

11. MATERIAL ASSETS: TRAFFIC AND TRANSPORT

11.1 Introduction

This chapter of the EIAR comprises of quantifying the existing transport environment and details results of assessment work undertaken to identify the likely significant effects on the Traffic and Transportation environment arising from the proposal.

The scope of this assessment covers transport and sustainability issues including access, pedestrian, cyclist and public transport connections. Recommendations contained within this chapter are based on existing and proposed road layout plans, site visits, on site traffic observations and junction vehicle turning count data.

This chapter was prepared by Sayed Ahmad Saeed BEng Tech, BEng (Hons), MIEI and Mark Kelly BA, BAI (Hons), MSc, CEng MIEI of DBFL Consulting Engineers, and approved by Dan Reilly BEng, CEng, FConsEI, MIEI, MIHT, MCIWEM, Director of Civils and Transportation with DBFL Consulting Engineers.

This assessment of traffic and transportation was carried out in accordance with the following guidance and established best practice, and was tailored accordingly based on professional judgement and local circumstance:

- Environmental Protection Agency (EPA) Guidelines on the Information to be contained in the Environmental Impact Assessment Reports (EPA, 2017) and will follow all future revisions or finalised EIA guidelines as appropriate; and
- Transport Infrastructure Ireland (TII) (formerly the National Roads Authority) Traffic and Transportation Assessment Guidelines.

Reference has been made to the "Celbridge Local Area Plan 2017-2023" and the "Kildare County Development Plan 2017-2023".

11.2 Assessment Methodology

The approach to the study accords with policy and guidance at EU, national and local level. Accordingly, the adopted methodology responds to best practices, current and emerging guidance, exemplified by a series of publications, all of which advocate this method of analysis. Key publications consulted include:

- 'Traffic and Transport Assessment Guidelines' (May 2014) National Road Authority;
- 'Traffic Management Guidelines' Dublin Transportation Office & Department of the Environment and Local Government (May 2003);
- 'Guidelines for Traffic Impact Assessments', The Institution of Highways and Transportation (1994);
- 'Celbridge Local Area Plan 2017-2023'; and
- 'Kildare County Council County Development Plan 2017-2023'.

The methodology employed, incorporated a number of key inter-related stages, including:

- Site Audit: A site audit was undertaken to quantify existing road network issues and identify local infrastructure characteristics, in addition to establishing the level of accessibility to the site in

terms of walking, cycling and public transport. An inventory of the local road network was also developed during this stage of the assessment.

- **Traffic Counts:** Junction traffic counts were undertaken and analysed with the objective of establishing local traffic characteristics in the immediate area of the proposed residential development.
- **Trip Generation:** A trip generation exercise has been carried out to establish the potential level of vehicle trips generated by the proposed residential development.
- **Trip Distribution:** Based upon both the existing traffic characteristics and the network layout in addition to the spatial / land use configuration and density of the urban structure across the catchments area of the development, a distribution exercise has been undertaken to assign site generated vehicle trips across the local road network.
- **Network Analysis:** Further to quantifying the predicted impact of vehicle movements across the local road network for the adopted optimum site access strategy, more detailed computer simulations have been undertaken to assess the operational performance of key junctions in the post development 2021, 2026 and 2036 development scenarios.

11.3 Receiving Environment

The subject 9.55ha development site is currently a greenfield agricultural site.

The subject site is located approximately 2 kilometres north of Celbridge Main Street and is directly served by the R405 Maynooth Road along the south-western boundary and the R449 to the north-western boundary which is a link to the M4 motorway. The existing site is bounded to the south by existing residential housing (Crodaun Forrest Park) and to the north-west by the M4 business park. The site is adjacent to agricultural/forest land to its north-eastern and south-west boundaries. The M4 motorway is approximately 500 meters north of the subject site.

The site is in the Crodaun area of Celbridge, shown under the Celbridge Local Area Plan as Key Development Area 4, and is accessed from the western boundary of the subject site via R405.

The general site location is shown in Figure 11.1. This figure also demonstrates the sites proximity to the nearest Town Centres. The indicative site boundary is presented in Figure 11.2 overleaf.

Figure 11.1 Site Location



Figure 11.2 Indicative Site Boundary



11.3.1 Existing Transportation Infrastructure

Road Network

The main road within the study area that directly serves the subject site is, the R405 Maynooth Road which is situated on the western boundary of the proposed development site. The proposed development site gains vehicular access to Maynooth Road, a two-way single lane carriageway with a 60kph speed limit. The subject site can be easily accessed by road from a number of directions including:

- (i) M4 motorway via junction 6;
- (ii) From the northeast via R449 (M4 Link Road); and
- (iii) From the northwest and south via Maynooth Road (R405);

Travelling northwest bound along the R405, the road crosses over the M4 motorway and continues into the town of Maynooth whereas travelling south bound, it continues into Celbridge Town. The R449 (M4 Link Road) located to the northwest / north of the subject site offers a connection to M4 motorway via junction 6. The R449 also links the site to Leixlip Train station and Leixlip town centre. The M4 motorway offers connections between Dublin and Enfield with further connections along the motorway. Figure 11.3 illustrates road network surrounding the proposed development site.

Figure 11.3 Road Network



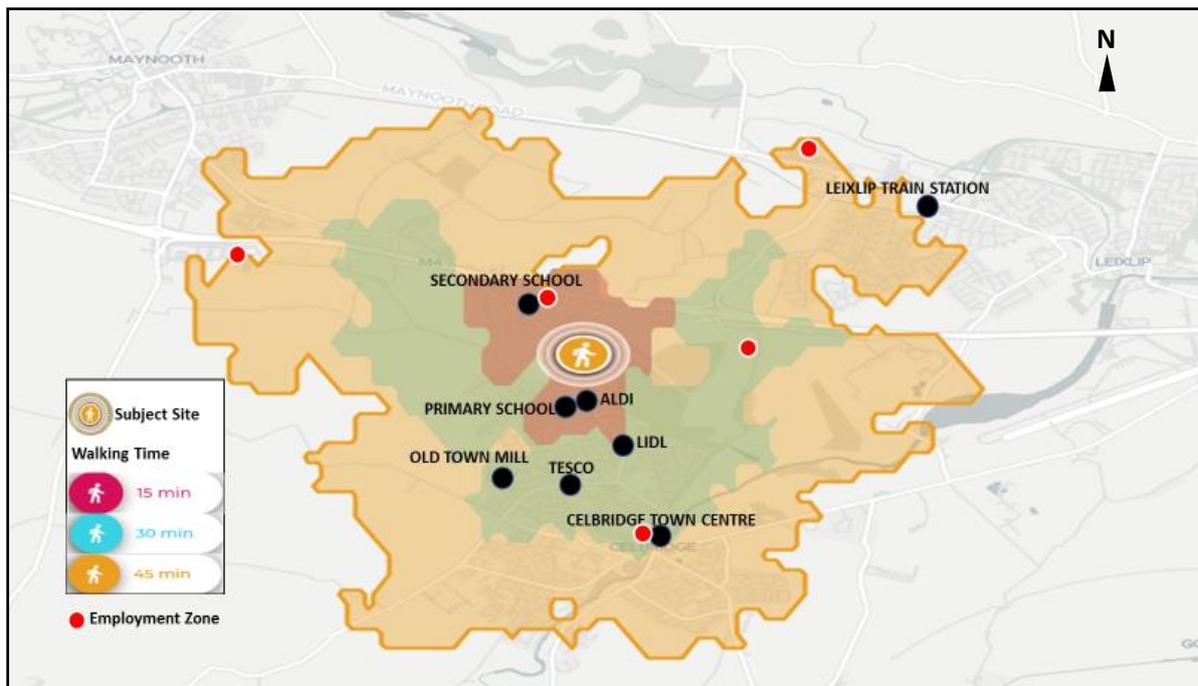
A traffic survey was undertaken with the objective of quantifying the existing traffic movements across the local road network which is discussed in detail in Chapter 5 of the TTA report.

Pedestrian Facilities

In the immediate vicinity of the subject site pedestrians can benefit from the existing footways approximately 1.25m wide along both sides of the R405 Maynooth Road and R449 M4 Link Road. Public lighting is provided along one side of the R405 and R449 roads. A signal controlled pedestrian crossing is provided in close proximity of the proposed site access along the R405.

Figure 11.4 Pedestrian Facilities in Proximity of the Proposed Development Site Entrance

Existing walking time isochrones from the development site are shown in Figure 11.5 (below), illustrates the high levels of accessibility for pedestrians walking to/from the site. The walking time isochrones illustrates that schools and food supermarkets are within a 15 minute walking distance from the subject site, Celbridge Town Centre is within a 30 minute walking distance and Leixlip Train Station is within a 45 minute walking distance.

Figure 11.5 Walking Isochrones from the Subject Development Site

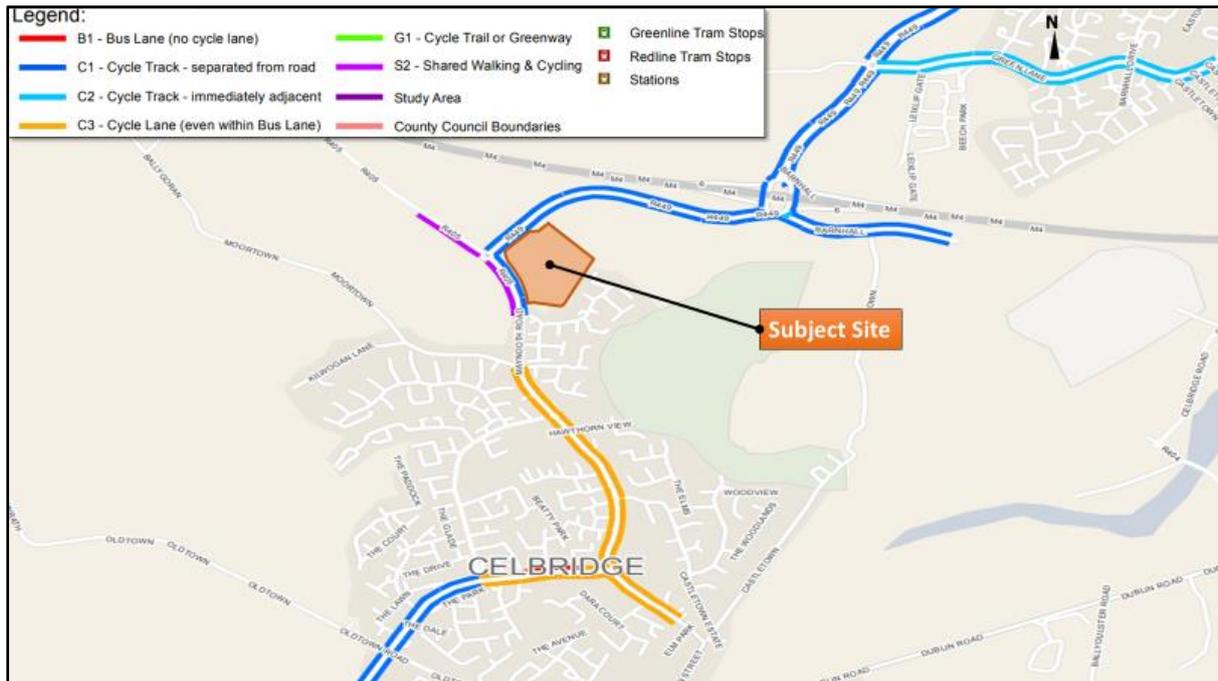
Cycling Facilities

The subject site is also currently very well served with cycle facilities as segregated cycle tracks are provided along both the R405 and R449. A two-way cycle track has been provided along the R405 western side and a one-way cycle track on eastern side of the carriageway. The existence of quality cycle facilities along the key roads which lead to the subject site provides an enhanced accessibility and connections to/from the proposed development site.

The Greater Dublin Area Cycle Network Plan (GDACNP) details the GDA's existing Cycle Network incorporating Urban, Inter-urban and Green Route networks. The subject site is located within the sector designated as "Maynooth, Celbridge & Leixlip". Figure 11.6 illustrates the existing cycle infrastructure in the vicinity of the subject site at the time the Plan was published in December 2013.

The proposed site has available cycle connections to Celbridge Town centre, Leixlip and Maynooth through both primary/secondary cycle routes and greenway routes.

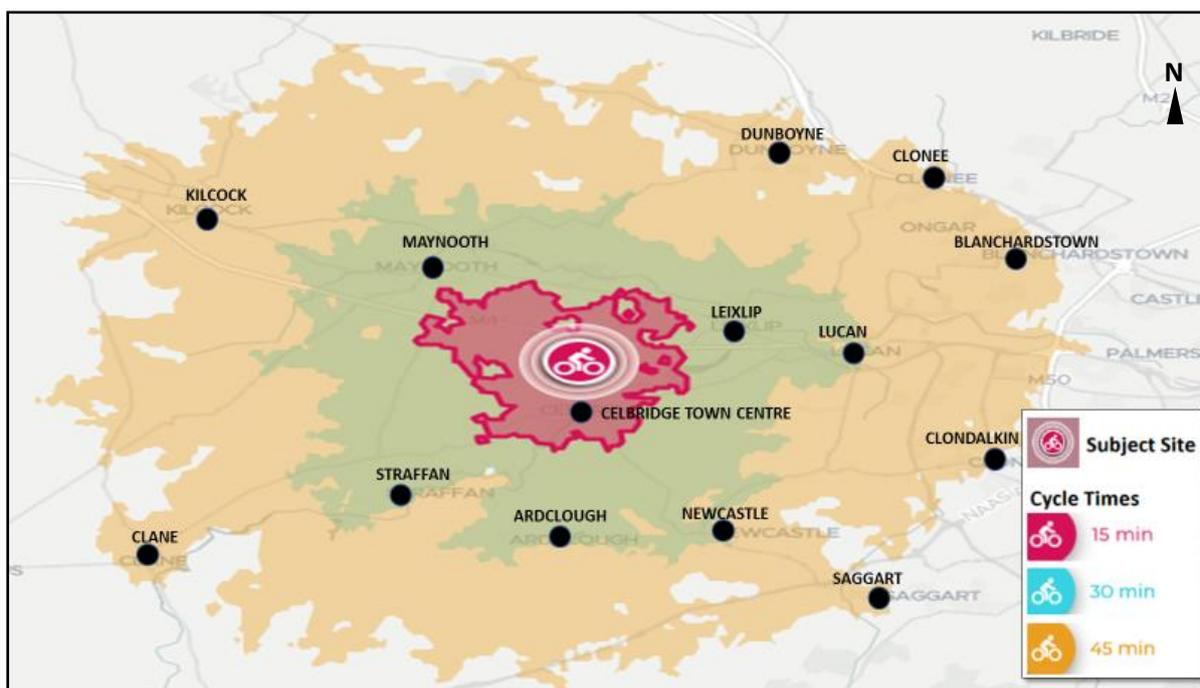
Figure 11.6 Existing Cycle Facilities



Source: Sheet E16, NTA's GDA Cycle Network Plan 2014

The cycling time isochrones from the development site were created and are shown in Figure 11.7 below, illustrates that Celbridge Town Centre is within a 15 minute cycling distance from the subject site, whereas, Maynooth, Leixlip, Lucan, Newcastle, Ardclough, Straffan town centres are within 30 minute and Clane, Kilcock, Blanchardstown, Clondalkin and Saggart town centres are within a 45 minute of cycling distance from the proposed development site entrance.

Figure 11.7 Cycling Isochrones from the Subject Development Site



Public Transport – Bus

The proposed subject site is serviced by Dublin bus and provides bus stops within proximity of the proposed site access of the development. There are three routes (67, 67x and 67n) that serve these bus stops providing connections to Maynooth and Merrion Square. Table 11.1 below outlines the bus routes and their frequencies whereas Figure 11.8 illustrates the location of the bus stops in context of the development site.

Table 11.1 Bus Services (No. of services per day)

Service	Route No.	Direction	Mon-Fri	Sat	Sun
Dublin Bus	67	Merrion Square – Celbridge – Maynooth	35	35	25
		Maynooth – Celbridge – Merrion Square	37	35	29
	67n	Westmoreland St – Celbridge/ Maynooth	4*	4	n/a
	67x	UCD Belfield – Celbridge (Salesian College)	4	n/a	n/a
		Celbridge (Salesian College) – UCD Belfield	4	n/a	n/a

* Fridays Only

Figure 11.8 Map of Dublin Bus Services



Bus Eireann

Bus Eireann also provides five routes that serve Celbridge Town Centre with bus stop on Main Street which is approximately 2.5km from the proposed site. Bus Eireann provides connections between Dublin and Tullamore. Table 11.2 below outlines the bus routes and their frequencies whereas Figure 11.9 below shows the location of Bus Eireann stop in the context of the development site whereas.

Table 11.2 Bus Eireann Routes Serving Celbridge Town Centre-Frequency (No. of Service)

Route No.	Route	Mon – Fri	Sat	Sun
120	Dublin - Tullamore	23	11	7
	Tullamore – Dublin	22	12	7
121	Dublin- Mullingar	n/a	1	n/a
	Mullingar- Dublin	n/a	1	n/a
123	Dublin – Naas	4	n/a	n/a
	Naas - Dublin	4	n/a	n/a
126	Dublin- Kildare	1	n/a	n/a
	Kildare- Dublin	1	n/a	n/a

Figure 11.9 Bus Eireann Stops Serving Celbridge Town Centre



Public Transport – Railway

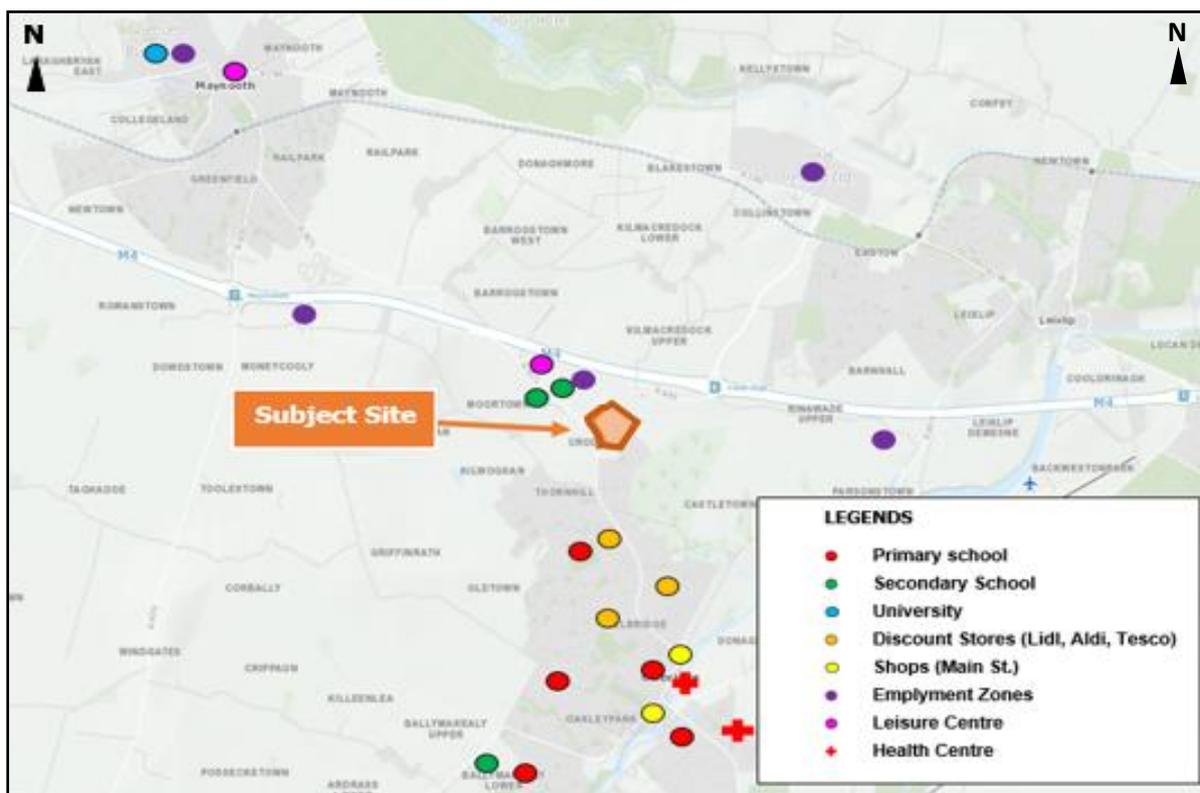
The proposed development site is within a 12 minute cycling or 45 minute walking distance of the Leixlip Train Station which is approximate 3.9 km away. The Leixlip Train Station is fully accessible and benefits from car-parking. It connects the subject site to Dublin, Longford and various areas along the route.

11.3.2 Local Amenities

The proposed development site is very well placed in terms of the availability of local amenities. In addition to the third level institution (Maynooth University) being located within approximately 5km from the subject site, there are a number of schools accessible within 3km of the subject site including Salesian College, Celbridge Community College, Scoil Mochua, Scoil na Mainistreach, St. Brigid’s Girls National School, Primrose Hill National School, Wolstan’s School and North Kildare Educate Together.

Furthermore, the subject site benefits from good access to leisure facilities such as Base Entertainment Centre and Glenroyal leisure Club located within approximately 800m and 4.4km respectively. The site also benefits from local shops and discount stores including Lidl, Aldi and Tesco being located within approximately 1.5km of the subject site. The site can also benefit number of medical and health centres including Celbridge Medical Centre located within approximately 2.2km of the subject site. Figure 11.10 below shows indicatively the subject site’s location in relation to the aforementioned local amenities.

Figure 11.10 Subject Site Local Amenities



Source: OSI, annotated by DBFL

11.3.3 Proposed Transportation Infrastructure

Cycle Network Proposals

The Greater Dublin Area (GDA) Cycle Network Plan outlines the various plans and proposals to improve the cycle network in the Greater Dublin Area, Rural Areas and Towns. The GDA proposed network plan for towns also includes Celbridge Town and the proposed development site boundary.

Figure 11.11 below illustrates the proposed cycle routes which includes the following main routes with respect to the subject development site;

- Primary/Secondary route **C6** along the Maynooth Road and **C7** along R449;
- **C8 / C8a / C8b** Greenway
- Inter-Urban route **K2** connecting to Maynooth;
- Inter-Urban route **K3** connecting to Clane;
- **Feeder** route along Kilwogan Lane; and
- A number of rural cycle routes connecting Celbridge to surrounding settlements.

Figure 11.11 Proposed Cycle Routes



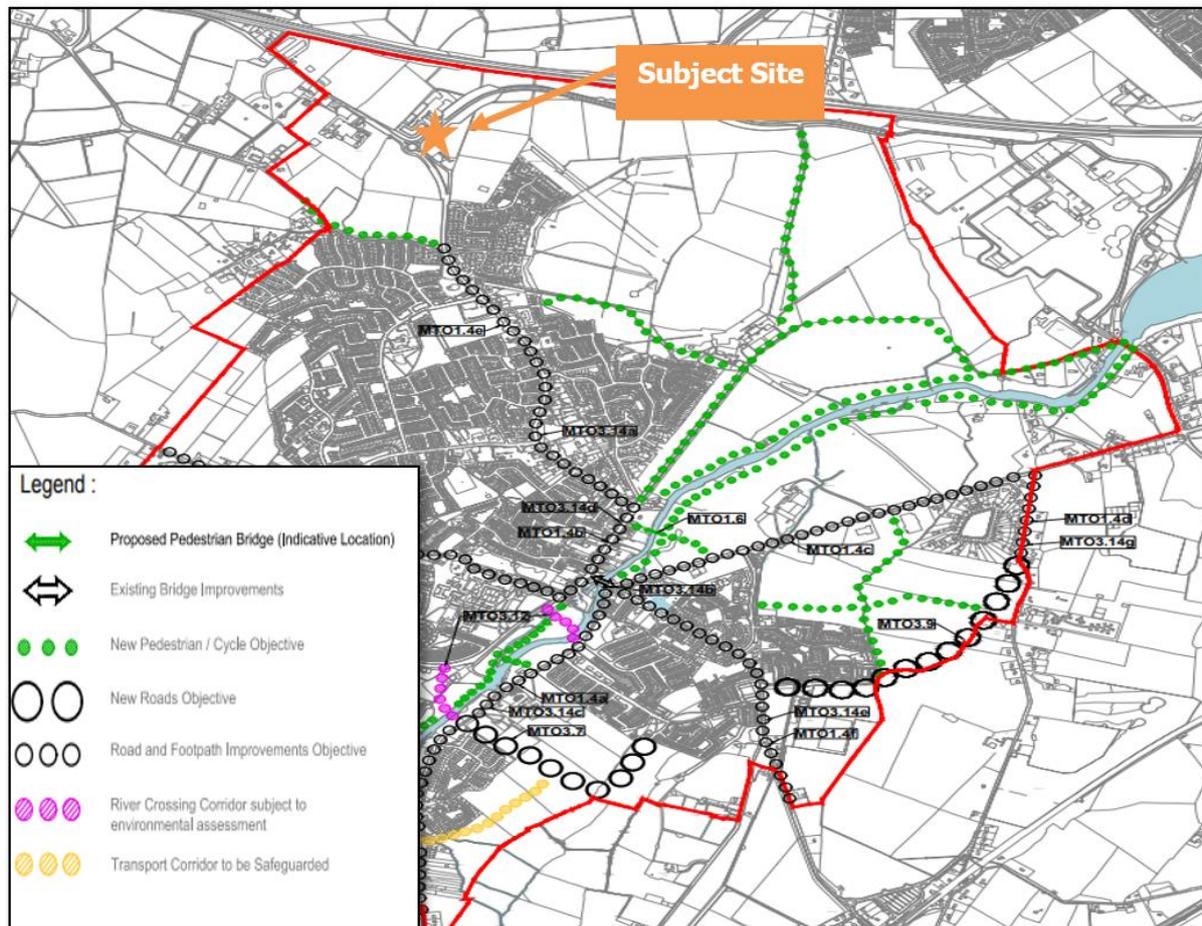
Source: NTA's GDA Cycle Network Plan

Proposed Roads Schemes

The Celbridge Local Area Plan (LAP) (2017-2023) outlines road objectives for the town area. There are several road improvement proposals within the LAP which all of them will ultimately benefit the subject site. Among the road proposals, the most relevant to the subject site includes improvement of Maynooth Road and footpaths from the Celbridge town centre towards the subject site. As illustrated on Figure

11.12 below the implementation of the following proposed objectives will be beneficial to the proposed residents of the subject site:

Figure 11.12 Roads Proposals (Extract from Celbridge LAP 2017-2023 Map 8.1)



Bus Connects

Bus Connects is a transport strategic plan transforming and revamping the current bus system with building "next generation" bus corridors on busiest routes and redesigning routes with the aim to offer fast, predictable and reliable bus journeys.

The proposed development site will be serviced by the following bus connects proposed routes as outlined in the Figure 11.13 below;

- Radial Route: **C4**: directly serves and connects the site to Dublin city centre with a frequency of every 30 minutes.
- Orbital Route: **W8**: The orbital route W8 also directly serves and connects the site to Maynooth and Tallaght with a frequency of every 30 minutes.
- Local Route: **259**: local route 259 serves directly serves and links the site to Leixlip and Celbridge with a frequency of every 30 minutes.
- Peak Time Routes: **327** and **328**: connects the subject site to Lucan Bypass - Chapelizod Bypass - Heuston Station - Custom House - Merrion Square - Ballsbridge - St Vincent's Hospital. This service only operates during peak travel periods, generally weekday mornings and evenings.

Figure 11.13 Bus Connects Proposed Routes Serving the Subject Site

11.4 Characteristics of the Proposed Development

The proposed development site comprises of approximately 9.55 hectares of land which is currently a greenfield site located to the northwest of Celbridge town centre. The proposed development scheme comprises the follows:

- 218 no. houses (terraced and semi-detached);
- 154 no. apartments and duplex units;
- Creche (at least 42 Child Spaces);
- 633 no. car parking spaces (436 houses, 149 apartments, 38 visitors and 10 creche); and
- 340 no. cycle parking spaces;

Allocation of the proposed parking spaces is outlined below;

- 436 no. Parking spaces for 218 no. houses (2/unit);
- 149 no. parking spaces for 154 no. apartment/maisonettes (0.97/unit) which includes 2 no. GoCar spaces and 10 no. Disabled spaces;
- 38 no. visitor parking spaces (includes 2 disable space)
- 10 no. parking spaces for creche (includes 1 disable space)

Cycle Parking

Each of the proposed houses benefit from private rear gardens that can be used for cycle storage.

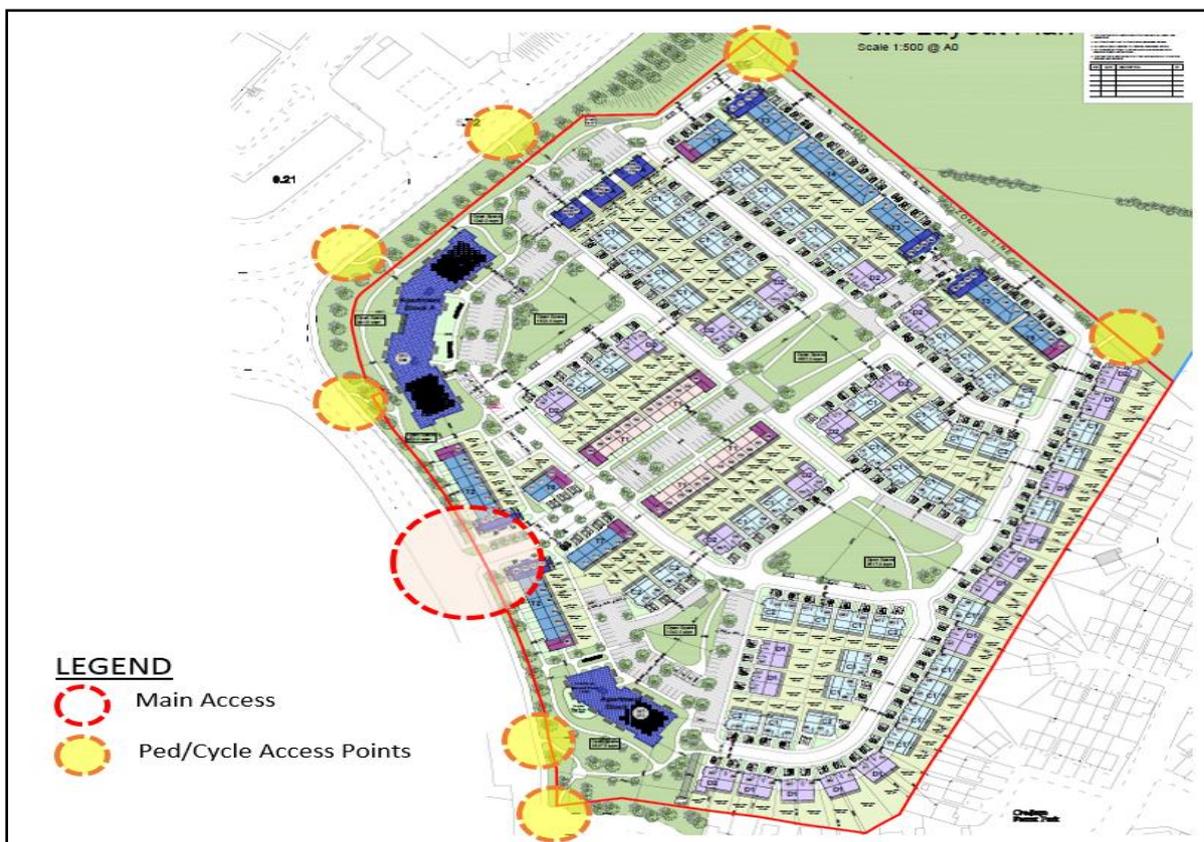
The development proposes 334 no. dedicated cycle parking spaces to serve the apartments/duplexes with an additional 6 no. cycle parking spaces for the creche, which equates to a total of 340 cycle spaces. This level of cycle parking encourages and supports increased usage of cycling as a sustainable mode of travel to/from the proposed development.

Vehicle / Pedestrian / Cycle Access

The subject site will benefit from 1 number vehicular, pedestrian and cyclist access / egress location on the R405-Maynooth Road to the southwest of the development site as illustrated in Figure 11.14. This site access point is proposed as a priority junction approximately mid-way along the R405 frontage of the site and complies with DMURS for design standards and sightlines for a 50kph road, with sightline being achievable. In addition to the main site access, there will be several pedestrian/cycle access points provided along R405-Maynooth Road and R449-M4 Link Road.

Accordingly, the subject site will be highly accessible to both pedestrian and cyclists with permeable connections provided to the neighbouring lands via the access points, local streets and footpaths throughout the proposed development.

Figure 11.14 Proposed Vehicle Access Locations



Source: JFA Architects, annotated by DBFL

11.5 Identification of Likely Significant Impacts

11.5.1 Construction Phase Impacts

All construction activities will be regulated by means of an agreed Construction Traffic Management Plan (CTMP) - the details of which will be agreed with the local roads' authority prior to the commencement of construction activities on-site.

The principal objective of the CTMP is to ensure that the impacts of all building activities generated during the construction of the proposed residential development upon both the public (off-site) and internal (on-site) workers environments, are fully considered and proactively managed / programmed respecting key stakeholders requirements thereby ensuring that both the public's and construction workers safety is maintained at all times, disruptions minimised and undertaken within a controlled hazard free / minimised environment.

The likely impact of the construction works will be short-term in nature. The number of staff on site will fluctuate over the implementation of the subject scheme. Nevertheless, based upon the experience of similar projects, it would be expected that approx. 30 - 40 staff will be on site at any one time, subsequently generating low levels of two-way vehicle trips during the peak AM and PM periods over the period of the construction works (construction workers will use shared transport). On-site employees will generally arrive before 08:00, thus avoiding the morning peak hour traffic. These employees will generally depart after 16:00.

The potential impact during the construction phase with all the above considered would have a short-term slight effect on the surrounding network however, with the CTMP and deliveries managed accordingly, this will have imperceptible effect in Celbridge Town Centre and key traffic corridors into the town.

At this initial stage it is assumed that whilst the first 100 units will be completed by the end of 2021, the full scheme is unlikely to be fully completed before 2026, which is the assumed Interim design year for this proposed development.

All construction activities will be regulated by a Construction Traffic Management Plan (CTMP) - the details of which will be agreed with the Planning Authority prior to the commencement of the development. The number of staff on site will fluctuate over the implementation of the subject scheme. Nevertheless, based upon the experience of similar projects, a development of this type and scale would on average necessitate approximately 30 - 40 staff on site at any one time, subsequently generating no more than 10 - 15 two-way vehicle trips during the peak AM and PM periods over the period of the construction works, (construction workers will use shared transport). On-site employees will generally arrive before 08:00, thus avoiding the morning peak hour traffic. These employees will generally depart after 16:00. It should be noted that a large proportion of construction workers would arrive in shared transport.

Deliveries would arrive at a steady rate during the course of the day. An estimated 42,000m³ of inert fill material will be brought onto the site over the entire duration of the construction stage of the development. Existing spoil material and spoil generated from earthworks, service trenching and excavation of foundations will be retained on-site, however the additional importation of 42,000m³ fill material will be needed to ensure proposed dwellings are elevated above the adjacent 100-year flood extent. This stage of importation is anticipated to last 48 months in duration.

The estimated 42,000m³ of fill material equates to between 4,828 and 5,385 truckloads upon vehicles characteristics. At 3 loads per hour and 10 hours per day this equates to 180 days of importation of fill material as part of the adopted worst-case assessment. Considering the programme for this importation is 48 months, the effect on the local road network is considered negligible.

In relation to the proposed haul routes for the fill material, it is proposed that vehicles will exit and enter the site from the R405 Maynooth Road to/from the respective licensed facility. This proposed haul route will bypass Celbridge Town Centre.

For the above reasons we do not believe that construction traffic will generate any traffic concerns or impede upon the operational performance of the local road network and its surrounding junctions, and therefore conclude that there will be slight short-term impacts during construction phase. However, with the CTMP and deliveries managed accordingly, this will have imperceptible effect in Celbridge Town Centre and key traffic corridors into the town.

11.5.2 Operational Phase Impacts

Once the subject development is fully complete and occupied two distinct peak arrival / departure times are expected during a typical weekday. Specifically, there is expected to be AM peak between 08:00 to 09:00 when people are leaving for work or educational purposes. The PM peak is expected around 16:00 to 17:00 when residents would be returning to the subject site from work.

The development traffic will be accommodated by one proposed access junction onto the neighbouring road network; a priority-controlled junction with the R405 Maynooth Road. In order to analyse and assess the impact of the proposed development on the surrounding road network, a traffic generation and distribution model (excel based) of the following key junctions was created (illustrated in Figure 11.15):

- Junction 1 – R405 Maynooth Road (N)/R449 M4 Link Road/R405 Maynooth Road (S)
- Junction 2 – Proposed Site Access/R405 Maynooth Road
- Junction 3 - R405 Maynooth Road/Crodaun Forest Park

Figure 11.15 Junctions Included Within the Network Analysis

Source: Google Maps, annotated by DBFL

Once in operation the proposed development is expected to establish permanent travel patterns and trip generation on the surrounding transport network which would be reflective of existing and forecasted conditions in Celbridge. Potential impacts would be predicted at immediate key junctions on the road network and would have a moderate effect but consistent with baseline trends.

Trip Generation

Most person trips to/from the proposed development will be undertaken by private vehicles, however, sustainable modes of travel will be encouraged and promoted. The specific impact of the subject scheme will be predominantly influenced by the number of vehicle movements that the scheme could potentially generate. To assist in determining this, a review of trip generation factors contained within the TRICS database was carried out. TRICS data is primarily UK based, although a number of Irish sites have recently been included and the number of Irish sites continues to expand. Nevertheless, we consider that TRICS will provide a reasonable indication of traffic generation from the proposed development.

Notwithstanding the above, internal research undertaken by TRICS has shown that there is no direct evidence of trip rate variation by country or region. The use of English, Scottish or Welsh data can be equally applicable to Ireland if users take into account important site selection filtering factors such as levels of population, location type, local public transport provision, and development size and car ownership level, amongst others.

Data supplied for inclusion in TRICS undergoes a procedure of validation testing, and there is no evidence from this procedure suggesting that data from Ireland bears any significant fundamental differences to that from the other countries included. Consequently, we consider that TRICS will provide a reasonable indication of traffic generation from the proposed development.

Table 11.3 below includes the predicted trip generations and our estimate of the likely traffic flows in and out of the proposed development during the morning and evening peak hour periods using data from TRICS.

Table 11.3 Proposed Development Trip Rates (TRICS)

Land Use	Units	AM Peak Hour			PM Peak Hour		
		Arr	Dep	Total	Arr	Dep	Total
Apartments	Per Unit	0.052	0.224	0.276	0.129	0.076	0.205
Houses	Per Unit	0.14	0.415	0.555	0.294	0.181	0.475

Based on the above trip rates, potential peak hour traffic generation is calculated based on 154 apartments, 218 houses and a creche. Considering size and capacity of the creche, it can only cater for the future residents of the development and will not attract trips from outside the subject site. Since the creche will not generate external trips, it has been omitted from this assessment. Table 11.4 summarises the predicted peak hour AM and PM traffic generated by the proposed development. The TRIC's output files are included at Appendix C of the TTA included at Appendix I of this report.

Table 11.4 Proposed Development Vehicle Trips

Land Use	Units	AM Peak Hour			PM Peak Hour		
		Arr	Dep	Total	Arr	Dep	Total
Apartments	154	8	35	43	20	12	32
Houses	218	31	90	121	64	39	104

Trip Generation – Construction Rate

For the purpose of this assessment and utilising typical house construction rates it is estimated that 100 houses, of the proposed 372 dwellings, and the creche could be constructed by the year 2021, with the remaining 272 dwellings (118 houses and 154 apartments) constructed prior to the adopted 2026 design. The creche due to its size and capacity can only cater for the future residents of the development and will not attract trips from outside. Since the creche will not generate external trips, it has been omitted from this assessment. Table 11.5 below summarises the predicted peak hour AM and PM traffic generated by the proposed residential development in each of the adopted design years.

Table 11.5 Proposed Development Traffic Generation

Design Year	Land Use	AM Peak Hour			PM Peak Hour		
		Arr	Dep	Total	Arr	Dep	Total
2021	100 units	14	42	56	29	18	48
2026	272 units	25	83	108	55	33	88
2036 Total		39	125	163	84	51	135

Trip Distribution & Assignment

The distribution and assignment of the proposed development's vehicular traffic across the local road network as proposed by DBFL is presented in Figure 2 as included in Appendix C of the TTA report included at Appendix I of this EIAR. The associated development vehicle trips have been assigned to the surrounding road network based on the following:

- 60% travelling to the subject site via Maynooth Road (North), and
- 40% travelling to the subject site via Maynooth Road (South).
- 60% travelling from the subject site via Maynooth Road (North), and
- 35% travelling from the subject site via Maynooth Road (South)
- 5% travelling from the subject site via Crodaun Forest Park

The associated residential vehicle trips have been assigned to the surrounding road network based on the surveyed traffic movements passing the site based on the following assumptions.

- Traffic Flows and patterns will remain similar to surveyed traffic flow data.
- Trips from the development are to be consistent with the existing trends along either road; and
- % distribution of flows changes between AM and PM scenarios in accordance with survey data.

Traffic Growth

The TTA adopts an Opening Design Year of 2021, Interim Design Year of 2026 and Future Horizon Year of 2036 (+15 years) as per TII guidelines. Although traffic growth may not increase at the rates once predicted, to ensure a robust analysis of the impact of traffic upon the local road network we have adopted growth rates using the Transport Infrastructure Ireland (TII) "Travel Demand Projections".

Table 6.2 within the TII Project Appraisal Guidelines Units 5.3 provides Link-Based Annual Traffic Growth Factors for the different regions within Ireland. The subject site lies within 'County Kildare' with the growth factors as outlined within Table 11.6 below.

Table 11.6 Link-Based Growth Rates: Annual Growth Factors (Extract from Table 6.2 PAG Unit 5.3, May 2019)

LOW SENSITIVITY GROWTH		
2016-2030	2030-2040	2040-2050

LOW SENSITIVITY GROWTH					
LV	HV	LV	HV	LV	HV
1.018	1.0363	1.0044	1.0135	1.0035	1.0169
CENTRAL GROWTH					
2016-2030		2030-2040		2040-2050	
LV	HV	LV	HV	HV	LV
1.0197	1.0378	1.0062	1.0155	1.0053	1.0187
HIGH SENSITIVITY GROWTH					
2016-2030		2016-2030		2040-2050	
LV	HV	LV	HV	LV	HV
1.0229	1.0413	1.0098	1.0191	1.0107	1.0283

Applying the annual factors (central growth) as outlined in Table 11.6 above for the adopted Opening Year of 2021 and Future Horizon Year of 2036 (+15 years), the following growth rates have been adopted to establish corresponding 2021, 2026 and 2036 baseline network flows: -

- 2018 to 2021 – 1.0603 (or 6%);
- 2018 to 2026 – 1.1689 (or 16.9%); and
- 2018 to 2036 – 1.2942 (or 29.4%)

Assessment Scope

A total of three different traffic scenarios have been investigated across the three different design years;

- 'Base' (Do-Nothing) traffic characteristics – baseline network conditions for 2021, 2026 and 2036
- 'Post development' (Do-Something Scenario 2021,2026 and 2036) traffic characteristics

The 'Base' traffic scenario takes into account the existing flows travelling across the network. The proposed development traffic is then added to the network's 'Base' traffic flows to establish the 'Post Development' traffic flows. In summary, the following network modelling scenarios are considered: -

Do Nothing

- 2021 Base Traffic Flows
- 2026 Base Traffic Flow
- 2036 Base Traffic Flows

Do Something

- 2021 Do Nothing + Proposed Residential Development (100 units + creche)

- 2026 & 2036 Do Nothing + Proposed Residential Development (Full Development 372 units)

Assessment Periods

The networks AM and PM peak hour flows have been identified as occurring between 08:00 to 09:00 and 16:00 to 17:00 respectively.

The following figures as included in Appendix B of the TTA (Appendix I) present the vehicle flows across the local road network for each of the adopted development scenarios: -

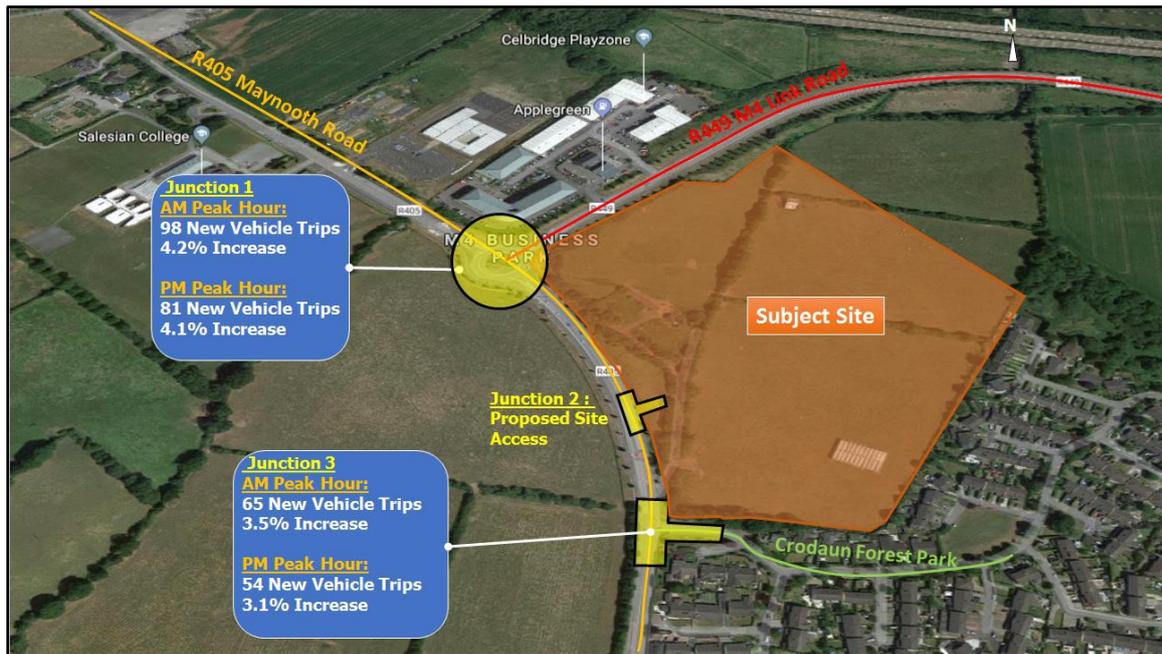
- Figure 3 – 2021 Do Nothing
- Figure 4 – 2026 Do Nothing
- Figure 10 – 2036 Do Nothing
- Figure 11 – 2021 Do Something (100 Units)
- Figure 12 – 2026 Do Something (Full Development 372 Units)
- Figure 13 – 2036 Do Something (Full Development 372 Units)

Impact of Proposals

The Institution of Highways and Transportation document 'Guidelines for Traffic Impact Assessments' (1994) states that the impact of a proposed development upon the local road network is considered material when the level of traffic it generates surpasses 10% and 5% on normal and congested networks respectively. When such levels of impact are generated a more detailed assessment should be undertaken to ascertain the specific impact upon the network's operational performance. These same thresholds are reproduced in the NRA document entitled Traffic and Transport Assessment Guidelines (2014).

Figure 11.16 below details the amount of two-way vehicle trips to/from the proposed development site that will travel through Junction 1 and 3 in the 2026 Horizon Design year scenario. This Scenario (2026 Horizon Design Year) was considered as it has the largest percentage impact on the surrounding junctions with all 372 units assigned to the 2026 traffic model with the base traffic flows increased to those expected for the Design year, in accordance with TII Project Appraisal Guidelines.

Figure 11.16 Increase in Vehicle Trips Generated 2026 Do Something Scenario



The resulting percentage increase in traffic flows as a result of the traffic generated by the proposed development is established as being below the 10% threshold at all off-site junctions in both the AM and PM peak periods.

For the key junctions surveyed, it can be seen that the proposed development (372 units) in 2026 & 2036 would result in the following percentage impacts:

- Junction 1 – R405 Maynooth Road (N)/R449 M4 Link Road/R405 Maynooth Road (S)
- Junction 3 - R405 Maynooth Road/Crodaun Forest Park

Table 11.7 Network Impact Through Key Junctions (2026 & 2036)

Scenario	Junction ID	Location	% Impact	
			AM Peak	PM Peak
2026	1	R405 Maynooth Road (N)/R449 M4 Link Road/R405 Maynooth Road (S)	4.2%	4.1%
	3	R405 Maynooth Road/Crodaun Forest Park Priority Controlled Junction	3.5%	3.1%
2036	1	R405 Maynooth Road (N)/R449 M4 Link Road/R405 Maynooth Road (S)	3.8%	3.7%
	3	R405 Maynooth Road/Crodaun Forest Park Priority Controlled Junction	3.2%	2.8%

Results of this assessment show that junctions 1 & 3 do not exceed the threshold of 5% traffic impact for Junction 1 (R405 / R449) and Junction 3 (R405/Crodaun Forest Park). However, for the purpose of robust analysis, the junction 1 ((R405 / R449 Roundabout) has been further analysed. Junction 1 along with junction 2 (Site access junction) have been analysed using the modelling software Junction 9.0 ARCADY and PICADY respectively.

Network Analysis

The operational assessment of the local road network has been undertaken using the Transport Research Laboratory (TRL) computer package Junctions 9.0 using PICADY for priority-controlled junctions and ARCADY for roundabout junctions.

When considering both roundabout and priority-controlled junctions, a Ratio of Flow to Capacity (RFC) of greater than 85% (0.85) would indicate a junction to be approaching capacity, as operational performance above this RFC value begins to become poor and deteriorates quickly.

For the ARCADY/PICADY analysis a 90-minute weekday AM and PM period has been simulated, namely from 08:00 to 09:30 and 17:00 to 18:30, as influenced by local traffic conditions. Traffic flows were entered using an Origin-Destination table for the peak hour periods.

In order to determine if the local road network can adequately cater for the predicted level of traffic as potentially generated by the proposed office development, an area wide traffic model incorporating the local key junctions has been analysed for the schemes adopted future design years. The assessment has adopted a 2021 Opening Year, 2026 Interim Year and a 2036 Horizon Design Year. Figure 11.17 below illustrates location of the junctions included in the ARCADY/PICADY analysis;

Figure 11.17 Junctions included in the Network Analysis

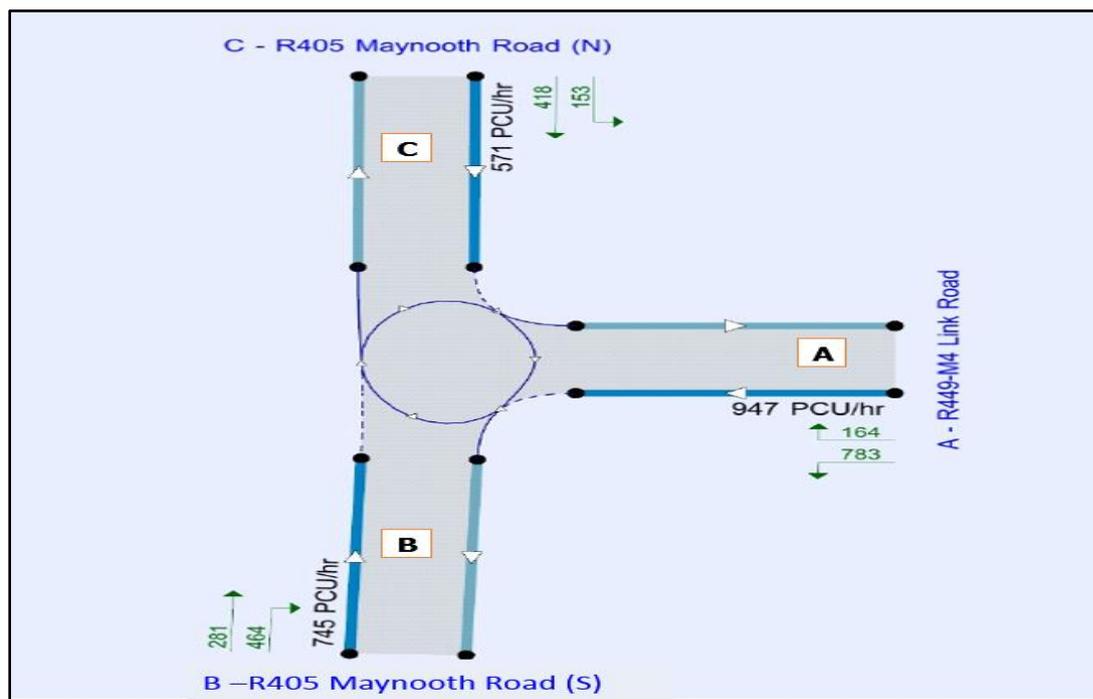


Junction 1: R405 Maynooth Road/R449 M4 Link Road Roundabout

The three arms of the roundabout junction, which may be seen in Figure 11.18 below are labelled as follows:

- Arm A: R449 M4 Link Road
- Arm B: R405 Maynooth Road (S)
- Arm C: R405 Maynooth Road (N)

Figure 11.18 Junction 1 R405/R449



Baseline Scenario

The 'Baseline' 2018 AM peak hour ARCADY results (Table 11.8) indicate that this junction operates within capacity with a maximum Ratio of Flow to Capacity (RFC) value of 65% and a corresponding queue of 2.0 pcu's being recorded on arm B of the roundabout junction. During the 'Baseline' 2018 PM peak hour, a maximum RFC value of 51% and a corresponding queue of 1.1 pcu's being recorded on arm A of the roundabout junction.

Table 11.8 2018 Baseline ARCADY Analysis Results

Scenario	Period	Arm	RFC	Queu0.3e (PCU)2.0	Delay (s)
Base 2018	AM Peak	A	0.24	0.3	3.39
		B	0.65	2.0	6.70
		C	0.47	1.0	4.84
	PM Peak	A	0.51	1.1	5.20
		B	0.36	0.6	3.66
		C	0.28	0.4	3.25

Do Nothing Scenario

The ARCADY results reveal that the roundabout junction operates within capacity during the Do Nothing 2021 Opening Year and 2026 Interim Design Year analysis scenarios, however, the junction will operate at approaching capacity with a max RFC value of 0.86 during AM peak hour 2036 Future Horizon Year (+15).

Table 11.9 below presents the ARACDY results for the Do Nothing scenario.

Table 11.9 Do Nothing ARCADY Analysis Results

Scenario	Period	Arm	RFC	Arm Name	Queue (PCU)	Delay (s)
2021 Do Nothing	AM Peak	A	0.25	R449	0.4	3.50
		B	0.69	R405 (S)	2.5	7.63
		C	0.50	R405 (N)	1.1	5.28
	PM Peak	A	0.54	R449	1.3	5.65
		B	0.38	R405 (S)	0.7	3.81
		C	0.30	R405 (N)	0.5	3.37
2026 Do Nothing	AM Peak	A	0.28	R449	0.4	3.71
		B	0.77	R405 (S)	3.6	10.12
		C	0.57	R405 (N)	1.4	6.30

Scenario	Period	Arm	RFC	Arm Name	Queue (PCU)	Delay (s)
	PM Peak	A	0.61	R449	1.7	6.66
		B	0.42	R405 (S)	0.8	4.10
		C	0.33	R405 (N)	0.5	3.61
2036 Do Nothing	AM Peak	A	0.32	R449	0.5	3.99
		B	0.86	R405 (S)	6.2	16.14
		C	0.65	R405 (N)	2.0	8.11
	PM Peak	A	0.68	R449	2.3	8.42
		B	0.47	R405 (S)	1.0	4.51
		C	0.38	R405 (N)	0.7	3.93

Do Something Scenario

The ARCADY results reveal that the roundabout junction operates within capacity during the Do Something 2021 Opening Year and 2026 Interim Design Year analysis scenarios, however, the junction will operate at approaching capacity with a max RFC value of 0.91 during AM peak hour 2036 Future Horizon Year (+15). The 'Do Something' is comparable to the 'Do Nothing' scenario with the Ratio of Flow to Capacity (RFC) increasing by only 0.05. Table 11.10 below presents the ARCADY results for Do Something scenario.

Table 11.10 Do Something ARCADY Analysis Results

Scenario	Period	Arm	Arm Name	RFC	Queue (PCU)	Delay (s)
2021 Do Something	AM Peak	A	R449	0.26	0.4	3.53
		B	R405 (S)	0.71	2.7	8.03
		C	R405 (N)	0.51	1.1	5.37
	PM Peak	A	R449	0.55	1.3	5.78
		B	R405 (S)	0.39	0.7	3.85
		C	R405 (N)	0.30	0.5	3.40
	AM Peak	A	R449	0.30	0.5	3.79

Scenario	Period	Arm	Arm Name	RFC	Queue (PCU)	Delay (s)
2026 Do Something		B	R405 (S)	0.82	4.8	12.77
		C	R405 (N)	0.59	1.6	6.74
	PM Peak	A	R449	0.63	1.9	7.24
		B	R405 (S)	0.44	0.9	4.25
		C	R405 (N)	0.35	0.6	3.73
2036 Do Something	AM Peak	A	R449	0.33	0.5	4.07
		B	R405 (S)	0.91	9.3	23.42
		C	R405 (N)	0.68	2.3	8.83
	PM Peak	A	R449	0.71	2.7	9.37
		B	R405 (S)	0.49	1.1	4.69
		C	R405 (N)	0.39	0.7	4.08

The Maximum Ratio of Flow to Capacity (RFC) within 'Do Something' and 'Do Nothing' scenarios during all design years are summarised in the RFC comparison Table 11.11 below.

Table 11.11 Comparison of Ratio of Flow to Capacity (RFC)

Design Year	RFC - Do Nothing	RFC - Do Something	RFC Increase
2021	0.69	0.71	0.02
2026	0.77	0.82	0.05
2036	0.86	0.91	0.05

The ARCADY results reveal that the roundabout junction will operate at approaching capacity with a max RFC value of 0.86 during the AM peak hour 2036 'Do Nothing' and a max RFC value of 0.91 during AM peak hour 2036 'Do Something' scenario. As outlined in Table 11.11 above, the maximum RFC is increasing by only 5% in the Do Something scenario.

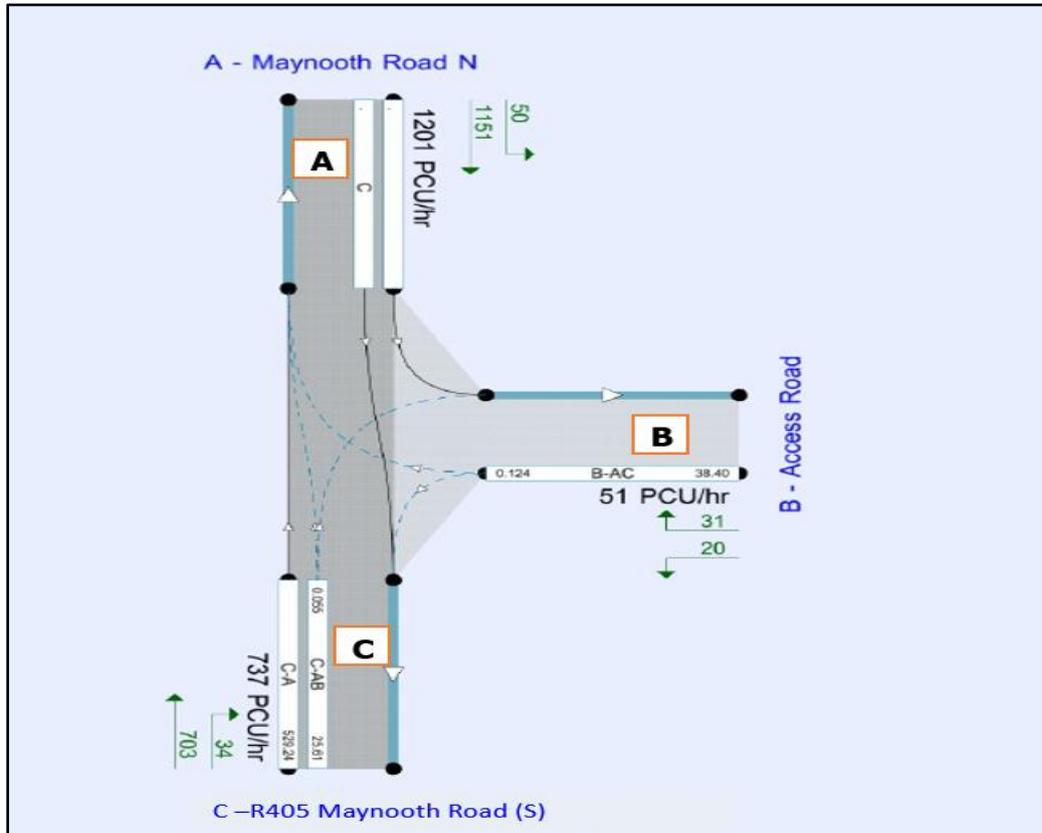
A copy of the ARCADY output files can be found in Appendix D of the TTA (included at Appendix I).

JUNCTION 2: R405-Maynooth Rd/Site Access

The results of the operational assessment of this priority T junction during the morning and evening peaks are summarised in Table 11.12 below. The arms were labelled as follows within the PICADY model:

- Arm A: Maynooth Road N
- Arm B: Site Access Road
- Arm C: Maynooth Road S

Figure 11.19 Junction3: R405-Maynooth Rd /Site Access



The PICADY results reveal that the roundabout junction operates within capacity during the Do Something 2021 Opening Year, 2026 Interim Design Year and 2036 Future Horizon Year (+15) analysis scenarios,

The access junction will operate well within capacity in all scenarios with the maximum RFC value of 0.63 and the corresponding queue of 1.8 pcu's being recorded on the arm B (Site Access Road).

Table 11.12 below presents the PICADY results for Do Nothing scenario.

Table 11.12 Do Something PICADY Analysis Results

Scenario	Period	Arm	Arm Name	RFC	Queue (PCU)	Delay (s)
2021 Do Something	AM Peak	A	R405 (N)	-	-	-
		B	Site Access	0.16	0.2	16.03
		C	R405 (S)	0.01	0.0	7.68

Scenario	Period	Arm	Arm Name	RFC	Queue (PCU)	Delay (s)
	PM Peak	A	R405 (N)	-	-	-
		B	Site Access	0.08	0.1	0.1
		C	R405 (S)	0.03	0.0	0.0
2026 Do Something	AM Peak	A	R405 (N)	-	-	-
		B	Site Access	0.54	1.2	33.33
		C	R405 (S)	0.03	0.0	8.13
	PM Peak	A	R405 (N)	-	-	-
		B	Site Access	0.26	0.4	24.41
		C	R405 (S)	0.09	0.1	11.02
2036 Do Something	AM Peak	A	R405 (N)	-	-	-
		B	Site Access	0.63	1.8	48.70
		C	R405 (S)	0.3	0.0	8.42
	PM Peak	A	R405 (N)	-	-	-
		B	Site Access	0.32	0.5	32.43
		C	R405 (S)	0.10	0.1	11.94

A copy of the PICADY output files can be found in Appendix D of the TTA (Appendix I of Volume 2 of this EIAR).

11.5.3 Potential Cumulative Impacts

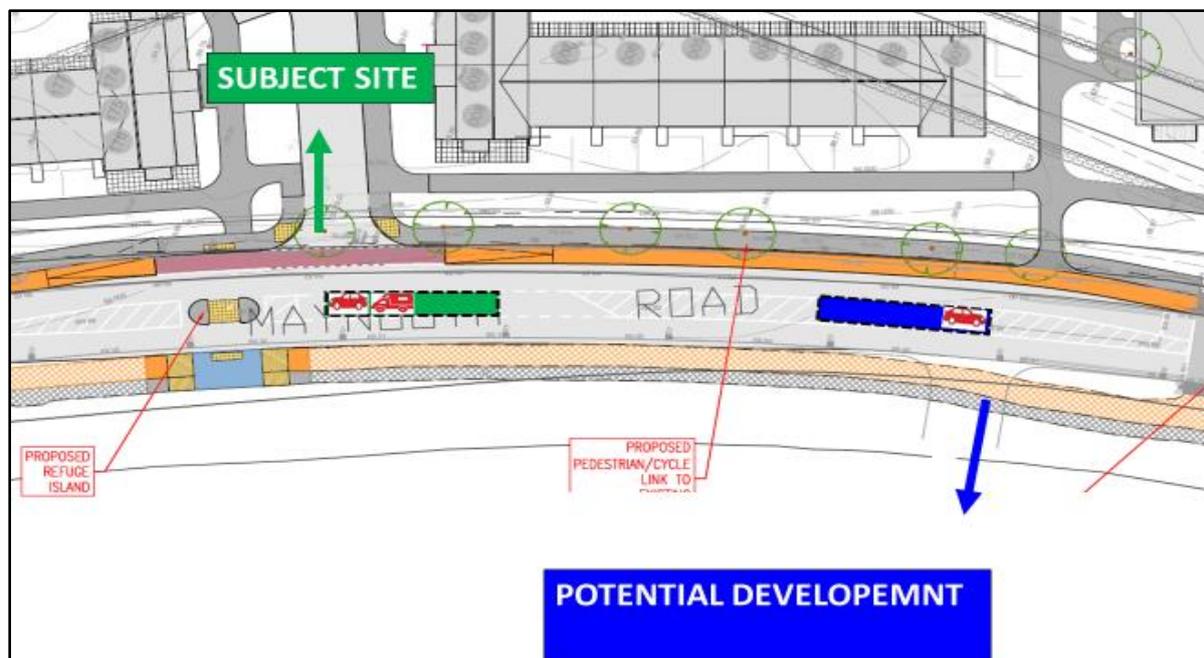
Potential cumulative impacts have been assessed in relation to the existing and permitted transportation schemes. The site of the proposed residential development is positioned within the urban environment which will ideally position the site to maximise access to / from the site by sustainable forms of travel including walking, cycling and public transport.

Any other future development in the vicinity of the site would have to similarly undergo traffic and transport assessments to assess the potential cumulative impacts to the transport network. A desktop study was conducted of planning applications in the vicinity of the subject development in Kildare County Council planning database archive to assess any cumulative impacts from granted or committed applications to the subject scheme. No planning applications were found within the immediate vicinity

of the transport network assessed that would have a cumulative impact to traffic or to this proposed development. As part of the Crodaun KDA a residential zoned area is located to the south of the R405. This residential area/development has not been permitted/committed. However, as there is a reasonable prospect of this residential area/scheme being delivered over the immediate/short term planning horizon (Crodaun KDA), an assessment of the interaction of both site access junctions was undertaken. This assessment was undertaken to determine if there was sufficient separation distance between the junctions and predicted queuing in both right-turn pockets. Figure 11.20 below, illustrates proximity between the two site access junctions.

For the purpose of this assessment, it is assumed that a development quantum in the order of 500 residential dwellings can be delivered on the remainder of the Crodaun KDA4 to the south of the R405. It has also been assumed that the mix of dwellings is split equally between apartments and houses (i.e. (250 no. houses and 250 no. apartments). KDA 4 indicates that the potential development will have two accesses, therefore, it is also assumed that vehicular movements will be spread equally between the two accesses with only 50% (250 residential units) using the assumed access point onto the R405. The assessment of queue interaction between the subject site access and the potential development access within KDA 4 Crodaun onto the R405 revealed that both accesses can function properly without any overlapping occurring between both right turn pockets/lanes. The PICADY analysis revealed that in the worst case 2036 scenario a maximum queue of 2 PCU's recorded on subject site access whereas a maximum queue of 1 PCU recorded on the potential development access as illustrated in Figure 11.20 below.

Figure 11.20 Illustration of the Subject Site Access and Potential Development Access



11.5.4 Do Nothing Scenario

In the absence of the proposed development, the operational performance of the existing junctions on the surrounding road network will remain relatively unchanged with the exception of the impact caused by the forecast network traffic growth.

11.6 Mitigation Measures

11.6.1 Construction Phase Mitigation Measures

All construction related parking will be provided on-site. Construction traffic will consist of the following two principal categories:

- Private vehicles owned and driven by site construction staff and by full time supervisory staff.
- Excavation plant and dumper trucks involved in site development works and material delivery vehicles for the following: granular fill materials, concrete pipes, manholes, reinforcement steel, ready-mix concrete and mortar, concrete blocks, miscellaneous building materials, etc.

It is anticipated that the trip generation of HGV'S during the construction period will be evenly spread throughout the day and as such will not impact significantly during the peak traffic periods. Nevertheless, mitigations measures outlined for the Construction Stage include the provision of a Construction Management Plan, to be agreed with the Local Authority and which will include details on the following:

- Prescribed and agreed working hours;
- Agreed haul routes for incoming materials;
- Licensed hauliers to be used;
- Disposal sites;
- Travel arrangements for construction personnel;
- Appropriate on-site parking arrangements for construction personnel to prevent overspill parking on the local road network;
- Temporary construction entrances to be provided (if necessary)
- Wheel wash facilities to be provided;
- Road cleaning and sweeping measures to be put in place if required;
- Temporary construction signage to be put in place and maintained;
- Any proposed traffic management measures such as temporary traffic lights and signage on any public roads

11.6.2 Operational Phase Mitigation Measures

In order to promote and maximise sustainable transportation modes, cycle parking has been provided at a rate which exceeds Kildare County Development Plan (2017-2023) minimum standards which may act as a facilitator for the growth of Cycle trips undertaken for short to medium distance trips to/from the site, whilst apartment vehicle parking spaces have been provided at a rate slightly below the Department of Housing, Planning and Local Government's Sustainable Urban Housing: Design Standards for New Apartments Guidelines (0.97/unit), which is lower than those outlined in the Kildare County Development Plan.

The increase in cycle parking provisions, and simultaneous reduction in vehicle parking provisions for apartment and duplex units aim to increase the number of cycle trips taken and therefore encourage a modal split shift towards cycling for short to medium distance trips. Furthermore, the proposed

pedestrian access points and pedestrian linkages to/from the subject site will also encourage and support the uptake walking trips for short to medium distance trips.

11.6.3 Residual Impacts

11.6.3.1 Construction Phase

Provided the above mitigation measures and management procedures are incorporated during the construction phase, the residual impact on the local receiving environment will be temporary in nature and neutral in terms of quality and effect.

The significance of each of the projected impacts are detailed in Table 11.13 for the following key junctions:

- **Junction 1:** R405 Maynooth Road/R449 M4 Link Road Roundabout
- **Junction 3:** R405-Maynooth Rd / Crodaun Forest Park

The significance of the impacts has been determined in accordance with the classifications stipulated within the Environmental Protection Agency Guidelines on the Information to be Contained in Environmental Impact Assessment Reports - Draft (August 2017).

Table 11.13 Impact Significance – Construction Phase

Junctions		Environment Character	Quality / Scale of Impact	Impact Significance	Duration
1	R405-Maynooth Rd/R449-M4 Link Rd	Low Sensitivity	Negative - Low	Slight	Temporary
3	R405Maynooth Rd/Crodaun Forest Park	Low Sensitivity	Negative - Low	Slight	Temporary

11.6.3.2 Operational Phase

The implementation of the mitigation measures outlined above, will ensure that the residual effect on the local receiving environment is both managed and minimised. The analysis predicts the scale of residual impact, during both the 2026 and 2036 design years, as being below 5% on the surrounding links, as shown in Table 11.14.

Table 11.14 Network Impact Categorisation 2026 & 2036 AM and PM Peak Hours

Scenario	Junction ID	Location	Period	Impact Scale	Impact Level
2026	1	R405-Maynooth Rd/R449-M4 Link Rd	AM	4.2%	Slight
			PM	4.1%	Slight
	3	R405Maynooth Rd/ Crodaun Forest Park	AM	3.5%	Slight
			PM	3.1%	Slight

Scenario	Junction ID	Location	Period	Impact Scale	Impact Level
2036	1	R405-Maynooth Rd/R449-M4 Link Rd	AM	3.8%	Slight
			PM	3.7%	Slight
	3	R405Maynooth Rd/Crodaun Forest Park	AM	3.2%	Slight
			PM	2.8%	Slight

With regards to the TII thresholds, both the 2026 and 2036 analysis for R405 Maynooth Road/R449 M4 Link Road and R405Maynooth Rd/Crodaun Forest Park demonstrate that the proposed development will not generate an impact greater than 10% or 5% on normal or congested networks respectively. As a result, the impact can be classified as sub threshold.

The significance of each of the projected impacts at each of the key links is detailed within the following tables for the worst case (e.g. peak hours) 2036 Future Year scenarios.

Table 11.15 Impact Significance – 2036 Design Year (AM)

Ref	Environment Character	Quality / Scale of Impact	Impact Significance	Duration
1	Low Sensitivity	Low - Negligible	Not Significant	Long Term
3	Low Sensitivity	Low - Negligible	Not Significant	Long Term

Table 11.16 Impact Significance – 2036 Design Year (PM)

Ref	Environment Character	Quality / Scale of Impact	Impact Significance	Duration
1	Low Sensitivity	Low - Negligible	Not Significant	Long Term
3	Low Sensitivity	Low - Negligible	Not Significant	Long Term

11.7 Interactions and Human Health

11.7.1 Construction Phase

Temporary negative impacts to human health may be likely during the construction phase due to noise, dust, and air quality which are discussed in Chapters 9 and 10 of this EIAR. The traffic impacts are detailed in Section 11.5.3. These impacts will be temporary in nature and are not considered to be significant.

11.7.2 Operational Phase

The increased traffic as a result of the proposed development has been shown to have a negligible impact in terms of traffic. Accordingly, the associated impact on Human Beings will be limited.

Impact on air and noise quality will be negligible, as outlined above and in Chapters 9 and 10 of this EIAR.

11.8 Accidents & Disasters

11.8.1 Construction Phase

During the construction stage, the risk of accidents associated with the proposed development would not cause unusual, significant or adverse effects to the access of the existing public road network. The vast majority of the works are away from the public road. Measures will be put in place to assess the risk of road traffic accidents during the construction phase. It is expected that the risk of accidents would be low during the construction of the proposed development. Standard construction practises would be implemented, and no unusual substances or technologies would be used nor predicted.

Table 11.17 Description of Effects – Construction Phase

Ref	Environment Character	Quality/ Scale of Impact	Impact Significance	Duration
1	Medium/ High Sensitivity	Neutral - Negligible	Not Significant	Temporary
2	Low Sensitivity	Negative - Low	Slight	Temporary

11.8.2 Operational Phase

The potential for increased accidents during the operational phase is considered low as a result of improved road safety. Data obtained from the Road Safety Authority shows that since 2005, no serious or fatal accidents have occurred adjacent to the proposed development entrance.

Table 11.18 Description of Effects – Operational Phase

Ref	Environment Character	Quality/ Scale of Impact	Impact Significance	Duration
1	Medium/ High Sensitivity	Negative - High	Not Significant	Long Term
2	Low Sensitivity	Positive - Low	Slight	Long Term

Monitoring

While it has been demonstrated that the proposed development has negligible impact on the operation of the local network, it is nevertheless recommended that the local area should be monitored in terms of transportation efficiencies into the future.