline guidance relates to practical noise control at source techniques which relate to specific site considerations:

- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant will be switched off when not in use and not left idling;
- For percussive tools such as pneumatic concrete breakers or tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker ‘tool’ and ensuring any leaks in the air lines are sealed. Erection of localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries are other suitable forms of noise reduction;
- For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum;
- For all materials handling, the contractor will ensure that best practice site noise control measures are implemented including ensuring that materials are not dropped from excessive heights;
- Where compressors, generators and pumps are located in areas in close proximity to noise sensitive properties/ areas and have potential to exceed noise criterion, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation;
- Resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can be controlled by fixing resilient materials in between the surfaces in contact;
- Demountable enclosures can also be used to screen operatives using hand tools and may be moved around site as necessary, and;
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

### Screening

Typically screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, and its position relative to both the source and receiver.

The length of the screen should in practice be at least five times the height, however, if shorter sections are necessary then the ends of the screen will be wrapped around the source.

BS 5228 -1:2009+A1 2014 states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the barrier will be such that there are no gaps or openings at joints in the screen material. In most practical situations the effectiveness of the screen is limited by the sound transmission over the top of the barrier rather than the transmission through the barrier itself. In practice screens constructed of materials with a mass per unit of surface area greater than 10kg/m<sup>2</sup> will give adequate sound insulation performance. As an example, the use of a standard 2.4m high construction site hoarding will provide a sufficient level of noise screening once it is installed at a suitable position between the source and receiver.

#### Working Hours

Normal working times will be 07:00 to 19:00hrs Monday to Friday and 08:00 to 13:00hrs Saturday. Construction works for the bridge crossing which require possession of the railway line will also be required to be undertaken at night or at weekends however these will be temporary.

Additional works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of the Contracting Authority. This permission, if granted, can be withdrawn at any time should the working regulations be breached.

When overtime and shift work is permitted, the hauling of spoil and delivery of materials outside normal working hours is prohibited and the noise limits outlined in Table 4.13 will apply.

### 4.8.7 Residual Impact for Noise

#### **Operational Phase**

The residual impacts of the proposed development have been assessed taking into account the recommended noise mitigation measures set out in Section 4.8.6. **Table 4-25** presents the residual noise impacts taking into account the proposed mitigation measures for noise.

**Table 4-25 Residual Noise Impacts during Operational Phase**

Receiver Location Reference	Description	Do Minimum 2036	Do Something 2036	Above 60dB L <sub>den</sub> ?	Magnitude of Change (DMRB – Long term)
		L <sub>den</sub> (dB)	L <sub>den</sub> (dB)		
R1	Carton Grove	63	64	Yes	Negligible
R2	Carton Grove	64	64	Yes	No Change / Reduction
R3	Carton Grove	69	67	Yes	No Change / Reduction
R4	R148, east of MERR	71	67	Yes	No Change / Reduction
R5	R148, east of MERR	61	62	Yes	Negligible

Receiver Location Reference	Description	Do Minimum 2036	Do Something 2036	Above 60dB L <sub>den</sub> ?	Magnitude of Change (DMRB – Long term)
		L <sub>den</sub> (dB)	L <sub>den</sub> (dB)		
R6	R148, east of MERR	69	68	Yes	No Change / Reduction
R7	R148, west of MERR	66	63	Yes	No Change / Reduction
R8	Blacklion halting site	56	57	No	Negligible
R9	Blacklion halting site	54	56	No	Negligible
R10	Parklands Lodge	53	55	No	Negligible
R11	Rail Park	51	55	No	Minor
R12	Rail Park	52	56	No	Minor
R13	Rail Park	52	58	No	Moderate
R14	Rail Park	49	55	No	Moderate
R15	Rockfield Green	51	55	No	Minor
R16	Rockfield Close	52	57	No	Minor
R17	Barrogstown West	55	59	No	Minor
R18	Rockfield Park	55	56	No	Negligible
R19	Maynooth Educate Together NS	59	61	Yes	Negligible
R20		61	60	No	No Change / Reduction
R21	Residence R405 east of MERR	51	62	Yes	Major
R22		63	64	Yes	Negligible
R23		48	57	No	Moderate
R24		63	63	Yes	No Change / Reduction
R25		66	67	Yes	Negligible
R26		62	62	Yes	Negligible
R27		65	65	Yes	Negligible
R28	Residence R405 east of MERR	64	64	Yes	No Change / Reduction
R29		67	65	Yes	No Change / Reduction
R30		59	59	No	No Change / Reduction
R31		65	63	Yes	No Change / Reduction
R32		63	61	Yes	No Change / Reduction
R33	Gaelscoil Ui Fhiach	60	59	No	No Change / Reduction

Receiver Location Reference	Description	Do Minimum 2036	Do Something 2036	Above 60dB L <sub>den</sub> ?	Magnitude of Change (DMRB – Long term)
		L <sub>den</sub> (dB)	L <sub>den</sub> (dB)		
R34	Griffith Rath Hall	66	66	Yes	No Change / Reduction
R35		69	70	Yes	No Change / Reduction
R36	Griffith Rath Manor	67	68	Yes	Negligible
R37		66	64	Yes	No Change / Reduction
R38	Griffith Rath Hall	68	67	Yes	No Change / Reduction
R39	Griffith Rath Manor	66	63	Yes	No Change / Reduction
R40	Griffith Rath Hall	68	67	Yes	No Change / Reduction
R41	Griffith Rath Manor	66	63	Yes	No Change / Reduction
R42	Griffith Rath Hall	68	67	Yes	No Change / Reduction
R43	Griffith Rath Manor	66	66	Yes	No Change / Reduction
R44	Griffith Rath Hall	68	68	Yes	No Change / Reduction
R45	Griffith Rath Hall	65	65	Yes	No Change / Reduction

The assessment has determined that with the inclusion of the recommended noise mitigation measures, traffic noise levels associated with the proposed road combined with traffic along the adjacent surrounding roads will result in a neutral to minor noise impact at the majority of noise sensitive locations in proximity to the proposed development.

Moderate impacts will be experienced at properties within Rail Park and front of residential property along the R405 at the MERR junction. Noise mitigation measures are incorporated at these properties and operational noise levels are all below 60dB L<sub>den</sub>. The overall impact is considered acceptable at these properties and no further noise mitigation is considered necessary.

One location will experience a residual 'major' noise impact (R21) due to the calculated increase in noise levels between the Do Minimum and Do Something scenarios. The calculated residual noise level at this location is 62dB L<sub>den</sub>. This calculated level is in line with noise levels to the front of the property along the R405. In order to further reduce noise levels at this property to below 60dB L<sub>den</sub>, substantial barrier lengths and heights will be required, as a minimum height of 4m.

Notwithstanding this project is not a national road scheme, TII notes the following with respect to the provision of noise barriers for traffic noise mitigation:

*“in some cases the attainment of the design goal may not be possible by sustainable means”.* This guidance document also notes that caution should be exercised specifying substantial screening where small benefits (<3dB) are only achieved, given a change of 3dB(A) is the smallest change that would give a reliable difference in public response. Specifically, the TII 2014 document goes on to note that:

*“It may be unsustainable to increase barrier dimensions significantly where the result would be a reduction of 1dB or less, as such a reduction would be close to imperceptible in a laboratory situation and would not result in a difference in public response in the real-world environment.”*

In this instance, the extent of screening deemed feasible to achieve further traffic noise reductions at this property has been assessed, taking into account a level of proportionality with respect to changes in noise level. Further discussions with landowners can be held during the detailed design of the project to assess the proportionality of installing higher noise barriers against visual intrusion and other engineering considerations.

For properties along Griffin Rath Road, the inclusion of upgraded boundary treatments to residential properties within Griffin Rath Manor and Griffin Rath Hall can suitably reduce noise levels to within those associated with the Do Minimum scenario which includes traffic along the Straffan Link Road.

#### **Construction Phase Noise**

During the construction phase of the project there will be short term moderate to major impacts on nearby residential properties due to noise emissions from site traffic and other activities. The application of noise limits, restricted hours of operation, along with implementation of appropriate noise control measures, will be designed in order to control noise emissions to within the noise limits for this phase.



## 4.9 Air Quality and Climate

### 4.9.1 Background Information

#### Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or “Air Quality Standards” are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 4-26 and Appendix D).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate EU Directive 2008/50/EC, which has set limit values for SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, benzene and CO (see Table 4-26). Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions (see Appendix D).

#### Climate Agreements

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the Kyoto Protocol in principle in 1997 and formally in May 2002<sup>(1,2)</sup>. For the purposes of the EU burden sharing agreement under Article 4 of the Kyoto Protocol, in June 1998, Ireland agreed to limit the net growth of the six GHGs under the Kyoto Protocol to 13% above the 1990 level over the period 2008 to 2012<sup>(4,5)</sup>. The UNFCCC is continuing detailed negotiations in relation to GHGs reductions and in relation to technical issues such as Emission Trading and burden sharing. The most recent Conference of the Parties to the Convention (COP24) took place in Katowice, Poland from the 4<sup>th</sup> to the 14<sup>th</sup> December 2018 and focussed on advancing the implementation of the Paris Agreement. The Paris Agreement was established at COP21 in Paris in 2015 and is an important milestone in terms of international climate change agreements. The Paris Agreement was agreed by over 200 nations and has a stated aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 giga-tonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to greenhouse gas emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made on elevating adaption onto the same level as action to cut and curb emissions.

The EU, in October 2014, agreed the “2030 Climate and Energy Policy Framework”<sup>(24)</sup>. The European Council endorsed a binding EU target of at least a 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990. The target will be delivered collectively by the EU in the most cost-effective manner possible, with the reductions in the ETS and non-ETS sectors amounting to 43% and 30% by 2030 compared to 2005, respectively. Secondly, it was agreed that all Member States will participate in this effort, balancing considerations of fairness and solidarity. The policy also outlines, under “Renewables and Energy Efficiency”, an EU binding target of at least 27% for the share of renewable energy consumed in the EU in 2030.

The Irish government have established the Climate Change and Low Carbon Development Act 2015<sup>(31)</sup> which provides a statutory basis for achieving the national

transition objective of transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050<sup>(32)</sup>. Under the Climate Change and Low Carbon Development Act 2015 a National Mitigation Plan and National Adaptation Framework were to be developed. The National Mitigation Plan was established in 2017 and sets out objectives for achieving a reduction in GHG emissions and transitioning the four key sectors (power generation, built environment, transport and agriculture) to decarbonisation. The National Adaptation Framework was published in 2018 and sets out a strategy to reduce the vulnerability of the country to the negative effects of climate change<sup>(33)</sup>. Under this framework local authorities are required to develop adaptation strategies which will outline their aims to adapt to climate change and transition to decarbonisation. New plans and projects should consider climate adaptation and low carbon emissions in their proposals.

### Gothenburg Protocol

*Transboundary Air Pollution.* The objective of the Protocol is to control and reduce emissions of Sulphur Dioxide (SO<sub>2</sub>), Nitrogen Oxides (NO<sub>x</sub>), Volatile Organic Compounds (VOCs) and Ammonia (NH<sub>3</sub>). To achieve the targets Ireland will, by 2010, have to meet national emission ceilings of 42kt for SO<sub>2</sub> (67% below 2001 levels), 65kt for NO<sub>x</sub> (52% reduction), 55kt for VOCs (37% reduction) and 116kt for NH<sub>3</sub> (6% reduction). *European Commission Directive 2001/81/EC*, the National Emissions Ceiling Directive, prescribes the same emission limits. Emissions of SO<sub>2</sub> and NH<sub>3</sub> from the road traffic sector are insignificant accounting for less than 1.5% of total emissions in Ireland in 2001. Road traffic emissions of Nitrogen Oxides (NO<sub>x</sub>) and Volatile Organic Compounds (VOCs) are important accounting for 37% and 38% respectively of total emissions of these pollutants in Ireland in 2001<sup>(6,7)</sup>. A National Programme for the progressive reduction of emissions of the four transboundary pollutants is in place since April 2005<sup>(8)</sup>. A review of the National Programme in 2011<sup>(9)</sup> showed that Ireland complied with the emissions ceilings for SO<sub>2</sub>, VOCs and NH<sub>3</sub>, but failed to comply with the emission ceiling for NO<sub>x</sub>. Although emissions from road traffic decreased by 47% over the period 1990 – 2011, NO<sub>x</sub> levels in 2011 were 2.6 kt above the emission ceiling of 65kt<sup>(10)</sup>.

European Commission Directive 2001/81/EC and the National Emissions Ceiling Directive (NECD), prescribes the same emission limits as the 1999 Gothenburg Protocol. A National Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005<sup>(7)</sup>. The Data available from the EU in 2010 indicated that Ireland complied with the emissions ceilings for SO<sub>2</sub>, VOCs and NH<sub>3</sub> but failed to comply with the ceiling for NO<sub>x</sub><sup>(28)</sup>. Directive (EU) 2016/2284 “*On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC*” was published in December 2016. The Directive will apply the 2010 NECD limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, NH<sub>3</sub>, PM<sub>2.5</sub> and CH<sub>4</sub>. In relation to Ireland, 2020 emission targets are 25 kt for SO<sub>2</sub> (65% on 2005 levels), 65 kt for NO<sub>x</sub> (49% reduction on 2005 levels), 43 kt for VOCs (25% reduction on 2005 levels), 108 kt for NH<sub>3</sub> (1% reduction on 2005 levels) and 10 kt for PM<sub>2.5</sub> (18% reduction on 2005 levels). In relation to 2030, Ireland's emission targets are 85% below 2005 levels for SO<sub>2</sub>, 69% reduction for NO<sub>x</sub>, 32% reduction for VOCs, 5% reduction for NH<sub>3</sub> and 41% reduction for PM<sub>2.5</sub>.

**Table 4-26 Air Quality Standards Regulations**

Pollutant	Regulation Note 1	Limit Type	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m <sup>3</sup>
		Annual limit for protection of human health	40 µg/m <sup>3</sup>
		Critical level for protection of vegetation	30 µg/m <sup>3</sup> NO + NO <sub>2</sub>
Particulate Matter (as PM <sub>10</sub> )	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m <sup>3</sup>
		Annual limit for protection of human health	40 µg/m <sup>3</sup>
Particulate Matter (as PM <sub>2.5</sub> )	2008/50/EC	Annual limit for protection of human health	25 µg/m <sup>3</sup>
Benzene	2008/50/EC	Annual limit for protection of human health	5 µg/m <sup>3</sup>
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	10 mg/m <sup>3</sup> (8.6 ppm)

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

## 4.9.2 Assessment Methodology

### Local Air Quality Assessment

The air quality assessment has been carried out following procedures described in the publications by the EPA<sup>(10,11)</sup> and using the methodology outlined in the guidance documents published by the UK DEFRA<sup>(12-15)</sup>. The assessment of air quality was carried out using a phased approach as recommended by the UK DEFRA<sup>(13)</sup>. The phased approach recommends that the complexity of an air quality assessment be consistent with the risk of failing to achieve the air quality standards. In the current assessment, an initial scoping of possible key pollutants was carried out and the likely location of air pollution “hot-spots” identified. An examination of recent EPA and Local Authority data in Ireland<sup>(17,18)</sup> has indicated that SO<sub>2</sub>, smoke and CO are unlikely to be exceeded at the majority of locations within Ireland and thus these pollutants do not require detailed monitoring or assessment to be carried out. However, the analysis did indicate potential issues in regards to nitrogen dioxide (NO<sub>2</sub>), PM<sub>10</sub> and PM<sub>2.5</sub> at busy junctions in urban centres<sup>(17,18)</sup>. Benzene, although previously reported at quite high levels in urban centres, has recently been measured at several city centre locations to be well below the EU limit value<sup>(17,18)</sup>. Historically, CO levels in urban areas were a cause for concern. However, CO concentrations have decreased significantly over the past number of years and are now measured to be well below the limits even in urban centres<sup>(10,11)</sup>. The key pollutants reviewed in the assessments are NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, benzene and CO, with particular focus on NO<sub>2</sub> and PM<sub>10</sub>.

Key pollutant concentrations will be predicted for nearby sensitive receptors for the following seven scenarios:

- The Existing baseline scenario, for model verification;
- Operational Year Do- Minimum scenario (DM), which assumes no development in place;

- Operational Year Do-Something scenario (DS), which assumes the proposed development in place.

The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model<sup>(15)</sup> (Version 1.03c, July 2007), the NO<sub>x</sub> to NO<sub>2</sub> Conversion Spreadsheet<sup>(19)</sup> (Version 6.1, October 2017), and following guidance issued by the TII<sup>(20)</sup>, UK Highways Agency<sup>(15)</sup>, UK DEFRA<sup>(12-16)</sup> and the EPA<sup>(10,11)</sup>.

The TII guidance<sup>(20)</sup> states that the assessment must progress to detailed modelling if:

- Concentrations exceed 90% of the air quality limit values when assessed by the screening method; or
- Sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc).

The UK DMRB guidance<sup>(15)</sup>, on which the TII guidance was based, states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 AADT or more;
- HGV flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

Concentrations of key pollutants are calculated at sensitive receptors that have the potential to be affected by the proposed development. For road links which are deemed to be affected by the proposed development and within 200m of the chosen sensitive receptors inputs to the air dispersion model consist of; road layouts, receptor locations, annual average daily traffic movements (AADT), percentage heavy goods vehicles, annual average traffic speeds and background concentrations. The UK DMRB guidance states that road links at a distance of greater than 200m from a sensitive receptor will not influence pollutant concentrations at the receptor. Using this input data the model predicts the road traffic contribution to ambient ground level concentrations at the worst-case sensitive receptors using generic meteorological data. The DMRB model uses conservative emission factors, the formulae for which are outlined in the DMRB Volume 11 Section 3 Part 1 – HA 207/07 Annexes B3 and B4. These worst-case road contributions are then added to the existing background concentrations to give the worst-case predicted ambient concentrations. The worst-case ambient concentrations are then compared with the relevant ambient air quality standards to assess the compliance of the proposed development with these ambient air quality standards. The TII Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes<sup>(20)</sup> detail a methodology for determining air quality impact significance criteria for road schemes. The degree of impact is determined based on both the absolute and relative impact of the proposed development. The TII significance criteria have been adopted for the proposed development and are detailed in Table 4-27 to Table 4-29. The significance criteria are based on PM<sub>10</sub> and NO<sub>2</sub> as these pollutants are most likely to exceed the annual mean limit values (40 µg/m<sup>3</sup>). However, the criteria have also been applied to the predicted 8-hour CO, annual benzene and annual PM<sub>2.5</sub> concentrations for the purposes of this assessment.

**Table 4-27 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations**

Magnitude of Change	Annual Mean NO <sub>2</sub> / PM <sub>10</sub>	No. days with PM <sub>10</sub> concentration > 50 µg/m <sup>3</sup>	Annual Mean PM <sub>2.5</sub>
Large	Increase / decrease ≥4 µg/m <sup>3</sup>	Increase / decrease >4 days	Increase / decrease ≥2.5 µg/m <sup>3</sup>
Medium	Increase / decrease 2 - <4 µg/m <sup>3</sup>	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m <sup>3</sup>
Small	Increase / decrease 0.4 - <2 µg/m <sup>3</sup>	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m <sup>3</sup>
Imperceptible	Increase / decrease <0.4 µg/m <sup>3</sup>	Increase / decrease <1 day	Increase / decrease <0.25 µg/m <sup>3</sup>

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes – Transport Infrastructure Ireland (2011)

**Table 4-28 Air Quality Impact Significance Criteria For Annual Mean Nitrogen Dioxide and PM10 and PM2.5 Concentrations at a Receptor**

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration <sup>Note 1</sup>		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m <sup>3</sup> of NO <sub>2</sub> or PM <sub>10</sub> ) (≥25 µg/m <sup>3</sup> of PM <sub>2.5</sub> )	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m <sup>3</sup> of NO <sub>2</sub> or PM <sub>10</sub> ) (22.5 - <25 µg/m <sup>3</sup> of PM <sub>2.5</sub> )	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m <sup>3</sup> of NO <sub>2</sub> or PM <sub>10</sub> ) (18.75 - <22.5 µg/m <sup>3</sup> of PM <sub>2.5</sub> )	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m <sup>3</sup> of NO <sub>2</sub> or PM <sub>10</sub> ) (<18.75 µg/m <sup>3</sup> of PM <sub>2.5</sub> )	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m <sup>3</sup> of NO <sub>2</sub> or PM <sub>10</sub> ) (≥25 µg/m <sup>3</sup> of PM <sub>2.5</sub> )	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m <sup>3</sup> of NO <sub>2</sub> or PM <sub>10</sub> ) (22.5 - <25 µg/m <sup>3</sup> of PM <sub>2.5</sub> )	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m <sup>3</sup> of NO <sub>2</sub> or PM <sub>10</sub> ) (18.75 - <22.5 µg/m <sup>3</sup> of PM <sub>2.5</sub> )	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m <sup>3</sup> of NO <sub>2</sub> or PM <sub>10</sub> ) (<18.75 µg/m <sup>3</sup> of PM <sub>2.5</sub> )	Negligible	Negligible	Slight Beneficial

Note 1 Well Below Standard = <75% of limit value.

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes – TII (2011)

**Table 4-29 Air Quality Impact Significance Criteria For Changes to Number of Days with PM10 Concentration Greater than 50 µg/m3 at a Receptor**

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration <sup>Note 1</sup>		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

Note 1 Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes – TII (2011)

### Regional Air Quality and Climate Impact Assessment

The impact of the proposed development at a national / international level has been determined using the procedures given by Transport Infrastructure Ireland<sup>(20)</sup> and the methodology provided in Annex 2 in the UK Design Manual for Roads and Bridges<sup>(13)</sup>. The assessment focused on determining the resulting change in emissions of volatile organic compounds (VOCs), nitrogen oxides (NO<sub>x</sub>) and carbon dioxide (CO<sub>2</sub>). The Annex provides a method for the prediction of the regional impact of emissions of these pollutants from road schemes. The inputs to the air dispersion model consist of information on road link lengths, AADT movements and annual average traffic speeds.

#### Conversion of NO<sub>x</sub> to NO<sub>2</sub>

NO<sub>x</sub> (NO + NO<sub>2</sub>) is emitted by vehicles exhausts. The majority of emissions are in the form of NO, however, with greater diesel vehicles and some regenerative particle traps on HGV's the proportion of NO<sub>x</sub> emitted as NO<sub>2</sub>, rather than NO is increasing. With the correct conditions (presence of sunlight and O<sub>3</sub>) emissions in the form of NO, have the potential to be converted to NO<sub>2</sub>.

Transport Infrastructure Ireland states the recommended method for the conversion of NO<sub>x</sub> to NO<sub>2</sub> in "Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes"<sup>(20)</sup>. The TII guidelines recommend the use of DEFRA's NO<sub>x</sub> to NO<sub>2</sub> calculator<sup>(19)</sup> which was originally published in 2009 and is currently on version 6.1. This calculator (which can be downloaded in the form of an excel spreadsheet) accounts for the predicted availability of O<sub>3</sub> and proportion of NO<sub>x</sub>



emitted as NO for each local authority across the UK. O<sub>3</sub> is a regional pollutant and therefore concentrations do not vary in the same way as concentrations of NO<sub>2</sub> or PM<sub>10</sub>.

The calculator includes Local Authorities in Northern Ireland and the TII guidance recommends the use of 'Armagh, Banbridge and Craigavon' as the choice for local authority when using the calculator. The choice of Craigavon provides the most suitable relationship between NO<sub>2</sub> and NO<sub>x</sub> for Ireland. The "*All other Non-Urban UK Traffic*" traffic mix option was used.

### Ecological Sites

For routes that pass within 2km of a designated area of conservation (either Irish or European designation) the TII requires consultation with an Ecologist<sup>(20)</sup>. However, in practice the potential for impact to an ecological site is highest within 200m of the proposed development and when significant changes in AADT (>5%) occur.

Transport Infrastructure Ireland's *Guidelines for Assessment of Ecological Impacts of National Road Schemes*<sup>(26)</sup> and *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities*<sup>(25)</sup> provide details regarding the legal protection of designated conservation areas.

If both of the following assessment criteria are met, an assessment of the potential for impact due to nitrogen deposition should be conducted:

- A designated area of conservation is located within 200 m of the proposed development; and
- A significant change in AADT flows (>5%) will occur.

The Rye Water Valley/Carton SAC (site code 001398) is within 2km of the proposed route options, however it does not lie within 200m of the proposed development. Thus, an assessment of the impact of NO<sub>x</sub> concentrations is not necessary.

The proposed MERR directly crosses the Royal Canal pNHA (site code 002103). A number of existing road links are also within 200m of the pNHA. As such an assessment of the impact with regards to nitrogen deposition was conducted. Dispersion modelling and prediction was carried out at typical traffic speeds at this location. Ambient NO<sub>x</sub> concentrations were predicted for the operational year along a transect of up to 200 m within the pNHA. The road contribution to dry deposition along the transect was also calculated using the methodology outlined in Appendix 9 of the *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*<sup>(20)</sup>.

## 4.9.3 Baseline Environment for Air Quality

### Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels)<sup>(22)</sup>. Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM<sub>10</sub>, the situation is more complex due to the range of sources of this pollutant.

Smaller particles (less than PM<sub>2.5</sub>) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles (PM<sub>2.5</sub> - PM<sub>10</sub>) will actually increase at higher wind speeds. Thus, measured levels of PM<sub>10</sub> will be a non-linear function of wind speed.

The wind-rose from Casement Aerodrome Meteorological Station for the years 2013 - 2017 is shown in Figure 4.41. Casement Aerodrome Meteorological Station is located circa 12km south east of the proposed development. Casement Aerodrome meteorological station is considered the most representative of the conditions in the region of the proposed development due to its similar distance inland to the proposed route. The wind-rose indicates the prevailing wind speed and direction over the five-year period. The prevailing wind direction is from south westerly to westerly in direction, with generally moderate wind speeds.

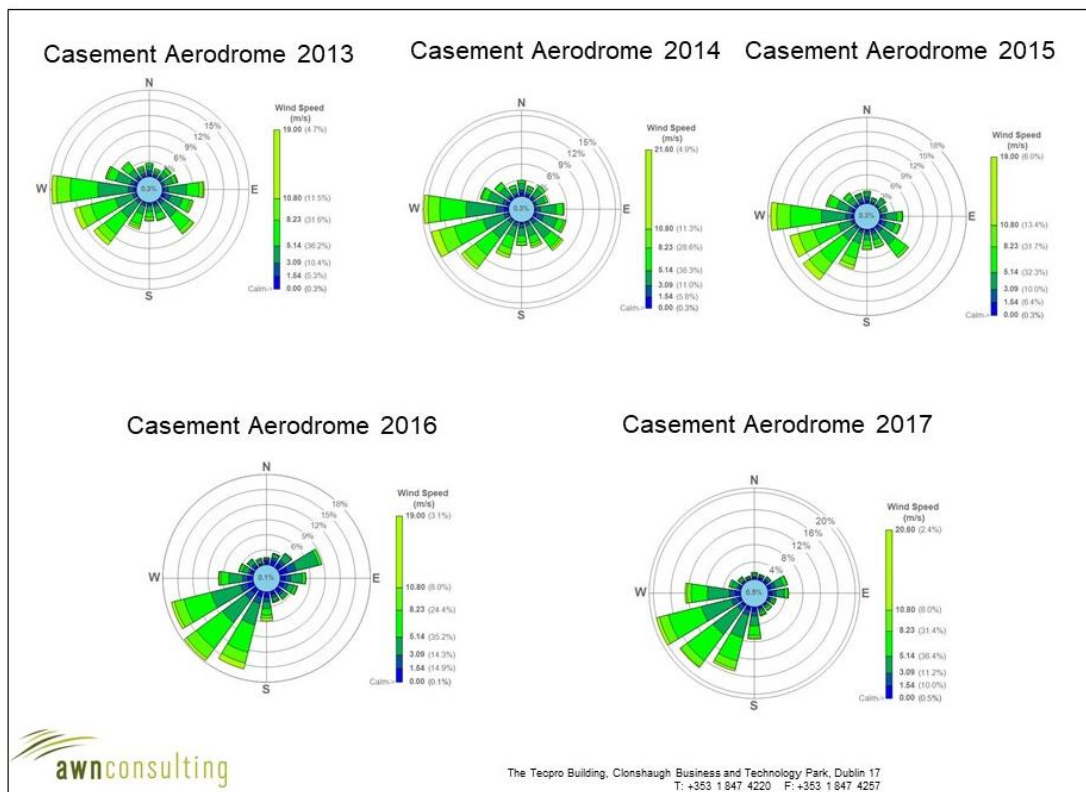


Figure 4.41 Casement Aerodrome Windrose 2013 – 2017

### Trends in Air Quality

Air quality is variable and subject to both significant spatial and temporal variation. In relation to spatial variations in air quality, concentrations generally fall significantly with distance from major road sources<sup>(15)</sup>. Thus, residential exposure is determined by the location of sensitive receptors relative to major roads sources in the area. Temporally, air quality can vary significantly by orders of magnitude due to changes in traffic volumes, meteorological conditions and wind direction. In 2011 the UK DEFRA published research<sup>(27)</sup> on the long term trends in NO<sub>2</sub> and NO<sub>x</sub> for roadside monitoring sites in the UK. This study found a marked decrease in NO<sub>2</sub> concentrations between 1996 and 2002, after which the concentrations stabilised with little reduction between 2004 and 2010. The result of this study is that there now exists a gap between projected NO<sub>2</sub> concentrations which UK DEFRA previously published and monitored concentrations. The impact of this 'gap' is that the DMRB screening model can under-predict NO<sub>2</sub> concentrations for predicted for future years. Subsequently, the UK

Highways Agency (HA) published an Interim advice note (IAN 170/12) in order to correct the DMRB results for future years.

### Baseline Air Quality – Review of Available Background Data

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality in Ireland is “*Air Quality In Ireland 2017*”<sup>(18)</sup>. The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments<sup>(17)</sup>.

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes<sup>(17)</sup>. Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the proposed development is within Zone D (EPA, 2019). The long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

NO<sub>2</sub> monitoring was carried out at two rural Zone D locations, Emo and Kilcatt and in two urban areas, Enniscorthy and Castlebar<sup>(18)</sup> (Table 4-30). The NO<sub>2</sub> annual average in 2017 for Castlebar was 7µg/m<sup>3</sup>. The rural Zone D locations of Emo and Kilcatt recorded results of 3µg/m<sup>3</sup> and 2µg/m<sup>3</sup> in 2017 respectively. Long-term average concentrations measured at all Zone D locations were significantly lower than the annual average limit value of 40µg/m<sup>3</sup>. The average results over the last three years in Kilcatt and Emo suggests an upper average of no more than 4µg/m<sup>3</sup> as a background concentration for a completely rural area as shown in Table 4-30. The annual average results over the last five years in Castlebar and Enniscorthy indicate an upper average concentration of no more than 11µg/m<sup>3</sup>. Based on the above information, a conservative estimate of the current background NO<sub>2</sub> concentration for the region of the proposed development is 11µg/m<sup>3</sup>.

Long term NO<sub>x</sub> monitoring has been carried out at a four Zone D locations in recent years: Castlebar, Enniscorthy, Kilcatt and Emo. Annual mean concentrations of NO<sub>x</sub> at the monitoring sites over the period 2013 – 2017 ranged from 2 µg/m<sup>3</sup> for a purely rural area to 25µg/m<sup>3</sup> for an urbanised area. These results suggest an upper average over the five-year period of no more than 17µg/m<sup>3</sup> as a background concentration (see Table 4-31). The area of the proposed development is similar to that of Castlebar and so an appropriate estimate for the current background NO<sub>x</sub> concentration in the region of the proposed development is 13µg/m<sup>3</sup>.

**Table 4-30 Trends In Zone D Air Quality - Nitrogen Dioxide (NO<sub>2</sub>)**

Year	Castlebar	Kilcatt	Emo	Enniscorthy
2013	11	4	4	-
2014	8	3	3	13
2015	8	2	3	9
2016	9	3	4	10
2017	7	2	3	-

<b>Average</b>	<b>8.0</b>	<b>2.6</b>	<b>3.4</b>	<b>10.5</b>
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Note 1 Annual average limit value - 40µg/m<sup>3</sup> (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

**Table 4-31 Trends In Zone D Air Quality - Nitrogen Oxide (NO<sub>x</sub>)**

Year	Castlebar	Kilkitt	Emo	Enniscorthy
2013	16	5	5	-
2014	12	3	5	25
2015	11	2	3	9
2016	13	4	6	17
2017	11	3	4	-
<b>Average</b>	<b>12.5</b>	<b>3.3</b>	<b>4.6</b>	<b>17.0</b>

Note 1 Annual average limit value - 30µg/m<sup>3</sup> (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Long-term PM<sub>10</sub> monitoring was carried out at the urban Zone D locations of Castlebar, Kilkitt, Enniscorthy and Claremorris over the period 2013 - 2017. The maximum 24-hour concentration (as a 90.4<sup>th</sup>ile) at each of the Zone D locations is shown in Table 4-32. The average long-term 24-hour concentration (measured as a 90.4<sup>th</sup>ile) is 28.2µg/m<sup>3</sup> for the urban sites or 16.8µg/m<sup>3</sup> for the rural locations. The annual average results over the last five years at rural Zone D locations suggests an upper average of 13µg/m<sup>3</sup> as an annual average background concentration as shown in Table 4-33 and 19µg/m<sup>3</sup> for the urban sites. Based on the EPA data, a conservative estimate of the current background PM<sub>10</sub> concentration in the region of the proposed development is 19µg/m<sup>3</sup>.

**Table 4-32 90<sup>th</sup>ile of 24-Hour PM<sub>10</sub> Concentrations In Zone D Locations (µg/m<sup>3</sup>)**

Year	Claremorris	Kilkitt	Enniscorthy	Castlebar
2013	21.0	18.6	-	26.9
2014	15.2	15.4	37.3	20.9
2015	16.5	17.7	33.8	22.2
2016	17.4	15.0	32.3	20.0
2017	17.3	14.0	-	19.1
<b>Average</b>	<b>17.5</b>	<b>16.1</b>	<b>34.5</b>	<b>21.8</b>

**Table 4-33 Trends In Zone D Air Quality – PM<sub>10</sub>**

Year	Castlebar	Kilkitt	Claremorris	Enniscorthy
2013	15	11	13	-
2014	12	9	10	22
2015	13	9	10	18
2016	12	8	10	17
2017	11	8	11	-
<b>Average</b>	<b>12.1</b>	<b>8.5</b>	<b>10.2</b>	<b>19.0</b>

Note 1 Annual average limit value - 40µg/m<sup>3</sup> (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Continuous PM<sub>2.5</sub> monitoring carried out at the Zone D location of Claremorris showed PM<sub>2.5</sub>/PM<sub>10</sub> ratios ranging from 0.50 – 0.62 over the period 2013 – 2017. Based on

this information, a ratio of 0.65 was used to generate a background PM<sub>2.5</sub> concentration in the region of the proposed development of 12.4µg/m<sup>3</sup>.

In terms of benzene, monitoring data for the Zone D location of Shannon Town is available for the period 2011 – 2012 with an average concentration of 0.4µg/m<sup>3</sup>. More recent data for Zone D locations is not available, as an alternative, monitoring in the Zone C location of Kilkenny for the period 2014 – 2017 showed an upper average concentration of no more than 0.2µg/m<sup>3</sup>, which is significantly below the 5µg/m<sup>3</sup> limit value. Based on this monitoring data a conservative estimate of the current background concentration in the region of the development is 0.2µg/m<sup>3</sup>.

With regard to CO, annual averages at the Zone D, location of Enniscorthy for over the 2014 – 2016 period are low, peaking at 6% of the limit value (10 mg/m<sup>3</sup>)<sup>(18)</sup>. More recent data for Zone D locations is not available. Data for the Zone C monitoring station in Portlaoise gave an annual mean concentration of 0.2mg/m<sup>3</sup> in 2017. Based on this EPA data, a conservative estimate of the current background CO concentration in the region of the development is 0.6mg/m<sup>3</sup>.

Background concentrations for the operational year of 2036 have been calculated. These have used 2017 background concentrations and the year on year reduction factors provided by Transport Infrastructure Ireland in the *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* and the UK Department for Environment, Food and Rural Affairs LAQM.TG(16)<sup>(12)</sup>.

#### 4.9.4 Characteristics of the Proposed Development

The proposed development is located to the east of Maynooth town. The predominant land use in the vicinity of the proposed development is primarily farmland and residential housing. When considering a development of this nature, the potential air quality and climate impact on the surroundings must be considered for each of two distinct stages:

- (a) construction phase, and;
- (b) operational phase.

The primary sources of air and climatic emissions in the operational context are deemed long term and will involve the change in traffic flows or congestion in the local areas which are associated with the proposed development.

During the construction phase of the development there will be different sources of potential air quality impacts. The following describes the primary sources of potential air quality impacts which have been assessed as part of this report.

#### 4.9.5 Predicted Impacts for Air Quality

##### Construction Phase

##### Air Quality

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust and PM<sub>10</sub>/PM<sub>2.5</sub> emissions. Due to the size and nature of the proposed development it can be categorised as moderate, indicating that there are potential dust soiling effects within 50m of the works areas (Table 4-34). While construction dust tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. There are a number of sensitive receptors, predominantly

residential properties in close proximity to the proposed development, particularly at the northern and southern ends where it meets the R148 and R405 respectively. In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of a dust minimisation plan. Provided the dust minimisation measures outlined in the plan (see Appendix D) are adhered to, the air quality impacts during the construction phase will not be significant. These measures are summarised in Section 4.9.6.

**Table 4-34 Assessment Criteria for the Impact of Dust from Construction, with Standard Mitigation in Place <sup>(23)</sup>**

Source		Potential Distance for Significant Effects (Distance From Source)		
Scale	Description	Soiling	PM <sub>10</sub>	Vegetation Effects
Major	Large construction sites, with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads	25m	10m	10m

### Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO<sub>2</sub> and N<sub>2</sub>O emissions. However, the impact on the climate is considered to be imperceptible in the long and short term.

### **Operational Phase**

#### Local Air Quality

There is the potential for a number of emissions to the atmosphere during the operational phase of the development. In particular, the traffic-related air emissions may generate quantities of air pollutants such as NO<sub>2</sub>, CO, benzene and PM<sub>10</sub>.

Traffic flow information was obtained from AECOM and has been used to model pollutant levels under various traffic scenarios and under sufficient spatial resolution to assess whether any significant air quality impact on sensitive receptors may occur.

Cumulative effects have been assessed, as recommended in the EU Directive on EIA (Council Directive 97/11/EC) and using the methodology of the UK DEFRA<sup>(12,13)</sup>. Firstly, background concentrations<sup>(18)</sup> have been included in the modelling study. These background concentrations are year-specific and account for non-localised sources of the pollutants of concern<sup>(18)</sup>. Appropriate background levels were selected based on the available monitoring data provided by the EPA and Local Authorities<sup>(17,18)</sup> (see Section 4.9.3).

The impact of the proposed development has been assessed by modelling emissions from the traffic generated as a result of the proposed development. The impact of CO, benzene, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> for the operational year was predicted at the nearest sensitive receptors to the development. This assessment allows the significance of the development, with respect to both relative and absolute impacts, to be determined.



The receptors modelled represent the worst-case locations close to the proposed development and were chosen due to their close proximity (within 200m) to the road links impacted by proposed development. The worst-case traffic data used in this assessment is shown in Table 4-35, with the percentage of HGV's shown in parenthesis beside the AADT. Six sensitive receptors have been chosen as they have the potential to be adversely impacted by the development, these receptors are shown in Table 4-36 and Figure 4.42.

The DMRB model does not account for congestion or queuing traffic associated with junctions. Detailed modelling is undertaken if the DMRB screening indicates there are potential issues. In order to address concerns related to queuing traffic, particularly at receptor R3 which will have up to three lanes of queuing traffic on the R148 directly opposite the property, modelling was conducted at lower traffic speeds to somewhat characterise queuing traffic. This sensitivity assessment has adopted a conservative approach by modelling the traffic on this road link (R148E) at a speed as low as 10 kmph over the full assessment year. Traffic will not travel at this low speed for the majority of the day, but this approach was taken to provide a worst-case assessment.

**Table 4-35 Traffic Data used in Modelling Assessment**

Road Name	Speed (kph)	Base Year	Do- Minimum	Do-Something
			2036	2036
R148E	60	10,300 (1.8%)	24,190 (5%)	22,061 (6%)
R148W	60	10,516 (1.8%)	16,096 (4%)	14,598 (2%)
R405E	50	6,500 (0.2%)	15,423 (3%)	14,249 (7%)
R405W	50	5,858 (0.2%)	11,637 (3%)	9,324 (2%)
R157	60	10,100 (1.3%)	20,181 (7%)	23,616 (16%)
Griffin Rath Road	50	0 (0%)	12,400 (4%)	16,800 (21%)
MERR	50	0 (0%)	0 (0%)	22,775 (16%)

**Table 4-36 Description of Sensitive Receptors**

Name	Receptor Type	X <sup>Note 1</sup>	Y <sup>Note 1</sup>
R1	Residential	661248	5917426
R2	Residential	661400	5917489
R3	Residential	661553	5917360
R4	Residential	661062	5916060
R5	Residential	660920	5916135
R6	Residential	661365	5917068

Note 1 Coordinates in UTM, approximate to nearest 5 m



**Figure 4.42 Sensitive Receptor Locations**

### Modelling Assessment

Transport Infrastructure Ireland Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes<sup>(20)</sup> detail a methodology for determining air quality impact significance criteria for road schemes. The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the ‘Do- Minimum’ scenario, which assumes that the proposed development is not in place in future years, in order to determine the degree of impact.

### NO<sub>2</sub>

The results of the assessment of the impact of the proposed development on NO<sub>2</sub> in the operational year 2036 are shown Table 4-37 for the Highways Agency IAN 170/12 and Table 4-38 using the UK Department for Environment, Food and Rural Affairs technique respectively. The annual average concentration is in compliance with the limit value at all worst-case receptors using both techniques. Levels of NO<sub>2</sub> are 58% of the annual limit value using the more conservative IAN technique, while concentrations are 46% of the annual limit value in 2036 using the UK Department for Environment, Food and Rural Affairs technique. The hourly limit value for NO<sub>2</sub> is 200 µg/m<sup>3</sup> and is expressed as a 99.8<sup>th</sup> percentile (i.e. it must not be exceeded more than 18 times per year). The maximum 1-hour NO<sub>2</sub> concentration is not predicted to be exceeded using either technique (Table 4-39).

The impact of the proposed development on annual mean NO<sub>2</sub> levels can be assessed relative to “Do Minimum (DM)” levels. Relative to baseline levels, some large increases in pollutant levels are predicted as a result of the proposed development. With regard to impacts at individual receptors, the greatest impact on NO<sub>2</sub> concentrations will be an increase of 21% of the annual limit value at Receptor 1. In terms of queuing traffic, the assessment has found that NO<sub>2</sub> results are also below the

annual and 1-hour limit values. As a worst-case Receptor 3 will experience an increase of 24% of the annual limit value. Thus, using the assessment criteria outlined in Table 4-27 and Table 4-28, the impact of the proposed development in terms of NO<sub>2</sub> is considered slight adverse. Therefore, the overall impact of NO<sub>2</sub> concentrations as a result of the proposed development is long-term and slight negative.

#### *PM<sub>10</sub>*

The results of the modelled impact of the proposed development for PM<sub>10</sub> in the operational year 2036 are shown in Table 4-40. Predicted annual average concentrations at the worst-case receptor in the region of the development are at most 51% of the limit value. The 24-hour mean limit value of 50µg/m<sup>3</sup> is expressed as a 90.4<sup>th</sup> percentile (i.e. it must not be exceeded more than 35 times per year). It is predicted that the worst-case receptor (R1) will experience 4 days of exceedances with proposed development in place, this is an increase of 1 day compared with the do minimum scenario. Receptor R6 will also experience one additional day of exceedance (from 2 to 3 days) with the proposed development in place. However, the 35 days of exceedance permitted per year are not exceeded (Table 4-41).

Relative to baseline levels, some small increases in PM<sub>10</sub> levels at the worst-case receptors are predicted as a result of the proposed development. The greatest impact on PM<sub>10</sub> concentrations in the region of the proposed development will be an increase of 3% of the annual limit value at Receptor 1. The impact of queuing traffic at Receptor 3 will also result in, as a worst case, an increase of 3% of the annual limit value, the magnitude of the changes in air quality are negligible at all receptors based on the criteria outlined in Table 4-27, Table 4-28 and Table 4-29. Therefore, the overall impact of PM<sub>10</sub> concentrations as a result of the proposed development is long-term and imperceptible.

#### *PM<sub>2.5</sub>*

The results of the modelled impact of the proposed development for PM<sub>2.5</sub> are shown in Table 4-42. Predicted annual average concentrations in the region of the proposed development are 53% of the limit value in 2036 at the worst-case receptor.

Relative to baseline levels, small increases in PM<sub>2.5</sub> levels at the worst-case receptors are predicted as a result of the proposed development. None of the receptors assessed will experience an increase in concentrations of over 3% of the limit value. Therefore, using the assessment criteria outlined in Table 4-27 and Table 4-28, the impact of the proposed development with regard to PM<sub>2.5</sub> is negligible at all of the receptors assessed. Overall, the impact of increased PM<sub>2.5</sub> concentrations as a result of the proposed development is long-term and imperceptible.

#### *CO and Benzene*

##### **The results of the modelled impact of CO and benzene are shown in**

Table 4-43 and Table 4-44 respectively. Predicted pollutant concentrations with the proposed development in place are below the ambient standards at all locations. Levels of CO are 35% of the limit value with levels of benzene reaching 6% of the limit value.

Relative to baseline levels, some imperceptible increases in CO levels are predicted as a result of the proposed development. The greatest impact on CO concentrations will be an increase of 2% of the CO limit at Receptor 1. In terms of benzene some imperceptible increases in concentrations are also predicted. The worst-case receptor will experience an increase of 1% of the benzene limit value. Impacts in relation to

queuing traffic are also considered imperceptible. Thus, using the assessment criteria for NO<sub>2</sub> and PM<sub>10</sub> outlined in Table 4-27, Table 4-28 and Table 4-29 and applying these criteria to CO and benzene, the impact of the proposed development in terms of CO and benzene is negligible, long-term and imperceptible.

#### *Summary of Local Air Quality Modelling Assessment*

Levels of traffic-derived air pollutants from the proposed development will not exceed the ambient air quality standards either with or without the proposed development in place. Using the assessment criteria outlined in Table 4-27, Table 4-28 and Table 4-29, the impact of the development in terms of PM<sub>10</sub>, PM<sub>2.5</sub>, CO and benzene is negligible, long-term, localised negative and imperceptible. In terms of NO<sub>2</sub> the impact will be long-term and slight negative at the worst-case receptors assessed.

#### Regional Air Quality Impacts

The regional impact of the proposed development on emissions of NO<sub>x</sub> and VOCs has been assessed using the procedures of Transport Infrastructure Ireland<sup>(20)</sup> and the UK Department for Environment, Food and Rural Affairs<sup>(13)</sup>. The results (see Table 4-45) show that the likely impact of the proposed development on Ireland's obligations under the Targets set out by Directive (EU) 2016/2284 “*On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC*” are imperceptible and long-term. For the assessment year of 2036, the predicted impact of the changes in AADT is to increase NO<sub>x</sub> levels by 0.0261% of the NO<sub>x</sub> emissions ceiling and increase VOC levels by 0.0042% of the VOC emissions ceiling to be complied with in 2030.

#### Air Quality Impact on Sensitive Ecosystems

The impact of NO<sub>x</sub> (i.e. NO and NO<sub>2</sub>) emissions resulting from the traffic associated with the proposed development at the Royal Canal pNHA was assessed. The traffic data, which satisfied the assessment criteria outlined in Section 4.9.2 and used in the modelling assessment is detailed in Table 4-35. Ambient NO<sub>x</sub> concentrations were predicted for the operational year of 2036 along a transect of up to 200m and are given in Table 4-46. The road contribution to dry deposition along the transect is also given and was calculated using the methodology of TII<sup>(20)</sup>.

The predicted annual average NO<sub>x</sub> level in the Royal Canal pNHA is above the limit value of 30µg/m<sup>3</sup> for the “Do Something” scenario with the proposed development in place, with NO<sub>x</sub> concentrations reaching 151% of the limit value in the operational year of 2036, including background levels.

The impact of the proposed development can be assessed relative to “Do Minimum” levels, the impact of the proposed development leads to an increase in NO<sub>x</sub> concentrations of at most 24.7µg/m<sup>3</sup> within the Royal Canal pNHA. Appendix 9 of the TII guidelines<sup>(22)</sup> state that where the proposed development is expected to cause an increase of more than 2µg/m<sup>3</sup> and the predicted concentrations (including background) are close to, or exceed the standard, then the sensitivity of the habitat to NO<sub>x</sub> should be assessed by the project ecologist. Concentrations within the pNHA are predicted to increase by 2µg/m<sup>3</sup> or more and the predicted concentrations are also above the standard, as such it was necessary for the sensitivity of the habitat to NO<sub>x</sub> to be assessed by an ecologist.

The assessment carried out by the ecologist found that the maximum increase in the NO<sub>2</sub> dry deposition rate is 1.22Kg(N)/ha/yr, as detailed in Table 4-46. This is well below the critical load for inland and surface water habitats of 5 - 10Kg(N)/ha/yr<sup>(22)</sup> as listed in TII<sup>(20)</sup>.

It can therefore be determined that the changes arising from the increase in NO<sub>2</sub> on the Royal Canal pNHA will be imperceptible.

Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the operational phase of the development. Road traffic and space heating of buildings may give rise to CO<sub>2</sub> and N<sub>2</sub>O emissions. However, due to the size of the development the impact of the proposed development on national greenhouse gas emissions is predicted to be insignificant in terms of Ireland's obligations under the EU 2020 target.

The impact of the proposed development on emissions of CO<sub>2</sub> were assessed using the Design Manual for Roads and Bridges screening model (see Table 4-45). The results show that the impact of the proposed development in 2036 will be to increase CO<sub>2</sub> emissions by 0.01% of Ireland's EU 2020 Target. Thus, the impact of the proposed development on national greenhouse gas emissions will be insignificant in terms of Ireland's obligations under the EU 2020 Target<sup>(24)</sup>.

Therefore, the likely overall magnitude of the changes on climate in the operational stage is imperceptible and long-term.

**Table 4-37 Annual Mean NO<sub>2</sub> Concentrations (µg/m<sup>3</sup>) (using Interim advice note 170/12 V3 Long Term NO<sub>2</sub> Trend Projections)**

Receptor	Impact 2036				
	DM	DS	DS-DM	Magnitude	Description
R1	14.8	23.1	8.3	Large	Large Increase
R2	15.6	17.3	1.7	Small	Small Increase
R3	15.6	17.1	1.6	Small	Small Increase
R4	15.2	22.0	6.8	Large	Large Increase
R5	13.9	13.9	0.0	Imperceptible	Negligible Increase
R6	9.9	17.6	7.8	Large	Large Increase

**Table 4-38 Annual Mean NO<sub>2</sub> Concentrations (µg/m<sup>3</sup>) (using UK Department for Environment, Food and Rural Affairs Technical Guidance)**

Receptor	Impact 2036				
	DM	DS	DS- DM	Magnitude	Description
R1	11.9	18.5	6.6	Large	Large Increase
R2	12.5	13.8	1.3	Small	Small Increase
R3	12.4	13.6	1.2	Small	Small Increase
R4	11.5	16.7	5.1	Large	Large Increase
R5	10.8	10.8	0.0	Imperceptible	Negligible Increase
R6	7.3	13.0	5.7	Large	Large Increase

**Table 4-39 99.8<sup>th</sup> percentile of daily maximum 1-hour for NO<sub>2</sub> concentrations (µg/m<sup>3</sup>)**

Receptor	IAN 170/12 V3 Long Term NO <sub>2</sub> Trend Projections Technique		Defra's Technical Guidance Technique	
	Impact 2036		Impact 2036	
	DM	DS	DM	DS
R1	51.8	80.7	41.5	64.8
R2	54.7	60.5	43.7	48.4
R3	54.5	60	43.3	47.7
R4	53.3	77.1	40.3	58.3
R5	48.6	48.7	37.8	37.8
R6	34.6	61.8	25.6	45.6

**Table 4-40 Annual Mean PM<sub>10</sub> Concentrations (µg/m<sup>3</sup>)**

Receptor	Impact 2036				
	DM	DS	DS- DM	Magnitude	Description
R1	19.4	20.5	1.0	Small	Small Increase
R2	19.5	19.6	0.1	Imperceptible	Negligible Increase
R3	19.5	19.7	0.2	Imperceptible	Negligible Increase
R4	19.5	19.9	0.5	Small	Small Increase
R5	19.3	19.3	0.0	Imperceptible	Negligible Decrease
R6	18.6	19.4	0.8	Small	Small Increase

**Table 4-41 Number of days with PM<sub>10</sub> concentration > 50 µg/m<sup>3</sup>**

Receptor	Impact 2036	
	DM	DS
R1	3	4
R2	3	3
R3	3	3
R4	3	3
R5	3	3
R6	2	3

**Table 4-42 PM<sub>2.5</sub> Annual Mean PM<sub>2.5</sub> Concentrations (µg/m<sup>3</sup>)**

Receptor	Impact 2036				
	DM	DS	DS- DM	Magnitude	Description
R1	12.6	13.3	0.7	Small	Small Increase
R2	12.7	12.7	0.1	Imperceptible	Negligible Increase
R3	12.7	12.8	0.1	Imperceptible	Negligible Increase
R4	12.6	13.0	0.3	Imperceptible	Negligible Increase
R5	12.6	12.5	0.0	Imperceptible	Negligible Decrease
R6	12.1	12.6	0.5	Small	Small Increase



**Table 4-43 Maximum 8-hour CO Concentrations (mg/m<sup>3</sup>)**

Receptor	Impact 2036				
	DM	DS	DS- DM	Magnitude	Description
R1	3.24	3.46	0.23	Imperceptible	Negligible Increase
R2	3.24	3.25	0.00	Imperceptible	Negligible Increase
R3	3.24	3.27	0.03	Imperceptible	Negligible Increase
R4	3.25	3.30	0.04	Imperceptible	Negligible Increase
R5	3.22	3.20	-0.01	Imperceptible	Negligible Decrease
R6	3.00	3.18	0.18	Imperceptible	Negligible Increase

**Table 4-44 Annual Mean Benzene Concentrations (µg/m<sup>3</sup>)**

Receptor	Impact 2036				
	DM	DS	DS- DM	Magnitude	Description
R1	0.25	0.31	0.06	Imperceptible	Negligible Increase
R2	0.26	0.26	0.00	Imperceptible	Negligible Increase
R3	0.27	0.27	0.00	Imperceptible	Negligible Increase
R4	0.26	0.26	0.00	Imperceptible	Negligible Increase
R5	0.25	0.25	0.00	Imperceptible	Negligible Decrease
R6	0.20	0.24	0.04	Imperceptible	Negligible Increase

**Table 4-45 Regional Air Quality and Climate Assessment**

Year	Scenario	VOC (kg/annum)	NO <sub>x</sub> (kg/annum)	CO <sub>2</sub> (tonnes/annum)
2036	Do Minimum	2,082	7,505	3,840
	Do Something	4,239	18,009	7,639
Increment in 2036		2413.2 kg	2,156.4 kg	10,503.8 kg
Emission Ceiling (kilo Tonnes) 2020 <small>Note 1</small>		<b>56.8</b>	<b>56.8</b>	<b>66.2</b>
Emission Ceiling (kilo Tonnes) 2030 <small>Note 2</small>		<b>51.5</b>	<b>51.5</b>	<b>40.2</b>
Impact in 2036 (%)		0.0047 %	0.0042 %	0.0261 %

Note 1 Targets under Directive (EU) 2016/2284 “On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC”

Note 2 20-20-20 Climate and Energy Package

**Table 4-46 Assessment of NO<sub>x</sub> Concentrations and NO<sub>2</sub> Dry Deposition Impact on the Royal Canal pNHA**

Distance to Road (m)	NO <sub>x</sub> Conc. (µg/m <sup>3</sup> ) <sup>Note 1</sup>			NO <sub>2</sub> Dry Deposition Rate Impact
	Do Minimum	Do Something	Change in NO <sub>x</sub> Conc.	Kg N ha <sup>-1</sup> yr <sup>-1</sup>
2	20.6	45.2	24.7	1.22
12	18.4	39.5	21.1	1.06
22	16.8	32.8	16.0	0.82
32	15.6	27.9	12.3	0.64
42	14.6	24.2	9.6	0.51
52	13.7	21.3	7.5	0.40
62	12.9	18.8	5.9	0.32
72	12.4	17.1	4.6	0.25
82	12.1	15.7	3.7	0.20
92	11.8	14.6	2.9	0.16
102	11.6	13.8	2.2	0.12
112	11.4	13.1	1.7	0.10
122	11.3	12.7	1.4	0.07
132	11.2	12.3	1.1	0.06
142	11.2	12.1	0.9	0.05
152	11.2	11.9	0.8	0.04
162	11.1	11.8	0.7	0.04
172	11.0	11.7	0.6	0.04
182	11.0	11.5	0.5	0.03
192	10.8	11.2	0.4	0.02
202	10.8	11.1	0.3	0.02

Note 1 Based on a background NO<sub>x</sub> concentration of 10.8 µg/m<sup>3</sup> in 2036

#### 4.9.6 Mitigation Measures for Air Quality

In order to sufficiently ameliorate the likely air quality impact, a schedule of air control measures has been formulated for both construction and operational phases associated with the proposed development.

##### Construction Phase

###### Air Quality

The greatest potential impact on air quality during the construction phase is from construction dust emissions and the potential for nuisance dust.

In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of a dust minimisation plan. These follow recommendations and guidance contained in the Institute of Air Quality Management *Guidance on the Assessment of Dust from Demolition and Construction*<sup>(23)</sup> for sensitive receptors. Provided the dust minimisation measures outlined in the plan (see Appendix 2) and construction management plan are adhered to, the air quality impacts during the construction phase should be not be significant. In summary the measures which will be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20kph, and on hard surfaced roads as site management dictates.
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

### Climate

Construction traffic and embodied energy of construction materials are expected to be the dominant source of greenhouse gas emissions as a result of the construction phase of the development. Construction vehicles, generators etc., may give rise to some CO<sub>2</sub> and N<sub>2</sub>O emissions. However, due to short-term and temporary nature of these works, the impact on climate will not be significant.

Nevertheless, some site-specific mitigation measures can be implemented during the construction phase of the proposed development to ensure emissions are reduced further. In particular the prevention of on-site or delivery vehicles from leaving engines idling, even over short periods. Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.

## **Operational Phase**

### Air Quality

Emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from heavily congested areas or ensuring free flowing traffic through good traffic management plans and the use of automatic traffic control systems<sup>(12,13)</sup>.

### Climate

Improvements in air quality are likely over the next few years as a result of the on-going comprehensive vehicle inspection and maintenance program, fiscal measures to encourage the use of alternatively fuelled vehicles and the introduction of cleaner fuels.

Ireland has developed strategies for implementing the Paris Agreement which aims to limit global temperature rise to below 2°C above pre-industrial levels. The National Mitigation Plan<sup>(30)</sup>, which was established under the Climate Action and Low Carbon Development Act 2015<sup>(31)</sup>, sets out objectives for achieving a reduction in GHG emissions and transitioning the four key sectors (power generation, built environment, transport and agriculture) to decarbonisation. Policy measures are included to manage GHG emissions in order to achieve the national transition objective. The goal is to achieve decarbonisation by 2050, with additional measures added to the plan as time progresses in line with emerging and developing technologies. In relation to decarbonising the transport sector, Ireland has set a target that all new cars and vans sold in Ireland will be zero carbon emissions or zero emission capable by 2030, targets are also included for public transport buses and trains. The Renewable Energy Directive specifies a legally binding 10% renewable energy in transport target to be achieved by all Member States by 2020, with the main driver at achieving this in Ireland being the Biofuels Obligations Scheme<sup>(30)</sup>. With the implementation of the aforementioned measures carbon emissions should be greatly reduced in future years thus benefitting climate.

#### 4.9.7 Conclusions for Air Quality

There will be a slight adverse impact to air quality at the worst-case receptors assessed as a result of NO<sub>2</sub> emissions related with traffic on the proposed MERR and the associated road network. However, the overall result of the assessment found no significant impacts to either air quality or climate are predicted during the construction or operational phases of the proposed development. Once the dust minimisation measures outlined in Appendix 2 are implemented, fugitive emissions of dust from the site during construction will be insignificant and pose no nuisance to nearby receptors. The results of the air dispersion modelling study indicate that the residual impacts of the proposed development on air quality in terms of PM<sub>10</sub>, PM<sub>2.5</sub>, CO and benzene is long-term, localised negative and imperceptible. In terms of NO<sub>2</sub> the impact will be long-term and slight negative at the worst-case receptors assessed. Residual impacts to climate are predicted to be imperceptible with respect to the operational phase for the short and long term.

#### 4.9.8 References

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- (21) World Health Organisation (2006) Air Quality Guidelines - Global Update 2005 (and previous Air Quality Guideline Reports 1999 & 2000)
- (22) UK Highways Agency (2012) Interim Advice Note 170/12 Updated air quality advice on the assessment of future NO<sub>x</sub> and NO<sub>2</sub> projections for users of DMRB Volume 11, Section 3, Part 1 - Air Quality
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- (28) European Economic Area (2011) NEC Directive Status Reports 2010
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- (30) Department of Communications, Climate Action and Environment (DCCAE) (2017) National Mitigation Plan
- (31) Government of Ireland (2015) Climate Action and Low Carbon Development Act 2015 (No. 46)
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- (33) Department of Communications, Climate Action and Environment (DCCAE) (2018) National Adaptation Framework

## 4.10 Cultural Heritage

### 4.10.1 Introduction

The following section details the archaeological and built heritage assessment which has been undertaken for the proposed development. This assessment has been carried out to ascertain the potential impact of the proposed development on the archaeological, historical, and built heritage resource that may exist within the area.

### 4.10.2 Receiving Environment for Cultural Heritage

The archaeological assessment involved a detailed study of the archaeological and historical background of the proposed development site and the surrounding area. This included records from the National Monuments Service, the National Inventory of Archaeological Heritage (NIAH) and from the Record of Monuments and Places in Maynooth.

#### **Kildare County Development Plan 2017-2023**

The Kildare County Development Plan (2017-2023) recognises the statutory protection afforded to all recorded monuments under the National Monuments Legislation (1930–2014). The Development Plan recognises that the urban and rural areas of County Kildare are enriched with archaeological and architectural heritage sites and aims to protect and conserve these areas through identification of policies and objectives including the following:

**PS I** *‘Conserve and protect buildings, structures and sites contained on the Record of Protected Structures of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest’.*

**PS 2** *‘Protect the curtilage of protected structures or proposed protected structures and to refuse planning permission for inappropriate development within the curtilage or attendant grounds of a protected structure which would adversely impact on the special character of the protected structure including cause loss of or damage to the special character of the protected structure and loss of or damage to, any structures of architectural heritage value within the curtilage of the protected structure. Any proposed development within the curtilage and/or attendant grounds must demonstrate that it is part of an overall strategy for the future conservation of the entire built heritage complex and contributes positively to that aim’.*

#### **Record of National Monuments**

There are two records of national monuments located approximately 150 m south of the southern tie-in junction of the proposed development as per Table 4-47. In 2004, the two sites were excavated and recorded in advance of the construction of the Corran Rath Housing Estate. The excavation works uncovered a small burial ground (KD010-



040---), which dated back to an Early Christian Period. There were no artefacts found with any of the burials. Two bowl furnaces (KD011-061----) with diameters of 0.66m and 0.9m were also discovered as part of the excavation works.

**Table 4-47 Recorded Archaeological Sites in vicinity of the proposed Development**

RMP No.	Location	Classification	Distance to proposed development
KD010-040 ----	Moneycooly	Burial ground	c. 150 m south of the southern end tie-in junction
KD011-061----	Moneycooly	2 bowl Furnaces	c. 150 m south of the southern end tie-in junction

### Built Heritage

The Record of Protected Structures (RPS) for County Kildare is listed in the Kildare County Development Plan 2017-2023. The Plan also outlines objectives for the protection of these structures, or parts of these structures. A Lime Kiln (B06-06) is listed as a protected structure in the Railpark area and is located within 500m of the proposed development. The Interiors of Carton Demesne (House and Gardens) Carton Demesne House are also listed on the RPS and are located northeast of the development. The estate is surrounded by a boundary wall which is visible along the R418. See table 4-48 for details of Built Heritage records.

**Table 4-48 Record of Protected Structures in vicinity of the proposed development**

RPS No.	Location	Classification	Distance to proposed development
B06-06	Railpark	Lime Kiln	c. 300 m east
B06-09i	Carton Demesne	Interiors of Carton Demesne (House and Gardens)	Immediately north of the proposed development

### Architectural Conservation Areas

There are no Architectural Conservation Areas (ACA) listed in the Kildare County Development Plan 2017-2023 within the study area. The closest ACA, the Maynooth ACA is located in Maynooth town and is 1km to the west of the proposed development.

### Aerial Photographic Analysis

Inspection of the aerial photographic coverage of the proposed development area held by the Ordnance Survey (1995, 2000, 2005), Google Earth (2008) and Bing Maps did not reveal any previously unknown archaeological or architectural features.

### National Inventory of Architectural Heritage (NIAH)

#### Building Survey

A review of the architectural survey at <http://www.buildingsofireland.ie> was undertaken as part of this assessment which included buildings within 250m of the study area. There are no structures listed on the NIAH building survey that are within 250m of the study area.

#### Garden Survey

There are no demesne landscapes listed within the study area of the proposed development in the Garden Survey of the NIAH. However, the demesne landscapes

associated with Carton Demesne (NIAH reference no. KD-50-N-954387), an 18<sup>th</sup> century estate, are located to the immediate north and east of the proposed development where, a boundary stone wall is seen along the R157 Dunboyne Road and the R148 Leixlip Road (see Figure 4.43). Carton Demesne and its gardens are protected structures. The Maynooth LAP (2013-2019), does not include Carton within its boundary area, but notes the importance of the demesne and its relationship to the town via Carton Avenue, which links the centre of Maynooth with the Carton Estate, across the Dunboyne Road of The Kildare County Development Plan (2017 -2023) sets out a number of Policies and Objectives for the Country Houses and Demesnes including the following

**CH 2** *'Preserve and protect the historic gardens and designed landscapes identified in the National Inventory of Architectural Heritage'*

**CHO 1** *'Assess the demesnes and historic designed landscapes within Kildare and promote the conservation of their essential character, both built and natural, while allowing for appropriate re-use'*

Policies and objectives for the protection and conservation of landscape and visual features of the Carton Demesne are also included in the Kildare County Development Plan 2017-2023 and are assessed in the Landscape and Visual section of this report (see section 4.7).

Furthermore, there are several protected structures within the Carton Demesne listed in the Kildare County Development Plan 2017-2023 including, a 17<sup>th</sup> century Carton House (B05-55), which is also a National Monument (KD006-009----), and the interiors of Carton Demesne including the House and Gardens (B06-09i). Additionally, there are several records of National Monuments within the demesne including the Carton House (KD006-009---) and two Holy Wells (KD006-015---- and KD006-011---).



**Figure 4.43** Boundary stone wall of Carton Demesne at R148/R157 junction

### **Summary of Previous Archaeological Fieldwork**

A review of the Excavations Bulletin (1970–2017) revealed that one archaeological investigation was undertaken within the study area. In 2008, six-trenches, comprising 375 linear meters were excavated at the Gaelscoil Uí Fhiaich, adjacent to the R405 Celbridge road. No archaeological features or deposits were found.

Two other excavation works were recorded in proximity to the proposed development. In 2000, excavation works were undertaken within the Carton Demesne, in proximity to the R148 Leixlip Road. A group of at least four small ring ditches were uncovered however, no traces of these sites remained above ground.

The second archaeological fieldwork was carried out in 2005, in advance of the extension of a quarry, where several features were identified during test-trenching at Brownstown, Corbally, Co. Kildare. Possible ditch features, two possible pot-holes, a cremation pit, a possible pit and a small area of heat-reddened clay were uncovered. No artefacts were recorded during the excavation.

Analysis of the cartographic sources revealed that the study area remained undeveloped throughout the 18<sup>th</sup>, 19<sup>th</sup> and 20<sup>th</sup> century. In terms of built heritage, these records reveal that no sub-surface remains of protected structures are located within the study area.

#### **4.10.3 Predicted Impacts for Cultural Heritage**

The degree of impact to the archaeological, architectural and cultural heritage sites from the proposed development can be categorised as direct and indirect impacts. Direct impacts relate to a situation where the extents of a site or of its features are physically located within the footprint of the proposed road development and the associated construction works. This may include the removal of part or all of the site. Indirect impact results if the sites are in the immediate environs of the proposed development. An indirect impact can also occur if a site or parts of its features are in close proximity to the new development i.e. within c. 50m.

##### **Archaeology**

A large section of the proposed development is located within a greenfield site and therefore, it is possible that previously unrecorded archaeological features that have the potential to survive beneath the current ground level in greenfield areas which may be impacted by the proposed works. This could be caused by earthworks associated with the proposed development.

##### **Built Heritage**

No direct impact is predicted to the setting of any protected structures from the proposed development as they are located more than 50m from the study area.

Although the proposed development will not have a direct impact on the Interiors of Carton Demesne, the boundary of the Carton Demesne, due to its proximity to construction works (within c. 50m) may be subject to indirect impacts. The construction works in this area will include the tie-in of the proposed road development with the R148 Leixlip Road / R157 Dunboyne Road and realignment on the existing sections. By design, the construction works associated with the proposed development in this section will be over an existing built area and will not impact the boundary wall of Carton Demesne and therefore, no significant effects on the boundary wall will occur. Indirect impacts on Carton Demesne as a result of the proposed development are assessed under the Landscape and Visual section of this report (see section 4.7), and a comprehensive landscaping plan will be implemented to avoid/minimise visual effects.

#### **4.10.4 Mitigation Measures for Cultural Heritage**

All recommendations are subject to approval by the National Monuments Service of the Heritage and Planning Division, Department of Culture, Heritage and the Gaeltacht. The mitigation measures recommended include:

##### **Archaeology**

It is recommended that all ground disturbances associated with the proposed development in greenfield areas be monitored by a suitably qualified archaeologist. If any features of archaeological potential are discovered during the course of the works further archaeological mitigation may be required, such as preservation in-situ or by record. Any further mitigation will require approval from the NMS of the DoCHG.

##### **Architecture**

A condition survey of the Carton Demesne wall will be undertaken prior to construction to ensure that the wall will not be impacted by the construction works. A post construction condition survey will also be carried out to ensure that no impacts have occurred and that no further mitigation measures are required. Works shall be kept as far away from the Carton Demesne Wall as possible to avoid any impacts.

#### **4.10.5 Residual Impacts for Cultural Heritage**

Following the implementation of the mitigation measures, as proposed above, there will be no residual impact on the archaeological and built heritage resource.

### **4.11 Material Assets and Land**

#### **4.11.1 Introduction**

Material assets are taken to include infrastructure and utilities including rail, road, water supply, the electric grid, gas network and wastewater treatment facilities. It also includes economic assets, properties and land. Due to the nature and location of the proposed development there are a number of material assets present within the development boundary. These include roads (Refer to Section 0), rail lines, electricity supply, gas networks, telecommunications, water supply and wastewater treatment facilities detailed below.

#### **4.11.2 Receiving Environment for Material Assets and Land**

##### **Properties**

The majority of the proposed development is located within the Railpark townland to the east of Maynooth town, where lands are owned privately and are currently used for agricultural purposes. The zoning of lands set out in the Maynooth LAP 2013 – 2019 (Incorporating Amendment No.1) identifies these lands to be zoned 'New Residential', a change from the previous 'Agriculture' zoning that applied to the land.

There are a number of residential properties located in proximity to the proposed development including, properties within Griffin Rath Manor and Griffin Rath Hall estates at the southern tie-in junction; properties of Carton Wood estate to the west of the northern tie-in junction; properties on Parklands Grove within the Railpark townland to the west of the proposed development; and those on the R405 and R148 in proximity to the two new junctions.

## **Land**

The land required for the construction of the proposed development is currently agricultural lands and is owned by local landowners. It is zoned as 'New Residential' for the extent of the northern section of the development while the southern sections are zoned as both 'Community and Educational' and 'Agriculture'. Land will need to be acquired by Kildare County Council to construct the proposed development.

## **ESB**

The ESB distribution network comprises medium voltage (MV) (10kV / 20kV) and low voltage (LV) electricity lines which are managed by ESB networks area offices.

These include:

- Existing MV/LV underground lines across the R405 Celbridge Road;
- Existing LV overhead lines across the R405 Celbridge Road, the greenfield sites through which the proposed development crosses and across the R148 Leixlip Road; and
- Existing overhead HV network is located to the south west of the study area.

## **Gas Networks**

Gas Networks Ireland records indicate that there are existing medium pressure gas distribution pipes within the vicinity of the proposed road development, namely gas mains along the R405 Celbridge Road and the R148 Leixlip Road.

## **Iarnród Éireann**

The bridge which is included as part of the proposed development spans over the twin track Dublin to Sligo railway line.

## **Telecommunications**

Aurora Telecom records indicate that there is an existing fibre optic network running alongside the Royal Canal Way within the vicinity of the proposed road infrastructure works.

BT records indicate that there is existing BT infrastructure located in vicinity of the proposed road infrastructure works.

Eircom records indicate that there is an existing Eircom infrastructure in vicinity of the proposed road infrastructure works.

Virgin Media records indicate that there is existing Virgin Media infrastructure located within the vicinity of the proposed road infrastructure works.

## **Water Supply**

Existing water services records have been obtained from the Kildare County Council and Irish Water. The records indicate that there is existing watermain infrastructure located within the vicinity of the proposed road infrastructure works and are found in the following locations:

- Existing 200mm uPVC and 400mm asbestos watermain along the R405 Celbridge Road
- Existing 4 uPVC watermain along the R148 Leixlip Road.
- Existing 200mm uPVC watermain in Griffin Rath Road with 100mm uPVC watermains in Griffin Rath Manor and Griffin Rath Hall.

- Existing 900 mm concrete surface gravity main on the greenfield sites to the west of the proposed development;
- Existing 360 concrete surface gravity main to the west of Griffin Rath Road along the R405 Celbridge Road

### **Foul Sewerage / Wastewater**

Existing water services records have been obtained from the Kildare County Council and Irish Water. The records indicate that there is existing watermain infrastructure located within the vicinity of the proposed road infrastructure works and are found in the following locations:

- Existing 400mm asbestos cement rising main running parallel to the Royal Canal Way; and,
- Existing 300mm concrete foul gravity main pipe on the greenfield site to the west of the proposed development.

## **4.11.3 Predicted Impacts for Material Assets and Land**

### **Properties and Land**

The proposed development will not require demolition of any buildings. However, acquisition of private lands from landowners will be required through a separate Compulsory Purchase Order (CPO).

During the construction phase, the boundaries of a number of properties will be affected to provide sufficient cross section for the junction tie-ins. The wall and part of the green area to the front of the Carton Wood estate west of the northern junction, on the R148 Leixlip Road will be impacted. However, a similar replacement boundary wall will be provided at the end of the construction phase and therefore, no significant adverse effects are likely. The boundary of the property east of the southern junction will also be impacted. An alternative, safer entrance will be provided for this property in agreement with the landowner. Where curtilage of any other private residential properties are affected, they will be reinstated as similar to the existing boundary as the design permits.

The infrastructure will provide access to the lands zoned as 'New Residential', facilitating the future development in accordance with planning policy for the area and therefore having a long-term positive effect for the growing population and economy of Maynooth. The proposed development is also included within the roads objectives of the Maynooth LAP 2013-2019 Incorporating Amendment No.1. The proposed development will provide improved infrastructure for the local area, enhancing connectivity and providing improved amenities.

### **ESB**

An assessment of the proposed road infrastructure works and the HV, MV and LV ESB network along the proposed road development revealed intersections as noted below:

- Existing MV/LV underground lines across the R405 Celbridge Road. It is proposed that these lines be retained in their existing location and protected as appropriate
- Existing LV overhead lines across the greenfield site to the east of the proposed development crosses the proposed development at approx. Ch. 1+100 and also



crosses the existing R148 Leixlip Road. It is generally proposed to maintain the existing lines in their current position where possible. The crossing at Ch. 1+100 will likely require a localised diversion to accommodate the proposed development. This diversion shall be undertaken in consultation with the ESB.

It is anticipated that a number of underground electricity supplies to individual properties will be affected during the construction phase in particular during the MERR alignment with the existing R405 Celbridge Road. These impacts will be momentary in nature and will be undertaken in consultation with the service provider and the effected properties. Supplies will be protected and/or diverted as appropriate as part of the Construction stage. There is potential for *slight negative momentary* impacts during the construction stage. No significant effects are predicted.

### **Gas Networks**

A comparison of the proposed road infrastructure upgrades and the distribution network has revealed intersections as noted below;

- 1) Gas Main along the R405 Celbridge Road  
Proposed Works: It is proposed the gas main be retained in its existing location and protected if required as the vertical alignment is generally proposed to be maintained along the R405 Celbridge Road.
- 2) Gas Main along the R148 Leixlip Road  
Proposed Works: It is proposed the gas main be retained in its existing location and protected if required as the vertical alignment is generally proposed to be maintained along the R148 Leixlip Road.

### **Iarnród Éireann**

The construction of the bridge will require the possession of the rail line at various phases during its construction. It is anticipated that the railway possessions will be required for the installation of the precast concrete beams, the pouring of the in-situ bridge deck and the installation of the precast concrete parapets. It is anticipated that these possessions will be undertaken at night and/or at weekends in order to reduce the impact on the railway services as much as is practicable. The extent and time of possessions is subject to Iarnród Éireann approval.

### **Telecommunications**

Eir underground ducting has been identified within the development boundary. It is proposed that all underground Eir Infrastructure be retained and or protected as required.

Virgin Media infrastructure. It is proposed that the underground Virgin Media ducting along the R405 Celbridge Road and the R148 Leixlip Road is retained and protected.

Aurora Telecom. It is proposed that the underground Aurora Telecom ducting along the Royal Canal Way is retained and protected.

No significant impacts are predicted.

### **Water supply**

A comparison of the water services records and proposed road development has revealed intersections as noted below:

- Existing 200mm uPVC and 400mm asbestos water main along the R405 Celbridge Road

Proposed Works: It is proposed that the existing watermain pipes be retained in their existing location and protected as required.

- Existing 4µPVC watermain along the R148 Leixlip Road  
Proposed Works: it is proposed that the existing watermain be retained in its existing location and protected as required
- Existing 200mm uPVC watermain in Griffin Rath Road with 100mm uPVC watermain in Griffin Rath Manor and Griffin Rath Hall.  
Proposed Works: it is proposed that the existing watermain be retained in its existing location and protected as required;
- Existing 900 mm concrete surface gravity main on the greenfield sites to the west of the proposed development;  
Proposed Works: it is proposed that the existing watermain be retained in its existing location and protected as required
- Existing 360 concrete surface gravity main to the west of Griffin Rath Manor along the R405 Celbridge Road  
Proposed Works: it is proposed that the existing watermain be retained in its existing location and protected as required

#### **Foul sewage/ wastewater**

Points of intersection have been identified at the following locations:

- Existing 400mm asbestos cement rising main running parallel to the Royal Canal Way.  
Proposed Works: A local diversion is required, as the rising main passes underneath the proposed location of the north bridge abutment. Works will be completed by contractors qualified in dealing with asbestos and an asbestos remediation strategy will be completed.
- Existing 300mm foul pipe on the greenfield site to the west of the proposed development.  
Proposed Works: it is proposed that the existing sewer main be retained in its existing location and protected as required.

### **4.11.4 Mitigation Measures for Material Assets and Land**

#### **Properties and Land**

The land required to construct the proposed development will be acquired through a separate CPO. Compensation will be given to landowners through this process which will be agreed with the landowners during the CPO process.

#### **Utilities**

The proposed development intercepts various utility services along its route. Locations where intersections with significant trunk and distribution services occur along the route have been identified through consultation with the relevant service providers and slit trenching. Effects on local domestic connections will be addressed at the detailed design stage.

Disruptions to the Dublin to Sligo Rail line will be discussed and agreed with Iarnród Éireann with any closures of the railway line to be undertaken during night time / weekends to minimise disruption.

Prior to construction the Contractor will be required to:

- Prepare a CEMP prior to construction to be agreed with Kildare County Council prior to the works commencing.
- The Construction Traffic Management Plan (TMP) will be required to maximise the safety of the workforce and the public and to minimise traffic delays, disruption and maintain access to properties. The TMP will:
  - Address temporary disruption to traffic signals, footpath access and the management of pedestrian crossing points; and
  - Be developed and agreed with Irish Rail.
- Prepare a Stakeholder Management Plan which will ensure agreement with utility owners and notification of local residents which may be affected by the interruption to utilities, services or infrastructure provisions during the construction stage.
- Prepare an Emergency Response Plan detailing the procedures to be undertaken in the event of a spill of chemical, fuel or other hazardous wastes, a fire, or non-compliance incident with any permit of license issues.
- Prepare a site plan showing the location of all surface water drainage lines and proposed discharge points to surface water. This will also include the location of all existing and proposed surface water protection measures, including monitoring points, sediment traps, settling basins, interceptors etc.

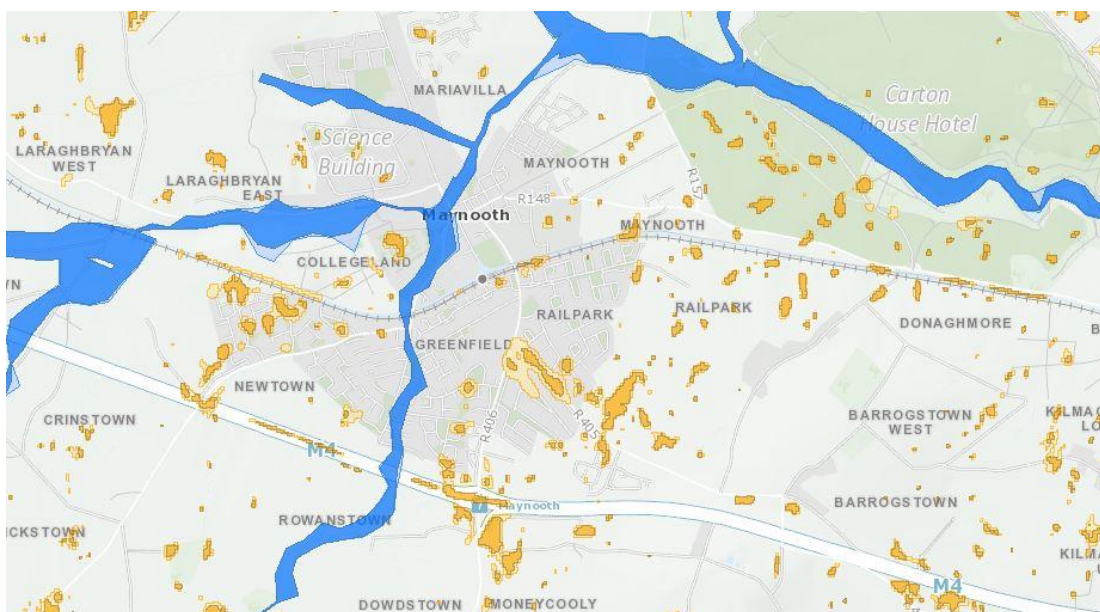
#### **4.11.5 Residual Impacts for Material Assets and Land**

There are no significant residual impacts predicated. Any disruptions to the Dublin to Sligo rail line or other utilities will be temporary and will be notified to those who may be affected in due time.

#### **4.12 Major Accidents and / or Disasters**

The potential for the construction phase of the proposed development to result in major accidents and/or disasters is low. All works will be subject to the implementation of a Construction Environmental Management Plan (CEMP) and Traffic Management Plan (TMP) to be prepared by the contractor and in agreement with the local authority prior to construction. Construction works will be subject to the normal health and safety controls and will be short-term in nature.

A flood risk assessment has been undertaken to assess the Maynooth Eastern Ring Road for the existing and future sources of flood risk. The primary source of flood risk identified for the site is pluvial flooding, as shown in the OPW Preliminary Flood Risk Assessment maps in Figure 4.44. The proposed development is suitable for the associated flood risk as per the OPW Guidelines. The drainage network for the proposed development on the site will incorporate Sustainable Drainage Systems (SuDS) for the purpose for managing surface water in terms of both flow and quality.



**Figure 4.44 OPW Preliminary Flood Risk Assessment (PFRA) maps**

One of the objectives of the proposed development is to provide a safer alternative to minor roads within the locality which are currently being used to avoid traffic in Maynooth town.

During the operational phase the road risk of accidents or disaster will be low as it will serve to alleviate congestion and provide a safer alternative to minor roads within the locality. A low speed limit of 50 kilometres per hour (kph) will apply to the proposed development with separate walking and cycling facilities provided for these users. The risk of collision or major accidents is based on road users due care and diligence in accordance with the requirements of the design of the road. Therefore, the risk of accidents associated with this development would not cause unusual, significant or adverse effects of a type that would, in themselves, require an EIA.

### 4.13 Cumulative Impacts

Cumulative impacts refer to a series of individual impacts that may, in combination, produce a significant impact. The underlying rationale of this cumulative or ‘in-combination’ assessment is to take account of cumulative impacts from existing or proposed plans and projects and these will often only occur over time.

A review of plans and projects was undertaken in Railpark area and in the adjacent townlands in the vicinity of the proposed development and assessed in **Table 4-49**. For the purposes of this cumulative assessment small scale and domestic developments were not considered given the urbanised nature of the Project and the fact that these developments would be subject to the stringent planning controls of Kildare County Council.

**Table 4-49 Assessment of Projects in Respect of their Potential to Result in Cumulative/ in-combination Effects with the proposed development**

Existing Project / Plan	Description of project/ plan	Cumulative Assessment
<b>Housing Development (Grant Thronton Corporate Finance Ltd) (Distance: 0m)</b>	The permission for the extension of construction of 151 semi-detached and terrace houses and a two-storey creche was granted by Kildare County Council in 2014 (application no. 14/519). The project is located to the north-west of the Crowncourt junction, at the northern end of the proposed development. An AA screening was carried out in 2014 for the proposed housing development and concluded that <i>“the proposed development will not cause significant impacts to the Rye Water Valley/Carton SAC, either alone or in combination with other plans or projects”</i>	No significant effects predicted to arise from the combination of this plan with the proposed development
<b>Housing Development (Orivo Properties Ltd.) (Distance: 200m)</b>	A permit was granted in 2010 (application no. 09/246) to Willowbridge Developments Ltd for the construction of 141 dwelling units on a 3.7ha site, off the R148 Leixlip Road, 200m from the Crowncourt junction. The application also included the development of surface-level car parking facilities, bicycle and bin stores, a new vehicular access on the Leixlip Road and secondary site development works. In 2014, Orivo Properties Ltd. applied for a grant permission to extend the permission to 2020 under application number 14/1002. To account for the minor modifications to already approved residential development in the existing permission, a further application was made in 2016 that was granted in 2017. An AA screening was carried out in 2016 and concluded that no potential significant effects are likely and will not result in any adverse impacts on any designated site	No significant effects predicted to arise from the combination of this project with the proposed development.
<b>Gaelscoil Ui Fhiaich (Distance: 150m)</b>	In 2008, the Gaelscoil Ui Fhiaich was granted permission (application no. 08/1946) which was amended in 2011 (application 11/9) to include additional classrooms. Further permission was granted by the Board of Management in 2015 (application no. 14760) for the erection of an all weather ‘astroturf’ playing pitch with associated perimeter fence and 4 no. flood lights and all associated site works. The school is located approximately 150m west of the southern tie-in of the Project on the R405 Celbridge Road.	No significant effects predicted to arise from the combination of this project with the proposed development.
<b>Maynooth Educate Together School (Distance: 0m)</b>	Maynooth Educate Together School was granted permission to construct a two storey 16 classroom Primary School and all associated works in October 2017. The development was proposed to be completed over two phases to allow the school to remain open. The primary school is located to the west of the southern junction tie-in, to be provided as part of the proposed development, on the R405 Celbridge Road. The school is currently undergoing construction and it is likely to be completed prior to the proposed road development. The proposed development will provide improved access to the primary school from the northern extents of Maynooth town and will help alleviate traffic during peak hours due to school traffic. Positive impacts will therefore arise from the construction of the proposed development in combination with the Maynooth Educate Together School. Due to the small scale of the school project, the short-term construction stages for both developments and the delay between the two projects, the construction stage of both projects will not occur in tandem and will not have significant cumulative effects. Despite the close proximity it is not likely that the operation of the two developments will cause significant cumulative effects in-combination with the proposed development.	No significant effects predicted to arise from the combination of this project with the proposed development.

Existing Project / Plan	Description of project/ plan	Cumulative Assessment
<p><b>A Strategic Housing Development (Distance: 1km)</b></p>	<p>In 2018 (application no. 18/301230), an application for a Strategic Housing Development was lodged to An Bord Pleanála by Cairn Homes Properties Ltd. for a proposed residential development on the Moyglare Road and Dunboyne Road within the townland of Mariavilla. The mix-use development will comprise the construction of 462 dwellings, including the refurbishment of Gate Lodge (a Protected Structure), 483 student accommodation bed spaces, creche, café, gym and retail unit, provision of a new 800 m link street with one pedestrian/vehicular bridge across the Lyreen River. An EIAR was submitted with the planning application and concluded that no significant impacts were likely to occur. Impacts to watercourses including the Lyreen River and the Rye Water River were identified to be imperceptible and short-term. A Stage II Natura Impact Statement (NIS) was carried out and mitigation measures were put in place to ensure that the conservation objectives and integrity to the Natura 2000 sites are maintained and that they will not be adversely affected by construction-related surface water discharges, by surface water discharges, by surface water or waste water discharges or by changes in hydrology as a result of the development. Due to the results of the assessments carried out for the above project, and the distance between the Cairn Homes Properties Ltd development and the proposed MERR, it is not likely that there will be any significant cumulative effects in combination with the proposed development.</p>	<p>No significant effects predicted to arise from the combination of this project with the proposed development.</p>
<p><b>Housing Development (Kelston Properties Ltd. (Distance: 200m)</b></p>	<p>Permission was granted to Kelston Properties Ltd in 2016 for a development including 181 no. dwellings, a 2-storey Crèche (552m<sup>2</sup>) and all associated and ancillary site development works including link road. The site is located west of the Griffin Rath Hall Estate, adjacent to the M7 Motorway. Two amendment applications were submitted in 2018 to omit a portion of the lands to the north west of the site, to reduce the house count to 84 in total, reduce the Creche to 380m<sup>2</sup> and to include for a link street (objective TRO 2(a) of the Maynooth LAP) among other ancillary works. The development was subject to Appropriate Assessment Screening by competent authority which concluded that there would be no significant effects on any Natura 2000 Site. The proposed development will tie in to the link street within this project once both developments are constructed. The traffic assessment for the MERR has incorporated the opening of the link street proposed above, for the design year of 2036 Do-Minimum Scenario. The traffic assessment has therefore assessed the cumulative effects of the Kelston Properties development and the proposed MERR. It is therefore concluded that there will be no significant effects as a result of the proposed Kelston Properties Development in combination with the proposed Maynooth Eastern Ring Road.</p>	<p>No significant effects predicted to arise from the combination of this project with the proposed development.</p>



Existing Project / Plan	Description of project/ plan	Cumulative Assessment
<p><b>Housing Development (Killross Properties Ltd)</b> <b>(Distance: 4.5km)</b></p>	<p>Permission was granted for the provision of 170 no. house units and 30. no apartment units, 430 no. car parking spaces, a childcare facility and a vehicular and pedestrian access onto Green Lane. The proposed housing development is located 4.5km east of the proposed Maynooth Ring Road, to the west of Celbridge. There have been a number of amendments to the house types included in this application, with the addition of 1 no. housing unit under the application no. 18/664. An AA Screening has been carried out for the Killross Properties Development, which concluded there to be no significant effects on the Rye Water Valley/Carnton SAC. Due to the distance of the housing development from the proposed Ring Road and the nature of the project, it is not likely that there will be any significant effects as a result of the Killross Properties Development and the proposed Maynooth Eastern Ring Road.</p>	<p>No significant effects predicted to arise from the combination of this project with the proposed development.</p>
<p><b>Road Development (Kildare County Council)</b> <b>(Distance 150m)</b></p>	<p>The planning application for the development of a Royal Canal Greenway was granted in 2016. The Royal Canal Greenway is a c.8.5km pedestrian and cycle greenway located along the Royal Canal towpath within Co. Kildare. The Greenway stretches from Maynooth to Confeay, an area north of Leixlip town. The greenway within Co. Kildare will provide a link between other greenway projects in adjacent lands which are being developed by Fingal County Council and Dublin City Council.</p> <p>The Royal Canal Greenway is located approximately 150m west of the northern tie-in of the proposed development on R157 Dunboyne Road. It is on the eastern side of the R157 Dunboyne Road, within the Carton Demesne and along the Royal Canal Way. Despite the close distance, significant cumulative effects with the proposed development are not expected.</p>	<p>No significant effects predicted to arise from the combination of this project with the proposed development</p>
<p><b>Maynooth Outer Orbital Route Mariavilla to the R157 Moygaddy Junction</b> <b>(Distance 750m)</b></p>	<p>The planning application is currently under judicial review for the construction of a c. 1.7 km single carriageway north of Maynooth town. The proposed road extends from the eastern end of the northern access road in the Moyglare Estate, Mariavilla in Co. Kildare to the Moygaddy Junction on the Dunboyne Road (R157). The road scheme comprises the construction of two bridge structures over the Rye Water and over the Blackhall Little. The road scheme also includes a roundabout at its junction with the Kilcoon Road (L2214) and bisects the Poundhill Road (L6219) with which it forms two T-junctions. The proposed road scheme is located approximately 750m north of the proposed development. An Appropriate Assessment Screening was carried out in 2016 for the development which concluded that the <i>“habitats and species for which the Rye Water Valley/ Carton SAC has been selected, including its conservation objectives and key elements of structure and function, will not be affected by the construction and operation”</i> of the proposed road scheme. An Environmental Impact Assessment Screening was also undertaken as part of the Part VIII process which found that there would be no significant effects on the environment. The proposed Maynooth Eastern Ring Road has accounted for future growth of Maynooth as far as 2036 and therefore will not be impacted by the Meath County Council development. The proposed road scheme is likely to have positive effects on connectivity through Maynooth and Meath in combination with the Maynooth Eastern Ring Road. Therefore, significant cumulative effects in combination with the proposed development are not expected.</p>	<p>No significant effects predicted to arise from the combination of this project with the proposed development</p>

Existing Project / Plan	Description of project/ plan	Cumulative Assessment
<p><b>Intel Ireland Limited, Collinstown Industrial Park, Leixlip (Planning Application 1991) (Distance 3km)</b></p>	<p>Intel Ireland Limited submitted an application to Kildare County Council (Planning Application 1991) for the permission to develop reconfigured and extended support buildings, water tanks and yards to provide for additional manufacturing capacity of a previously permitted manufacturing building (Planning Application 16/1229). The project will consist of buildings, site infrastructure and ancillary works, for the manufacture of integrated circuit boards. The project is located 3km east of the proposed development along the R148 Leixlip Road. A Natura Impact Statement (NIS) was carried out to determine whether the predicted impacts would adversely affect the integrity of the Rye Water Valley/Carton SAC, North Dublin Bay SAC, South Dublin Bay SAC, North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA. The NIS concluded that the project <i>'will not adversely affect (either directly or indirectly) the integrity of any European site, either alone or in combination with other plans and projects, and there is no reasonable scientific doubt in relation to this conclusion'</i>. This project is not expected to cause significant cumulative in-combination with the proposed MERR development.</p>	<p>No significant effects predicted to arise from combination of this project with the proposed development</p>

Potential pressures from in-combination effects could result in increased urbanisation. During the construction phase it could include combined impacts on the traffic environment, population and human health (noise, air quality, disturbance, or increased risk of accidents) or from accidents/ pollution events that may impact adversely on water quality.

The assessment found that the proposed development is likely to create a potential for urbanisation in adjacent lands as part of the Maynooth LAP (Amendment No.1). Any potential adverse cumulative effects are likely to be during the construction phase and will be short-term in nature. There is potential for significant positive long-term cumulative effects from the proposed development in-combination with other projects in the area, that will facilitate urbanisation on the outskirts of Maynooth town mainly for residential purposes as outlined in Maynooth LAP (Amendment No.1).

The separate AA Screening concluded, on the basis of objective information, that the Project, either individually or in combination with other plans or projects, in view of best scientific knowledge, is not likely to give rise to impacts which would constitute significant effects in view of the Conservation Objectives of the Rye Water River, or any other European site.

Having considered the anticipated overall potential impact with respect to each of these developments, it is considered that there are no likely significant effects on the environment when all of the above projects are considered in combination with each other and the proposed Maynooth Eastern Ring Road due to the location, scale and characteristics of the proposed developments and the likely impacts. The proposed Maynooth Eastern Ring Road has included for the future development of Maynooth town as part of its traffic assessment and therefore includes the worst case scenario for the Design Year of 2036, which will include the above projects.

Therefore it can be concluded that the proposed development is not likely to result in significant adverse impacts either alone or in combination with the existing planned or likely future projects.

## **5. CONCLUSIONS**

This Part VIII Planning Report and supporting drawings provides a description of the nature and extent of the proposed development. It has considered and assessed the likely significant environmental effects of the development of the Maynooth Eastern Ring Road.

The environmental considerations have included assessing likely impacts on a range of environmental topics including traffic; population and human health; biodiversity; soils, geology and hydrogeology; hydrology; landscape and visual; noise and vibration; air quality and climate; cultural heritage; and material assets and land. The likely environmental effects and recommended mitigation measures are detailed at the end of each environmental topic addressed in Section 4 of this Report. The Contractor will be required to demonstrate how it addresses the likely environmental effects and will be required to include suitable mitigation measures to be detailed as part of a Construction Environmental Management Plan and Traffic Management Plan which will be agreed with Kildare County Council prior to the works commencing. This assessment found that there are no likely significant adverse environmental effects as a result of the proposed development.

**APPENDIX A**  
**DEVELOPMENT DRAWINGS**

**Refer to Development Drawings booklet**

## **APPENDIX B**

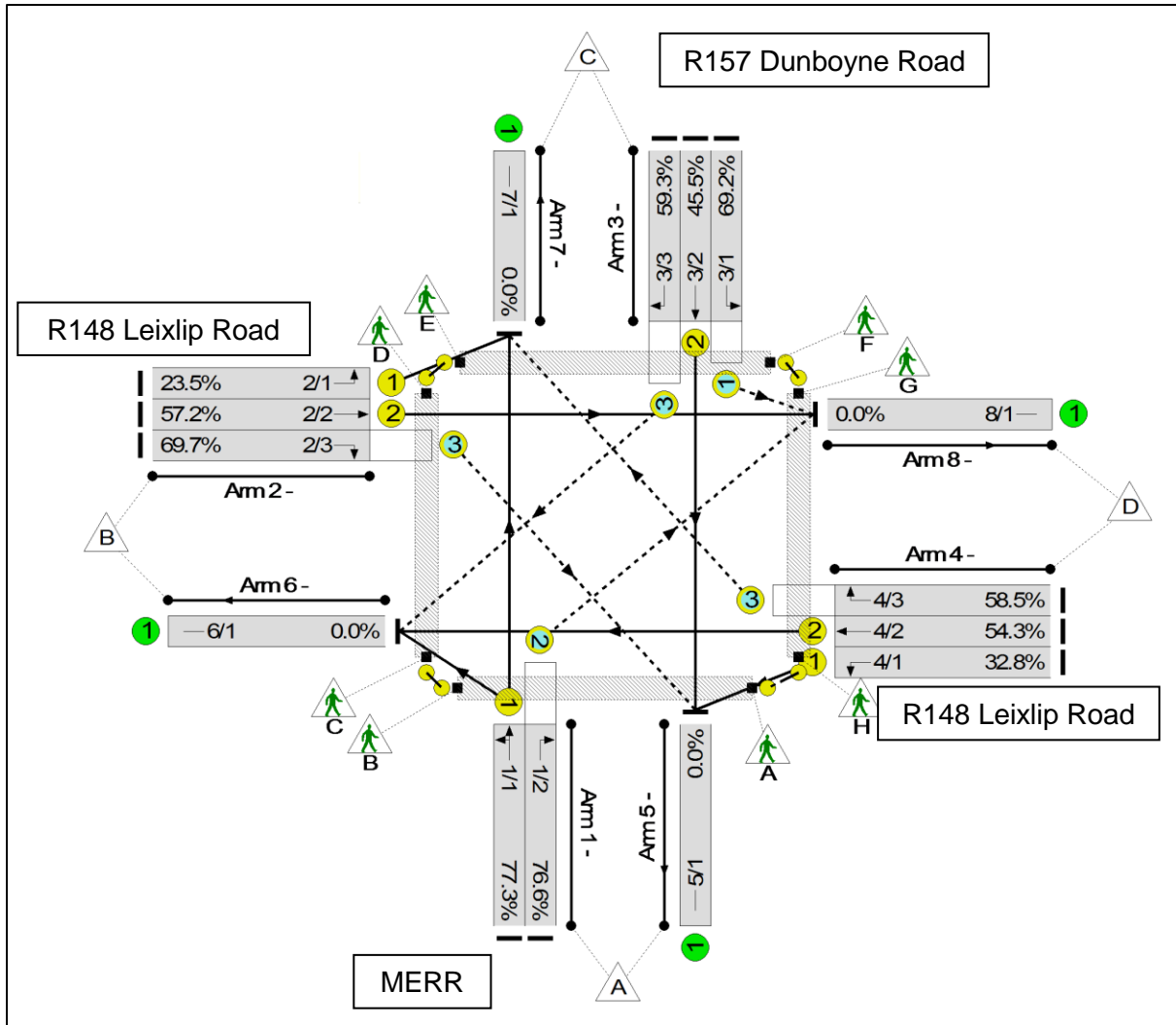
### **PHOTOMONTAGES**

**Refer to Photomontages booklet**



## **APPENDIX C**

### **TRAFFIC ANALYSIS**



**Figure C.1 Output from LinSig for Proposed Signalised Junction on R148 Leixlip Road during the AM Peak Hour**

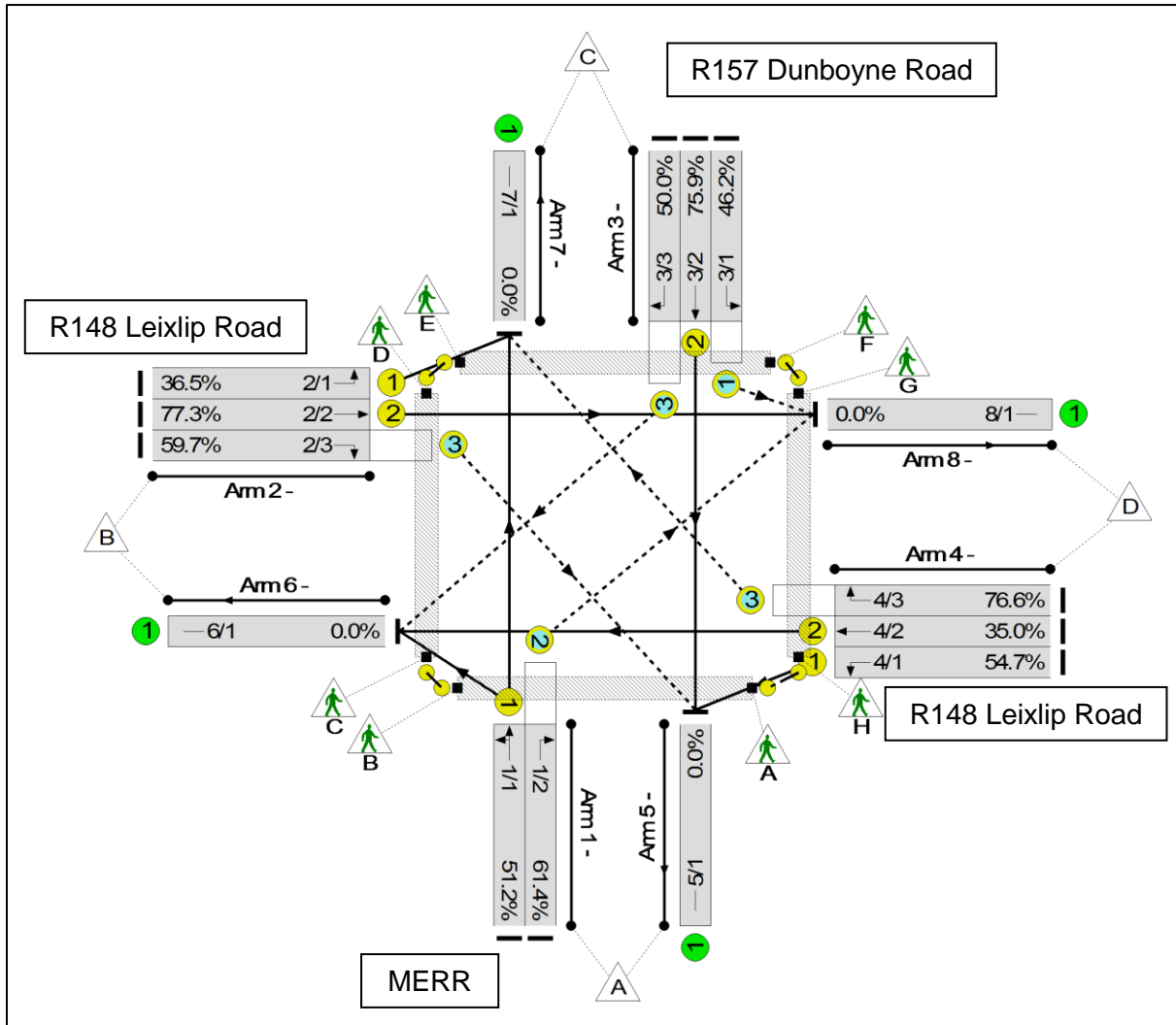


Figure C.2 Output from LinSig for Proposed Signalised Junction on R148 Leixlip Road during the PM Peak Hour

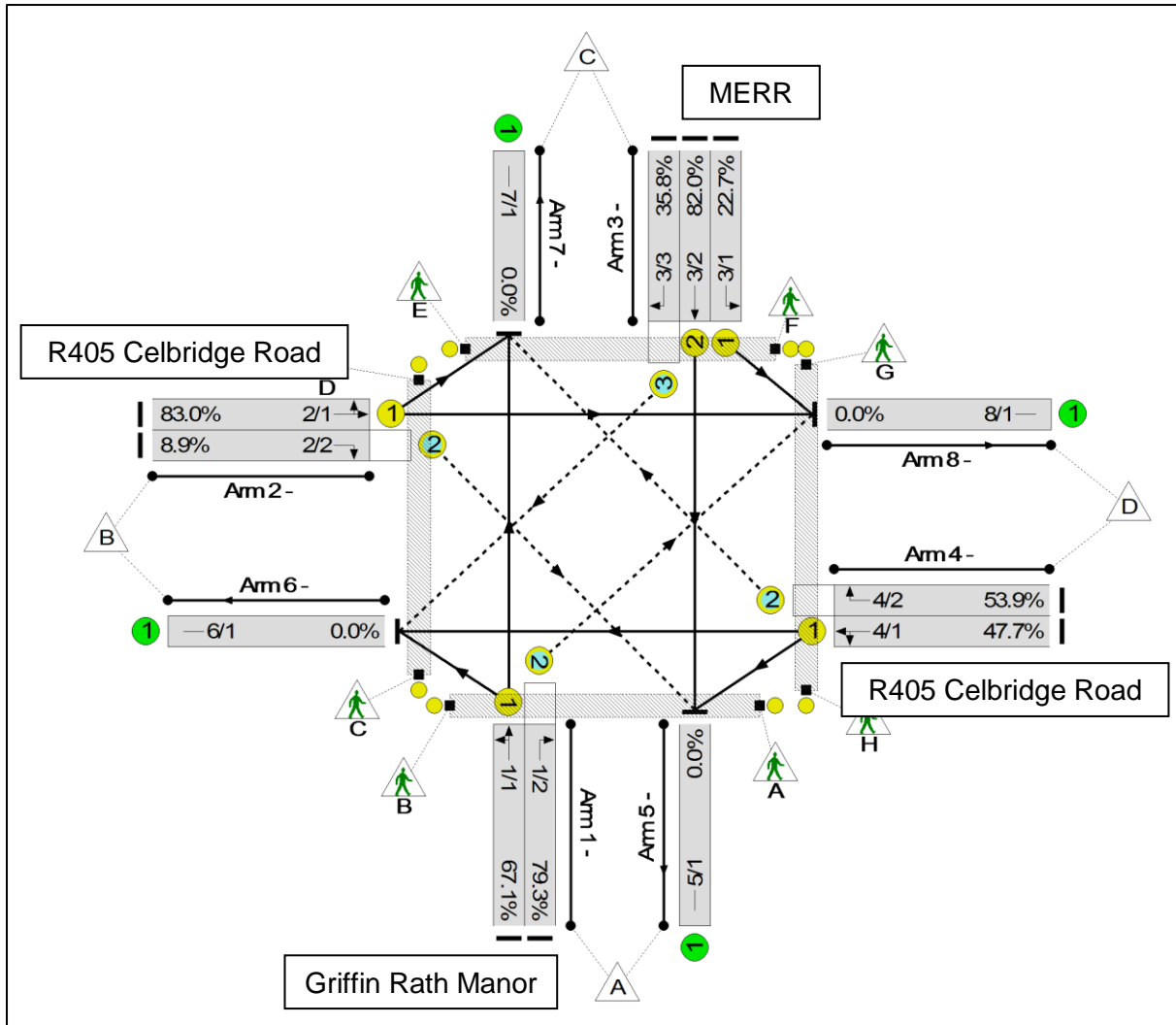


Figure C.3 Output from LinSig for Proposed Signalised Junction on R405 Celbridge Road during the AM Peak Hour

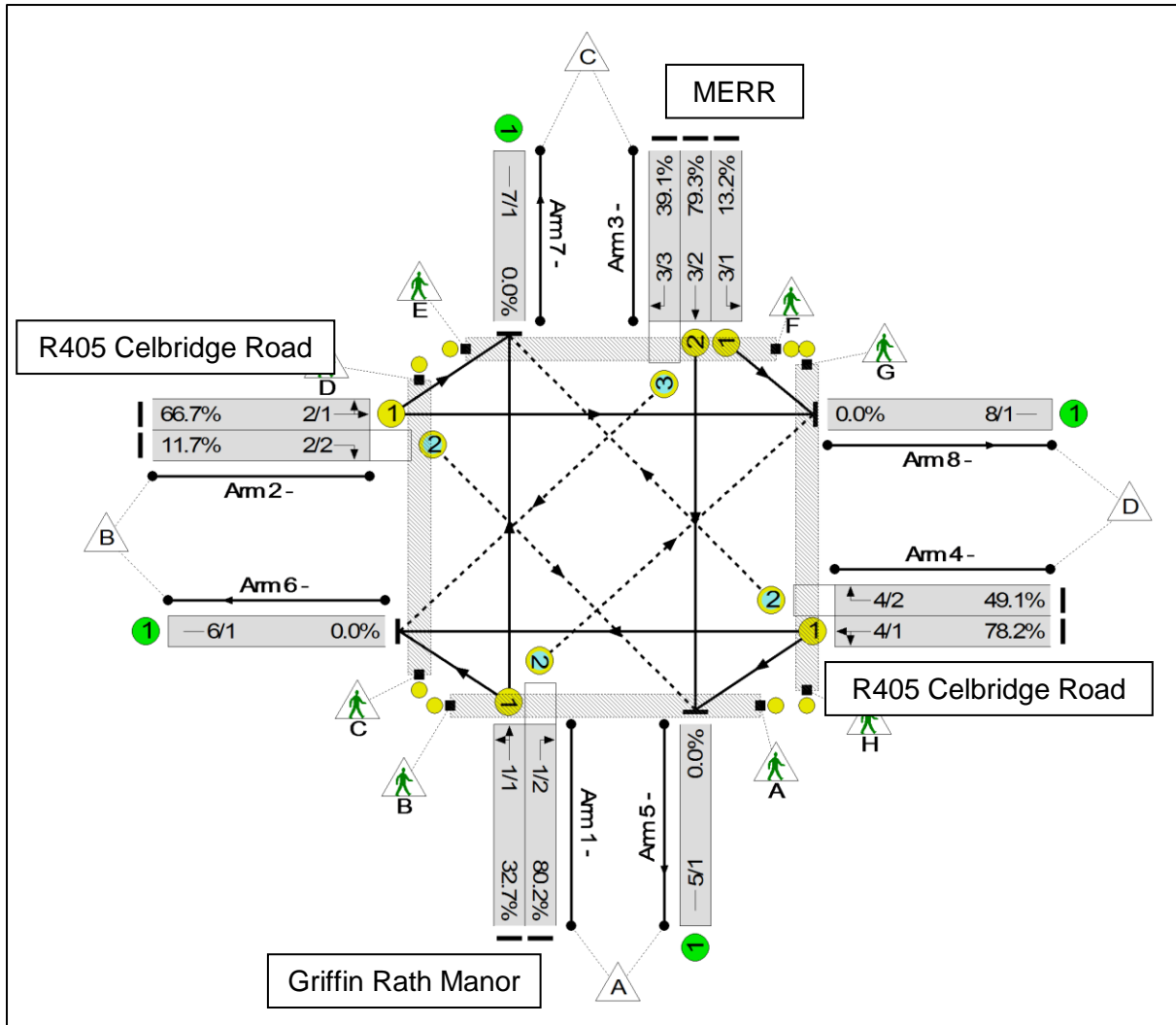


Figure C.4 Output from LinSig for Proposed Signalised Junction on R405 Celbridge Road during the PM Peak Hour

## **APPENDIX D**

### **AIR QUALITY AND CLIMATE APPENDICES**



## Ambient Air Quality Standards

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC) (see Table 4-26). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time which was the issue of acid rain. As a result of this sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, has been passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002), and has set limit values which came into operation on 17<sup>th</sup> June 2002. Council Directive 1999/30/EC, as relating to limit values for sulphur dioxide, nitrogen dioxide, lead and particulate matter, is detailed in Table 4-26. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM<sub>10</sub>, 40% for the hourly and annual limit value for NO<sub>2</sub> and 26% for hourly SO<sub>2</sub> limit values. The margin of tolerance commenced from June 2002, and started to reduce from 1 January 2003 and every 12 months thereafter by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, has published limit values for both carbon monoxide and benzene in ambient air as set out in Table 4-26. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08 which has been transposed into Irish Law as S.I. 180 of 2011. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. Provisions were also made for the inclusion of new ambient limit values relating to PM<sub>2.5</sub>. The margins of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regards to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for PM<sub>2.5</sub> are included in Directive 2008/50/EC. The approach for PM<sub>2.5</sub> was to establish a target value of 25 µg/m<sup>3</sup>, as an annual average (to be attained everywhere by 2010) and a limit value of 25 µg/m<sup>3</sup>, as an annual average (to be attained everywhere by 2015), coupled with a target to reduce human exposure generally to PM<sub>2.5</sub> between 2010 and 2020. This exposure reduction target will range from 0% (for PM<sub>2.5</sub> concentrations of less than 8.5 µg/m<sup>3</sup> to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 µg/m<sup>3</sup>). Where the AEI is currently greater than 22 µg/m<sup>3</sup> all appropriate measures should be employed to reduce this level to 18 µg/m<sup>3</sup> by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008 - 2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 µg/m<sup>3</sup> was set to be complied with by 2015 again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 96/62/EC as “a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 96/62/EC”. These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 96/62/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 96/62/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

An annual average limit for both NO<sub>x</sub> (NO and NO<sub>2</sub>) is applicable for the protection of vegetation in highly rural areas away from major sources of NO<sub>x</sub> such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex VI of EU Directive 1999/30/EC identifies that monitoring to demonstrate compliance with the NO<sub>x</sub> limit for the protection of vegetation should be carried out distances greater than:

- 5km from the nearest motorway or dual carriageway
- 5km from the nearest major industrial installation
- 20km from a major urban conurbation

As a guideline, a monitoring station should be indicative of approximately 1000 km<sup>2</sup> of surrounding area.

Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other things, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

### **Air Dispersion Modelling**

The inputs to the DMRB model consist of information on road layouts, receptor locations, annual average daily traffic movements, annual average traffic speeds and background concentrations<sup>(15)</sup>. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data.

The DMRB has recently undergone an extensive validation exercise<sup>(16)</sup> as part of the UK's Review and Assessment Process to designate areas as Air Quality Management Areas (AQMAs). The validation exercise was carried out at 12 monitoring sites within the UK

DEFRA's national air quality monitoring network. The validation exercise was carried out for NO<sub>x</sub>, NO<sub>2</sub> and PM<sub>10</sub>, and included urban background and kerbside/roadside locations, “open” and “confined” settings and a variety of geographical locations<sup>(16)</sup>.

In relation to NO<sub>2</sub>, the model generally over-predicts concentrations, with a greater degree of over-prediction at “open” site locations. The performance of the model with respect to NO<sub>2</sub> mirrors that of NO<sub>x</sub> showing that the over-prediction is due to NO<sub>x</sub> calculations rather than the NO<sub>x</sub>:NO<sub>2</sub> conversion. Within most urban situations, the model overestimates annual mean NO<sub>2</sub> concentrations by between 0 to 40% at confined locations and by 20 to 60% at open locations. The performance is considered comparable with that of sophisticated dispersion models when applied to situations where specific local validation corrections have not been carried out.

The model also tends to over-predict PM<sub>10</sub>. Within most urban situations, the model will over-estimate annual mean PM<sub>10</sub> concentrations by between 20 to 40%. The performance is comparable to more sophisticated models, which, if not validated locally, can be expected to predict concentrations within the range of ±50%.

Thus, the validation exercise has confirmed that the model is a useful screening tool for the Second Stage Review and Assessment, for which a conservative approach is applicable<sup>(16)</sup>.

## Dust Minimisation Plan

A dust minimisation plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within two hundred metres of the construction area.

In order to ensure mitigation of the effects of dust nuisance, a series of measures will be implemented. Site roads shall be regularly cleaned and maintained as appropriate, dry sweeping of large areas should be avoided. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only. Given the nature of the development it is unlikely any un-surfaced roads will be present. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions. All site fencing, barriers and scaffold should be kept clean using wet methods.

Prior to demolition blocks should be soft striped inside buildings (retaining walls and windows in the rest of the building where possible, to provide a screen against dust). During the demolition process explosive blasting should be avoided, water suppression should be used, preferably with a hand held spray. Only the use of cutting, grinding or sawing equipment fitted or used in conjunction with a suitable dust suppression technique such as water sprays/local extraction should be used. Drop heights from conveyors, loading shovels, hoppers and other loading equipment should be minimised, if necessary fine water sprays should be employed.

Vehicles delivering material with dust potential to an off-site location shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust. Access gates to be located at least 10 m from receptors where possible. Vehicles should have engines switched off when stationary – no idling. Similarly, the use of diesel or petrol powered generators should be avoided and electricity or battery powered equipment should be used when practical.

Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site shall be regularly inspected for cleanliness, and cleaned as necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. Record should be kept of all inspections of the haul routes and any subsequent action in a site log book.

Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods, activities such as scabbling should be avoided. Bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.

At all times, the procedures put in place will be strictly monitored and assessed by the contractor. In the event of dust nuisance occurring outside the site boundary, satisfactory procedures will be implemented to rectify the problem. Dust deposition monitoring should be put in place to ensure dust mitigation measures are controlling emissions. Dust monitoring

should be conducted using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m<sup>2</sup>\*day) during the monitoring period between 28-32 days.

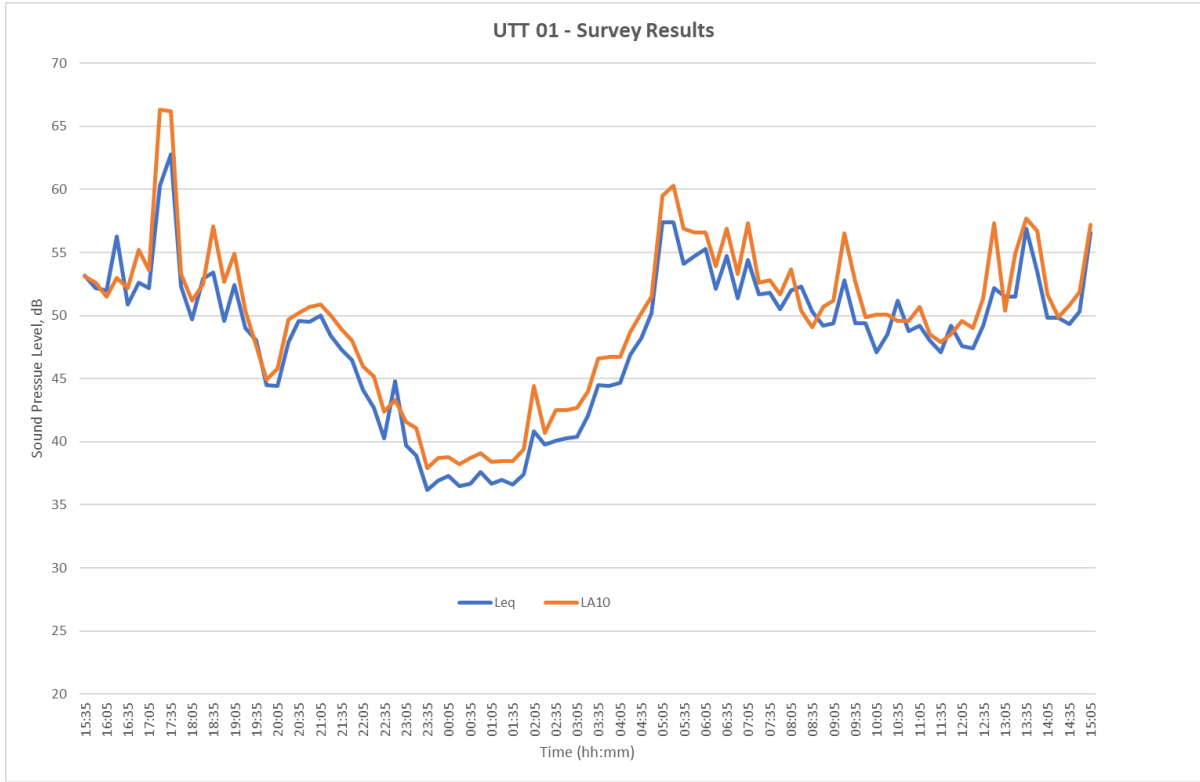
The Dust Minimisation Plan shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. The name and contact details of a person to contact regarding air quality and dust issues should be displayed on the site boundary, this notice board should also include head/regional office contact details. Community engagement before works commence on site should be put in place, including a communications plan. All dust and air quality complaints should be recorded and causes identified, along with the measures taken to reduce emissions. This complaints log should be available for viewing by the local authority, if requested. Daily on and off site inspections should occur for nuisance dust and compliance with the dust management plan. This should include regular dust soiling checks of surfaces such as street furniture, windows, and cars within 100m of the site boundary. Cleaning should be provided if necessary.

## **APPENDIX E**

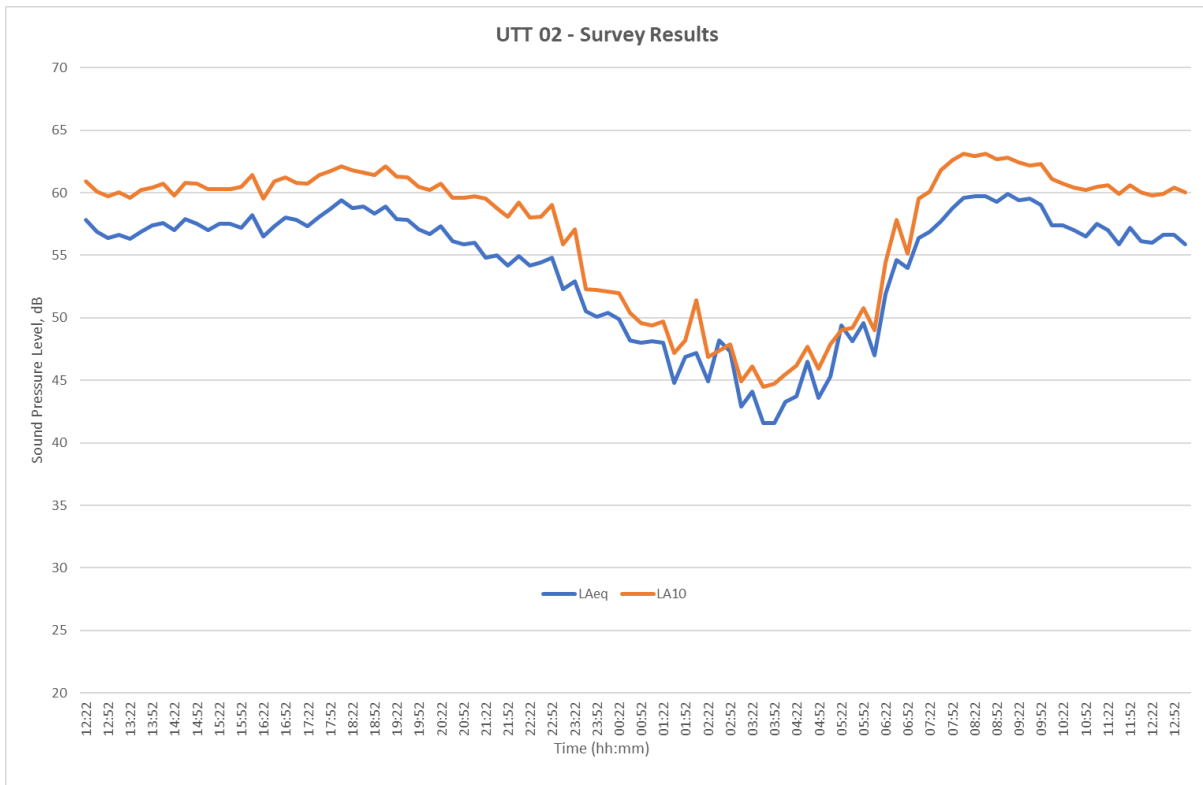
### **NOISE AND VIBRATION APPENDICES**



### Unattended Noise Survey Results for UTT 1



### Unattended Noise Survey Results for UTT 2



## **APPENDIX F**

### **FLOOD RISK ASSESSMENT**

# Maynooth Eastern Ring Road

MERR-ROD-EWE-SW\_ML-RP-EN-3001

## Flood Risk Assessment

May 2019



# Maynooth Eastern Ring Road

## Flood Risk Assessment

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## 1. INTRODUCTION

As part of the preliminary design of the Maynooth Eastern Ring Road, Roughan & O'Donovan Consulting Engineers has carried out a Flood Risk Assessment of the proposed road alignment, which are located on lands to the east of Maynooth town. This report has been prepared to assess the flood risk to the subject site and adjacent lands as a result of the proposed development.

## 2. METHODOLOGY

### 2.1 Introduction

This report has been prepared in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' herein referred to as 'The Guidelines' as published by the Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoHLE) in 2009.

### 2.2 Definition of Flood Risk

Flood risk is a combination of the likelihood of a flood event occurring and the potential consequences arising from that flood event and is then normally expressed in terms of the following relationship:

Flood risk = Likelihood of flooding x Consequences of flooding.

To fully assess flood risk an understanding of where the water comes from (i.e. the source), how and where it flows (i.e. the pathways) and the people and assets affected by it (i.e. the receptors) is required. Figure 2.1 below shows a source-pathway-receptor model reproduced from 'The Guidelines'.

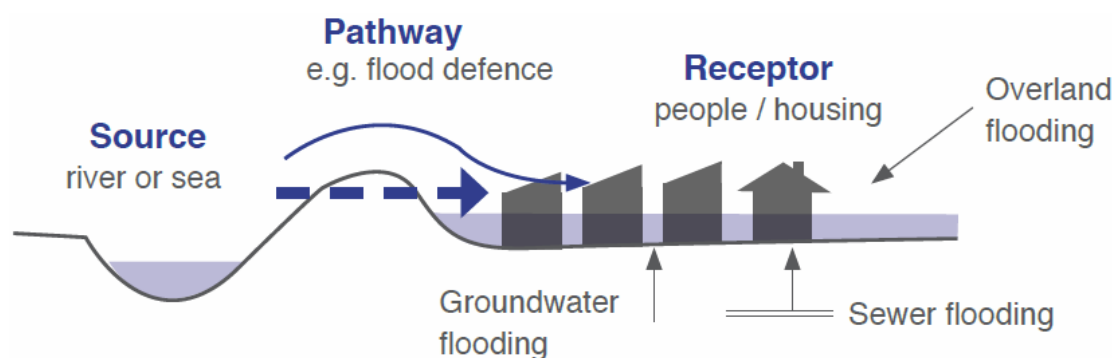


Figure 2.1: Source-Pathway-Receptor Model

The principal sources of flooding are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors can include people, their property and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

### 2.3 Likelihood of Flooding

The Guidelines define the likelihood of flooding as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as a return period or annual exceedance probability (AEP). A 1% AEP flood indicates a flood event that will be equalled or exceeded on average

once every hundred years and has a return period of 1 in 100 years. Annual Exceedance Probability is the inverse of return period as shown in Table 2.1 below.

**Table 2.1: Correlation between return period and AEP**

Return Period (years)	Annual Exceedance Probability (%)
1	100
10	10
50	2
100	1
200	0.5
1000	0.1

## 2.4 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and are split into three categories in The Guidelines:

### Flood Zone A

Flood Zone A where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

### Flood Zone B

Flood Zone B where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 and 0.5% or 1 in 200 for coastal flooding);

### Flood Zone C

Flood Zone C where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding. Flood Zone C covers all plan areas which are not in zones A or B.

It is important to note that when determining flood zones the presence of flood protection structures should be ignored. This is because areas protected by flood defences still carry a residual risk from overtopping or breach of defences and the fact that there is no guarantee that the defences will be maintained in perpetuity.

## 2.5 Objectives and Principles of the Planning Guidelines

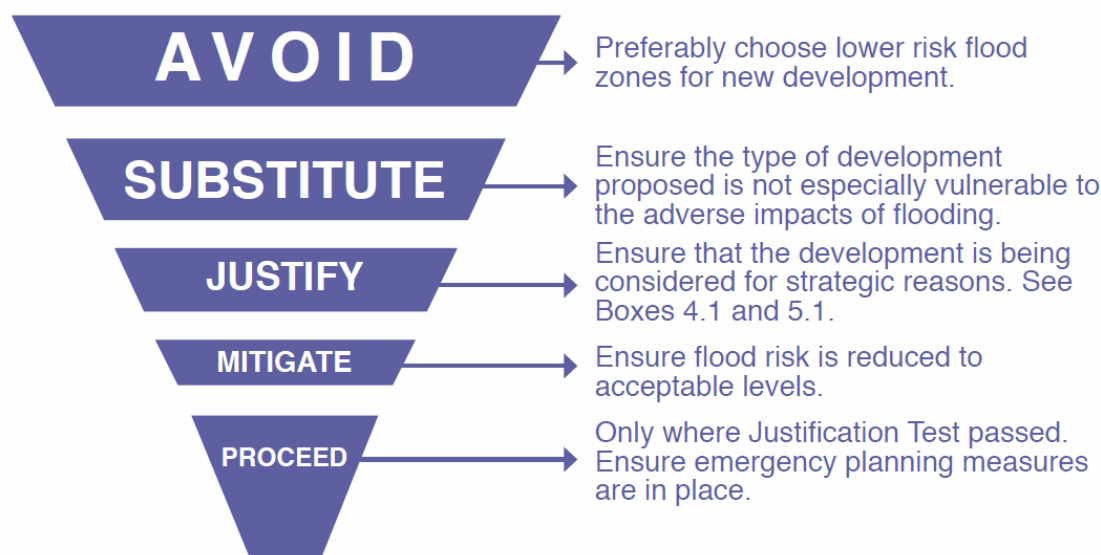
The principle actions when considering flood risk are set out in the planning guidelines and are summarised below:

- *“Flood hazard and potential risk should be determined at the earliest stage of the planning process...”*
- *“Development should preferentially be located in areas with little or no flood hazard thereby avoiding or minimising the risk....”*
- *“Development should only be permitted in areas at risk of flooding when there are no alternative, reasonable sites available...”*
- *“Where development is necessary in areas at risk of flooding an appropriate land use should be selected”*

- *A precautionary approach should be applied, where necessary, to reflect uncertainties in flooding datasets and risk assessment techniques...”*
- *“Land required for current and future flood management... should be proactively identified...”*
- *“Flood risk to, and arising from, new development should be managed through location, layout and design incorporating Sustainable Drainage Systems (SuDS) and compensation for any loss of floodplain...”*
- *Strategic environmental assessment (SEA) of regional planning guidelines, development plans and local area plans should include flood risk as one of the key environmental criteria...”*

## 2.6 The Sequential Approach and Justification Test

The Guidelines outline the sequential approach that is to be applied to all levels of the planning process. This approach should also be used in the design and layout of a development and the broad philosophy is shown in Figure 2.2 below. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach. However, this is not always possible as many town and city centres are within flood zones and are targeted for development.



**Figure 2.2: Sequential Approach (Source: The Planning System and Flood Risk Management)**

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The test comprises the following two processes.

- The first is the Plan-making Justification Test and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.
- The second is the Development Management Justification Test and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

Table 2.2 below illustrates the types of development that would be required to meet the Justification Test.



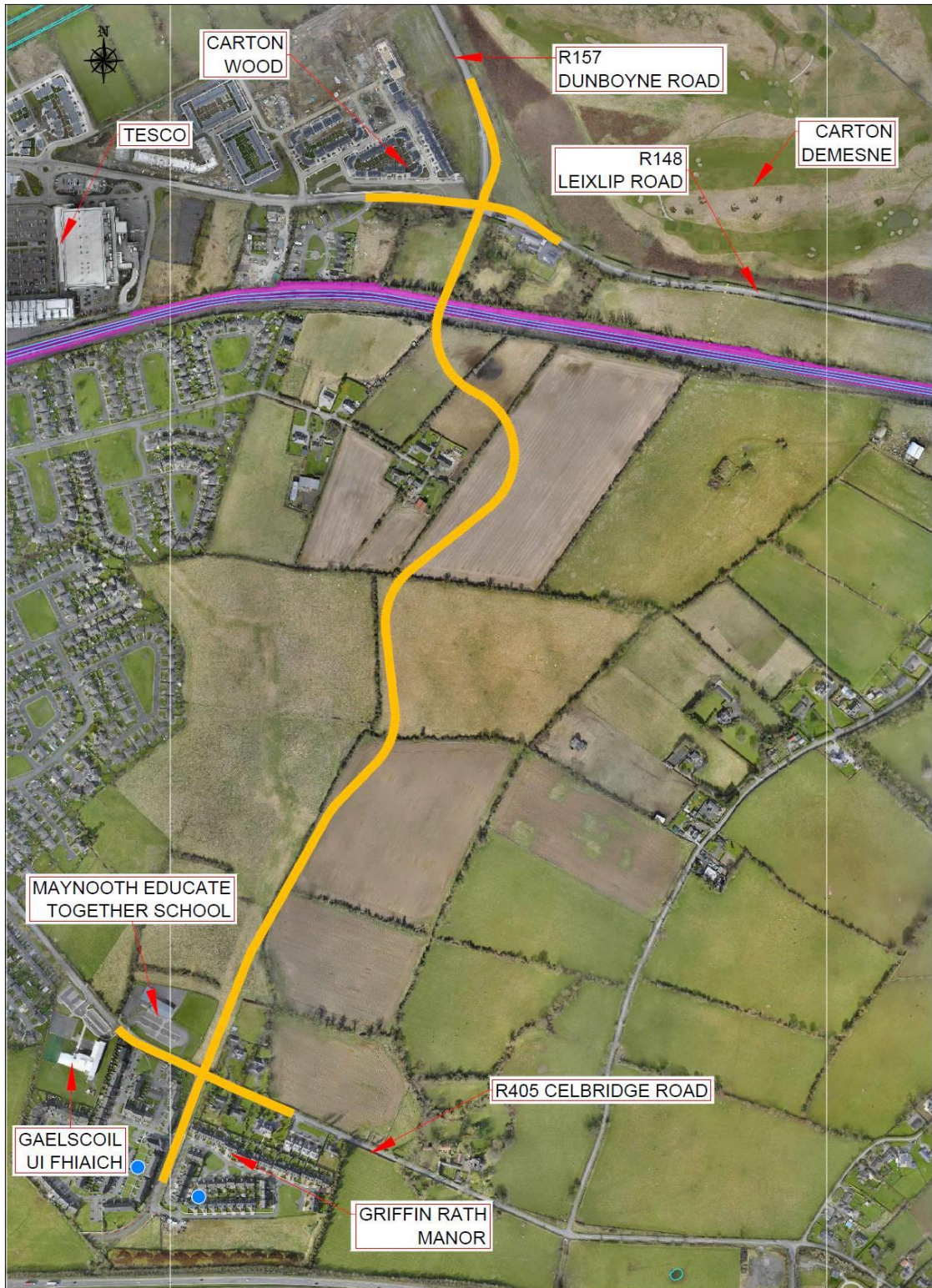
**Table 2.2: Matrix of Vulnerability Versus Flood Zone to Illustrate Appropriate Development and that Required to Meet the Justification Test (Source: The Planning System and Flood Risk Management)**

	Flood Zone A	Flood Zone B	Flood Zone C
<b>Highly vulnerable development (including essential infrastructure)</b>	Justification Test	Justification Test	Appropriate
<b>Less vulnerable development</b>	Justification Test	Appropriate	Appropriate
<b>Water-compatible development</b>	Appropriate	Appropriate	Appropriate

### 3. PROJECT SCOPE

The proposed development is located in the Railpark townland to the east of Maynooth, in a semi-urban area. The proposed road alignment is shown in figure 3.1 below. The proposed development will comprise approximately 1.55 km of ring road linking the R148 Leixlip Road and the R405 Celbridge Road in a north-south direction. The development will involve the upgrade of existing priority junctions to signal-controlled junctions existing roads, providing access to the R405 and the R148, and a new bridge crossing of the Royal Canal and Dublin/Sligo railway line. Additional aspects of the proposed development include pedestrian and cycle facilities and the provision of property accesses.

Local Authority drainage records indicate that a 900mm surface water sewer and a 300m foul sewer are located within Railpark to the west of the proposed alignment. A 400mm foul rising main runs parallel to the northern bank of the Royal Canal.



**Figure 3.1: Site Locations**

## 4. FLOOD RISK IDENTIFICATION

### 4.1 General

This Flood Risk Identification includes a review of the existing information and the identification of any flooding or surface water management issues in the vicinity of the proposed site that may warrant further investigation.

### 4.2 Information Sources Consulted

The following information sources were consulted as part of the Flood Risk Identification:

**Table 4.1: Information Sources Consulted**

Source	Comments
OPW Preliminary Flood Risk Assessment (PFRA) maps consulted	Fluvial, Pluvial, Coastal and Groundwater flooding examined;
OPW Benefitting Land Maps	Available at OPW Drainage District Viewer
OPW National Flood Hazard Mapping	<a href="http://www.floodmaps.ie">www.floodmaps.ie</a>
Geological Survey of Ireland (GSI) Maps	Utilised multiple data layers available at the GSI Groundwater Data viewer
OSI Historical Maps	OSI 6" and 25" mapping assessed
Catchment Flood Risk Assessment and Management Study (CFRAM)	No CFRAM mapping is available for the site.
Irish Coastal Protection Strategy Study (ICPSS)	No ICPSS maps available for non-costal/tidal waterbodies

#### 4.2.1 Predictive Flood Maps and Flood Hazard Records

##### (i) OPW Preliminary Flood Risk Assessment

The PFRA is a national screening exercise, based on available and readily derivable information, to identify areas where there may be a significant risk associated with flooding (referred to as Areas for Further Assessment or AFA's). As part of the PFRA study, maps of the country were produced showing the indicative fluvial, coastal, pluvial and groundwater flood extents.

The PFRA mapping for the proposed development site indicates that there is no fluvial derived flooding within 700m of the proposed site. The PFRA mapping also indicates that there is no groundwater derived flooding within Maynooth and its hinterland.

The PFRA mapping for the proposed development site indicates that there is 1 in 100 year pluvial flooding within and adjacent to the proposed site.

The *PFRA Maps for the area are reproduced in Appendix A.*

##### (ii) OPW Drainage Districts

Drainage Districts are areas where drainage schemes to improve land for agricultural purposes were constructed. Under the Arterial Drainage Act, 1945 the OPW undertook a number of arterial drainage schemes to improve land for agricultural production. The OPW has a statutory duty to maintain these schemes, which is delivered through their arterial drainage maintenance programme. The OPW does not have powers to undertake river or channel maintenance other than where these rivers form part of an arterial drainage scheme or flood relief schemes.

The OPW Drainage district maps do not indicate any section of the proposed alignment is within benefiting lands. The Rye River, which is approximately 500 meters north of the site is identified as an OPW managed watercourse.

*The OPW Drainage Districts are reproduced in Appendix B.*

**(iii) OPW National Flood Hazard Mapping**

The OPW National Flood Hazard Mapping Web Site, [www.floodmaps.ie](http://www.floodmaps.ie), was examined to identify any recorded flood events within the vicinity of the proposed development site. There are no records of flooding in the vicinity of the proposed development on the OPW flood hazard website. The closest recorded flood event is 750m within Maynooth Town.

*The OPW Flood Hazard Mapping is reproduced in Appendix C.*

**(iv) Ground Investigations**

In October 2018, Priority Geotechnical undertook ground investigations as part of the Maynooth Eastern Ring Road contract. Seventeen (17) cable percussion, eleven (11) rotary boreholes, seventeen (17) trial pits and twenty one (21) slit trenches were undertaken.

Groundwater was encountered between depths of 1.0m bgl and 6.7m bgl. The ground investigations indicate that clays are the predominant soil type throughout and the site is underlain by grey limestones.

*The Ground Investigation borehole logs are reproduced in Appendix D.*

**(v) Waterways Ireland Preliminary Flood Risk Analysis Report**

Waterways Ireland undertook a preliminary flood risk assessment in 2011 which looked at the possible flooding mechanisms arising from the national canal infrastructure and includes an analysis of historic flooding and potential future flooding of the Grand and Royal Canals. The conclusion of the PFRA report is that the Royal Canal infrastructure in Maynooth does not give rise to significant flood risk.

*The Waterways Ireland PFRA is reproduced in Appendix E.*

**(vi) Secondary Sources of Baseline Data**

The following sources were also examined to identify areas that may be liable to flooding:

**Table 4.2: Secondary Sources of Baseline Data**

Source	Data Gathered
<b>GSI Maps</b>	<p>GSI Teagasc subsoils map shows the proposed site is underlain by BminDW - Deep well drained mineral (Mainly basic) and BminPD - Mineral poorly drained (Mainly basic). Soil permeability is identified as moderate through the site.</p> <p>Records of Dugs Wells within the Railpark townland indicate that groundwater is less than 5.8m below the ground surface. The groundwater recharge rate for the site is indicated to be a maximum of 200mm/y, which is relatively low.</p> <p>No evidence of Karst features have been identified within the Railpark Townland. However, there appear to be a number of groundwater springs within the vicinity of the subject site. Refer to Appendix F for GSI maps.</p>
<b>Historical Maps</b>	<p>No areas of the site are labelled as "liable to flooding" or have other indicators of historic flooding. The historic mapping indicates a syphon under the canal that previously drained a small field boundary channel and groundwater spring. Refer to Appendix G for Historical Maps.</p>

## 5. FLOOD RISK IDENTIFICATION SUMMARY

In accordance with “The Planning System and Flood Risk Management Guidelines for Planning Authorities” the possible sources of flooding associated with this development have been identified. These are summarised in Table 5.1 (taken from Appendix A of the Guidelines).

**Table 5.1: Possible Sources of Flooding Associated within the Dublin Port Sites**

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	Overland flow, out of bank	Proposed Site (Railpark)	Low Possibility	Medium (due to the nature of the development)	Low (due to relative elevation and distance of site to nearest tidal waterbody.)
Fluvial	Overland flow, out of bank	Proposed Site (Railpark)	Possible	Medium (due to the nature of the development)	Low (none of the queried sources indicate that there is fluvial derived flood risk or out of bank flooding from the canal)
Pluvial / Surface Water	Overland flow	Proposed Site (Railpark)	Possible	Medium (due to the nature of the development)	Low (if appropriate drainage system is incorporated in development and maintained appropriately)
Ground Water	Rising levels	Proposed Site (Railpark)	Possible	Medium (due to the nature of the development)	Low (due to soil drainage characteristics including moderate soil permeability)

The information provided in this section identifies that there is possible flood risk within the proposed site. The potential flood risk is assessed further in Stage 2.

## 6. STAGE 2 – INITIAL FLOOD RISK ASSESSMENT

### 6.1 General

A Stage 2 SFRA (initial flood risk assessment) was undertaken to:

- Confirm the sources of flooding that may affect the subject site;
- Appraise the adequacy of existing information as identified by the Stage 1 FRA.

### 6.2 Sources of Flooding

#### Flooding from Fluvial & Sea Level Rises / Coastal Flooding

The proposed alignment of the Maynooth Eastern Ring Road crosses the Royal Canal and terminates 500m south of the Rye River. The site is not indicated to flood from fluvial or tidal sources in extreme events up to 1 in 1000 year (0.1%AEP). Previous studies by Waterways Ireland indicate that there is a low risk of flooding



arising from the Royal Canal in Maynooth. A small field boundary channel and syphon under the canal that historically took discharge from a groundwater spring now appears to be dry following the blockage/covering over of the spring. The proposed site is considered to not require a stage 3 detailed flood risk assessment with respect to flooding derived from fluvial and tidal sources.

### **Surface Water Flooding**

Surface water flooding occurs when the local drainage system cannot convey stormwater flows from extreme rainfall events. The rainwater does not drain away through the normal drainage pathways or infiltrate into the ground but instead ponds on or flows over the ground instead. Surface water flooding is unpredictable as it depends on a number of factors including ground levels, rainfall and the local drainage network. The drainage network for the proposed development on the site will incorporate Sustainable Drainage Systems (SuDS) for the purpose for managing surface water in terms of both flow and quality. The proposed site is not considered to require a stage 3 detailed flood risk assessment with respect to surface water flooding.

### **Groundwater Flooding**

Ground water flooding is a result of upwelling in occurrences where the water table or confined aquifers rises above the ground surface. This tends to occur after long periods of sustained rainfall and/or very high tides. High volumes of rainfall and subsequent infiltration to ground will result in a rising of the water table. Groundwater flooding tends to occur in low-lying areas where, with additional groundwater flowing towards these areas, the water table can rise to the surface causing groundwater flooding. The ground investigations recorded significant variation in ground water levels throughout the site, this may be due to the clay soils creating highly localised perched water tables. Groundwater springs identified in historic mapping appear to have been blocked/covered over and no longer discharge to the surface. The sources consulted such as the PFRA mapping and GSI records show no indication that the subject site is subject to groundwater derived flooding. Factors such as soil permeability and drainage characteristics indicates that the risk of groundwater flooding is low. The proposed development is not considered to require a stage 3 detailed flood risk assessment with respect to groundwater flooding.

### **Pluvial Flood Risk**

Pluvial flooding results from heavy rainfall that exceeds ground infiltration capacity or more commonly in Ireland where the ground is already saturated from previous rainfall events. This causes ponding and flooding at localized depressions. Pluvial flooding is commonly a result of changes to the natural flow regime such as the implementation of hard surfacing and improper drainage design. The sources consulted such as the PFRA mapping indicate that the proposed development site is subject to pluvial derived flooding at topographic low points. Pluvial flooding will be managed the design and implementation of sustainable drainage systems as part of planned development. The proposed development is not considered to require a stage 3 detailed flood risk assessment with respect to flooding derived from pluvial sources.

## **7. COMPLIANCE WITH THE PLANNING SYSTEM AND FLOOD RISK MANAGEMENT GUIDELINES**

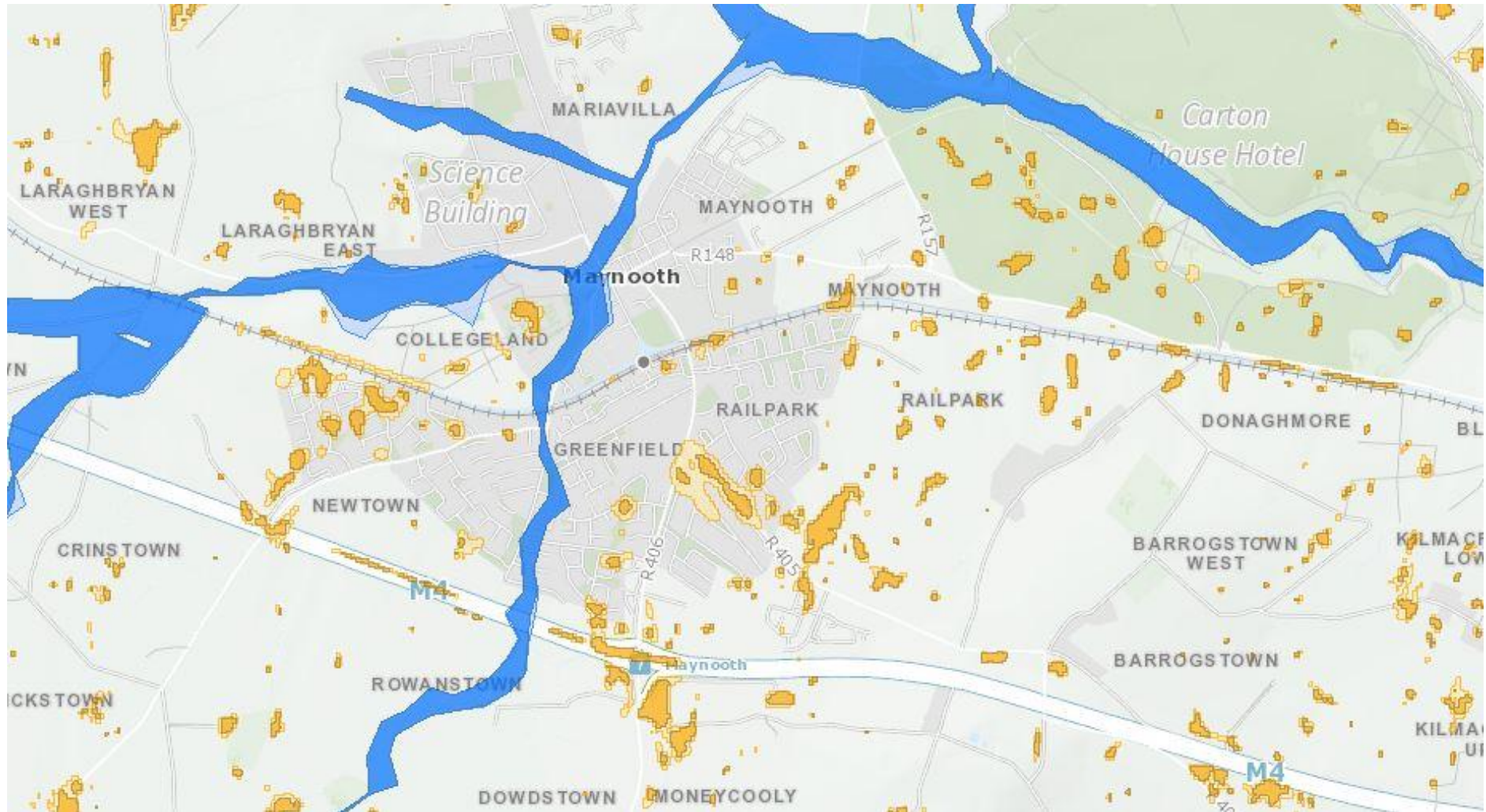
The consulted sources indicate that the proposed alignment of the Maynooth Eastern Ring Road is within Flood Zone C as per the 2009 OPW Flood Risk Guidelines for Planning Authorities. The Guidelines state that all types of developments are suitable within flood zone C.

## **8. FLOOD RISK ASSESSMENT CONCLUSIONS**

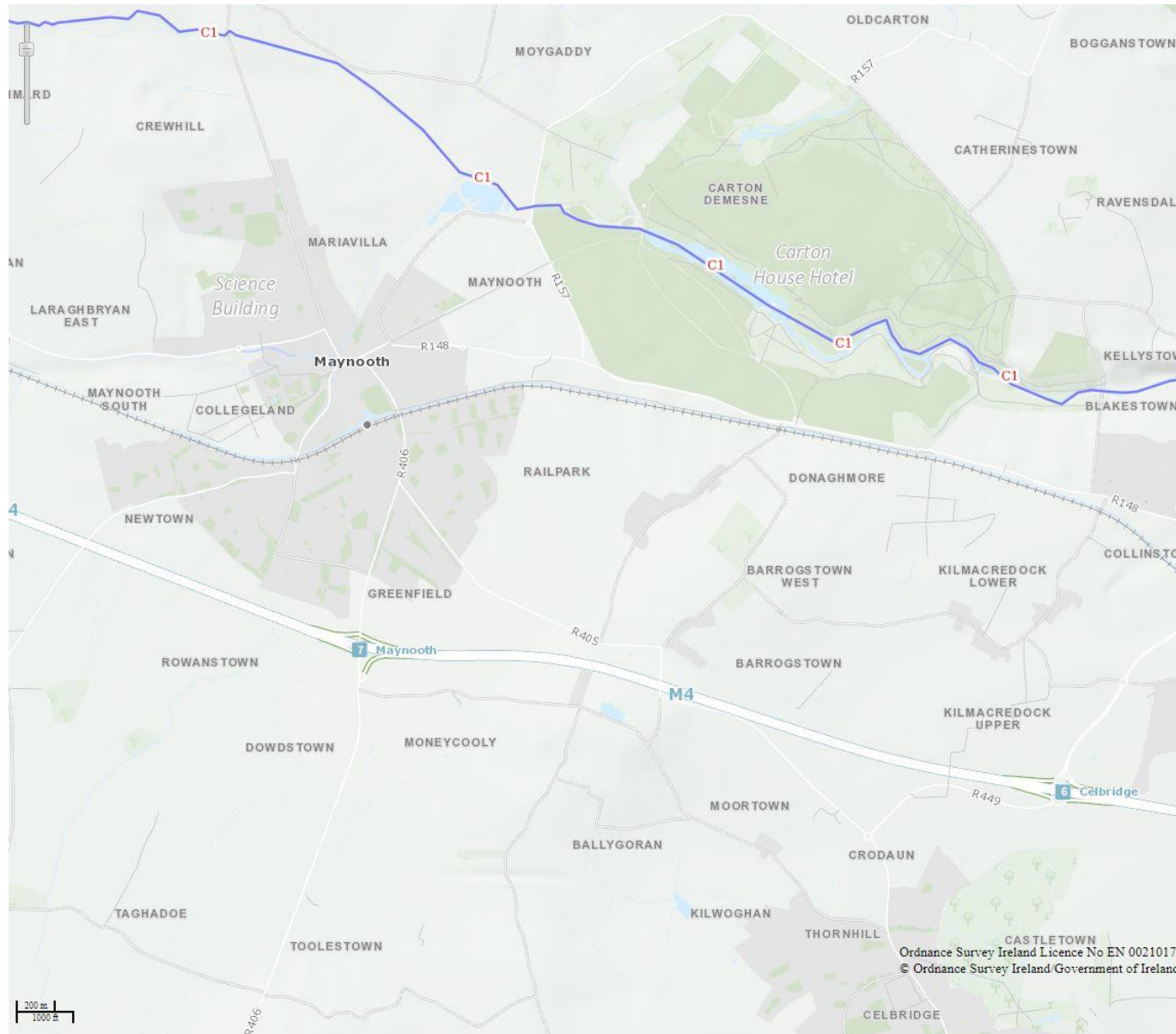
The proposed alignment of the Maynooth Eastern Ring Road has been assessed for existing and future sources of flood risk. The primary source of flood risk identified for the sites pluvial flooding. The proposed development is suitable for the associated flood risk as per the OPW Guidelines. The drainage network for the proposed development on the site will incorporate Sustainable Drainage Systems (SuDS) for the purpose for managing surface water in terms of both flow and quality.



## **APPENDIX A PFRA MAPS**



## **APPENDIX B OPW BENEFITTING LAND MAPS**



## **APPENDIX C OPW FLOOD HAZARD RECORDS**

**OPW** National Flood Hazard Mapping

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**Summary Local Area Report**

This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

**The map centre is in:**  
**County:** Kildare  
**NGR:** N 950 369

This Flood Report has been downloaded from the Web site [www.floodmaps.ie](http://www.floodmaps.ie). The users should take account of the restrictions and limitations relating to the content and use of this Web site that are explained in the Disclaimer box when entering the site. It is a condition of use of the Web site that you accept the User Declaration and the Disclaimer.

Map Scale 1:33,434

**Map Legend**

	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

\* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained in the Glossary.

**8 Results**

- |  |  |  |
|--|--|--|
|  | <p>1. Meadowbrook Greenfield M4 Nov 2000<br/>                     County: Kildare</p> <p>Additional Information: <a href="#">Reports (5)</a> <a href="#">Press Archive (2)</a> <a href="#">More Mapped Information</a></p>                           | <p>Start Date: 05/Nov/2000<br/>                     Flood Quality Code:2</p> |
|  | <p>2. Meadowbrook Estate Parson St Maynooth Nov 2000<br/>                     County: Kildare</p> <p>Additional Information: <a href="#">Photos (1)</a> <a href="#">Reports (3)</a> <a href="#">More Mapped Information</a></p>                      | <p>Start Date: 05/Nov/2000<br/>                     Flood Quality Code:2</p> |
|  | <p>3. Lyreen Maynooth College Nov 2000<br/>                     County: Kildare</p> <p>Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (5)</a> <a href="#">More Mapped Information</a></p>                             | <p>Start Date: 05/Nov/2000<br/>                     Flood Quality Code:2</p> |
|  | <p>4. Ryewater Maynooth Carton Nov 2000<br/>                     County: Kildare</p> <p>Additional Information: <a href="#">Photos (1)</a> <a href="#">Reports (1)</a> <a href="#">Press Archive (6)</a> <a href="#">More Mapped Information</a></p> | <p>Start Date: 05/Nov/2000<br/>                     Flood Quality Code:2</p> |
|  | <p>5. Lyreen Maynooth Nov 2002<br/>                     County: Kildare</p>  | <p>Start Date: 15/Nov/2002<br/>                     Flood Quality Code:2</p> |

Report Produced: 26-Apr-2018 10:25

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Additional Information: [Reports \(2\)](#) [Videos \(3\)](#) [Press Archive \(5\)](#) [More Mapped Information](#)



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6. Laurence Avenue, Maynooth Nov 2002

Start Date: 14/Nov/2002

County: Kildare

Flood Quality Code:3

Additional Information: [Reports \(2\)](#) [More Mapped Information](#)



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7. Lyreen Maynooth University June 1993

Start Date: 01/Jun/1993

County: Kildare

Flood Quality Code:2

Additional Information: [Reports \(1\)](#) [More Mapped Information](#)



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8. Lyreen River 24th Oct 2011 Maynooth

Start Date: 24/Oct/2011

County: Kildare

Flood Quality Code:2

Additional Information: [Reports \(1\)](#) [More Mapped Information](#)

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Report Produced: 26-Apr-2018 10:25



## **APPENDIX D GROUND INVESTIGATION BOREHOLE LOGS**





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Drilled By:

PC, KC

Logged By:

OD

Borehole No.

**BH102**

Sheet 1 of 1

<b>Project Name:</b> Maynooth Eastern Ring Road	<b>Project No.:</b> P18247	<b>Co-ords:</b>	<b>Hole Type:</b> CP
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<b>Location:</b> Co. Kildare	<b>Level:</b>	<b>Scale:</b> 1:50
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<b>Client:</b> Kildare County Council	<b>Date:</b> 22/01/2019 - 22/01/2019
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Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 0.50	B				Brown, slightly gravelly, damp CLAY. Gravel is fine to coarse and sub angular to sub rounded.		
		0.50 - 1.20	B		0.50				
		1.00	SPT (C)	25 (10,15/25 for 10mm)	1.30		Brown, slightly gravelly CLAY with low cobble content. Gravel is fine to coarse and sub angular to sub rounded. Cobbles are up to 140mm and sub angular to sub rounded.	1	
		End of Borehole at 1.300m							2
									3
									4
									5
									6
									7
									8
									9

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered	1.30	200	200	1.20	1.30	01:00	Chisel.
					<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> Borehole terminated at 1.30m bgl due to obstruction	<b>Shift Data:</b>		<b>GW (m bgl)</b>	<b>Shift</b>	<b>Depth (m bgl)</b>	<b>Remarks</b>
		Dry	22/01/2019 08:00	0.00	Start of borehole	
			22/01/2019 18:00	1.30	End of borehole	



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Drilled By: PC  
 Logged By:  
 Borehole No. **BH103**  
 Sheet 1 of 1

Project Name: Maynooth Eastern Ring Road Project No. P18247 Co-ords: Hole Type CP

Location: Co. Kildare Level: Scale 1:50

Client: Kildare County Council Date: 24/01/2019 - 24/01/2019

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00	B				Brown, CLAY.		
		1.00 - 2.00 1.00	B SPT (C)	N=22 (3,3/6,6,5,5)	1.00		Brown, CLAY with cobble content. Cobbles are Limestone lithology.	1	
		2.00	SPT (C)	50 (25 for 5mm/50 for 0mm)	2.10		End of Borehole at 2.100m	2	
								3	
								4	
								5	
								6	
								7	
								8	
								9	

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered.	2.10	200	200	2.00	2.10	01:00	Chisel.
					<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> BH103 terminated at 2.1m bgl, obstruction.	<b>Shift Data:</b>		GW (m bgl)	Shift	Depth (m bgl)	Remarks
				19/02/2019 08:00	0.00	Start of shift.
			Dry	19/02/2019 18:00	2.40	End of borehole.



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Borehole No.

**BH104**

Sheet 1 of 1

<b>Project Name:</b> Maynooth Eastern Ring Road	<b>Project No.:</b> P18247	<b>Co-ords:</b>	<b>Hole Type:</b> CP
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<b>Location:</b> Co. Kildare	<b>Level:</b>	<b>Scale:</b> 1:50
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<b>Client:</b> Kildare County Council	<b>Date:</b> 23/01/2019 - 23/01/2019
---------------------------------------	--------------------------------------

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00	B						
		1.00 - 2.00 1.00	B SPT (C)	N=8 (2,2/2,2,2,2)	1.00			Brown, slightly gravelly CLAY. Gravel is fine to coarse and sub angular to sub rounded.	1
					2.30			Brown, slightly sandy gravelly CLAY with moderate cobble content. Sand is fine to coarse. Gravel is fine to coarse and sub angular to sub rounded. Cobbles are up to 180mm and sub angular to sub rounded.	2
								End of Borehole at 2.300m	3
									4
									5
									6
									7
									8
									9

<b>Groundwater:</b>				<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
2.00	1.90	20		2.30	200	200	2.20	2.30	01:00	Chisel.
				<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> Borehole terminated at 2.30m bgl due to obstruction.	<b>Shift Data:</b>	GW (m bgl)	Shift	Depth (m bgl)	Remarks
		1.90	23/01/2019 08:00	0.00	Start of borehole
				2.30	End of borehole



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Borehole No.  
**BH105**  
 Sheet 1 of 1

Project Name: Maynooth Eastern Ring Road      Project No. P18247      Co-ords:      Hole Type CP

Location: Co. Kildare      Level:      Scale 1:50

Client: Kildare County Council      Date: 24/01/2019 - 24/01/2019

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 0.85	B				Brown, CLAY with cobble content. Cobbles are angular.		
		0.85	SPT (C)	50 (25 for 0mm/50 for 0mm)	0.90		End of Borehole at 0.900m	1	
								2	
								3	
								4	
								5	
								6	
								7	
								8	
								9	

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered.	0.90	200	200	0.85	0.90	01:00	Chisel.
					<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> Borehole terminated at 0.9m bgl. obstruction.	<b>Shift Data:</b>				
	GW (m bgl)	Shift	Depth (m bgl)	Remarks	
	Dry	24/01/2019 08:00	0.00	Start of shift.	
		Dry	24/01/2019 18:00	0.90	End of borehole.



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Borehole No.  
**BH106**  
Sheet 1 of 1

Project Name: Maynooth Eastern Ring Road      Project No. P18247      Co-ords:      Hole Type CP

Location: Co. Kildare      Level:      Scale 1:50

Client: Kildare County Council      Date: 23/01/2019 - 23/01/2019

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00	B				Brown, slightly gravelly CLAY with low cobble content. Gravel is fine to coarse. Cobbles are up to 140mm and sub angular to sub rounded.		
		1.00 - 2.00 1.00	B SPT (C)	N=9 (2,2/3,2,2,2)	1.00		Brown, slightly gravelly CLAY with moderate cobble content. Gravel is fine to coarse. Cobbles are up to 140mm and sub angular to sub rounded.	1	
		2.00 - 3.00 2.00	B SPT (C)	N=16 (3,3/4,4,4,4)	2.00		Brown, slightly gravelly CLAY with low cobble content. Gravel is fine to coarse. Cobbles are up to 140mm and sub angular to sub rounded.	2	
		3.00	SPT (C)	N=58 (4,8/58 for 230mm)	3.60			3	
							End of Borehole at 3.600m	4	
								5	
								6	
								7	
								8	
								9	

<b>Groundwater:</b>				<b>Hole Information:</b>			<b>Chiselling Details:</b>				
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				See shift data	3.60	200	200	1.80	2.00	01:00	Chisel.
								3.55	3.60	01:00	Chisel.
				<b>Equipment:</b> Dando 2000							

<b>Remarks:</b> Borehole terminated at 3.60m bgl due to obstruction.	<b>Shift Data:</b>		GW (m bgl)	Shift	Depth (m bgl)	Remarks
				23/01/2019 08:00	0.00	Start of borehole
			Dry	23/01/2019 18:00	3.60	End of borehole





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Borehole No.

**BH107**

Sheet 1 of 1

<b>Project Name:</b> Maynooth Eastern Ring Road	<b>Project No.:</b> P18247	<b>Co-ords:</b>	<b>Hole Type:</b> CP
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<b>Location:</b> Co. Kildare	<b>Level:</b>	<b>Scale:</b> 1:50
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<b>Client:</b> Kildare County Council	<b>Date:</b> 24/01/2019 - 24/01/2019
---------------------------------------	--------------------------------------

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00	B		0.30		Topsoil		
		1.00 - 2.00 1.00	B SPT (C)	N=10 (2,2/2,2,3,3)			Brown, slightly gravelly CLAY with low cobble content. Gravel is fine to coarse. Cobbles are up to 140mm and sub angular to sub rounded.	1	
		2.00 - 3.00 2.00	B SPT (C)	N=17 (3,3/4,4,5,4)				2	
		3.00 - 3.60 3.00	B SPT (C)	N=33 (4,4/5,9,9,10)	3.60			3	
		End of Borehole at 3.600m							4
									5
									6
									7
									8
									9

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				Non encountered	3.60	200	200	2.90	3.00	01:00	Chisel.
								3.50	3.60	01:00	Chisel.
					<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> Borehole terminated at 3.60m bgl due to obstruction	<b>Shift Data:</b>	GW (m bgl)	Shift	Depth (m bgl)	Remarks
		Dry	24/01/2019 08:00	0.00	Start of borehole
			24/01/2019 18:00	3.60	End of borehole



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Borehole No.  
**BH108**  
Sheet 1 of 1

Project Name: Maynooth Eastern Ring Road Project No. P18247 Co-ords: Hole Type CP

Location: Co. Kildare Level: Scale 1:50

Client: Kildare County Council Date: 25/01/2019 - 25/01/2019

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00	B				Brown, slightly gravelly CLAY with rootlets. Gravel is fine to coarse and sub angular to sub rounded.		
		1.00 - 2.00 1.00	B SPT (C)	N=11 (2,2/2,3,3,3)	1.00		Brown, slightly sandy gravelly CLAY with moderate cobble content. Sand is fine to coarse. Gravel is fine to coarse and sub angular to angular. Cobbles are up to 160mm and sub angular to angular.	1	
		2.00 - 3.00 2.00	B SPT (C)	N=22 (3,3/6,6,5,5)				2	
		3.00	SPT (C)	25 (35 for 75mm/25 for 0mm)	3.20			3	
							End of Borehole at 3.200m	4	
								5	
								6	
								7	
								8	
								9	

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered	3.20	200	200	3.10	3.20	01:00	Chisel.
					<b>Equipment:</b> Dando 2000						

**Remarks:** Borehole terminated at 3.20m bgl due to obstruction.

<b>Shift Data:</b>	GW (m bgl)	Shift	Depth (m bgl)	Remarks
		25/01/2019 08:00	0.00	Start of borehole
	Dry	25/01/2019 18:00	3.20	End of borehole



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Borehole No.  
**BH109**  
 Sheet 1 of 1

Project Name: Maynooth Eastern Ring Road Project No. P18247 Co-ords: Hole Type CP

Location: Co. Kildare Level: Scale 1:50

Client: Kildare County Council Date: 29/01/2019 - 29/01/2019

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00	B		1.00			Brown, slightly gravelly SILT with rootlets. Gravel is fine to coarse and sub angular to sub rounded.	1
		0.00 - 1.00	D						
		1.00 - 2.00	B	N=12 (2,2/3,3,3,3)					
		1.00 - 2.00 1.00	D SPT (C)						
2.00 - 3.00	B	N=17 (4,3/3,4,5,5)							
2.00 - 3.00 2.00	D SPT (C)								
		3.00 - 4.00	B	N=19 (4,4/5,5,4,5)	2.00		Brown, slightly gravelly CLAY with moderate cobble content. Gravel is fine to coarse and sub angular to sub rounded. Cobbles are up to 150mm and sub angular to sub rounded.	2	
		3.00	D SPT (C)						
		4.00	B	25 (9,11/25 for 5mm)					
		4.00	D SPT (C)						
		End of Borehole at 4.100m						4	
								5	
								6	
								7	
								8	
								9	

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered	4.10	200	200	2.75	2.90	01:00	Chisel.
								4.05	4.10	01:00	Chisel.
					<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> Borehole terminated at 4.10m bgl due to obstruction.	<b>Shift Data:</b>		GW (m bgl)	Shift	Depth (m bgl)	Remarks
				29/01/2019 08:00	0.00	Start of borehole
				29/01/2019 18:00	4.10	End of borehole



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Borehole No.  
**BH110**  
Sheet 1 of 1

Project Name: Maynooth Eastern Ring Road      Project No. P18247      Co-ords:      Hole Type CP

Location: Co. Kildare      Level:      Scale 1:50

Client: Kildare County Council      Date: 30/01/2019 - 30/01/2019

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00 0.00 - 1.00	B D		1.00		Brown, slightly gravelly SILT. Gravel is fine to coarse and sub angular to sub rounded.	1	
		1.00 - 2.00 1.00 - 2.00 1.00	B D SPT (C)	N=10 (2,2/2,2,3,3)			Brown, slightly gravelly, damp CLAY. Gravel is fine to coarse and sub angular to sub rounded.		
		2.00	SPT (C)	N=40 (4,4/5,9,11,15)	2.50		End of Borehole at 2.500m	2	
								3	
								4	
								5	
								6	
								7	
								8	
								9	

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
2.00	1.75	20			2.50	200	200	2.35	2.50	01:00	Chisel.
					<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> Borehole terminated at 2.50m bgl due to obstruction	<b>Shift Data:</b>			
	GW (m bgl)	Shift	Depth (m bgl)	Remarks
	1.75	30/01/2019 08:00	0.00	Start of borehole
		30/01/2019 18:00	2.50	End of borehole





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Borehole No.  
**BH112**  
 Sheet 1 of 1

Project Name: Maynooth Eastern Ring Road      Project No. P18247      Co-ords:      Hole Type CP

Location: Co. Kildare      Level:      Scale 1:50

Client: Kildare County Council      Date: 31/01/2019 - 31/01/2019

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description			
		Depth (m bgl)	Type	Results							
		0.00 - 1.00	B		0.30			Topsoil	1		
		0.00 - 1.00	D					Brown, slightly gravelly CLAY. Gravel is fine to coarse.			
		1.00 - 2.00	B					N=8 (1,1/1,1,3,3)			
		1.00 - 2.00	D								
1.00	SPT (C)						2				
		2.00 - 3.00	B	N=33 (3,3/9,9,9,6)	2.00			Brown, clayey GRAVEL with moderate cobble content. Gravel is fine to coarse. Cobbles are up to 140mm and sub angular to sub rounded.	2		
		2.00	SPT (C)								
		3.00	SPT (C)	25 (15,15/25 for 0mm)	3.20			End of Borehole at 3.200m	3		
										4	
									5		
									6		
									7		
									8		
									9		

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered	3.20	200	200	3.10	3.20	01:00	Chisel.
					<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> Borehole terminated at 3.20m bgl due to obstruction.	<b>Shift Data:</b>			
	GW (m bgl)	Shift	Depth (m bgl)	Remarks
	Dry	31/01/2019 08:00	0.00	Start of borehole
		31/01/2019 18:00	3.20	End of borehole



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Borehole No.  
**BH113**  
Sheet 1 of 1

Project Name: Maynooth Eastern Ring Road      Project No. P18247      Co-ords:      Hole Type CP

Location: Co. Kildare      Level:      Scale 1:50

Client: Kildare County Council      Date: 05/02/2019 - 05/02/2019

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00	B		0.30			Topsoil	
		0.00 - 1.00	D						
		1.00 - 2.00	B	N=22 (2,2/3,3,6,10)				Brown, slightly gravelly CLAY. Gravel is fine to coarse. .	1
		1.00 - 2.00	D						
		1.20	SPT (C)	0 (50 for 0mm/0 for 0mm)	1.70			End of Borehole at 1.700m	2
		1.60	SPT (C)						
									3
									4
									5
									6
									7
									8
									9

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered	1.70	200	200	1.60	1.70	01:00	Chisel.
					<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> Borehole terminated at 1.70m bgl due to obstruction.	<b>Shift Data:</b>			
	GW (m bgl)	Shift	Depth (m bgl)	Remarks
		05/02/2019 08:00	0.00	Start of borehole
	05/02/2019 18:00	1.70	End of borehole	





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Borehole No.

**BH114**

Sheet 1 of 1

<b>Project Name:</b> Maynooth Eastern Ring Road	<b>Project No.:</b> P18247	<b>Co-ords:</b>	<b>Hole Type:</b> CP
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<b>Location:</b> Co. Kildare	<b>Level:</b>	<b>Scale:</b> 1:50
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<b>Client:</b> Kildare County Council	<b>Date:</b> 01/02/2019 - 01/02/2019
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Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00	B				Brown SILT with medium cobble content.		
		1.00 - 1.80 1.00	B SPT (C)	N=25 (3,3/4,4,8,9)	1.00		Brown, slightly gravelly CLAY. Gravel is fine to coarse, sub-angular.	1	
		1.70	SPT (C)	50 (25 for 0mm/50 for 0mm)	1.80		End of Borehole at 1.800m	2	
								3	
								4	
								5	
								6	
								7	
								8	
								9	

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered.	1.80	200	200	1.70	1.80	02:00	Chisel.
					<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> Borehole terminated at 1.80m bgl, obstruction.	<b>Shift Data:</b>			
	GW (m bgl)	Shift	Depth (m bgl)	Remarks
	Dry	01/02/2019 08:00 01/02/2019 18:00	0.00 1.80	Start of shift. End of borehole.



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Borehole No.

**BH115**

Sheet 1 of 1

<b>Project Name:</b> Maynooth Eastern Ring Road	<b>Project No.:</b> P18247	<b>Co-ords:</b>	<b>Hole Type:</b> CP
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<b>Location:</b> Co. Kildare	<b>Level:</b>	<b>Scale:</b> 1:50
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<b>Client:</b> Kildare County Council	<b>Date:</b> 31/01/2019 - 31/01/2019
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Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 1.00	B		1.00		Brown, slightly gravelly SILT with rootlets. Gravel is fine to coarse and sub angular to sub rounded.		
		0.00 - 1.00	D						
		1.00 - 2.00	B	35 (6,8/35 for 80mm)	1.15		Brown, slightly gravelly CLAY. Gravel is fine to coarse and sub angular to sub rounded. End of Borehole at 1.150m	1	
		1.00 - 2.00	D					2	
		1.00	SPT (C)					3	
								4	
								5	
								6	
								7	
								8	
								9	

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered	1.15	200	200	0.60	0.80	01:00	Chisel.
					<b>Equipment:</b> Dando 2000			1.10	1.15	01:00	Chisel.

<b>Remarks:</b> Borehole terminated at 1.15m bgl due to obstruction.	<b>Shift Data:</b>	GW (m bgl)	Shift	Depth (m bgl)	Remarks
			31/01/2019 08:00	0.00	Start of borehole
		Dry	31/01/2019 18:00	1.15	End of borehole



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Borehole No.  
**BH116**  
 Sheet 1 of 1

Project Name: Maynooth Eastern Ring Road      Project No. P18247      Co-ords:      Hole Type CP

Location: Co. Kildare      Level:      Scale 1:50

Client: Kildare County Council      Date: 31/01/2019 - 31/01/2019

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description	
		Depth (m bgl)	Type	Results					
		0.00 - 0.50	B						
		0.00 - 0.50	D						
		0.50 - 0.80	D						
		0.50	SPT (C)	0 (40 for 75mm/0 for 0mm)	0.80				
								1	
								2	
								3	
								4	
								5	
								6	
								7	
								8	
								9	

<b>Groundwater:</b>					<b>Hole Information:</b>			<b>Chiselling Details:</b>			
Struck (m bgl)	Rose to	After (mins)	Sealed	Comment	Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)	Top (m)	Base (m)	Duration (hh:mm)	Tool
				None encountered	0.80	200	200	0.60	0.80	01:00	Chisel.
					<b>Equipment:</b> Dando 2000						

<b>Remarks:</b> Borehole terminated at 0.80m bgl due to obstruction.	<b>Shift Data:</b>	GW (m bgl)	Shift	Depth (m bgl)	Remarks
			31/01/2019 08:00	0.00	Start of borehole
		Dry	31/01/2019 18:00	0.80	End of borehole

## **APPENDIX E WATERWAYS IRELAND PFRA**

# **Preliminary Flood Risk Analysis Report**

**Waterways Ireland**

**18<sup>th</sup> July 2011**

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## **Executive Summary**

The statutory function of Waterways Ireland, the largest of the six North/South Implementation Bodies established under the British-Irish Agreement Act 1999, is to manage, maintain, develop and restore specified inland navigable waterways; the Barrow Navigation, the Lower Bann Navigation, the Royal Canal, the Erne System, the Shannon-Erne Waterway, the Grand Canal and the Shannon Navigation principally for recreational purposes.

The Statutory instrument transposing EU 'Floods' Directive into Irish law identifies roles for organisations such as local authorities, Waterways Ireland and ESB to undertake certain duties with respect to flood risk within their area of responsibility. Such risks must be identified through a preliminary flood risk assessment by December 2011. The PFRA is a high level screening exercise which involves collecting existing and readily available information on historic and potential floods, assembling it into a preliminary assessment report and using it to identify Flood Risk Areas which are areas where the risk of flooding is significant.

This report looks at the possible flooding mechanisms arising from the 'artificial water bearing infrastructure' and includes an analysis of historic flooding and potential future flooding of the Grand and Royal Canals and other smaller canals linked to the Shannon Navigation, the Lough Allen Canal, the Jamestown Canal and the River Blackwater / Erina-Plassey Canal.

## **Conclusion**

The analysis of historic data shows that, while there have been incidences of flooding caused by failure of embankments and operational issues on the Grand and Royal Canals, they have generally occurred in rural areas with very limited damage to property. In only 2 cases a small number of houses and businesses were affected but for the remainder of cases the damage has been limited to temporary flooding of bog or farmland. In Tullamore and Edenderry the ground levels are lower than the canal in some areas and there is a potential for some flooding of property but the only area where the consequences of an embankment failure is relatively high is the embanked section of canal close to Mullingar, Co. Westmeath where up to 200 houses could be flooded. However this embankment has no history of failure, has been strengthened and partially lined in recent years, is inspected weekly for any sign of a potential breach and remedial action would be put in place immediately so while the consequences would be significant the likelihood of failure is extremely low and therefore this is not considered to be an area of significant flood risk.

Waterways Ireland is committed to continuing to work with the Office of Public Works and the ESB to deliver the Assessment and Management of Flood Risks on designated waterways as required by EC Dir 2007/60/EC.



## **1.0 Background and Introduction**

Between 1998 and 2004 Europe suffered over 100 major damaging floods including the catastrophic floods along the Danube and Elbe rivers in Summer 2002. Further severe floods in 2005 further reinforced the need for a co-ordinated approach to the management of the problem. Since 1998 floods in Europe have caused up to 700 deaths, the displacement of 500,000 people and at least €25 billion in insured economic losses. Catastrophic floods endanger human lives and cause human tragedy as well as heavy economic losses and can have severe environmental consequences. Floods are natural phenomena but through the right measures it is possible to reduce their likelihood and lessen their impact.

Directive 2007/60/EC on the assessment and management of flood risks aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. Under S.I. 122 of 2010 European Communities (Assessment and Management of Flood Risks) Regulations 2010, the Statutory Instrument transposing the EU Directive into Irish Law, the Commissioners of Public Works in Ireland are appointed as the Competent Authority for flood risk management and other local authorities and organizations are named. Waterways Ireland, as the statutory body responsible for the majority of Ireland's inland navigable waterways, is obliged to undertake tasks the first of which is to prepare a Preliminary Flood Risk Assessment (PFRA) of the potential flood risk posed by the structural or operational failure of any of its infrastructure.

The PFRA is a high level screening exercise which involves collecting existing and readily available information on historic and potential floods, assembling it into a preliminary assessment report and using it to identify Flood Risk Areas which are areas where the risk of flooding is significant. This PFRA concentrates on flooding which has arisen or is likely to arise from the Royal and Grand Canals, classified in the legislation as 'artificial water bearing infrastructure'.

## 2.0 Waterways Ireland

Waterways Ireland is the largest of the six North/South Implementation Bodies which was established by means of an international treaty made on 8 March 1999 between the British and Irish Governments. This treaty was given domestic effect by means of the North/South Co-operation (Implementation Bodies) (Northern Ireland) Order 1999, and the British-Irish Agreement Act 1999 respectively.

As a Cross Border body, Waterways Ireland operates under the policy direction of the North / South Ministerial Council and the two Governments, and is accountable to the Northern Ireland Assembly and the Houses of the Oireachtas.

The statutory function of Waterways Ireland is to manage, maintain, develop and restore specified inland navigable waterways, principally for recreational purposes.

Waterways Ireland has responsibility for approximately 1,000 km of navigable waterways (Figure 1) comprising;

- the Barrow Navigation
- the Lower Bann Navigation
- the Royal Canal
- the Erne System
- the Shannon-Erne Waterway
- the Grand Canal
- the Shannon Navigation

Waterways Ireland's remit was extended by the North South Ministerial Council in July 2007 to include responsibility for the reconstruction of the Ulster Canal from Upper Lough Erne to Clones and following restoration for its management, maintenance and development principally for recreational purposes.

Of the water bodies listed above the artificial water bodies are the Grand Canal, the Royal Canal, part of the Shannon-Erne Waterway and a number of smaller canals linked to the Shannon Navigation namely the Lough Allen Canal, the Jamestown Canal and the Erina Plassey canal. The other navigation systems are a mix of River/Lake navigation with short lateral canals. Flooding on these systems is being dealt with under the fluvial PFRA being prepared by the Office of Public Works.

# Ireland's Waterways



**Figure 1**

## **3.0 Potential Flooding Mechanisms**

The possible flooding mechanisms arising from canal infrastructure are:

### **3.1 Failure or Breach of an Embankment**

A large proportion of the Grand and Royal Canals are built in embanked sections running at a higher level than the surrounding countryside. These embankments were constructed of local readily available material, sometimes stone and clay but in some cases they are soft peat embankments which require considerable maintenance. Failure or breach of these embankments results in water from the level being released but the impact of the flood waters very much depends on the time of year and the level of saturation of the surrounding area. The tables in Appendix 1 & 2 shows the maximum volume of water which would be released by a failure of each of the levels of the Grand and Royal Canals.

### **3.2 Overtopping of the Banks**

During periods of intense or prolonged heavy rainfall the volume of water running into the canal can exceed the volume of water which can be raked off using the overflows, the land tunnels and the gate sluices. This excess water overtops the banks and can cause flooding of surrounding areas if it cannot be discharged through the drainage network. The primary risk to the canal system of water entering at a rate which cannot be discharged or managed is that the canal water levels rise and will overtop. In embanked areas there is then a risk of failure particularly due to the erosion of the top bank level.

### **3.3 Operational Issues**

Water has to be managed through the canal system to keep all levels at their optimum depth and sluices in the gates are used to carefully monitor the amount of water flowing from one level to the next. Overtopping from a long level to a shorter level can result in the shorter level being unable to discharge the volume of water and resultant flooding of the surrounding areas. Any failure of the lock-gates or interference with the sluices whether deliberate through acts of vandalism or accidental can result in overtopping of a short level as described above.

## 4.0 The Grand Canal



### 4.1 History of Construction

Work on the Grand Canal from Ringsend to the River Shannon, crossing the central plain and the Bog of Allen, commenced in 1756 and was complete to the Shannon in 1804. The canal is 182km long including the Branch Lines to Naas and Edenderry. The summit level at Lowtown is 40km west of Dublin and 85m above low tide at Dublin where there are 3 sea locks linking the Grand Canal Basin with the tidal River Liffey. The rise from Dublin to the summit is by way of 26 locks and the 50m fall to the River Shannon is by way of 18 locks over a distance of 93km. The average rise or fall of the locks is 3.0m while the largest is 5.7m at Inchicore Lock.

The Barrow Line of the Grand Canal is 45km from the summit at Lowtown to where it joins the Barrow River at Athy. The descent to the Barrow is by way of 9 locks, 2 of which are double-chambered.

There are 14 supply channels feeding the system at various lengths totally approximately 64km; the principal one being the Milltown supply from Pollardstown Fen which feeds the summit level. Most of the supply channels are artificially constructed and require constant maintenance particularly where they are embanked or through bog sections. From the summit level at Lowtown the canal begins its slow descent to Shannon Harbour where it joins the River Shannon. It passes through a varied landscape a particular feature of which is the high embankments with 24km through bogs.

## 4.2 Historic Flooding on the Grand Canal

### 4.2.1 Flooding due to embankment failure

Approximately 50% of the Grand Canal is built in embanked sections at a higher level than the surrounding countryside. These embankments were constructed in the late 1700s of readily available local material sometimes stone and clay but 24km are soft peat embankments which require considerable maintenance. There were numerous breaches of these embankments during the 1800s but none resulted in any significant flooding or damage to property, mainly due to the rural nature of the surrounding countryside much of which is bog.

The most significant breach of a peat embankment was the Edenderry breach in 1989 which occurred in a 31.5km level, the longest level of the Grand Canal. The Edenderry embankment, stretching from the Blundell Aqueduct to Downshire Bridge, is constructed entirely from turf, the only material available to the builders in the 18<sup>th</sup> century. When this section was first watered in 1797 it promptly collapsed and this was followed by further failures in 1800, 1855 and 1916. The most recent failure occurred in January 1989 when a large breach opened in the North bank about 950m west of the Blundell Aqueduct near the town of Edenderry. It is estimated that up to 135,000 m<sup>3</sup> of water was discharged through the breach and 100,000 m<sup>3</sup> of embankment material was displaced over a length of 300m; however, the damage to the surrounding land was comparatively minor. Approximately 12 acres of land were flooded with short term flooding of a further 36 acres including some football fields. This receded within a day and left little or no residual damage.

The failure was the result of a long length having become saturated over a period of many years. When the canals were commercially used 12 boats were continuously employed claying this section to avoid leaks. However, this ceased when the canals were closed to commercial traffic resulting in the peat becoming completely saturated and the continuing leaks causing piezometric pressure to build up near the base of the embankment. Long term wetting deteriorates the strength of the peat and eventually a point was reached, in this case, when the resistance due to the shear strength of the peat became less than the upward piezometric pressure resulting in a large wedge of the embankment simply floating away.

Similar breaches occurred in the Derries Embankment in 1955 and the Killeen embankment in 1975. In the former case the water was discharged to the Silver River in the immediate vicinity and the latter resulted in the flooding of some bogland. In August 1993 the partial collapse of a culvert at Hartley Bridge, Ticknevin, Co. Kildare resulted in the loss of approximately 30,000m<sup>3</sup> of water. This did not result in any damage to land but did cause some inconvenience to 3 dwellings during the repair of the culvert.

#### **4.2.2 Flooding due to overtopping and operational issues**

There have been a number of minor flooding incidents caused by overtopping and operational issues.

- In the Bluebell area of Dublin city in November 2005 some damage was caused to 5 business premises due to vandalism at locks which resulted in bank overtopping.
- Some flooding occurred in Ardclough village near Celbridge, Co. Kildare in winter 2009 partly as a result of overtopping of the canal bank but no houses or businesses were affected.
- In Ballycommon, Co. Offaly in August 2008 during a period of intense heavy localised rainfall the large diameter pipes under the towpath could not take the flow from the surrounding high ground and the water entered the canal flowing over the towpath. The volume of water entering the canal exceeded the volume of water which was being discharged via the sluices, overflows and racks. At the time there was a significant risk of overtopping and emergency services were put on alert but no damage occurred.

#### **4.3 Inspection and Maintenance Regime**

When a breach occurs dams are installed immediately to reduce the loss of water and the embankment is repaired. In the case of the 1989 Edenderry breach the section of embankment was completely rebuilt and lined and, as a result of the lessons learned, peat embankments are now inspected regularly for any signs of damage or leaks and there is an ongoing program to strengthen them and line them where necessary to reduce the risk. In addition a stop chamber was constructed at Rathmore which reduces the length of the level likely to be affected by another breach of this embankment to 8km and so the amount of water which would be discharged would be 25% less than was discharged in 1989.



Water is carefully managed throughout the system and all locks are inspected regularly to ensure that the water management regime is in order. Where there is a risk or history of vandalism, locks are placed on the sluices to prevent interference. Where banks have limited freeboard there is an ongoing program to raise them to increase the carrying capacity of the canal and there is also an ongoing maintenance program for overflows and back-drains.

#### **4.4 Potential Future Floods**

The majority of the Grand Canal runs through remote rural areas much of which is bog and so flooding will result in limited damage. The canal passes through a number of villages and 2 towns Edenderry and Tullamore.

Edenderry town ground levels are below canal water level and the toe of the embankment has been damaged in the past due to industrial activity particularly in the Edenderry Business Park. A catastrophic failure of this embankment could have serious consequences to property due to the volume of water contained in the 31.5km level and the topography of the area; however, some of the risk has been mitigated by the introduction of the stop chamber, the works done to the embankment and the regular inspections of the embankment.

The ground levels in some areas of Tullamore town are also below canal water level. The embankments here are intact but continuous development alongside the canal including underground services could impact on the structural stability of the canal embankments. A breach in the Tullamore area would have serious effects on property however, continuous monitoring and maintenance regimes are in place and a breach is thought to be unlikely in this area.

Appendix 1 lists all reaches of the Grand Canal system giving dimensions, embankment details, inflows and potential flooding volumes.

## 5.0 The Royal Canal



### 5.1 History of Construction

The Royal Canal was the second canal to be built across the country from Dublin to the River Shannon. Work started in 1790 and the canal reached the Shannon in 1817. Spencer Dock in Dublin was not complete until 1873. The navigation starts at Spencer Dock and the canal rises steeply out of the city through a succession of double locks. From the 10<sup>th</sup> lock, although still in Dublin, it begins to assume a rural aspect through an attractive tree lined stretch. It climbs up to a summit level through Mullingar at 94.3m higher than the entry level at Spencer Dock, then drops down to the River Shannon at approximately 40m above sea level. The canal is 146km in length with 46 locks 10 of which are double chambered and there is also a sea lock where the canal joins the River Liffey in Dublin. Approximately 55% of the Royal canal is embanked with 3 peat embankments at Cloonbreany, Beggagh and Ballymaclavy and a 3km embankment running around the town of Mullingar, Co. Westmeath. The Royal Canal was closed to navigation from 1960 and was only fully reopened in 2010 following a lengthy period of reconstruction.

## **5.2 Historic Flooding on the Royal Canal**

### **5.2.1 Flooding due to embankment failure**

The only significant breach of the Royal Canal embankments in recent years occurred in June 1993 on the 32.4km long level of the Royal Canal near the Longwood Aqueduct at Ballycooley, Longwood, Co. Meath. The breach was approximately 15m wide and occurred in a 6m high embankment. The water flowed through the breach into a low-lying strip of waste land and from there through a culvert under the railway and flooded a lane and some fields. A large area of land was flooded however the floods receded within 2 days and the breach did not result in any significant damage. A similar breach occurred in this area in the 1920s.

### **5.2.2 Flooding due to overtopping and operational issues**

The most significant flooding due to overtopping was in the Spencer Dock area in Dublin city in 2002 when, due to the very high tide levels, the River Liffey was 0.4m higher than the level in the Royal Canal. The water flowed back up the Royal Canal and caused flooding of a maximum of 20 houses and 5 business premises.

Other flood events were extremely minor in nature Maynooth Harbour has occasional flooding of 1 garden if sluices in the lock gates are not left in the correct position and there is also occasional flooding of the road east of Darcy's Bridge and near Ferns Lock.

## **5.3 Remedial Action**

Immediate repairs were made to the Longwood embankment which was rebuilt and sealed with a HDPE liner and puddle clay. The embankment is inspected regularly for any signs of a further breach.

In Spencer dock a new sea lock and flood protection system was constructed so that high tides can no longer cause this type of flooding.

## **5.4 Inspection and Maintenance Regime**

All of the embankments in the Royal Canal are inspected regularly. Because of the level of risk the Mullingar embankments are inspected weekly while the Longwood, Downs and Ballymaclavy embankments are inspected monthly. Any necessary repairs are carried out immediately.

## 5.5 Potential Future Floods

The only area of potentially significant flood risk identified by this study is Mullingar where up to 200 houses could be flooded in the event of a failure of the embankment however

- this embankment has no history of failure
- has been strengthened and partially lined in recent years
- is inspected weekly for any sign of a potential breach
- remedial action would be put in place immediately

while the consequences of failure would be significant the likelihood of failure is extremely low and therefore this is not considered to be an area of significant flood risk.

Appendix 2 lists all reaches of the Royal Canal system giving dimensions, embankment details, inflows and potential flooding volumes.

## **6.0 Lough Allen Canal**

### **6.1 History of Construction**

The Lough Allen Canal is approximately 7.4Km long. It was constructed in the early 19<sup>th</sup> century to connect the Shannon Navigation at Battlebridge to Lough Allen at Drumshanbo Bridge through Acres Lake, near Drumshanbo. The canal fell into disuse after 1933 but was restored and reopened as far as Acres Lake in 1977 and fully reopened to Lough Allen in 1995.

Datum Levels (Poolbeg)

Ordinary summer Level for Lough Allen is 48.16m OD.

The canal is formed on two levels, (1) Drumshanbo to Acres lake to Drumleague Lock 3.18km at OSL of 49.85m. OD and (2) Drumleague to Battlebridge, a length of 2.67km at OSL (Ordinary Summer Level) of 46.45m OD

The Ordinary Summer level downstream of Battlebridge lock is 42.98m

#### **6.1.1 Storage capacity**

The volume of water stored at Level 1 is  $221.7 \times 10^3$  cubic metres. The volume of water stored at Level 2 is  $57.6 \times 10^3$  cubic metres. In times of low water, the level is maintained by an intake pumps. In times of heavy rainfall, levels are reduced by gravity flow through lock gate and land sluices.

### **6.2 Historic flooding on the Lough Allen Canal**

While there is a historical reference to bank failure in 1876, the raised embankment section of the Lough Allen canal performed satisfactorily in recent flooding events.

### **6.3 Inspection and Maintenance Regime**

Water Levels are managed daily by experienced personnel. Inspection regimes are in place to carry out regular inspections of the canals and amenities. Maintenance programmes are in place to address reported defects.

During a flood event water levels are monitored daily and sometimes hourly and water levels are managed to reduce pressure on the banks.

## **6.4 Potential Future Floods**

Specifically, in consideration of potential floods arising from Waterways Ireland infrastructure and not from river flooding, the potential risks are associated with failure of raised canal banks, failure of lock gates, and potential vandalism, neglect or human error.

There is 3.18km of raised bank on Level (1) and 2.40km of raised bank on Level (02). This represents 35% and 45% of the canal banks respectively.

## **7.0 Jamestown Canal**

### **7.1 History of Construction**

The Jamestown Canal is located just south of the village of Jamestown on the Roscommon side of the Shannon. The canal is approximately 2.7km long. It was originally constructed in 1754 and upgraded in 1845. As a lateral canal the water level is determined by the upper region and is the same as the Carrick-on-Shannon to Jamestown stretch with an OSL of 42.98m OD. 24% of Jamestown canal is raised bank.

#### **7.1.1 Storage capacity**

As a lateral canal, the canal level is determined by the River Shannon, and therefore Jamestown Canal will be incorporated in the River Shannon Assessment.

### **7.2 Historic Flooding on the Jamestown Canal**

The canal does not contribute to flood relief. During the 1999/00 and 2009 floods, temporary dams were required to reduce pressures on the canal banks.

### **7.3 Inspection and Maintenance Regime**

Water Levels are managed daily by experienced personnel. Inspection regimes are in place to carry out regular inspections of the canal and amenities. Maintenance programmes are in place to address reported defects.

Appendix 3 contains summary details and dimensions.

## **8.0 Shannon Navigation – River Blackwater**

### **8.1 River Blackwater**

The River Blackwater is a small tributary of the River Shannon which joins the latter on its right bank about 2 miles upstream of Limerick City. The catchment area covers 15,500 acres and is entirely in Co. Clare with the village of Clonlara almost in the centre. From the southern slopes of the Slieve Barnagh range of hills the several streams which form the river flow from north to south where it then passes under the Headrace of the Ardnacrusha generating station west of Clonlara and thence in a south-westerly direction to join the Shannon. Most of the area is steeply sloped having Knockanuartha (1017ft) and Knockaphunta (845ft.) on its watershed. The lowlands (about 40ft) are just 10miles from the farthest point on the watershed. Due to the very steep slope of the catchment the river responds extremely quickly to rainstorms. Rainfall in the upper reaches discharges into the lowland area in about 2 ½ hrs after the commencement of a storm resulting in floods of high intensity and short duration causing damage to several hundred acres of land and at times flooding buildings.

### **8.2 Errina Plassy Canal**

When the Commissioners of Inland Navigation and / or the Limerick Navigation Company in or about 1770 were making the River Shannon navigable from the head of the tideway at Limerick to Lough Derg they constructed a 6 ½ mile long lateral canal between Plassy and Errina just downstream of O'Briensbridge to overcome the falls at Doonass and Castleconnell. A supply of water from the Canal was taken from the River Shannon at the upstream end and near Errina. No other water was carried in the Canal. There were 6 navigation locks to overcome a total lift of about 56 feet. The Canal was not finally completed by the Directors General of Inland Navigation until about 1812. Ownership passed to the Limerick Navigation Company in 1829, to the Shannon Commissioners in 1839 to the Commissioners of Public Works in 1846 and to Waterways Ireland in 1999.



The Canal has not been used for navigation since 1930 when the Shannon Hydroelectric Scheme rendered the waterway unusable as a route to Lough Derg and a new navigation was incorporated in the Headrace Canal of the generating station.

The route of the Canal passes through the lower catchment area and flood plain of the River Blackwater. For topographical reasons it was not possible to carry the canal through the flood plain by aqueduct over the River Blackwater. The latter was diverted a short distance downstream of Mountcatherine Bridge, and both River and Canal were turned in a south-westerly direction to discharge into the Shannon at Plassy. Both run parallel and are separated by the canal's right embankment for the entire length of the diversion. This embankment retained the Canal's operating water level which in summer was higher than the diverted river. During flood periods however the river level used to rise higher than the Canal's level and can overtop the Canal embankment in extreme conditions.

As part of the diversion works embankments and a sluice were also constructed along both banks of the River Blackwater diversions as far as the diversion point which is also the upstream limit of Waterway Ireland's jurisdiction for Navigation purposes. Upstream of the diversion point and on both banks of the River Blackwater these embankments are continued to higher ground just downstream of Mountcatherine bridge. It is not known by whom the latter were constructed or where responsibility for their maintenance rests. Waterways Ireland however carries out repairs from time to time on the embankments downstream of the diversion point. In 1984 a landowner removed part of the embankment on the left bank of the River Blackwater just downstream of Mountcatherine Bridge, leaving a large gap in the flood defence works and contributing to a large extent to the flooding of the 5<sup>th</sup> / 6<sup>th</sup> August 1986.

The purpose of the river embankments was to divert all the upland water upstream of Mountcatherine Bridge along the new channel and to protect the Canal from flooding. This conferred valuable immunity from flooding on the low lying lands of the Blackwater through which the Canal is carried as long as the embankments from Mountcatherine Bridge to Plassy are not breached or overtopped. Even if they are the extent of flooding cannot be as great as would be the case had the Canal not been constructed since the diversion carries the bulk of the Blackwater's discharge away from the old course. The new channel is  $\frac{3}{4}$  mile shorter than the old course which was extremely tortuous and must have been inefficient to cater for any flood.

No records survive to indicate ancillary works carried out affecting the drainage of the low lying lands on either side of the Canal in the townlands of Mountcatherin, Newtown, Springfield and Cappavilla North. In times of flood the River Shannon backwaters along those drains and can cause flooding. The old course of the River Blackwater was abandoned but the outfall section from the River Shannon to a point about 1 mile south-east of Newtown Lock was retained to drain the balance of the Blackwater catchment not served by the diversion. The lands on either side of the canal are extremely low lying and of poor quality. Moderate rainfall causes waterlogging or flooding due to the small gradient and poor condition of the channels.

As the canal level is determined by the River Shannon it will be dealt with as part of the River Shannon study.

### **8.3 Past Floods on the River Blackwater**

#### Flooding of 5<sup>th</sup>/6<sup>th</sup> August 1986

Exceptional rainfall occurred throughout the Southwest and eastern parts of the country on the night of 5<sup>th</sup>/6<sup>th</sup> August 1986 when there was record rainfall in Counties Kerry, Cork, parts of Limerick and Dublin. However the storm was less intense when it reached east Limerick and Clare. The following rainfall fell in a period of 12 hours, Ardnacrusha 40mm, Parteen 46.6mm and Shannon Airport 35.5mm. The Metrological Service stated that the rainfall could have been as high as 50mm in the Clonlara area and considerably higher in the upper reaches of the Blackwater.

The discharge in the River Blackwater as a result of the rainstorm appears to have been exceptionally high. The flood peaked in the early hours of the 6<sup>th</sup> August and an estimate of the peak discharge was recorded as 2,500 cusecs.

Part of the discharge flowed directly through a breach in the left bank where a local landowner had removed a large section of embankment. In doing so one dwelling house and office was flooded to a depth of 2 and a half foot while another house was flooded to a depth of 6 inches.

Further downstream there was more flooding on the left bank as a result of damage to the embankments by cattle but no houses were affected.

#### **8.4 Remedial Action**

The embankments were repaired.

#### **8.5 Inspection Regime**

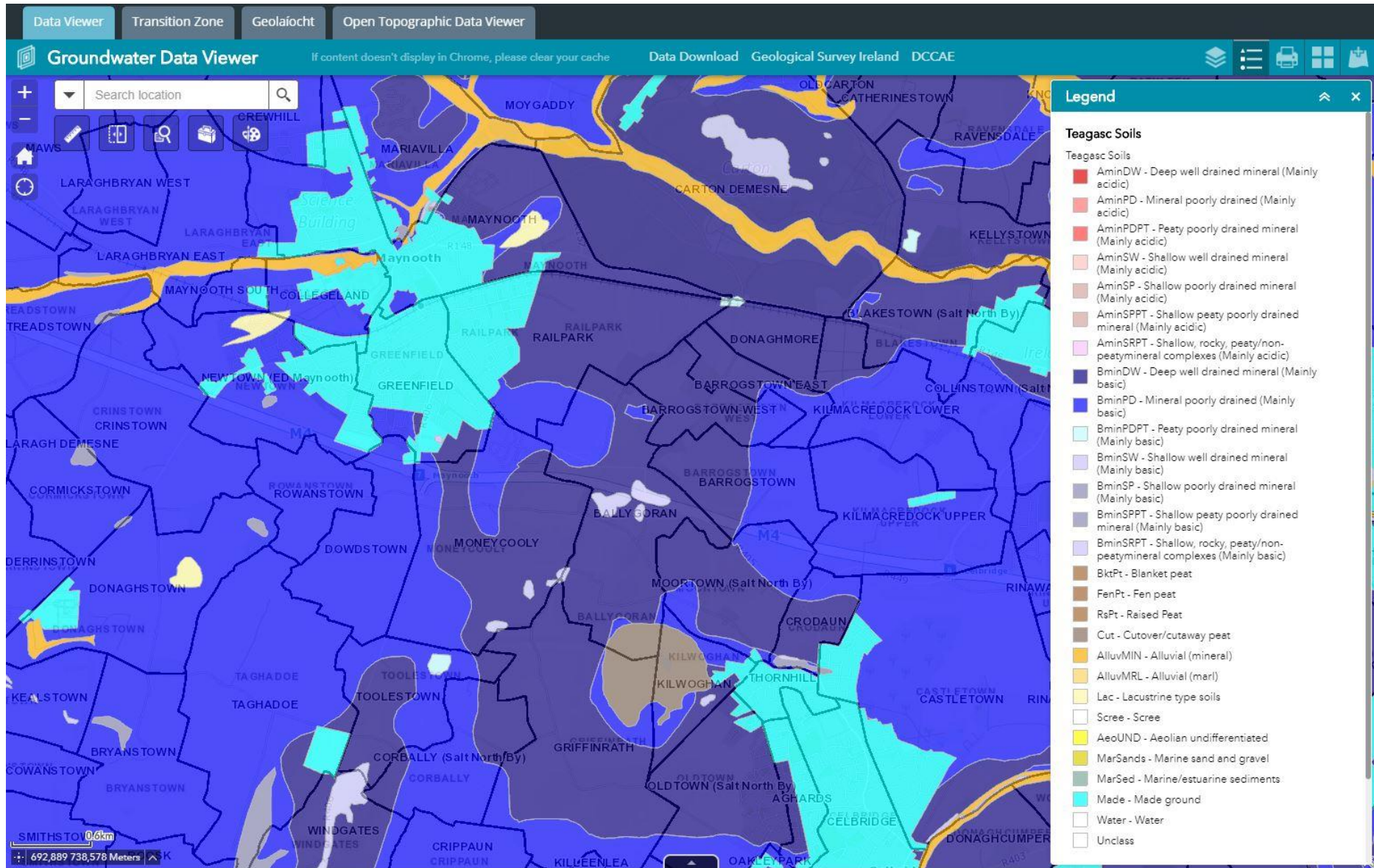
The banks are inspected regularly, once weekly and necessary repairs, removal of trees and debris carried out. The banks are also checked after high winds and heavy rain.

#### **8.6 Potential Future Floods**

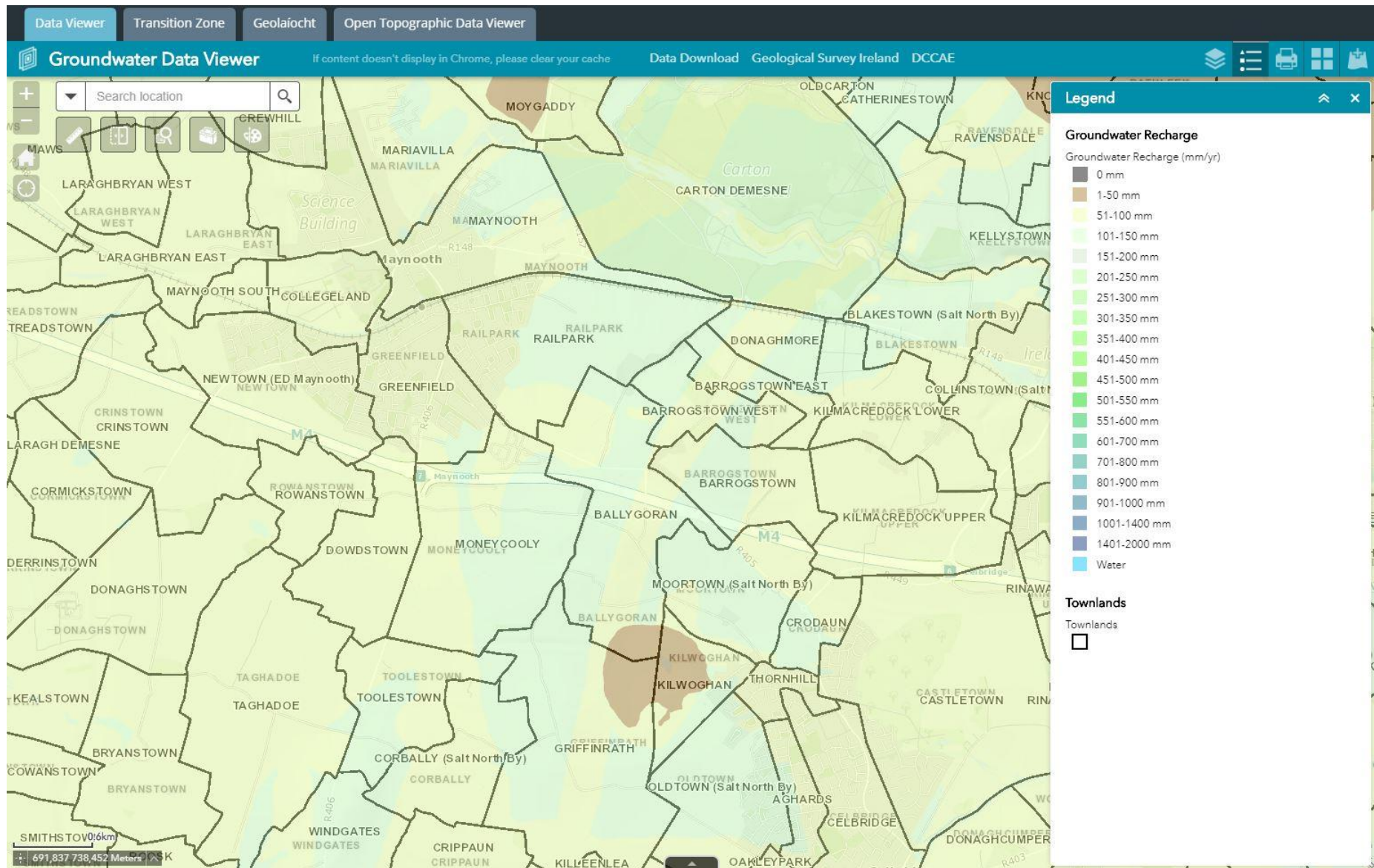
If the embankment was breached at the same location again, then there is the potential for more flooding of dwelling houses. There are now 27 houses at that location and, depending on their floor levels, some or all of those could be at risk of flooding. This falls outside the significant flood risk as defined for the PRFA Report.

The Inspection Regime mentioned above is in place and there was no flooding at this location in the extreme flood event of 2009.

**APPENDIX F**  
**GEOLOGICAL SURVEY OF IRELAND (GSI) MAPS**







## **APPENDIX G OSI HISTORICAL MAPS**



