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ENVIRONMENTAL IMPACT ASSESSMENT SCREENING REPORT FOR PROPOSED NTA PARK AND RIDE DEVELOPMENT AT FASSAROE BRAY CO. WICKLOW

Report Prepared For
Wicklow County Council

Report Prepared By
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1.0 INTRODUCTION

On behalf of National Transport Authority (NTA) Park and Ride Development Office (PRDO) and Wicklow County Council, AWN Consulting Limited (AWN) has prepared the following Environmental Impact Assessment (EIA) Screening Report to accompany the planning application for a proposed Park and Ride development (the "Proposed Development") at junction 6 N11 Fassaroe, Bray Co. Wicklow. The Proposed Development site is outlined in red on Figure 1 and 2.

The subject site is located immediately west of the M11 at Junction 6 Fassaroe adjacent to the greater Bray town area and approximately 100 meters south of the Wicklow/Dublin County boundary. The site is bounded by the junction 6 M11 off ramp to the east, local access road to the south, residential properties to the west and agricultural and forestry to the north. A review of historical aerial imagery from 1995 indicates that the project site was previously greenfield and used for agricultural purposes, most likely as arable land (BC1). Immature woodland, likely associated with recent woodland landscape planting associated with the M11 is shown to the southeast of the project site boundary. The 2000 aerial imagery indicates the presence of improved agricultural grassland dominating the site, with broad-leaved woodland associated with the landscaping of the M11 shown to the southeast of the Site boundary, while a treeline is shown forming the boundary of the Site along the slip roads to the east and north of the Site. The 2005 imagery indicate a significant change in the land cover at this Site with grassland surface removed and a denuded bare ground (ED2) surface dominating the cover within the site. Much of the treeline along the eastern and northern slip road boundaries and the broad-leaved woodland to the southeast was also removed at the time the 2005 imagery was recorded.

The proposed site is currently being used as a depot for the storage of construction material and equipment.

The River Dargle is located approximately 250 meters to the east beyond the M11 and flows in a north-westerly direction towards the Irish sea.

"The proposed development comprises a car park with 388 parking spaces, including 26 designated for mobility-impaired users, 42 for electric vehicles and 39 additional spaces futured proofed for electric vehicles.

The proposal involves provision of hardstanding areas for bike shelters and lockers, active travel connections, fencing, kerbs, drainage, road markings, public lighting, CCTV, ticketing machines, and a new ESB substation and switch room.

The scheme also features area with two bus bays, two passenger shelters, and a dedicated bus turning circle within the site. A new access junction is proposed at Fassaroe Lane, incorporating a new right-turning pocket lane for accessing the facility. The existing bus bay on the northern (eastbound) carriageway of Fassaroe Lane is proposed for removal."

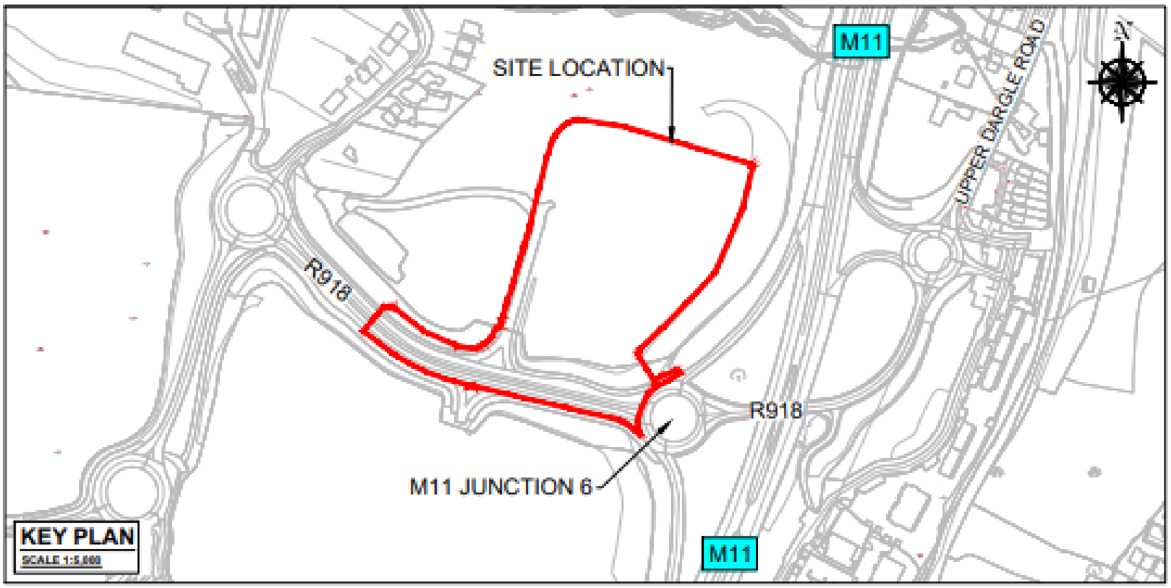


Figure 1. Proposed Development site (in red) (source: CSEA 20-008N-CSE-GEN-XX-DR-C-2200)

Figure 2. Proposed Development site (indicative site boundary in red) (source: Google Maps)

The purpose of this report is twofold, to provide Wicklow County Council with the information required under Schedule 7A to demonstrate the likely effects on the environment, having regard to the criteria set out in Schedule 7 of the Planning and Development Regulations 2001, as amended. This information will enable Wicklow

County Council to undertake a screening determination in respect of the need for an Environmental Impact Assessment Report (EIAR) for the Proposed Development. The second reason for this report is to document the studies undertaken by the Applicant, and the design team, which demonstrate there are no significant effects predicted as a result of the Proposed Development and the application can be determined by Wicklow County Council without an EIAR having been submitted.

There is a mandatory requirement for an EIA Report to accompany a planning application for some types of development that meet or exceed the "thresholds" as outlined in the Planning and Development Regulations 2001, as amended. In addition to the mandatory requirement, there is a case-by-case assessment necessary for sub-threshold developments as they may be likely to have significant effects on the environment. If a sub-threshold development is determined to be likely to have significant effect on the environment, then an EIA Report will be required.

1.1 EIA SCREENING LEGISLATION AND GUIDANCE

The legislation and guidance listed below has informed this report and the EIA Screening methodology:

- European Union (Planning & Development) (Environmental Impact Assessment) Regulations 2018;
- Environmental Impact Assessment of Projects – Guidance on Screening. (2022). European Commission.
- Guidelines on the Information to be contained in Environmental Impact Assessment Reports. (2022). Environment Protection Agency.
- Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report. (2022) European Commission.
- Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licensing Systems – Key Issues Consultation Paper (2017:DoHPCLG)
- Preparation of guidance documents for the implementation of EIA directive (Directive 2011/92/EU as amended by 2014/52/EU) – Annex I to the Final Report (COWI, Milieu; April 2017);
- European Union Environmental Impact Assessment (EIA) Directive 2011/92/EU as amended by 2014/52/EU
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment. (August 2018). Department of Housing, Planning and Local Government.
- Advice Notes for preparing Environmental Impact Statements. (Draft, September 2015). Environment Protection Agency
- Planning and Development Act, 2000 (as amended)
- Planning and Development Regulations 2001 (as amended)
- Interpretation of definitions of project categories of Annex I and II of the EIA Directive. (2015) European Commission
- Guidance for Consent Authorities regarding Sub-threshold Development (2003; DoEHLG).
- Office-of-the-Planning-Regulator (2021) Appropriate Assessment Screening for Development Management OPR Practice Note PN01. March 2021

The national requirements to provide an EIA with a planning application is outlined in *Planning and Development Act 2000 as amended* (the Act) and *Planning and Development Regulations, 2001 as amended* (the Regulations). In addition to the national legalisation there are requirements set out in the EU Directive (as referenced above); the EU Directive has been transposed into Irish Legislation.

There is a mandatory requirement for an EIA Report under Section 172(1)(a) of the Act to accompany a planning application for some types of projects which are equal to or exceeds a limit, quantity or "threshold" set for that class of development. The mandatory thresholds for an EIA Report are set out in Schedule 5 of the Regulations.

In addition to the mandatory requirement, there is a case-by-case assessment necessary for sub-threshold developments and a requirement under Section 172(1)(b) of the Act for an EIA to accompany a planning application for sub-threshold development which would be likely to have significant effects on the environment. In order to determine if a Project would be likely to have significant effects on the environment and if an EIA is required Schedule 7 of the Regulations sets out the relevant criteria to be considered by the Planning Authority.

Section 176A(2)(a) of the Act states that an application for screening for environmental impact assessment may be submitted to the Planning Authority. The scope of the information to be provided by the developer when an application for screening is made is set out in Section 176A(3) of the Act, Schedule 7A of the Regulations, and Annex IIA of the EU Directive.

The screening process followed in this report is in accordance with the EIA Directive 2011/92/EU of the European Parliament and of the Council as amended by 2014/52/EU and follows the format as per Section 3.2 of the EPA Guidelines (2022). The potential for significant effects of the proposed Project has been considered against Schedule 7 of the *Planning and Development Regulations, 2001 as amended*[1].

In producing this report due regard has been paid to other EIA guidance including the European Union's 2022 EIA *Guidance on Screening* and *Guidance on the preparation of the Environmental Impact Assessment Report* as well as the published *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessm*ent.

It is important for the Planning Authority to note that Article 27 of the EU Directive states that "*The screening procedure should ensure that an environmental impact assessment is only required for projects likely to have significant effects on the environment*". This screening exercise is used to establish whether the proposed Project is likely to have significant effects on the environment and if an EIA Report is required.

1.2 SCREENING METHODOLOGY

The key steps to screen for an EIA is set out in Section 3.2 of the EPA Guidelines (2022). This EIA Screening Report has been arranged to address the information as required by these steps. These steps are:

1. Is the development a type that that requires EIA?
2. Is it of a type that requires mandatory EIA?
3. Is it above the specified threshold?
4. Is it a type of project that could lead to effects? and/or
5. Is it a sensitive location? and/or

6. Could the effects be significant?

An assessment of the points 1 to 3 above has been made by AWN against the relevant legislation and thresholds set out in Schedule 5 of the Regulations, this evaluation has been documented in Section 2.0 of this report.

In order to address points 4 to 6 above, an evaluation of the characteristics of the project, the sensitivity of the location of the Proposed Development, and the potential for significant impacts has been made with regard to Schedule 7 of the Regulations. Schedule 7 of the Regulations sets out the criteria for the Planning Authority to determine whether a development would or would not be likely to have significant effects on the environment. The criteria is broadly set out under the three main headings:

- Characteristics of Proposed Development (Section 3.0)
- Location of Proposed Development (Section 4.0)
- Types and Characteristics of Potential Impacts (Section 5.0)

The Planning Authority must have regard to the Schedule 7 criteria in forming an opinion as to whether or not a development is likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location should be subject to EIA.

The information required to be submitted by the developer for the Planning Authority to make a determination on EIA Screening is set out in Schedule 7A of the Regulation, Section 176A(2)(a) of the Act, and Annex IIA of the EU Directive.

However, it is important to note that Schedule 7A states '*The compilation of the information at paragraphs 1 to 3 [*of Schedule 7A*] shall take into account, where relevant, the criteria set out in Schedule 7*.' The main body of this report (Sections 3.0, 4.0 and 5.0) will cover Schedule 7A fully, but it has been set out to present the information under the headings provided for in Schedule 7 in order to assist the Planning Authority in its screening assessment.

1.3 CONTRIBUTORS TO THE EIA SCREENING REPORT

The preparation and co-ordination of this screening report has been completed by AWN Consulting in conjunction with the project design team and developer.

Table 1. Contributors to this Report

Role	Contributor
Developer	Wicklow County Council
Architectural	Clifton Scannell Emmerson Associates
Planning	Clifton Scannell Emmerson Associates
Civil, Mechanical and Electrical Engineering, Traffic and Transportation	Clifton Scannell Emerson Associates
Population and Human Health; Land Soils, Geology, Hydrogeology, and Hydrology; Air Quality and Climate; Noise and Vibration; Material Assets and Waste management	AWN Consulting Limited

Landscape and Visual Impact	Macro works Ltd
Archaeology	Courtney Deery Archaeology and Cultural Heritage
Biodiversity including Appropriate Assessment Screening	Doherty Environmental Services

The various reports address a variety of environmental issues and assess the impact of the Proposed Development and demonstrate that, subject to implementation of the construction and design related mitigation measures recommended in this report, the Proposed Development will not have a significant impact on the environment. This EIA Screening Report should be read in conjunction with the plans and particulars submitted with the planning application.

2.0 SCREENING EVALUATION

2.1 IS THE DEVELOPMENT A PROJECT?

The first step in screening is to examine whether the proposal is a *project* as understood by the EU Directive. For the purposes of the EU Directive, 'project' means:

- the execution of construction works or of other installations or schemes, or
- other interventions in the natural surroundings and landscape including those involving the extraction of mineral resources.

The EPA Guidance (2022) states that if a proposed project is not of a type covered by the Directive, there is no statutory requirement for it to be subject to environmental impact assessment. In determining if the proposed project is of a type covered by the Directive it may be necessary to go beyond the general description of the project and to consider the component parts of the project and/or any processes arising from it.

If any such parts or processes are significant and, in their own right, fall within a class of development covered by the Directive, the proposed Project as a whole may fall within the requirements of the Directive.

Each element of the Proposed Development has been examined and the development clearly meets the definition of a Project as understood by the EU Directive.

2.2 IS THE DEVELOPMENT A PROJECT THAT REQUIRES A MANDATORY EIA?

The next step is to determine if the Proposed Development is of a project type that requires mandatory EIA; i.e. is the Proposed Development of a project type in which a thresholds do not exist. The types of projects to which thresholds do not apply are types that are considered to always be likely to have significant effects.

Ireland's type of projects for which an EIA is mandatory is set out in the Schedule 5 Part 1 and Part 2 of the Regulations. An EIA is deemed mandatory under Section 172 of the Act to accompany a planning application for development for the types of projects set out in Schedule 5. This list was developed from Annex I and Annex II of the EIA Directive.

There is no specific project type listed under Schedule 5, Part 1 or Part 2 of the Regulations for the Proposed Development.

In considering the wider context and the component parts of the project the Proposed Development would most appropriately fall under the project type *Schedule 5, Part 2, Class 10 Infrastructure Projects*. Class 10 is of a type that sets out project thresholds; therefore, the next screening step is to determine whether the project exceeds the specific project threshold.

2.3 IS THE PROJECT ABOVE THE THRESHOLD FOR EIA?

An EIAR is required to accompany an application for permission of a class set out in the Schedule 5 Part 1 and Part 2 of the Regulations which equals or exceeds, as the case may be, a limit, quantity or threshold set for that class of development. A development that does not exceed a limit, quantity or threshold set for that class of development in Schedule 5 of the Regulations is known as a 'sub-threshold development'.

The Proposed Development and component parts have been considered against the thresholds outlined in Schedule 5, Part 2 Class 10 (a) to (m). The most relevant project type in the context of the Proposed Development is Class 10 (b):

10. Infrastructure projects

(b) (ii) Construction of a car-park providing more than 400 spaces, other than a car-park provided as part of, and incidental to the primary purpose of, a development.

The Proposed Development site is a carpark with 388 car parking spaces. The Proposed Development site is not equal to nor does it exceed the limit, quantity or threshold set out in Class 10 (b); therefore, an EIA is not mandatory.

In addition the development does not entail an extension or change to any existing EIA project (i.e. Class 13).

2.4 CONCLUSION – SUB THRESHOLD DEVELOPMENT

The Proposed Development is '*of a type set out in Part 2 of Schedule 5 [in the Planning and Development Regulations, 2001 (as amended)] which does not equal or exceed, as the case may be, a quantity, area or other limit specified in that Schedule in respect of the relevant class of development*'. The development is outside the mandatory requirements for EIA, and is considered to be sub-threshold for the relevant project type.

An EIA Report is still required by Section 172 of the Act to accompany a planning application for sub-threshold development which would be likely to have significant effects on the environment, having regard to the criteria set out in Schedule 7.

However, where a Proposed Development is a sub-threshold development, the Applicant may make an application for a screening determination for EIA to the planning authority in whose area the development would be situated, under section 176A(2)(a) of the Act. Therefore, the final step in the screening process is to consider the need for an EIA on a discretionary basis.

Article 4(4) of Directive 2014/52/EU requires the developer to provide information on the characteristics of the project and its likely significant effects on the environment, to allow the competent authorities to make a determination on the requirement for an EIA.

The remainder of this report is to form the basis of the application made for sub-threshold screening for EIA under Section 176A(2)(a) and presents the information required by Schedule 7A to demonstrate the likely effects on the environment, having regard to the criteria set out in Schedule 7. The following Sections 3.0, 4.0 and 5.0 will provide information on the characteristics of the Proposed Development; the location and context, and its likely impact on the environment as well as a description of any features of the project and/or measures envisaged to avoid or prevent what might otherwise have been significant adverse effects on the environment. These sections present the information required under Schedule 7A of the Regulations, broadly set out in the structure Schedule 7 to ensure that each aspect for consideration is robustly addressed.

3.0 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

This section addresses the characteristics of the Proposed Development by describing the development in detail. This is to identify all areas of potential issues to explore further and assess for impacts.

3.1 SIZE AND DESIGN OF THE PROPOSED DEVELOPMENT

This EIA Screening Report should be read in conjunction with the plans and particulars submitted with the planning application. The overall site area is 3.3 ha.

The Proposed Development is presented in Figure 3 below.

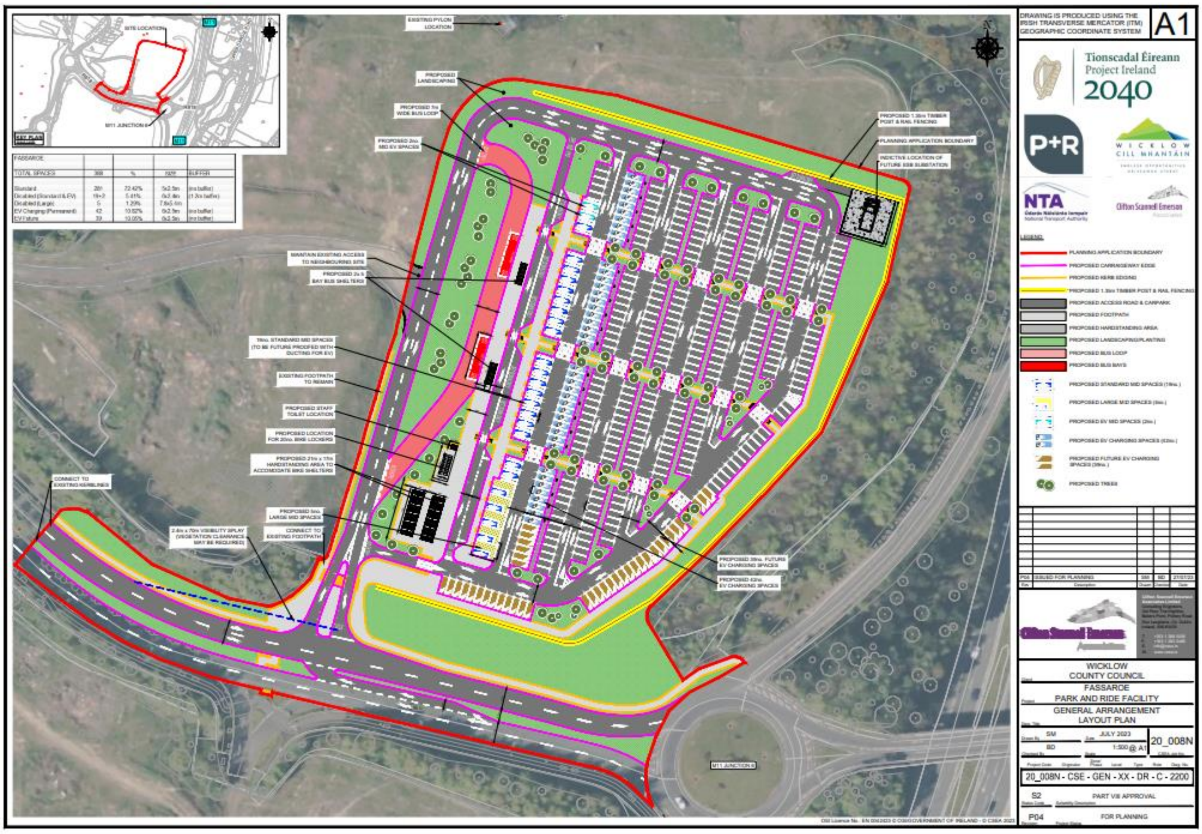


Figure 3. Proposed Development Layout (source: CSEA)

The Proposed Development, comprises the development of a Park and Ride Facility to include;

- A new car parking area capable of accommodating a total of 388 car parking spaces,
- Including 26 no. mobility impaired parking spaces and 42 no. e-car charging spaces.
- Construction of internal road network and circulation areas.
- New bus standing area with a dedicated turning circle,
- 2 new bus bays and 2 passenger shelters.
- New set-down areas and taxi ranks with dedicated access.
- Hardstanding area for bike shelter and lockers (30 no. bicycle parking Sheffield stands 8 no. cargo bike parking stands and 20 no. bike lockers).

- Construction of access arrangement, new right-turning lane Fassaroe Lane
- Height restriction barriers
- Hard and soft landscaping and planting, lighting, boundary treatments, and all associated and ancillary works including underground foul and storm water drainage network, and utility cables.
- Construction of a substation

This screening assessment considers the construction, operation and decommissioning of the Proposed Development.

The landscape design was developed to maximise the opportunity for green infrastructure and biodiversity to the local environment and surrounding context of the site. The existing mature vegetation located in the southern portion of the site is to be retained, while woodland edge planting mix along adjacent to the sites eastern boundary is proposed to bolster the existing mature vegetation surrounding the site. The design includes the planting of avenues of native trees between the proposed parking bays and pockets of ornamental pollinator friendly shrub and perennial planting located throughout the site. It is proposed to plant wet grass mix between parking bays and at swales aligning the proposed road carriageways. The design includes the planting of native trees within a native pollinator friendly wildflower meadow in the west portion of the subject site, while native hedgerow comprising of whips and advanced nursery stock planted along the western and northern site boundary.

The Landscape Design Rationale prepared by Macroworks describes the landscape design, which forms an integral part of the overall design. The Proposed Development at Fassaroe is contained in the landscape character unit ‘Urban Area’. The Proposed Development is situated along the western extend of this urban area, which transitions to the ‘Glencree/Glencullen – Area of Natural Beauty’ to the southwest of the site and the ‘Corridor Area East’ to the south of the site. The Proposed Development site is located in an area of contrasting landscape sensitivity, with the northern portion of the site classified with a ‘*Low to Medium Sensitivity’,* whilst the southern half of the site appears to be located in a ‘*Medium-High*’ sensitivity classification. In the wider surrounds of the site, the landscape to the east is generally classified with a ‘Low’ sensitivity as it is principally characterised by highly urban land uses such as large-scale residential development, whereas to the south and west where the landscape transitions towards the ‘Glencree/Glencullen Area of Natural Beauty’, the sensitivity classifications range from ‘Medium’ to ‘High’ sensitivity. As per the current Bray Local Area Plan (2018), the Proposed Development is located within the land use zoning E1 – Employments, which has a principal objective “*to provide for the development of enterprise and employment*”. Thus, it is considered that the proposed Park and Ride facility is an appropriate land uses in within this land use zoning. The objective through the design is to protect and enhance the existing landscape.

In order to facilitate the proposed park and ride facility there will be a requirement to completed cut and fill works. Whilst every effort has been made to reduce the need for large areas of cut and fill, there will be some areas of soil stripping to accommodate the proposed access tracks, parking bays and footpaths. There will be also be physical disturbance of soil/subsoil to accommodate the foundations of the proposed structures, such as the proposed bus shelters, bicycle shelters, charging points and lighting poles. Overall, the physical impacts of the Proposed Development will be relatively modest as it is located in a brownfield site with an existing access from Fassaroe Avenue.

There will be temporary construction stage landscape impacts relating to the excavation of materials, temporary storage of such materials and other building materials, and the occasional movement of construction machinery.

The various reports prepared by the specialist consultants are included in Appendices A – H and the design team members are outlined within Section 1.3. These reports describe particular aspects of the scheme in further detail, and form part of the overall application.

There are limited buildings and above ground structures associated with the Proposed Development. The architectural design of the Proposed Development included for bus shelters, bike shelters, Staff welfare facility, electricity substation and entrance barriers. These structures will have low visual impact due the limited height and extent of the structures and will be discretely located on the site.

Full details on water and wastewater is provided in the Engineering Planning Report (Drainage and Water Services) provided with planning.

The Proposed Development's surface water drainage system was designed in accordance with the Greater Dublin Strategic Drainage Strategy (GDSDS) and consists of two separate systems.

- The site will be drained through a series of gullies and into a piped drainage system that will ultimately be collected and conveyed through a series of proposed stormwater pipes prior to discharging into the existing storm water sewer within the R918 to the south of the site.

- To comply with the GDSDS guidelines in relation to SUDs, is proposed within the site, to promote infiltration to the groundwater where suitable. At locations where the infiltration rate is very low, a proposed perforated pipe will convey the excess runoff back to the piped drainage network.

The existing stormwater pipe located within in the R918 to the south of the site flows in a south-easterly direction toward the River Dargle.

The wastewater design includes the following:

- A pre-connection enquiry (PCE) form was submitted to Irish Water on 14th December 2022 which detailed the proposed foul sewer gravity system for the site (ref CDS22008848).
- The Proposed Development, subject to this planning application, comprises of 1No 150mm diameter gravity foul sewer line, connecting the staff toilet to the existing foul sewer within the R918 to the south of the site. As such, the overall wastewater discharge associated with the Proposed Development is in accordance with the demand/discharge rates based on IW Wastewater Infrastructure Code of Practice 2020. Disposal of foul water from the site is separated from that of surface water.
- As no industrial-specific wastewater flow will be generated from the development, the design Dry Weather Flow of the development is 300l/d.

Details of the pre-connection enquiry submitted to Irish Water in December 2022 is included within the Engineering Planning Report.

The utility connections for the subject development are as follows:

- A medium-pressure gas transmission main crosses the carriageway from south to north near the roundabout entry and runs towards west under the northern footway. A distribution main also runs under the southern footway with a connection line/main branching off into the site after crossing the carriageway in front of the existing site access junction. This transmission main ends 150 meters north of the junction.

- Water demand will be met from public supply. The Proposed Development's water demand is 300l/day.
- several existing water mains (150 dia, 200 dia, 600 dia, 800 dia) are present within the redline boundary with a majority of them close to the existing/proposed junction. The 600 dia main currently runs under the existing internal road for 95m meters before deviating north-west. 2 nos. of 200 dia main also run under the verge of the internal road for 130m.
- Based on the initial investigation, the scheme proposals will have no major impact on these existing utilities. The design has been optimised to ensure that the sections of utilities currently running under the footpath remain separate from the mainline carriageway without the involvement of any relocation work.
- The electricity will be drawn from the existing ESB pylon from the Northwest corner of the site as shown on various electrical and ducting drawing submitted with the planning application.

3.2 CUMULATION WITH OTHER EXISTING OR PERMITTED DEVELOPMENT

This section outlines the potential cumulation with other existing or permitted development. As part of the assessment of the impact of the Proposed Development, account has been taken of any relevant developments that are currently permitted, or under construction and substantial projects for which planning has been submitted within the surrounding areas, as well as existing local land uses.

The current / latest Bray Municipal District Local Area Plan (2018) indicated that the Proposed Development is located within the commercial land use zoning E1 – Employments, which has a principal objective "to provide for the development of enterprise and employment". The LAP states that "Uses generally appropriate for employment zoned land include general and light industry, office uses, enterprise units, appropriate warehousing, petrol filling stations (as deemed appropriate), <u>**public transport depots**</u>, open space, community facilities, utility installations and ancillary developments for employment and industry uses in accordance with the CDP". Therefore, it is considered that the proposed Park and Ride facility is an appropriate land uses in within this land use zoning.

As outlined in the Planning Engineering Report prepared by Clifton Scanell Emmerson and the Park and Ride Development Office which accompanies the planning application for the Proposed Development complies with the Wicklow County Development Plan 2022 - 2028.

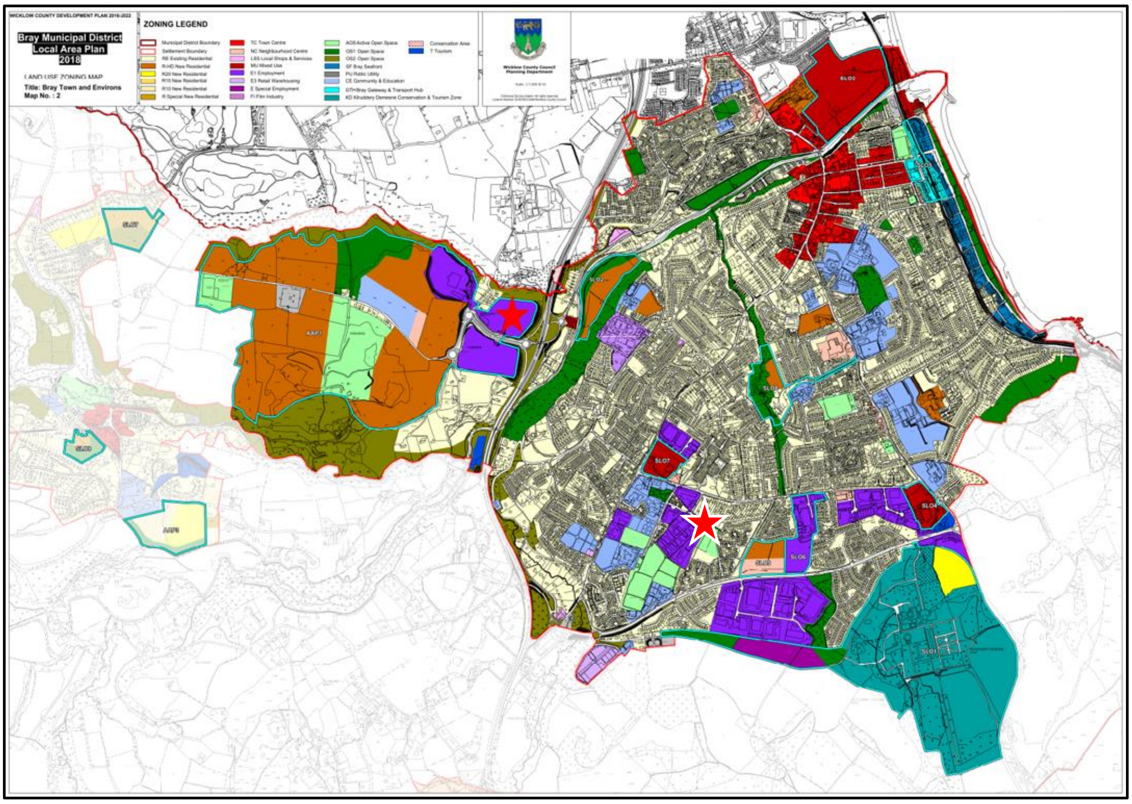


Figure 4 Site Zoning, approximate site location indicated by red star (Source: WCC Bray Municipal District Local Area Development Plan 2016-2022)

The Landscape and Visual Assessment conducted by Macro Works Ltd indicates that the landscape sensitivity in the vicinity of the site is varied. In the wider surrounds of the site, the landscape to the east is generally classified with a 'Low' sensitivity as it is principally characterised by highly urban land uses such as large-scale residential development, whereas to the south and west where the landscape transitions towards the 'Glencree/Glencullen Area of Natural Beauty', the sensitivity classifications range from 'Medium' to 'High' sensitivity. According to Macro Works Ltd (2023), the development will not encroach on this area and will seek to protect and enhance the appearance of the area. The Proposed Development is considered relatively modest in terms of its scale and nature, is discretely located and is a characteristic addition to the landscape in the immediate surrounds / vicinity of the site.

The Wicklow County Council online planning search systems were consulted to generate a list of applications granted permission within the previous 5 years. Appendix A documents the relevant planning history within the vicinity (2 km) of the subject site.

It is important to note that each project shown which has been permitted is subject to an EIA and/or planning conditions which include appropriate mitigation measures to minimise environmental impacts. Any new large-scale development proposed in the surrounding area would be accompanied by an EIA, or EIA Screening as appropriate and the take mitigation plan taken into consideration in the development of this site.

Each environmental discipline who has contributed to this report has considered relevant permitted or proposed projects and assessed the potential for cumulative impact due to these projects. This is further discussed in section 5.10.

3.3 NATURE OF ANY ASSOCIATED DEMOLITION WORKS

There are no existing structures onsite that require demolition.

3.4 USE OF NATURAL RESOURCES (LAND, SOIL, WATER, BIODIVERSITY)

This section describes the Proposed Development in terms of the use of natural resources, in particular land, soil, water, biodiversity. The Proposed Development will consume minimal amounts of natural resources during construction and operation.

Land and Soil

The subject site is well suited for the Proposed Development, which is permissible under the zoning of the lands. The Proposed Development at Fassaroe is contained in the landscape character unit 'Urban Area'. It is also worth noting that the Proposed Development is situated along the western extend of this urban area, which transitions to the 'Glencree/Glencullen – Area of Natural Beauty' to the southwest of the site and the 'Corridor Area East' to the south of the site. As per the current Bray Local Area Plan, the Proposed Development is located within the land use zoning E1 – Employments, which has a principal objective "*to provide for the development of enterprise and employment*". The LAP states that "*Uses generally appropriate for employment zoned land include general and light industry, office uses, enterprise units, appropriate warehousing, petrol filling stations (as deemed appropriate),* ***public transport depots****, open space, community facilities, utility installations and ancillary developments for employment and industry uses in accordance with the CDP.*

The Proposed Development which is currently a brown field site and being used for the storage of construction materials is situated in a small land parcel heavily enclosed by a belt of mature vegetation. The land holding forms part of Area Action Plan 1: Fassaroe, which is the location of a potentially major development on the outskirts of Bray. In terms of land uses, the Proposed Development is situated at the western periphery of the settlement of Bray, with much of the landscape to the east of the site heavily influenced by urban land uses such as large-scale residential development, major route corridors and commercial and retail developments. West of the M11/N11 and to the north, west and south of the site, the landscape begins to transition to a rural hinterland landscape and is principally dominated by pastoral farmland, areas of mature vegetation and dispersed rural settlements.

Land in the vicinity of the site will not be impacted by the Proposed Development, The existing mature vegetation located in the southern portion of the site is to be retained, while further addition / planting of woodland edge planting mix, native trees pockets of ornamental pollinator friendly shrub, perennial planting, wet grass mix, wildflower meadows, and native hedgerow comprising of whips and advanced nursery stock will in fact enhance landscape and biodiversity in this area. As such there is no loss of greenfield, amenity or agricultural land.

There will be a requirement for deliveries of imported engineering fill, and other construction materials. Other construction activities will include site storage of cement and concrete materials and fuels for construction vehicles.

For further detail on the physical characteristics of the Proposed Development please refer to the architectural and engineering drawings, engineering and planning report, and the landscape drawings which accompany this planning application.

Water consumption and wastewater requirement.

As outlined in the Engineering and Planning Report provided with planning:

The existing water infrastructure within the area has been confirmed to have adequate capacity to cater for the Proposed Development.

The proposed sites foul water demand (peak discharge of 300l/d) arises from a small staff only welfare facility and is sufficient for the 150mm diameter proposed foul water pipe to tie into the existing foul water pipe located at the R918 south of the site. The disposal of foul water from the site is separated from that of surface water.[1]

Water supply will be met from public supply. The Proposed Development water demand will be supplied the staff sanitary facility only and expected to be 300 litres per day. .

Biodiversity

Investigations into the impacts on biodiversity including species and habitats has been undertaken by the Doherty Environmental Consulting (DEC). The Appropriate Assessment (AA) Screening report and Ecological Impact Assessment (EcIA) are included in Appendix B.

Pat Doherty (DEC) undertook / conducted site surveys to identify the habitats and species within the site and surrounds. The desk review and field survey are documented as part of the AA screening.

According to the NPWS (2022) on-line database there are no special protected areas or special areas of conservation on or within the boundary of the Proposed Development site. The closest European listed sites are as follow:

- Ballyman Glen (000713) Special Area of Conservation (SAC) - circa. 0.5 km to the northwest of the site.
- Bray Head (000714) Special Area of Conservation (SAC) – circa 2.9 km to the east of the site.
- Rockabill to Dalkey Island (003000) Special Area of Conservation (SAC) - circa 6.3 km to the northeast of the site.

The River Dargle is the principal watercourse in relation to the site and flows in a general northeast direction through the surrounding landscape just over c.250m east of the site at its nearest point. A small stream in a densely wooded valley also passes immediately north of the site. The Proposed Development is located within the hydrological catchment of the Dargle River. The site currently has an indirect hydrological pathway or connection with the Bray Head SAC and Rockabill to Dalkey Island SAC through the local drainage network and via the County Brook stream (IE_EA_10D010250) and Dargle River both of which flows in an north easterly direction before ultimately discharging downstream into the Irish Sea at Bray Harbour, which subsequently is hydrologically connected / linked to Rockabill to Dalkey Island site. Figure 5.1 in the appendix B(i) Screening Report for Appropriate Assessment presents the location of these protected areas in the context of the subject development site.

The habitats occurring at the project site are dominated by spoil and bare ground (ED2), recolonising bare ground (ED3) and landscape planted broad-leaved woodland (WD1). Artificial surfaces in the form of existing roads and access tracks occur within the project site. There are no aquatic habitats occurring within or immediately adjacent to the project site.

Discharges during operation are to public sewers. Stormwater discharge is treated through a stormwater interceptor prior to discharge from the site to the stormwater sewer south of the site. Best practice measures are included in the design and CEMP to negate any off-site impact on birds and bats.

The Proposed Development is therefore considered to have an imperceptible impact on existing biodiversity resources.

Waste Management

Waste materials will be generated from the existing hardstanding areas on site, as well as from the excavation of the building foundations.

Further detail on the waste materials likely to be generated during the construction stage are presented in the project-specific Resource Waste Management Plan contained within Appendix G of this document. The RWMP provides an estimate of the main waste types likely to be generated during the Construction phase of the Proposed Development. The reuse, recycling / recovery and disposal rates have been estimated using the EPA National Waste Reports and these are summarised below.

Construction Phase

During the construction phase, waste will be produced from surplus materials such as broken or off-cuts of timber, plasterboard, concrete, tiles, bricks, etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. The appointed Contractor will be required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

There will be soil, stones, gravel, clay and made ground excavated to facilitate construction of new foundations. The development engineers (Clifton Scannell Emerson Associates Consulting Engineers) have estimated that the development will include the following earthworks:

- Earthworks Cut Volume (Existing Ground-Formation Level) – 8287 cubic meters;
- Topsoil Stripping Volume – 4477 cubic meters (300mm);
- Earthwork Fill Volume (Existing Ground-Formation Level) – 7111 cubic meters;
- Total Imported Fill (Pavement Built-up) Volume – 13103 cubic meters.

The waste hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling / recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal. The excavations are required to facilitate construction works so the preferred option (prevention and minimisation) cannot be accommodated for the excavation phase. It is currently envisaged that there will be opportunity for reuse of excavated material onsite. It is anticipated that all excavated topsoil (4,477m3) and 2633 m3 of subsoil will be reused on site. It is anticipated that 5,654 m3 of subsoil material will need to be removed offsite for appropriate reuse, recovery and/or disposal. This material will be taken for appropriate offsite reuse, recovery, recycling and / or disposal.

If the material that requires removal from Site is deemed to be a waste, removal and reuse / recycling / recovery / disposal of the material will be carried out in accordance with the Waste Management Act 1996 (as amended), the Waste Management (Collection Permit) Regulations 2007 (as amended) and the Waste Management (Facility Permit & Registration) Regulations 2007 (as amended). The volume of waste requiring recovery / disposal will dictate whether a Certificate of Registration (COR), permit or licence is required for the receiving facility. Alternatively, the material may be classed as by-product under Article 27 classification (European Communities (Waste Directive) Regulations 2011, S.I. No. 126 of 2011). For more information in relation to the envisaged management of by-products, refer to the RWMP (Appendix G).

In order to establish the appropriate reuse, recovery and / or disposal route for the soils and stones to be removed off-site, it will first need to be classified. Waste material will initially need to be classified as hazardous or non-hazardous in accordance with the EPA publication *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* (2019). Environmental soil analysis will be carried out prior to removal of the material on a number of the soil samples in accordance with the requirements for acceptance of waste at landfills (Council Decision 2003/33/EC Waste Acceptance Criteria). This legislation sets limit values on landfills for acceptance of waste material based on properties of the waste, including potential pollutant concentrations and leachability. It is anticipated that the surplus material will be suitable for acceptance at either inert or non-hazardous soil recovery facilities / landfills in Ireland or, in the unlikely event of hazardous material being encountered, be transported for treatment / recovery or exported abroad for disposal in suitable facilities.

Waste will also be generated from construction phase workers e.g. organic / food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and, potentially, sewage sludge from temporary welfare facilities provided on-site during the Construction phase. Waste printer / toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated in small volumes from site offices.

Further detail on the waste materials likely to be generated during the excavation and construction works are presented in the project specific RWMP (Appendix G). The CWMP provides waste management measures and an estimate of the main waste types likely to be generated during the Construction phase of the Proposed Development. These are summarised in Table 3.

Table 3. Estimated off-site Reuse, Recycle and Disposal Rates for Construction Waste

Waste Type	Tonnes	Reuse		Recycle/Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	51.2	10	5.1	80	41	10	5.1
Timber	17.4	40	7	55	9.6	5	0.9
Metals	12.4	5	0.6	90	11.2	5	0.6
Concrete	9.3	30	2.8	2.8	6.1	5	0.5
Other	46.6	20	9.3	60	27.9	20	9.3
Total	**136.9**		**24.8**		**95.7**		**16.4**

Operational Phase

The Proposed Development will give rise to minor quantities of waste during the operational phase, i.e. when the project is completed, and fully operational. Given the nature and function / purpose of the development as a carpark and bus stop, the waste generated will be limited / confined to bins strategically provided and dispersed across the site for the users of the Park & Ride facility. The waste generated will be collected and disposed regularly by an assigned waste contractor in the locality.

The following waste management measures will be implemented during the operational phase:

- All waste materials will be stored in colour coded bins or other suitable receptacles in designated, easily accessible locations. Bins will be clearly labelled with the approved waste type to ensure there is no cross contamination of waste materials;
- All waste collected from the development will be reused, recycled or recovered where possible, with the exception of those waste streams where appropriate facilities are currently not available; and
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities.

All waste contractors collecting waste from the site must hold a valid collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO) and waste will only be brought to suitably registered/permitted/licenced facilities. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices.

These measures will ensure the waste arising from the development is dealt with in compliance with the provisions of the *Waste Management Act 1996*, as amended, associated Regulations, the *Litter Pollution Act 1997* and the *EMR Waste Management Plan (2015 - 2021)*.

3.5 POLLUTION AND NUISANCES

There are potential short-term nuisances such as dust, noise, as well as the potential for pollution of groundwater or storm drains associated with, excavations and construction. A Resource Environmental Management Plan (REMP) has been prepared by AWN Consulting (Appendix G). In advance of work starting on site, the works contractor will prepare a detailed Construction Environmental Management Plan (CEMP). This CEMP will set out the overarching vision of how the construction of the Proposed Development will be managed in a safe and organised manner by the Contractor.

The CEMP includes mitigation measures to ensure that pollution and nuisances arising from site clearance and construction activities are prevented where possible and managed in accordance with best practice and any subsequent planning conditions relevant to the Proposed Development.

This CEMP will be maintained by the contractors during the construction phases and covers 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.

3.6 RISK OF MAJOR ACCIDENTS AND/OR DISASTERS

Landslides, Seismic Activity and Volcanic Activity

The Geological Survey Ireland (GSI) landslide database was consulted landslide in closest proximity to the Proposed Development was approximately 0.25 km to the east of the site located adjacent to the River Dargle, referred to as the Dargle1998 event (GSI_LS04-0003) which occurred in the year 1998. There have been no recorded landslide events at the subject site. Due to the local topography and the underlying strata there is a negligible risk of a landslide event occurring at the site.

In Ireland, seismic activity is recorded by the Irish National Seismic Network. The Geophysics Section of the School of Cosmic Physics at the Dublin Institute for Advanced Studies (DIAS) has been recording seismic events in Ireland since 1978. The station configuration has varied over the years. Currently there are five permanent broadband seismic recording stations in Ireland and operated by DIAS. The seismic data from the stations comes into DIAS in real-time and are studied for local and regional events. Records since 1980 show that the nearest seismic activity to the Proposed Development was in the Irish sea (1.0 – 2.0 Ml magnitude) and to the south in the Wicklow Mountains. There is a very low risk of seismic activity to the Proposed Development site. There are no active volcanoes in Ireland so there is no risk from volcanic activity.

Flooding/Sea Level Rise

The potential risk of flooding on the site was reviewed with regard to incidences of historical, regional and local flooding relevant to the area of the subject site. A Flood Risk Assessment has been prepared by the Park and Ride Development Office (PRDO) and is included with the planning application documentation for the Proposed Development. Resources on flooding aspects for the subject area were reviewed and included the following:

- Catchment Flood Risk Assessment and Management (CFRAM).

- Review of Historic Flood Events Office of Public Works (OPW) on-line database (floodinfo.ie).
- Wicklow County Development Plan Strategic Flood Risk Assessment 2022-2028. / Wicklow County Council Drainage Records

The CFRAM Draft Map for the proposed site does not indicate flooding under the following headings:

- Fluvial
- Pluvial
- Groundwater

A review of available information has identified no flood hazards at the Proposed Development site; therefore, in accordance with Flood Risk Management (FRM) Guidelines the site is located within Flood Zone C, where the probability of flooding is low. Low Probability flood events have an indicative 1-in-a-1000 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 0.1%. The Proposed Development is considered '*Appropriate'* for Flood Zone C.

According to OPW information there are 3 recorded flood events within 2.5km of the site. These flood events are listed on the Map report which is attached in Appendix A. The events are recorded as occurring to the north, northeast and south of the site. The event to the north is the occasional flooding due to hydraulic inadequacy. The event to the northeast occurred in August 1986 as a result of Hurricane Charlie causing flooding in the River Dargle. The event to the south of the site is the recurring flooding to the door of one property in Kilcroney Lane.

Assessment the available information and inspected the site and its environment. The probability of flooding from rivers and the sea is low (less than 1:1000) for both river and coastal flooding which would be equivalent to Flood Zone C. The proposed development is not deemed to be at any significant risk of flooding which is mainly attributable to the local topography and therefore a stage 2 assessment in not required in relation to this site. The proposed works are unlikely to raise significant flooding issues and do not obstruct existing flow paths. The restricted surface water discharge from the site does not adversely affect or increase the flood risk to adjacent or downstream sites.

The Proposed Development does not obstruct any existing flow paths and the surface water discharge from the site is restricted to equivalent green field run off thus not impacting or increasing the flood risk within the existing catchment.

Major Accidents/Hazards

The Seveso Directive (Directive 82/501/EEC, Directive 96/82/EC, Directive 2012/18/EU) was developed by the EU after a series of catastrophic accidents involving major industrial sites and dangerous substances. Such accidents can give rise to serious injury to people or serious damage to the environment, both on and off the site of the accident. The Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015) (the "COMAH Regulations"), implement the latest Seveso III Directive (2012/18/EU).

The Proposed Development will not be a Seveso/COMAH facility. There will be no substances stored on site controlled under Seveso/COMAH. The Proposed

Development site is not located within the consultation distance of any COMAH establishment that is notified to the HSA.

The Proposed Development has been designed in accordance with the Safety, Health and Welfare at Work Act 2005 (S.I. 10 of 2005) as amended and the Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2016 (S.I. 299 of 2007, S.I. 445 of 2012, S.I. 36 of 2016) as amended and associated regulations.

Minor Accidents/Leaks

There is a potential impact on the receiving environment as a result of minor accidents/leaks of fuel/oils during the construction. However, the implementation of the mitigation measures as set out in the Appendices included with this report and to be included in the Construction Environmental Management Plan (CEMP) will ensure that the residual effect on the environment is imperceptible.

3.7 RISKS TO HUMAN HEALTH

The characteristics of the Proposed Development, in terms of the risks to human health have been considered in this assessment. The primary potential impacts of the Proposed Development on human health would be increase in air pollution, noise, traffic, visual impact or pollution of groundwater/drainage as a result of the Proposed Development.

The location of the Proposed Development is within a previously undeveloped site which is currently being used a depot. The nearest residential locations are the properties to the east site along Thornhill Road and to the west beyond the M11 along the R918. Undeveloped land lies to the south with agricultural land and woodland to the north of the site.

The Geological Survey of Ireland data shows that the site does not lie within a drinking water protection area. The area is serviced by mains water supply therefore it is unlikely that any wells are used for potable water supply. There are no watercourses on the site and no open water connection to the River Dargle. As such the only pathway for contamination of a water resource would be through the stormwater drainage system. The proposed mitigation measures outlined in the CEMP will ensure that there are no impacts on groundwater or the stormwater drainage system. The Proposed Development will include an appropriately designed stormwater network including one hydrocarbon interceptor that will ensure any risk from diesel spills through the carparks and Bus bays are minimised. Wastewater from the Proposed Development will connect to mains supplies and will not have a potential impact on local amenities or the local population. As outlined within the Engineering and Planning Report (NTA, 2022) the proposed foul drainage design is subject to agreement with Irish Water (IW). Accordingly, a pre-connection enquiry (PCE) form was submitted to Irish Water on 14th December 2022 which detailed the proposed foul sewer gravity system for the site (ref CDS22008848).

The CEMP will incorporate best practice construction methodologies for the control of dust generation, traffic, and noise, as well as the management of impacts on groundwater or storm drainage system during the construction phase. Any impacts associated with dust generation, traffic, and noise will be ***short term***.

The potential impacts on human health as a result of the generation of Noise and Air Emissions are considered to be ***negligible*** and have been assessed through a detailed

Noise Impact Assessment. Air Quality Impact Assessment and Traffic Impact Assessment as detailed further in Appendix C, D and F respectively.

4.0 LOCATION AND CONTEXT OF THE PROPOSED DEVELOPMENT

4.1 EXISTING AND APPROVED LAND USE

The Proposed Development site represents a mixture of greenfield and brownfield land whereby the site is partially developed. The site is currently occupied by a hardstanding area in the north and grassland in the southern portion of the site, with some areas underlain by made ground deposits according to the geotechnical site investigation carried out by Site Investigations Ltd (2023)

The current / latest Bray Municipal District Local Area Plan (2018) indicated that the Proposed Development is located within the commercial land use zoning E1 – Employments, which has a principal objective "to provide for the development of enterprise and employment".

It is considered that the Proposed Development is consistent with the existing land uses and the wider residential, open space (greenfield), and commercial land uses in locality of the outskirts of Bray. According to LVIA undertaken by Macro Works Ltd (2023), the development will not encroach on this area and will seek to protect and enhance the appearance of the area. The Proposed Development is considered relatively modest in terms of its scale and nature, is discretely located and is a characteristic addition to the landscape in the immediate surrounds / vicinity of the site.

4.2 RELATIVE ABUNDANCE, AVAILABILITY, QUALITY AND REGENERATIVE CAPACITY OF NATURAL RESOURCES IN THE AREA AND ITS UNDERGROUND

4.2.1 Hydrogeology and Hydrology

Inspection of the available Geological Survey of Ireland mapping shows that the bedrock geology underlying the Proposed Development site belongs the Maulin Formation, which comprises Dark blue-grey slate, phyllite & schist (Code: OTMAUL). The site is underlain by Gravels derived from limestone (subsoil). The GSI categorises the bedrock aquifer underlying the Proposed Development site as having a 'High' vulnerability (>3 m of High permeable overburden thickness) which is consistent with the geotechnical site investigation results (Site Investigations Ltd, 2023)

The bedrock aquifer underlying most of the Proposed Development site according to the GSI National Draft Bedrock Aquifer Map is classified as a Locally Important Aquifer (Ll), Bedrock which is Moderately Productive only in Local Zones. A 'Poor Aquifer' (Pl) which is described as Bedrock which is Generally Unproductive except for Local Zones is located circa 90 m south of the development site. The site is not located near any public groundwater supplies or group schemes. There are no groundwater source protection zones in the immediate vicinity of the site.

The Groundwater Body (GWB) underlying the site is the Wicklow GWB. Currently, this GWB is classified under the WFD Risk Score system (EPA, 2021) as 'under review'. The Dublin GWB was given a classification of 'Good' for the last WFD cycle (2016-2021).

Consultation with the EPA mapping database concludes that the Dargle River waterbody (DARGLE_030) which is located c. 250 m to the east of the site, is currently classifies as having ‘Good’ status (3rd Cycle 2016-2021) and as being ‘Not at risk’. This risk score is attributed to the ecological status (good) and chemical surface water status (pass), thereby resulting in no harm to the river ecosystems. An active EPA water quality station is located in close proximity (c.550 m downstream) to the subject site (‘1km u/s Bray Br’); this station is classified with a Biological Q Rating of ‘Q4’ according to its 2022 records, which denotes a ‘Unpolluted’ status in the river. This is consistent with historical ecological conditions recorded in the Dargle River during previous years.

There is no direct discharge proposed to the Dargle River or groundwater. The contractor will be required to operate in compliance with a Construction Environmental Management plan to include the mitigation measures included in the support report to manage any accidental risk of discharge of sediment or hydrocarbon contaminated water during construction. Design measures including the installation of a petrol interceptor on the stormwater drainage will provide mitigation against unlicensed discharge during operation.

OPW Flood Maps show that the area proposed for development is located within Flood Zone C (i.e., where the probability of flooding or AEP from rivers is less than 0.1% or 1 in 1000).

Based on the hydrogeological and hydrological assessment present above. It is considered that the Proposed Development will have an ***imperceptible*** (following EIA guidance) impact on the existing water environment.

4.2.2 Biodiversity

The potential ecological impacts of Proposed Development have been considered in terms of the sensitivity of the location through the Doherty Environmental Consulting Appropriate Assessment (AA) Screening report (2023) included as Appendix B of this document.

The habitats occurring at the project site are dominated by spoil and bare ground (ED2), recolonising bare ground (ED3) and landscape planted broad-leaved woodland (WD1). Artificial surfaces in the form of existing roads and access tracks occur within the project site. There are no aquatic habitats occurring within or immediately adjacent to the project site.

A review of historical aerial imagery from 1995 indicates that the project site was previously used for agricultural purposes, most likely as arable land (BC1). Immature woodland, likely associated with recent woodland landscape planting associated with the M11 is shown to the southeast of the project site boundary. The 2000 aerial imagery indicates the presence of improved agricultural grassland dominating the site. broad-leaved woodland associated with the landscaping of the M11 is shown to the southeast of the Site Option boundary, while a treeline is shown forming the boundary of the Site Option along the slip roads to the east and north of the Site Option. The 2005 imagery indicate a significant change in the land cover at this Site Option with grassland surface removed and a denuded bare ground (ED2) surface dominating the cover within the site. Much of the treeline along the eastern and northern slip road boundaries and the broad-leaved woodland to the southeast was also removed at the time the 2005 imagery was recorded.

No European Sites are occurring at or in the immediate vicinity of the project site. The nearest European Sites is the Ballyman Glen SAC, located over 500m to the northwest of the project site.

As the nearest European Site is buffered from the project site by a distance of 500m, the project will not have the potential to result in direct impacts to European Sites, such as loss, habitat damage or disturbance to Annex 1 qualifying habitats or physical interaction with Annex 2 qualifying species/special conservation interest bird species within the boundary of the European Site. Thus, this Screening exercise focuses on investigating whether it can or cannot be excluded, on the basis of objective information, that the project will have the potential to result in indirect effects to European Sites (i.e., impacts via emission pathways or interaction with mobile species outside of European Sites).

The absence of any potential impact pathways as identified in the AA Screening will ensure that this project does not have the potential, either alone or in combination with other projects, to result in likely significant effects to European Sites or the local environment surrounding the project site.

The AA Screening concluded that:

- The Proposed Development is not directly connected with, or necessary to the conservation management of the European sites considered in this assessment.
- The Proposed Development, alone or in combination with other projects, is not likely to have significant effects on the European sites considered in this assessment.
- It is possible to rule out likely significant impacts on any European sites considered in the assessment.
- It is possible to conclude that there would be no significant effects, no potentially significant effects and no uncertain effects if the Proposed Development were to proceed.

Given that no European Sites occur within or bounding the project site a source-pathway-receptor model was used to identify the presence of any European Sites in the wider surrounding area occurring within the zone of influence of the project. The examination based on the source-pathway-receptor model found that no pathways connect the project site to the any European Sites occurring in the wider area surrounding the project site and there will be no potential for the project to interact with them or their qualifying features of interest/special conservation interests. Given the absence of any pathways and any European Sites within the zone of influence of the project, there will be no potential for the project to combine with other plans, projects or existing pressures to result in cumulative adverse effects to European Sites in the wider surrounding area.

In light of the findings of this report it is the considered view of the authors of this Screening Report for Appropriate Assessment that it can be concluded by Wicklow County Council that the project is ***not likely***, alone or in-combination with other plans or projects, to have a ***significant effect*** on any European Sites in view of their Conservation Objectives and on the basis of best scientific evidence and there is no reasonable scientific doubt as to that conclusion.

This Screening has resulted in a Finding of No Significant Effects and as such a Stage II Appropriate Assessment is not required.

4.3 ABSORPTION CAPACITY OF THE NATURAL ENVIRONMENT

The Proposed Development, due to its size and localised nature will not have any effect on wetlands, riparian areas, river mouths, coastal zones and the marine environment, mountain and forest areas, nature reserves and parks, or densely populated areas.

The environmental sensitivity of the proposed location in respect of Natura 2000 areas designated pursuant to the Habitats Directive and the Birds Directive been addressed through the AA Screening (Appendix B).

The Archaeological assessment undertaken by Cultural Resource Development Services Ltd (CRDS) in Appendix H has considered the landscapes and sites of historical, cultural or archaeological significance that are likely to be affected by the Proposed Development.

The Archaeological assessment concluded that there are no recorded archaeological or national monuments located within the Proposed Development site boundary. There is no recorded archaeological monument within the study area, hence ***no archaeological / heritage site will be impacted***, directly or indirectly, by the Proposed Development, due to its distance of separation.

5.0 TYPES AND CHARACTERISTICS OF POTENTIAL IMPACTS

This section sets out the likely significant effects on the environment of the Proposed Development in relation to criteria set out under paragraphs 1 and 2 (as set out in Sections 4 and 5 above), with regard to the impact of the project on the factors specified in paragraph (b)(i)(I) to (v) of the definition of 'environmental impact assessment report' in section 171A of the Act (as amended).

The quality, magnitude and duration of potential impacts are defined in accordance with the criteria provided in the *Guidelines on Information to be contained in Environmental Impact Assessment Reports* (EPA, 2022).

5.1 POPULATION AND HUMAN HEALTH

5.1.1 Construction Phase

The potential impacts of the Proposed Development on population human health and populations would be nuisances such as increased air pollution (dust), noise, traffic, and visual impact and construction waste. There is no significant risk of pollution of soil, groundwater or watercourses associated with the Proposed Development.

The CEMP will set out requirements and standards in relation to construction noise, traffic, and dust generation that must be met during the construction stage and will include any subsequent planning conditions relevant to the Proposed Development.

The potential impact of the Proposed Development with respect to population and human health during the construction phase is ***negative***, ***not significant*** and **short-term**. There are no likely significant effects in terms of the population and human health during the construction phase and it would not warrant preparation of an EIA on these grounds.

5.1.2 Operational Phase

A detailed Air Quality Impact Assessment has been undertaken (discussed in Section 5.4) to assess the impact of the Proposed Development with reference to human health criteria and concluded, based on conservative assumptions, that the Proposed Development will not result in any off-site exceedance of the relevant ambient air quality standards. Air dispersion modelling of operational traffic emissions associated with the Proposed Development was carried out using the TII REM tool. The modelling assessment determined that the change in emissions of NO_2 and PM_{10} at nearby sensitive receptors as a result of the Proposed Development will be neutral. Therefore, the operational phase impact to air quality is ***long-term, localised, neutral, imperceptible*** and ***non-significant***.

Emissions of air pollutants are predicted to be significantly below the ambient air quality standards which are based on the protection of human health. Therefore, impacts to human health are ***long-term, direct, neutral***, ***imperceptible*** and ***non-significant***.

Noise reduction is a central consideration in the design of the Proposed Development. Based on the findings of the Noise and Vibration Impact Assessment (Appendix C) the predicted noise levels from the Proposed Development, comply with the relevant noise criteria.

There are no planned direct discharges to water or land, although the risk of accidental discharge or spills exists. A number of design measures will be adopted to prevent the contamination of groundwater during the operational phase; as described in Section 5.2

The design of the Proposed Development has due regard of the sensitivity of the surroundings. Landscape and Visual impacts are discussed further in Section 5.7.

The potential impact of the Proposed Development with respect to populations and human health during the operational phase is ***neutral***, ***not significant*** and ***long-term***. There are no likely significant effects in terms of the populations and human health as during the operational phase, and it would not warrant preparation of an EIA on these grounds.

5.2 LAND, SOILS, GEOLOGY, HYDROGEOLOGY, HYDROLOGY

5.2.1 Construction Phase

Soil Handling, Removal and Compaction

Currently, there is no evidence of contamination on site. The Waste Classification report created using HazWasteOnlineTM software shows that the material tested can be classified as non-hazardous material. Following this analysis of the solid test results, the leachate disposal suite results indicate that the soils tested would generally be able to be treated as Inert Waste.

Six (6 no.) samples were tested for analysis but it cannot be discounted that any localised contamination may have been missed. Any MADE GROUND excavated on site should be stockpiled separately to natural soils to avoid any potential cross contamination of the soils. Additional testing of these soils may be requested by the individual landfill before acceptance and a testing regime designed by an environmental engineer would be recommended to satisfy the landfill.

Nonetheless material, which is exported from site, if not correctly managed or handled, could impact negatively on human beings (onsite and offsite) as well as water and soil environments. The project specific CEMP will set out best practice construction methodology to manage the soil movement on the site.

Accidental Spills, Run-off and Sediment Loading

Surface water run-off from site preparation, levelling, landscape contouring and excavations during the construction phase may contain increased silt levels or become polluted from construction activities. As there is no open water connection with the Dargle River, the potential for impact is negligible. The contractor will be required to operate in compliance with a CEMP to minimise the potential for contaminated water to discharge to sewers.

No dewatering is anticipated to be required for construction as groundwater is at a sufficient depth in comparison to required excavation levels and water ingress will be unlikely to occur. Groundwater was only recorded in BH01, BH02, BH04 at 9.20mbgl, 4.60mbgl and 6.80mbgl, respectively (Site Investigations Ltd, 2023).

If groundwater is encountered during excavations, then mechanical pumps will be required to remove the groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches. Any groundwater ingress to excavations will be pumped to a construction phase treatment train that will comprise a mobile attenuation tank and buffered outfalls over vegetated ground to the east of the project site.

Wastewater

Welfare facilities will be provided for the contractors on site during the construction works. During construction, portable sanitary facilities will be provided with waste collected and disposed of appropriately to an appropriate licenced facility. There are no predicted adverse impacts on wastewater systems during construction.

Conclusions

The predicted impact on land, soils, geology, hydrogeology, and hydrology during construction is considered to be ***negative, imperceptible*** and **short-term**. There are no likely significant effects in terms of the land, soils, geology, hydrogeology, and hydrology during the construction phase and it would not warrant preparation of an EIA on these grounds.

5.2.2 Operational Phase

Increase in Hardstand

There will be an increase in hardstand as a result of the Proposed Development. The Proposed Development's surface water drainage system was designed in accordance with the Greater Dublin Strategic Drainage Strategy (GDSDS) and consists of two separate systems.

- The site will be drained through a series of gullies and into a piped drainage system that will ultimately be collected and conveyed through a series of proposed stormwater pipes prior to discharging into the existing storm water sewer within the R918 to the south of the site.

- To comply with the GDSDS guidelines in relation to SUDs, a series of rain gardens are proposed across the site, to promote infiltration to the groundwater where suitable. At locations where the infiltration rate is very low, a proposed perforated pipe will convey the excess runoff back to the piped drainage network.

Accidental Spill and Leaks

The project will be connected to the receiving surface water environment during the operation phase via the proposed surface water drainage pathway. The internal access road will be drained through a series of gullies and into a piped drainage system that will ultimately be collected and conveyed through a series of proposed stormwater pipes prior to discharging into the existing storm water sewer within the R918 to the south of the site. The stormwater will pass through an interceptor prior to discharge to the storm water sewer in the R918. This surface water pipe conveys surface water to the east and eventually discharges to the River Dargle.

Conclusions

The predicted impact on land, soils, geology, hydrogeology, and hydrology during operation is considered to be ***neutral, imperceptible and long term.*** There are no likely significant effects in terms of land, soils, geology, hydrogeology, and hydrology and it would not warrant preparation of an EIA on these grounds.

5.3 BIODIVERSITY

5.3.1 Construction Phase

A baseline review of biodiversity at the site was carried out by the project ecologists Doherty Environmental Consultants Ltd.. No Japanese Knotweed, Giant Hogweed or other high impact non-native invasive plant species were detected on site during field studies. Giant Hogweed was noted during a review of historical records which is associated with the River Dargle south of the site, outside the project site boundary. Buddleja Davidii, a commonly occurring non-native invasive plant species was found to be present on site during surveys. The EcIA prepared for this project sets out measures for the removal of Buddleja Davidii from the project site. These measures are in line with best practice guidelines as set out by the TII. In addition pre-construction surveys will be completed to determine the distribution and extent of Buddleja Davidii on site prior to the commencement of construction works. Furthermore the pre-construction surveys will confirm the continued absence of Giant Hogweed and all other high impact non-native invasive plant species from the project site.

An invasive species management plan will need to be produced and submitted to WCC outlining a management plan to deal with the Buddleja Davidii and any other invasive plant species that may be discovered during the construction phase.

The potential impact from the Proposed Development on biodiversity with particular attention to species and habitats protected under the Habitats Directive and the Birds Directive has been considered as a part of the AA Screening provided in Appendix B.

The Proposed Development is predicted to have a neutral imperceptible effect on biodiversity. On the basis of the above with regard to the evidence set out within the AA Screening Report and the Ecological Impact Assessment (EcIA) Report the potential effects on local biodiversity and ecology are ***neutral***, ***imperceptible,*** and

short term for the construction phase. There are no likely significant effects in terms of biodiversity and ecology, and it would not warrant preparation of an EIA on these grounds.

5.3.2 Operational Phase

The operational phase of the Proposed Development is not predicted to have any ***imperceptible*** impact on biodiversity.

5.4 AIR QUALITY AND CLIMATE

5.4.1 Construction Phase

During the construction stage the main source of air quality impacts will be as a result of fugitive dust emissions from site activities and the potential for nuisance dust. Dust emissions will primarily occur as a result of site preparation works, earthworks and the movement of trucks on site and exiting the site. primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities.

There is no demolition associated with the Proposed Development. Earthworks primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category.

In terms of construction dust impacts, the concern from a health perspective is focussed on particles of dust which are less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$). With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland. During the peak excavation phase there will be a maximum of 50 outward HGV movements per day. In addition there is some areas of up to 100m of unpaved road on site. Therefore, the dust emission magnitude for the proposed trackout can be classified as medium. This coupled with the low sensitivity results in an overall low risk of dust soiling impacts and human health impacts as a result of the proposed trackout activities.

The site area is between 2,500 m^2 – 10,000 m^2. Therefore, the dust emission magnitude for the proposed earthwork activities can be classified as medium. In terms of receptor sensitivity to dust soiling, there are less than 10 no. high sensitivity residential properties within 100 m of the Proposed Development site boundary. Therefore, the overall sensitivity of the area to dust soiling impacts is considered low based on the IAQM criteria (AWN Consulting, 2023).

The dust emission magnitude for the proposed construction activities can be classified as small with some passenger shelters, bike shelter and lockers and driver welfare facilities. The construction processes will have low dust potential due to elements being preconstructed. This combined with the low sensitivity of the area to dust soiling, results in an overall low risk of dust soiling impacts and human health impacts as a result of the proposed earthworks activities. Subsequently, there is low potential for fugitive dust generation during construction therefore, the predicted impact of the construction works on air quality as a result of dust emissions will therefore be ***short-term*** and ***imperceptible***.

Construction stage traffic also has the potential to impact air quality through vehicle exhaust emissions. According to the Traffic Impact Assessment conducted by CSEA (2023) for the Proposed Development, the construction stage traffic has been reviewed in line with the TII screening criteria (Section 2.2) and it was determined that a detailed air quality modelling assessment of construction stage traffic was not required due to the low-level changes in traffic and low volume of construction stage traffic. As the construction stage traffic did not meet the screening criteria, a detailed air quality assessment of construction stage traffic emissions was screened out. It can be concluded that construction phase traffic emissions will have a ***short-term, localised, neutral,*** and ***non-significant*** impact on air quality.

The CEMP will set out minimisation measures to ensure nuisance dust arising from site clearance and construction activities is prevented where possible and managed in accordance with best practice and any subsequent planning conditions relevant to the Proposed Development. When the dust mitigation measures (detailed in the mitigation section of previously mentioned Air Quality report, Section 7.1) are implemented, the residual effect of fugitive emissions of dust and particulate matter from the site will be ***short term, direct, negative,*** and ***slight*** in nature, posing no nuisance at nearby receptors.

Best practice mitigation measures are proposed for the construction phase of the Proposed Development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the Proposed Development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the residual effect of construction of the Proposed Development will be ***short term, direct, negative*** and ***imperceptible*** with respect to human health.

Impacts to climate are considered ***short-term*** and ***imperceptible*** and will not impact Ireland's ability to meet its GHG targets under Regulation (EU) 2018/842.

On the basis of the above with regard to the evidence set out within the Air Quality Impact Assessment the potential effects on Air Quality and Climate are ***negative***, ***imperceptible,*** and ***short term*** for the construction phase. There are no likely significant effects in terms of Air Quality and Climate, and it would not warrant preparation of an EIA on these grounds.

5.4.2 Operational Phase

An Air Quality Impact Assessment has been undertaken by AWN Consulting and included in Appendix D. The assessment was carried out to determine the potential air quality impacts for the Proposed Development. A number of modelling scenarios were investigated for the purposes of this assessment. Both normal day-to-day testing operations were considered as well as emergency operations and testing operations The impact of NO_2 and PM_{10} emissions for the opening and design years was predicted at the nearest sensitive receptors to the development. The TII guidance PE-ENV-01106 (TII, 2022a) details a methodology for determining air quality impact significance criteria for TII road schemes and infrastructure projects however, this significance criteria can be applied to any development that causes a change in traffic.

The annual average concentration of NO_2 is in compliance with the limit value at the worst-case receptors in 2024 and 2039. Concentrations of NO_2 are at most 54% of the annual limit value in 2024 and 2039. There are predicted to be some increases in traffic between the opening and design years therefore, any decrease in concentration is due to increased uptake in electric vehicles and lower vehicle exhaust emissions. In addition, the TII guidance (2022a) states that the hourly limit value for NO_2 of 200 μg/m^3 is unlikely to be exceeded at roadside locations unless the annual mean is above 60 μg/m^3. As predicted NO_2 concentrations are significantly below 60 μg/m^3 it can be concluded that the short-term NO_2 limit value will be complied with at all receptor locations.

Concentrations of PM_{10} are at most 34% of the annual limit value in 2024 and 2039. In addition, the Proposed Development will not result in any exceedances of the daily PM_{10} limit value of 50 μg/m^3.

Overall, the potential impact of the Proposed Development on ambient air quality in the operational stage is considered ***long-term, localised, neutral, imperceptible*** and ***non-significant.***

Air dispersion modelling of operational traffic emissions associated with the Proposed Development was carried out using the TII REM tool. The modelling assessment determined that the change in emissions of NO_2 and PM_{10} at nearby sensitive receptors as a result of the Proposed Development will be neutral. Therefore, the operational phase impact to air quality is ***long-term, localised, neutral, imperceptible*** and ***non-significant***.

Emissions of air pollutants are predicted to be significantly below the ambient air quality standards which are based on the protection of human health. Therefore, impacts to human health are ***long-term, direct, neutral***, ***imperceptible*** and ***non-significant***.

There are no likely significant effects in terms of Air Quality, and it would not warrant preparation of an EIA on these grounds.

5.5 NOISE & VIBRATION

A site-specific Noise and Vibration Impact Assessment Report (Appendix C) has been prepared by AWN Consulting, this is provided with the planning documentation. This report has included the following:

- Review appropriate guidance, and standard documents relating to environmental noise, typical local authority planning conditions, etc. in order to identify appropriate noise criteria for the construction phase of the development and site operations;
- A review of the noise levels associated with the Proposed Development in light of relevant best practice noise guidance has been completed considering:
    - Construction Noise
    - Additional traffic movements on public roads
    - Vehicle activity on new site roads, and;
    - Car parking on site
- A description of the existing noise climate captured through environmental noise surveys at locations representative of the nearest noise sensitive locations to the development site;
- Description of noise modelling assessment relating to operational phase;
- Assessment of predicted levels against the appropriate criteria and existing noise levels and the required mitigation measures.
- A review of typical construction noise and vibration limits

5.5.1 Construction Phase

The largest noise and vibration impact of the Proposed Development will occur during the construction phase due to the operation of various plant machinery and HGV movement to, from and around the site. However, the construction phase can be classed as a short-term phase. The daytime significance threshold for construction noise at the site is set at 65 dB $L_{Aeq,T}$. A night-time threshold is not included as construction work will not be taking place at night.

Furthermore, the application of binding hours as set down by planning conditions for construction, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum.

The CEMP will set out mitigation measures to ensure nuisance noise arising from ground excavation, site clearance, loading lorries (dozers, tracked excavators and wheeled loaders) and construction activities is prevented where possible and managed in accordance with best practice and any subsequent planning conditions relevant to the Proposed Development.

A traffic impact assessment relating to the Proposed Development has been prepared as part of this planning assessment. Information from this report has been used to determine the predicted change in noise levels in the vicinity of a number of roads in the area surrounding the Proposed Development, for the opening and design years. The results of the predictions indicate that the noise impact due to increased traffic on existing roads will be negligible.

On the basis of the above with regard to the evidence set out within the Noise and Vibration Impact Assessment, predictions indicate that during the construction phase construction noise levels will be within the adopted criteria and that impacts will be ***not significant***. There are no likely significant effects in terms of Noise and Vibration, and it would not warrant preparation of an EIA on these grounds.

5.5.2 Operational Phase

The key potential noise source associated with the site operation relates to traffic along the existing road network and traffic entering and exiting the car park. Given the existing road network already carries high traffic volumes, it is appropriate to consider the change in traffic noise level that may arise with and without the car park in operation.

An assessment of the overall change in noise level when considering both the additional traffic on public roads and additional traffic on the new access road and car park concludes in all operational instances a negligible and imperceptible impact is identified and therefore, based on the assessment, no significant impact on residential amenity is predicted from the proposed operations.

On the basis of the above with regard to the evidence set out within the Noise and Vibration Impact Assessment in Appendix C, the potential effects on noise and vibration are ***imperceptible***, and ***long term*** for the operational phase. There are no likely significant effects in terms of Noise and Vibration, and it would not warrant preparation of an EIA on these grounds.

5.6 LANDSCAPE AND VISUAL IMPACT

Macro works Ltd has undertaken a landscape assessment in order to assess the risks to both the known and potential archaeological heritage resource as a result of the Proposed Development. This assessment is included as Appendix I.

5.6.1 Construction Phase

Construction of the Proposed Development will give rise to short term and substantially localised effects on landscape character. Within the local context, the magnitude of development is considered Low. Construction activity including movement of construction vehicles and gradual emergence of structures will result in localised disturbance. The predicted impact on landscape and visual impact during construction is ***neutral to negative, slight and short term in duration***. There are no likely significant effects in terms of the Landscape and Visual Impact during construction, and it would not warrant preparation of an EIA on these grounds.

5.6.2 Operational Phase

The current / latest Bray Municipal District Local Area Plan (2018) indicated that the Proposed Development is located within the commercial land use zoning E1 – Employments, which has a principal objective “to provide for the development of enterprise and employment”. The LAP states that “Uses generally appropriate for employment zoned land include general and light industry, office uses, enterprise units, appropriate warehousing, petrol filling stations (as deemed appropriate), **public transport depots**, open space, community facilities, utility installations and ancillary developments for employment and industry uses in accordance with the CDP”. Therefore, it is considered that the proposed Park and Ride facility is an appropriate land uses in within this land use zoning.

The Landscape and Visual Assessment conducted by Macro Works Ltd indicates that the landscape sensitivity in the vicinity of the site is varied. In the wider surrounds of the site, the landscape to the east is generally classified with a ‘Low’ sensitivity as it is principally characterised by highly urban land uses such as large-scale residential development, whereas to the south and west where the landscape transitions towards the ‘Glencree/Glencullen Area of Natural Beauty’, the sensitivity classifications range from ‘Medium’ to ‘High’ sensitivity. According to Macro Works Ltd (2023), the development will not encroach on this area and will seek to protect and enhance the appearance of the area. The Proposed Development is considered relatively modest in terms of its scale and nature, is discretely located and is a characteristic addition to the landscape in the immediate surrounds / vicinity of the site.

It is considered that the Proposed Development is consistent with the existing land uses and the wider residential, open space (greenfield), and commercial land uses in locality of the outskirts of Bray. According to LVIA undertaken by Macro Works Ltd (2023), the development will not encroach on this area and will seek to protect and enhance the appearance of the area. The Proposed Development is considered relatively modest in terms of its scale and nature, is discretely located and is a characteristic addition to the landscape in the immediate surrounds / vicinity of the site.

The proposed park and ride facility is considered an appropriate site development that will only have a very modest physical impact on the receiving landscape. Impacts on the local landscape character will also be diminished by the heavily contained nature of the site, which is currently influenced by an array of anthropogenic land uses such as existing major route infrastructure, residential development and a waste management facility. In terms of visual impacts, there will be limited potential to get any clear views of the site due to the surrounding mature vegetation that encloses the site, combined with the additional proposed landscaping measures. Thus, it is considered that in this robust and heavily modified landscape context, the significance of landscape and visual impacts will be no greater than **Slight**, and in the majority of cases, the significance of visual impact is likely to be **Imperceptible** and it would not warrant preparation of an EIA on these grounds.

5.7 ARCHAEOLOGY, ARCHITECTURE AND CULTURAL HERITAGE

Courtney Deery Heritage Consultancy Ltd (2023) has undertaken an archaeological assessment in order to assess the risks to both the known and potential archaeological heritage resource as a result of the Proposed Development. This assessment is included as Appendix H.

5.7.1 Construction Phase

The archaeological, architectural and cultural heritage impact at the site can be summarised as follows:

- There are no recorded archaeological sites or national monuments within the Proposed Development lands, as listed in the Record of Monuments and Places for Co. Wicklow.
- A national monument, Fassaroe Cross (St Valery's Cross) (NM No. 337; RMP WI007-026001-002), is located 200m to the south-west of the Proposed Development, the nature of these works will have no direct, physical impact on this cross.
- As demonstrated by aerial image the Park and Ride site has been previously disturbed and has been subjected to previous archaeological monitoring (Byrne 2004).
- Previously, as part of wider predevelopment works, a programme of archaeological testing took place around St Valerie's Cross (Licence No. 02E0084, Bulletin Ref. No. 2002:1967), no features of archaeological interest or potential were uncovered.
- As the site has been previously archaeologically assessed and nothing of an archaeological nature or interest was detected it is anticipated that no further archaeological works are required.
- As the site has been previously archaeologically assessed and nothing of an archaeological nature or interest was detected it is anticipated that no further archaeological works are required.
- In the vicinity of the Proposed Development, there are two protected structures recorded in the Dun Laoghaire Rathdown and the Wicklow County Development Plans: Vallombrosa (RPS Dlr Co. Co. 1886), located c. 400m north, and St. Valery Dargle Valley (RPS Wicklow Co. Co. 03-34), located c. 570m south of the Proposed Development site. The development will have no direct impact on either of these structures or their grounds which are maintained within woodland boundaries.
- Given the above, it is anticipated that no further archaeological or cultural heritage mitigation is required in order for the development to proceed.
- The Proposed Development will consist of the redevelopment of previously disturbed land within the footprint of the Proposed Development site. Should any previously unknown features have been present in these areas, they would not have survived the construction of previous developments.

- Should any excavations (apart from planting and fencing) be required in the greenfield area then it is anticipated that a condition on grant of permission would require that the developer engage the services of a fully licenced archaeologist to coordinate and undertake the required excavation of identified archaeological features in consultation with the National Monuments Service.

The impact during construction is considered to be ***neutral to negative, not-significant*** and ***short term*** in duration. There are no likely significant effects in terms of the Cultural Heritage Impact during construction, and it would not warrant preparation of an EIA on these grounds.

5.7.2 Operational Phase

The operational phase of the Proposed Development is not predicted to have any impact on archaeological, architectural and cultural heritage.

5.8 TRAFFIC AND TRANSPORTATION

CSEA has undertaken a traffic and transportation assessment in order to assess the risks of traffic impacts as a result of the Proposed Development. This assessment is included as Appendix F.

5.8.1 Construction Phase

During the construction phase of the Proposed Development, there will be additional traffic movements to/from the site from transportation of site machinery and materials, construction personnel, security staff, professional staff (i.e. design team, utility companies), excavation plant, dumper trucks and deliveries/removal of materials (waste/spoil). It is estimated that on average 10 no. staff will be working on the site during the construction phase.

The Proposed Development will not generate a significant volume of additional vehicular traffic during construction or operational phases. The level of traffic increase is not likely to have any adverse transport-related environmental effects in terms of noise, air quality, vibrations, etc. The environmental impact of the construction period will be short-term and not significant in nature.

The Traffic and Transportation Assessment confirmed following traffic modelling that there will be multiple potential impacts during the construction phase which include delay and inconvenience to existing traffic on the road network, noise / disturbance to other properties in the vicinity, dust generated from construction traffic, and dirt / mud dragged onto the road by construction traffic.

On the basis of the above with regard to the evidence set out within the Traffic and Transportation Assessment the potential effects on Traffic and Transportation are ***short-term***, ***negative*** and ***not significant*** for the construction phase. These impacts are not expected to result in significant residual impacts. The cumulative impacts of the construction phase in conjunction with surrounding permitted developments has also been assessed and given the temporary nature of the construction phase, the overall impact is considered ***short-term***, ***negative*** and ***not significant.*** There are no likely significant effects in terms of Traffic and Transportation, and it would not warrant preparation of an EIA on these grounds.

5.8.2 Operational Phase

The proposed Park and Ride facility site covers a total area of 33,007 sq. meters. It will consist of a new car parking area with 388 car parking spaces (including 26 designated for mobility-impaired users, 42 for electric vehicles and 39 additional spaces futured proofed for electric vehicles), set-down areas and taxi ranks with dedicated access. A dedicated bus service will be provided for the people from the Park and Ride site to Dublin city centre and vice versa. A new bus standing area is proposed with a dedicated turning circle, 2 new bus bays and 2 passenger shelters. 30 no. bicycle parking Sheffield stands, 8 no. cargo bike parking stands and 20 no. bike lockers will also be provided within the site to cater for cyclists accessing the facility.

The proposed site is reasonably close (circa 250m) to the motorway and will be accessed majorly from the N11 via Junction 6 followed by the existing dual carriageway road- Fassaroe Lane. As a part of the proposal, the existing left-in/left-out junction located on the dual carriageway road (Fassaroe lane) will be upgraded into a priority junction where both left and right turn movements will be allowed to access the Park and Ride site, and only left turn movement will be allowed to exit the Park and Ride facility. It is anticipated that the Proposed Development will become operational by 2024.

The estimated daily usage of the proposed Park and Ride facility is 340 no. car trips in the year of opening 2024 (the numbers are based on the demand analysis using ERM conducted by PRDO). The peak hours in the vicinity of the site are determined to be 08:00-09:00 AM and 17:00-18:00 PM, and the overall trips are likely to be concentrated around the peak hours due to the nature of the development's operations. Three buses per hour in each direction are proposed to service to/from the Park and Ride site during the peak periods.

During the opening year (2024), the Proposed Development will have the following traffic impacts on Junction 6. (Note: The impact of other committed developments has been taken into consideration while performing traffic analysis):

- Overall junction delay on the Western Roundabout (6A) is expected to increase by 10% and 1% respectively during the AM and PM peak hours;
- On the Eastern Roundabout (6B) the junction delay is expected to increase by 6% and 20%; respectively during the AM and PM peak hours;
- Mean max-queues on the Fassaroe Lane arm is expected to increase by 0.2 pcu during the AM peak and 0.1 pcu during the PM peak from the year of opening 2024 to the horizon year 2029;
- Mean max-queues on the R918 arm of the western roundabout is expected to increase by 0.1 pcu during the AM peak and 0.3 pcu during the PM peak from the year of opening 2024 to the horizon year 2029. On the eastern roundabout R918 arm, the mean max-queue is expected to increase by 1 pcu during both the peak hours.

The modelling results obtained shows that the junction will operate at a Level of Service A, with or without this Proposed Development. While the performance of the junction does become slightly lower, as would be expected with the opening of the Proposed Development, it should be noted that the impact of the development is minor and that the reduced performance of the junction is for the most part due to background traffic growth.

The Traffic and Transportation Assessment demonstrates that the additional traffic generated as a result of the operational phase can be accommodated within the surrounding road network and will not have an adverse impact.

The operational traffic associated with the surrounding permitted developments has been accounted for in the Traffic and Transport Assessment and therefore the cumulative impact has been accounted for.

The Engineering and Planning report included with the planning submission provides for the transportation needs of people during the operational phase of the Proposed Development. The core aim of the proposed development is to encourage sustainable and public transport modes over the use of the private car. The development when operational will be unmanned.

On the basis of the above with regard to the evidence set out within the Traffic and Transportation Assessment the potential effects on Traffic and Transportation are ***long-term, neutral*** and ***imperceptible*** for the operational phase. There are no likely significant effects in terms of Traffic and Transportation, and it would not warrant preparation of an EIA on these grounds.

5.9 MATERIAL ASSETS, AND WASTE

5.9.1 Construction Phase

Utilities: Foul Sewer, Stormwater and Potable Water

Welfare facilities (canteens, toilets etc.) will be required for the construction phase. It is anticipated foul sewage arising from welfare facilities will either be collected by tanker or a temporary connection to the mains network be established. There will be approximately 10 (Peak) of staff required for the construction phase of the Proposed Development.

Measures to contain run-off water containing silt should be detailed in the CEMP, this will include using temporary on-site settlement ponds/tanks/silt busters to ensure adequate silt removal prior to discharge to public drain (if required).

Based on the initial investigation of the Planning Engineering Report, the scheme proposals will have no major impact on these existing utilities. The design has been optimised to ensure that the sections of utilities currently running under the footpath remain separate from the mainline carriageway without the involvement of any relocation work. An electricity substation will be constructed as part of the Proposed Development to service the utilities and electric car charging points.

The power and electrical supply requirements during construction are relatively minor, and there is no potential impact anticipated on existing users in the area.

Any excavations and connections will be undertaken with consultation with the utility operators, therefore there is no potential impact anticipated on electrical infrastructure to existing users.

A medium-pressure gas transmission main crosses the carriageway from south to north near the roundabout entry and runs towards west under the northern footway. A distribution main also runs under the southern footway with a connection line/main branching off into the site after crossing the carriageway in front of the existing site access junction. This transmission main ends 150 meters north of the junction.

Several existing water mains (150 dia, 200 dia, 600 dia, 800 dia) are present within the redline boundary with a majority of them close to the existing/proposed junction. The 600 dia main currently runs under the existing internal road for 95m meters before deviating north-west. 2 nos. of 200 dia main also run under the verge of the internal road for 130m.

Waste and Waste Management

Project specific resource and waste management targets for the site have not yet been set and this information will be updated for these targets once these targets have been confirmed by the client. However, it is expected for projects of this nature that a minimum of 70% of waste is fully re-used, recycled or recovered where possible.

There will be soil, stones, clay, gravel and made ground excavated to facilitate construction of new foundations, underground services, and the installation of the proposed foundations. The development engineers Clifton Scannell Emerson Associates have estimated that 12,764m3 of material will need to be excavated to do so. It is currently envisaged that 7,111m3 will be able to be retained and reused onsite for landscaping and fill, the remaining material, will need to be removed offsite due to the limited opportunities for reuse on site. This will be taken for appropriate offsite reuse, recovery, recycling and / or disposal.

Dedicated bunded storage containers will be provided for hazardous wastes which may arise such as batteries, paints, oils, chemicals etc, if required.

During the construction phase there may be a surplus of building materials, such as timber off-cuts, broken concrete blocks, cladding, plastics, metals and tiles generated. There may also be excess concrete during construction which will need to be disposed of. Plastic and cardboard waste from packaging and supply of materials will also be generated.

Other than materials necessary for the construction of the facility, the Proposed Development will not produce significant volumes of waste generated. The contractor will be required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

Waste will also be generated from construction workers e.g. organic / food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided on site during the construction phase. Waste printer / toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices.

All waste arising during the construction phase will be managed and disposed of in a way that ensures the provisions of the Waste Management Act 1996 and associated amendments and regulations and the Waste Management Plan. In the event, there is excess material with no defined purpose, it will be transported to an authorised soil recovery site.

Waste during construction will be managed in accordance with a project specific CEMP.

It is considered that the Proposed Development will not have any significant impact in terms of resources or waste generation.

A carefully planned approach to waste management as set out in Section 3.0 and adherence to the Resource Waste Management Plan (RWMP) during the construction phase will ensure that the impact on the environment will be ***short-term, neutral*** and ***imperceptible***.

Conclusion

There are no likely significant environmental effects in terms of the material assets, for the Proposed Development and considering the existing environment and proposed future environment which would warrant preparation of an EIA.

5.9.2 Operational Phase

Utilities: Foul Sewer, Stormwater and Potable Water

As outlined in the Engineering and Planning Report provided with planning, the existing water infrastructure within the area has been confirmed to have adequate capacity to cater for the Proposed Development.

Water supply and wastewater will be provided via the existing public mains network adjacent to the site. The disposal of foul water from the site is separated from that of surface water.

Water supply will be met from public supply. The Proposed Development water demand will be supplied the staff sanitary facility only and expected to be 300l/s/day.

The proposed sites foul water demand (peak discharge of 300l/d) is sufficient for the 150 mm diameter proposed foul water pipe to tie into the existing 600mm diameter foul water pipe located to the south of the site.

Details of the pre-connection enquiry (PCE) form was submitted to Irish Water on 14th December 2022 which detailed the proposed foul sewer gravity system for the site (ref CDS22008848) is included with the Engineering Planning Report submitted as part of the planning application for the Proposed Development. The proposed sites foul water demand (peak discharge of 300l/d) is sufficient for the 150 mm diameter proposed foul water pipe to tie into the existing 600mm diameter foul water pipe located to the south of the site. The disposal of foul water from the site is separated from that of surface water.

The wastewater design includes the following:

- A pre-connection enquiry (PCE) form was submitted to Irish Water on 14th December 2022 which detailed the proposed foul sewer gravity system for the site (ref CDS22008848).
- The Proposed Development, subject to this planning application, comprises of 1No 150mm diameter gravity foul sewer line, connecting the staff toilet to the existing foul sewer within the R918 to the south of the site. As such, the overall wastewater discharge associated with the Proposed Development is in accordance with the demand/discharge rates based on IW Wastewater Infrastructure Code of Practice 2020. Disposal of foul water from the site is separated from that of surface water.
- As no industrial-specific wastewater flow will be generated from the development, the design Dry Weather Flow of the development is 300l/d.

There is no predicted impact in respect of foul sewer, stormwater and potable water, that would warrant the preparation of an EIA report.

The Proposed Development's surface water drainage system was designed in accordance with the Greater Dublin Strategic Drainage Strategy (GDSDS) and consists of two separate systems.

- The site will be drained through a series of gullies and into a piped drainage system that will ultimately be collected and conveyed through a series of proposed stormwater pipes prior to discharging into the existing storm water sewer within the R918 to the south of the site.

- To comply with the GDSDS guidelines in relation to SUDs, a series of water gardens are proposed across the site, to promote infiltration to the groundwater where suitable. At locations where the infiltration rate is very low, a proposed perforated pipe will convey the excess runoff back to the piped drainage network.

The existing stormwater pipe located within in the R918 to the south of the site. The stormwater drain flows in a south-easterly toward the River Dargle.

There is no predicted impact in respect of foul sewer, stormwater and potable water, that would warrant the preparation of an EIA report.

Waste and Waste Management

The Proposed Development will give rise to minor quantities of waste during the operational phase, i.e. when the project is completed, and fully operational. Given the nature and function / purpose of the development as a carpark and bus stop, the waste generated will be limited / confined to bins strategically provided and dispersed across the site for the users of the Park & Ride facility. The waste generated will be collected and disposed regularly by an assigned waste contractor in the locality. The predicted impact of the operational phase on the environment will be ***long-term, neutral*** and ***imperceptible***.

Conclusion

There are no likely significant environmental effects in terms of the material assets, for the Proposed Development and considering the existing environment and proposed future environment which would warrant preparation of an EIA.

5.10 ASSESSMENT OF POTENTIAL IMPACTS FROM INTERACTIONS AND CUMULATIVE IMPACTS

Interactions

This section discusses the potential interactions and inter-relationships between the environmental factors discussed in the preceding sections. This section covers both the construction operational and decommissioning phases of the Proposed Development.

In accordance with the guidance, not only are the individual significant impacts required to be considered when assessing the impact of a development on the environment, but so must the interrelationships between these factors be identified and assessed.

The majority of the interactions are considered not to be significant.

In the absence of mitigation, the following potential interaction could exist during construction:

- between land, soil geology, hydrogeology and hydrology if poorly managed surface water is allowed to run-off unmitigated during the construction phase of the Proposed Development.

– between air quality and human health and biodiversity, if dust generated is not managed adequately

– between noise and human health and biodiversity, if construction noise is not managed adequately

However, these are potential short-term interactions associated with the construction phase. In advance of work starting on site, the works contractor will prepare a detailed Construction Environmental Management Plan (CEMP). The measures within the CEMP will ensure that pollution and nuisances arising from site clearance and construction activities are prevented where possible and managed in accordance with best practice and any subsequent planning conditions relevant to the Proposed Development.

It is considered that there will be no likely significant interactions during construction or operation which would warrant preparation of an EIAR.

Cumulative Impacts

As part of the assessment of the Proposed Development, the likelihood of potential cumulative impact of the Proposed Development has been considered with any future development (as far as practically possible) and the cumulative impacts with developments in the locality (including planned and permitted developments).

As outlined in Section 3.2, above, a list of notable consented developments located in close proximity to the development site is included in Appendix A of this report.

Cumulative impacts are those impacts that relate to incremental / additive impacts of the planned development in addition to historical, present or foreseeable future actions. Cumulative impacts can be thought of as occurring through two main pathways: first, through persistent additions or losses of the same materials or resource, and second, through the compounding effects as a result of the coming together of two or more effects.

The Proposed Development is construction on a partially developed site. Mitigation is included in the project design to minimise impacts on the receiving environment.

Existing developments that are already built and in operation contribute to the characterisation of the baseline environment. As such any further environmental impacts that the Proposed Development may have in addition to these already constructed and operational developments has been assessed in the various impact reports and assessments attached to this EIAR screening report.

The following considers the cumulative impacts of the Proposed Development and proposed and permitted and operating facilities in the surrounding area in relation to the receiving environment. Notable developments are included in Appendix A.

Any future development will be required to incorporate appropriate mitigation measures (e.g. noise management, dust management, traffic management, management of water quality in run-off water, landscape, etc) during the construction phase as such any cumulative development will not have a significant effect on human health, material assets, land, soils, geology, hydrogeology, and hydrology.

Any future development proposed on the surrounding lands should be cognisant with the zoning and will be subject to EIA and/or planning conditions which include appropriate mitigation measures to minimise environmental impacts.

Based on the assessment of the environmental sensitivities in the existing environment and consideration of potential cumulative impacts, it is concluded that there are no likely significant cumulative environmental impacts which would warrant preparation of an EIAR.

6.0 FINDINGS AND CONCLUSIONS

The purpose of this EIA Screening Report has been to consider whether there is a requirement for the preparation of an Environmental Impact Assessment Report (EIAR) to accompany the planning application to Wicklow County Council ('WCC') for the Proposed Development.

The Proposed Development and component parts have been considered against the thresholds outlined in Schedule 5, Part 2 Class 10 (a) to (m). The most relevant project type in the context of the Proposed Development is Class 10 (b):

10. Infrastructure projects

(b) (ii) Construction of a car-park providing more than 400 spaces, other than a car-park provided as part of, and incidental to the primary purpose of, a development.

The Proposed Development site is a carpark with 388 car parking spaces. The Proposed Development site is not equal to nor does it exceed the limit, quantity or threshold set out in Class 10 (b); therefore, an EIA is not mandatory.

In addition the development does not entail an extension or change to any existing EIA project (i.e. Class 13).

On the basis of the evaluation set out in Section 2.0 of this document, an EIA for the Proposed Development is not mandatory; the Proposed Development is considered to be a sub-threshold development and therefore there is discretion over the submission of an EIAR with the planning application.

AWN has considered the Proposed Development and assessed the potential for significant environmental effects and the need for an EIAR on a discretionary basis; this evaluation is documented in Sections 3.0, 4.0 and 5.0 and is summarised below:

- The Appropriate Assessment Screening (Appendix B) concludes that an Appropriate Assessment (stage II) is not required. It is considered that the Proposed Development alone or in combination with other developments will have no likelihood of direct or indirect effects on European sites in view of their conservation objectives.

- The Options Assessment (Biodiversity) concludes there were no rare or protected habitats or species recorded on the site. A baseline review of biodiversity at the site was carried out by the project ecologists Doherty Environmental Consultants Ltd.. No Japanese Knotweed, Giant Hogweed or other high impact non-native invasive plant species were detected during the ecological survey of the site. Buddleja Davidii, a commonly occurring non-native invasive plant species was found to be present on site during surveys. An invasive species management plan will need to be produced and submitted to WCC outlining a management plan to deal with the Buddleja Davidii, and any other invasive plant species that may be discovered during the construction phase. During the Screening for Appropriate Assessment of the project 14 European Sites were identified within the wider area surrounding the project site, the nearest of which is the Ballyman Glen SAC, located over 500m to the west. All other European Sites are located at greater distance from the project site. The examination based on the source-pathway-receptor model found that no pathways connect the project site to any European Sites occurring in the wider area surrounding the project site and there will be no potential for the project to interact with them or their qualifying features of interest/special conservation interests. Given the absence of any pathways and any European Sites within the zone of influence of the project, there will be no potential for the project to combine with other plans, projects or existing pressures to result in cumulative negative effects to European Sites in the wider surrounding area.
- With regard to fauna occurring at and surrounding the project site best practice measures are included in the design and CEMP to negate any potential for significant impact on birds and bats. Best practice measures have been incorporated into the design of the project to ensure that all waters discharged from the project site are adequately managed and treated prior to release to the receiving aquatic environment. The Proposed Development is predicted to have a neutral imperceptible effect on biodiversity.
- A detailed Air Quality Impact Assessment Report (Appendix D) was completed to assess the impact of the development with reference to the protection of the environment and human health. This report concludes, on conservative assumptions, that the Proposed Development will not result in any off-site exceedances of the applicable ambient air quality standards (including at the nearest residential receptors).
- The Noise and Vibration Impact Assessment Report (Appendix C) has assessed the potential noise impact of the development and concludes that the Proposed Development, will comply with the relevant noise criteria at noise sensitive locations (including at the nearest residential receptors).
- The Cultural Heritage Assessment Report (Appendix H) concludes that there are no recorded archaeological sites or monuments within the Proposed Development lands, as listed in the Record of Monuments and Places for Co. Wicklow.
- The Traffic and Transportation Assessment (Appendix F) concludes that the Proposed Development (construction and operation) will not have a significant impact upon the established local traffic conditions with all junctions within the study area. Traffic generated as a result of the operational phase can be accommodated within the surrounding road network and will not have an adverse impact.
- The Soils Geology and Water assessment discussed in this report concludes that underlying bedrock, groundwater and local water courses will not be impacted. During operation stormwater drainage from the carpark area will

pass through an interceptor prior to discharge to the public stormwater sewer. Measures to contain potential contamination sources during construction will be detailed in a CEMP during construction. There is no likely impact on the receiving environment.

- The Resource Waste Management Plan (Appendix G) concluded that other than materials necessary for the construction of the building the Proposed Development will not produce significant volumes of waste. Waste during construction will be managed in accordance with a project specific Construction Waste Management Plan.
- The Landscape Assessment (Appendix I) concludes that the predicted impact on landscape and visual impact during operation is neutral, slight and Imperceptible. There are no likely significant effects in terms of the Landscape and Visual Impact during construction or operation that would warrant preparation of an EIA.
- The preparation of, and compliance with, a Construction Environmental Management Plan (CEMP) by the construction contractor prior to commencement will address potential short-term nuisances (such as dust and noise etc.) and risks from the storage of any hazardous substances (fuels, chemicals and other construction materials that may pose a risk to the environment) are avoided and minimised. The CEMP will ensure potential nuisances during the construction of the facility are avoided and minimised.

AWN has concluded, there are no likely significant environmental effects on the receiving environment for the Proposed Development, which would warrant preparation of an EIA.

A mandatory EIA is not required for the Proposed Development, and as the potential effects are not significant it is submitted by AWN that there is not a requirement for an EIAR to be submitted with this planning application.

7.0 REFERENCES

- Environment Protection Agency. Guidelines on the Information to be contained in Environmental Impact Assessment Reports. EPA: 2022
- Planning and Development Regulations, 2001 as amended.
- CSEA, Planning Engineering Report:M11-J6 (Fassaroe) Park & Ride, (Updated 6-6-23)
- NTA Park and Ride Development Office , Flood Report, January 2023.

Appendix A

APPENDIX A

RELEVANT PLANNING HISTORY WITHIN THE VICINITY OF THE SUBJECT SITE

AWN CONSULTING

Table 1: Relevant Planning History within the vicinity of the subject site

Planning Reference, Application and Location	Development Description	Decision and Grant Date
TA06D.314686 Shankill Property Investments Limited Former Bray Golf Club Lands, Off Ravenswell Road and Dublin Road, Bray, Co. Dublin and Co. Wicklow	Strategic Housing Development consisting of Change of use from former golf course, construction of 586 no. residential units (76 no. houses, 348 no. apartments, 162 no. Build to Rent apartments), creche and associated site works.	DECISION DUE 24 January 2023
22829 Wicklow County Council Herbert Road, Kilbride, Bray, Co. Wicklow	Installation of footpaths and public lighting , consisting of works as follows (a) regrading of verges, vegetation clearance and tree felling as required (b) construction of about 410m of concrete kerb and macadam footpaths varying from 1.5 - 1.8m in width (c) reducing roadway width to 6.0m on straight sections and 6.5m on curves, including widening of existing concrete footpath. Existing width on hairpin bend maintained. (d) install cable ducts, maximum 6m high lighting columns and S2 class lighting. (e) Install an advisory pedestrian crossing and ancillary warning signs on the route (f) new road surface over lay and landscaping disturbed ground at completion of other civil works	DECISION DUE 20 September 2022
TA27.313314 Cosgrave Property Group Fassaroe and Monastery, Bray, Co. Wicklow	Strategic Housing Development consisting of demolition of an existing dwelling at Berryfield Lane, construction of 650 no. residential units (241 no. houses, 409 no. apartments), creche and associated site works.	DECISION DUE 2 August 2022
22860 George Dunne Mount Herbert House, Herbert Road, Bray, Co. Wicklow	Slope stability remediation works on the sloped landscape areas to the north of the existing house and adjoining coach house, between the house and the River Dargle, as outlined on the planning application drawings. Works to include removal of existing trees and vegetation, slope regarding, soil nailing, construction of stone-filled gabion facing, foundations, drainage, underpinning and rebuilding of existing damaged walls, replanting of vegetation; Mount Herbert is listed as a Protected Structure, No. B20	GRANT PERMISSION WITH CONDITIONS 2 November 2022
22752 Ardmore Studios Limited Ardmore Studios, Herbert Road, Bray, Co. Wicklow	Modifications to permission WCC reg ref 20/402. Amendments to the sound stage include: subdivision of sound stages from 2 to 3 no. sound stages; additional entrances and exits added to all stages; minor modifications to façade; plant and pv panels added roofs. amendments to the workshops include: subdivision of workshops from 4 to 5 no. workshops; internal toilet block added to workshop no. 4; additional entrances and exits added to workshops; workshop roof height reduced and PV panels and roof lights added. Plant room to the northwest of sound stages increased in size by c.90 sqm and an additional storey added. Amendments to car and truck parking. All associated site development works, landscaping, boundary treatments and services provision	GRANT PERMISSION WITH CONDITIONS 21 September 2022
22675 Ardmore Studios Limited	Demolition of 3 no. single storey structures on site including Workshop 1 (296.24 sqm), Workshop 2 (171.05 sqm) the Cow Shed (c.263.77 sqm). All associated works and services provision	GRANT PERMISSION WITH CONDITIONS 8 September 2022

Planning Reference, Application and Location	Development Description	Decision and Grant Date
Ardmore Studios, Herbert Road, Bray, Co. Wicklow		
22659 Starrus Eco Holdings Ltd Fassaroe, Bray, Co. Wicklow, A98 KH67	The removal of the existing acoustic & dust screen, which consist of stacked shipping containers with mesh netting on top to allow for the erection of an extension to an existing permitted materials recovery facility. The extension is located to the western elevation of the existing building, which has a gross floor area of 1,006 sqm. The maximum height of the western extension is 10.25 metres with all associated site development works above and below ground. The development relates to a waste material recovery site which is operated under a Waste Licence granted by the EPA	GRANT PERMISSION WITH CONDITIONS 7 September 2022
20935 / PL27.310649 Starrus Eco Holdings Existing Materials Recovery Facility, Fassaroe, Bray, Co.Wicklow. (20935)	Three extensions to existing materials recovery facility and all associated site development works. The development relates to a waste material recovery site which is operated under a Waste Licence graned by the EPA.	GRANT PERMISSION WITH CONDITIONS 15 March 2022
211405 Kilbride Hill Ltd Kilbride Hill House, Herbert Road, Bray, Co. Wicklow	Amendments to the previously approved planning permission Reg Ref No: 17/1085 & Ref No: ABP-301577-18, the development comprises; (1) the addition of 4 dwelling units increasing the total new dwelling units on the site from 31 to 35. The 4 dwelling units will comprise of 3 no. 3 bed terraced dwelling units and 1 no. 3 bed semi-detached dwelling unit, (2) changing of a proposed of 1 no. 4 bed dwelling unit into a 3 bed semi-detached dwelling unit, and all associated site works all on a site of c. 3.705 hectares located at Kilbride Hill House (a Protected Structure, RPS Ref. 26)	GRANT PERMISSION WITH CONDITIONS 10 March 2022
21996 Aine Hayes Factory and Office Building, Fairgreen Road, Bray, Co. Wicklow, A98 K2FG	Demolition of existing part 2 storey, part single storey commercial units, 2 storey office building and associated outbuildings and the change of use from commercial and office to residential use with the construction of 15 no 2 storey, pitched roof, terraced houses, each with 2 bedrooms and a study, in 3 blocks (blocs A and C consist of 4 terraced houses, block B consists of 7 terraced houses), 16 no surface car parking spaces, 46no on site bicycle spaces, secure communal bin storage and the relocation of the vehicular and pedestrian entrance off Fairgreen Road, landscaping, new boundary wall to southern boundary and new boundary treatment to Fairgreen Road and associated works, suds surface water drainage, foul water, potable water connections and all ancillary works necessary to facilitate the development	GRANT PERMISSION WITH CONDITIONS 22 February 2022
21606 Larry Brennan Claren House, Killarney Road, Bray, Co. Wicklow	A proposed residential development (14 no. residential units) comprising of 1 no. 1 bedroom unit, 2 no. 2 bedroom units, 5 no. 3 bedroom units & 6 no. 4 bedroom units to be provided in a mix of unit types as follows: 4 no. semi-detached houses (2.5 storey), 5 no. terraced houses (2 to 2.5 storey), 4 no. duplex / apartment units (3 storey block), 1 no. own door unit (2 storey), together with all associated landscaping & site development works including estate road, vehicular entrance, car parking, bins & bicycle storage, services infrastructure & demolition of existing dwelling	GRANT PERMISSION WITH CONDITIONS 15 February 2022

Planning Reference, Application and Location	Development Description	Decision and Grant Date
TA27.310078 Cairn Home Properties Limited Cookstown and Powerscourt Demesne (Townlands), Cookstown Road, Enniskerry, Co. Wicklow	Strategic Housing Development consisting of 165 no. residential units (105 no. houses, 60 no. apartments), creche and associated site works.	GRANT PERMISSION WITH CONDITIONS 13 August 2021
20402 Ardmore Studios Limited Ardmore Studios, Herbert Road, Bray, Co. Wicklow	Demolition of 7 no. existing workshops and ancillary buildings (totalling c. 1,837 sq.m) and 1 no. existing stage building and 1 no. props building (totalling c. 1,329 sq.m) and construction of a new film studio building comprising 2 no. stage areas (c.2,410 sq.m and c.2,410 sq.m), and support buildings comprising of production offices and general space for costume, props, etc., together with plant room and associated ancillary areas. Total gross floor area of the new film studio building (stage & administrative buildings) is c.7,755 sq.m. The construction of 4 no. workshop buildings (totalling c. 1,133 sq.m). Relocation of existing vehicular (only) entrance along Herbert Road. Permission is also sought for parking within the Ardmore Studios property (including in proximity to Ardmore House (Protected Structure No. B21)). This entails a modification to WCC Reg. Ref. 19/1208 (Condition 12a) to allow use of this temporary parking for the duration of the construction period associated with the current application. All associated site development works, landscaping, boundary treatments, parking and services provision	GRANT PERMISSION WITH CONDITIONS 28 October 2020
20701 Lidl Ireland GmbH AO Smith Site, Boghall Road, Bray, Co. Wicklow, A98 C971	Modification to a previous permission Reg. Ref. 17/469 comprising the installation of a roof-mounted array of solar photovoltaic (PV) panels measuring 470sq. m together with inverters and electrical cabling on the permitted retail outlet to provide renewable energy during the operational phase	GRANT PERMISSION WITH CONDITIONS 19 October 2020
20296 Cosgrave Property Group La Vallee House, Upper Dargle Road, Bray, Co. Wicklow	Revisions to the development permitted under Planning Register Reference 01/150. The revisions now proposed include the provision of additional commercial floor space (GFA c. 426m2) by way of an additional floor onto the existing three storey commercial building (GFA c. 1,640m2), resulting in a four storey over basement commercial building with a total gross floor area of c. 2,066m2. Minor revisions are also proposed to the third storey of the existing commercial development to accommodate the additional floor above, including revisions to the circulation space at this level, permitted under Planning Register Reference 01/150. A plant enclosure (c. 30m2) is also proposed at roof level. The total gross floor area of the proposed development is c. 456m2. A total of 17 no. cycle parking spaces are proposed at surface level. Car parking is provided by the existing surface and basement car parking, permitted under Planning Register Reference 01/150 Reconfiguration of the existing car parking is proposed, with 16 no. spaces to be allocated to the subject proposal. Vehicular access to serve the development is provided by the existing local access road serving the 'La Vallee' development, permitted under Planning Register Reference 01/150; all on an overall site of c.0.37 Ha	GRANT PERMISSION WITH CONDITIONS 14 August 2020

Planning Reference, Application and Location	Development Description	Decision and Grant Date
TA06D.305844 Aeval Unlimited Company Townland of Cork Little and Shanganagh, Woodbrook, Shankill, Co. Dublin	Strategic Housing Development consisting of 685 no. residential units (207 no. houses, 478 no. apartments), creche and associated site works.	GRANT PERMISSION WITH CONDITIONS 27 February 2020
191242 Bray Primary Care DAC Bray Primary Care Centre, Killarney Road, Bray, Co. Wicklow	Minor modifications to approved plans Reg Ref 15/358 (Pl 27.245283) for the Bray Primary Care Centre currently under construction comprising a surface level set down area for ambulance and other emergency vehicles, and the relocation of the approved ESB substation and switch room building from a position adjacent to Killarney Road boundary to a position adjacent to the two storey car park. No additional works proposed to the protected boundary wall to Killarney Road	GRANT PERMISSION WITH CONDITIONS 20 February 2020
191208 Ardmore Studios Ltd Ardmore Studios, Herbert Road, Bray, Co. Wicklow	Demolition of existing administrative building (c185 sqm) security building (c29 sqm) and workshop (c169 sqm) and construction of a new film studio building comprising a stage area (c2017 sqm) and a 5 storey support building comprising support spaces, stores / props, waiting areas, changing areas, hair / make up, production offices / admin, loading areas, plant, and associated ancillary areas. Total gross floor area of the new film studio building (stage & administrative building) is c 4049 sqm, undercroft car park replacing existing surface car parking along with additional surface car parking and provision of temporary car parking within Ardmore Studios site (for duration of construction period) including in proximity to Ardmore House (Protected Structure No B21). Provision of a new single store security building (c19 sqm) and redesign of main site entrance and internal road layout, along with new footpaths, cycle parking, control points, security gates and deliveries / layby. Relocation of existing pillars from main entrance to the avenue within the Ardmore site. All associated site development works, landscaping, boundary treatments and services provision	GRANT PERMISSION WITH CONDITIONS 14 February 2020
19534 Wicklow County Council Lands North of Ard na Gréine, West Ward, Bray, Co. Wicklow	31 no houses and all associated works. The accommodation will consist of 21 no 2 bed houses (2 storey) and 10 no 3 bed houses (2 storey)	GRANT PERMISSION 1 November 2019
19711 Bray Primary Care DAC Bray Primary Care Centre, Killarney Road, Bray, Co. Wicklow	Minor modifications to approved plans Reg Ref 15/358 (Pl27.245283) for the Bray Primary Care Centre currently under construction as follows (1) 2 no stores (11.1 sqm) at lower car park level, (11) a platform lift within the car park (iii) the use of 24.25 sqm of courtyard for external seating area ancillary to the ground floor café, (iv) a pay station for the car park (v) a c 4.1m high freestanding internally illuminated variable message sign (1.25m x 1.25m) (iv) an L shaped entrance portal to the car park (overall height 2.9m with overall width of 3.6m) and (vii) the erection of 12 no signs per condition number 6 of permission Reg Ref 15/358 as follows: 1. 2 no internally lit pharmacy fascia signs (4.9m x 0.75m and 3.75m x 0.75m), 2 a projecting internally illuminated + pharmacy sign (0.7m x 0.7m), 3 an internal café sign (1.7m x 0.52m) 4. a 'HSE Bray Primary Care Centre' sign (4.66m x 0.6m) above the main entrance 5. a 'Bray Primary Care Centre' building	GRANT PERMISSION WITH CONDITIONS 12 September 2019

Planning Reference, Application and Location	Development Description	Decision and Grant Date
	identification sign (3.78m x 1.8m) above second floor level on the north east elevation, 6. 2 no free standing entry totem signs (c2.08m x 0.7m at main entrance and c 1.7m x 0.7m at back entrance) 7. a 2.9m high x 0.8m wide entrance pillar sign at car park entry ramps 8. a 'Q Park' stainless steel sign (2.15m x 0.84m) above entrance to lower car park level and 9. 2 no wall mounted signs (0.54 m x 0.54m each). No additional works proposed to the protected boundary wall to Killarney Road	
19620 Roadstone Ltd Fassaroe, Bray, Co. Wicklow	Continued operation of a previously consented construction and demolition (C&D) waste recovery facility (Ref No 14/1440) on a 3.0 ha site within the existing landholding. The development comprises a hard standing area for stockpiling construction and demolition (C&D) waste materials (principally concrete, bricks, tiles and ceramics) and undertaking waste recovery activities, principally crushing using mobile plant. The C&D waste recovery activity is regulated by a waste licence issued by the Environmental Protection Agency (Ref No W0269-01)	GRANT PERMISSION WITH CONDITIONS 2 September 2019
D18A/0606 Irish Water Old Connaught / Woodbrook Water Supply scheme at Ballyman Road, Ballyman, Co. Dublin	Permission is sought for provision of water supply infrastructure. The development will consist of: A 10 year permission to facilitate construction in two phases. The Phase 1 development will service existing customers and expected demand arising from land zoning as set out in the current County Development Plan and Local Area Plan. The Phase 1 infrastructure to be constructed comprises the following: 10,000m3 covered low level reservoir approximately 2560sqm with height above ground up to 4.5m approximately without handrailing on the roof (up to 5.7m approximately with handrailing); 2,500m3 covered high level reservoir approximately 660sqm with height above ground up to 4.5 approximately without handrailing on the roof (up to 5.7m approximately with handrailing); new building at the low level reservoir site housing pumps and secondary chlorination plant and de-chlorination facilities, approximately 95.8sq in plan with overall height of approximately 7.8m to the apex; emergency overflow pipeline from the proposed reservoirs to the County Brooks Stream; new access to low level reservoir site; new field access to high level reservoir site ; landscaping and fencing. Phase 2 of the development will be required when water supply demand reaches the capacity of the Phase 1 infrastructure, requiring additional storage to ensure at least 24 hours at average day demand. The Phase 2 infrastructure to be constructed comprises the following; 10,000m3 covered low level reservoir approximately 2560sqm with height above ground up to 4.5m approximately without handrailing on the roof (up to 5.7m approximately with handrailing); 2,500m3 covered high level reservoir approximately 660sqm with height above ground up to 4.7m approximately without handrailing on the roof (up to 5.9m approximately with handrailing); landscaping. The proposed development include: all associated site development works, hardstanding areas, provision of a temporary construction compound area, drainage collection systems with hydrocarbon interceptor and attenuation systems, all necessary ancillary	GRANT PERMISSION 17 April 2019

Planning Reference, Application and Location	Development Description	Decision and Grant Date
	pipework, mechanical and electrical services, diversion of services, ducting, kiosks, plant, instrumentation, automation, controls and equipment. All of the above is proposed on a site of approximately 6.3 hectares.	
1968 Roadstone Ltd Fassaroe Townland, Bray, Co. Wicklow	Extend the appropriate period of a permission - 08/1258 - backfill the existing quarry void to former ground level using imported inert soil and stones. The proposed development requires a waste licence from the Environmental Protection Agency	GRANT PERMISSION 5 March 2019
D18A/0668 Bray Emments GAA Club Bray Emmets GAA Club, Old Connaught Avenue, Bray, Co Dublin	Permission for the erection of 9 no. 20m high lighting poles with flood lighting plus associated site works, all at pitches 3 & 4.	GRANT PERMISSION 19 December 2018
171085 / PL27.301577 Balark Trading GP Ltd Site of c3.7 ha located at Kilbride Hill House (protected structure) and ancillary woodlands to the west of Kilbride Hill House Herbert Road, Bray, Co. Wicklow	43 houses, extension to gate lodge, new curtilage for Kilbride House, 90 car parking spaces provided on street and within curtilage, public open space, children’s play area, pedestrian links to woodland and associated site works and services.	GRANT PERMISSION WITH CONDITIONS 22 November 2018
17469 / PL27.300802 Lidl Ireland GmbH Smith Site, Boghall Road, Bray, Co. Wicklow	Demolition of industrial premises and security hut, construction of discount food store, access and all associated works	GRANT PERMISSION WITH CONDITIONS 5 November 2018
171478 Wicklow County Council Herbert Road Car Park, Bray, Co. Wicklow	Carry out extension to Herbert Road Car Park. The proposed work involves demolition of a dwelling on 1070 sqm site to be acquired by the Council adjacent to the car park, construction of new boundary wall to the acquired property, upgrading of public lighting and surface water drainage, relocation of car park entrance and infill of front boundary wall with cut stone to match existing, surfacing of extended area and resurfacing existing car park as required, laying out of new car park with 50 additional spaces, including additional disabled access parking, club car parking and electric vehicle charging bays	GRANT PERMISSION 12 April 2018
171488 Starrus Eco Holdings Ltd Fassaroe, Bray, Co. Wicklow, A98 KH67	Single storey waste materials recovery building to internally accommodate existing on site external waste management activities. The proposed building will be located to the north western corner of an existing operational yard area and will include inter alia external finishes to match the existing buildings on site, ramp access and egress to an internal recessed loading bay, ventilation systems, alterations as necessary to all ancillary site works and services. The proposed works will also include the installation of photovoltaic panels to the south facing roof of the proposed waste materials recovery building and also to the roof of the existing main commercial and industrial waste transfer building, combined with alterations as necessary to associated site works and services. The development relates to a waste material recovery site which is operated under a Waste Licence granted by the Environmental Protection Agency	GRANT PERMISSION WITH CONDITIONS 23 March 2018

Planning Reference, Application and Location	Development Description	Decision and Grant Date
D17A/1104 Board of Directors of St. Gerard`s School St. Gerard's School, Thornhill Road, Bray, Co Dublin	Permission is sought for the development of a new two-storey 672 sqm wing to the existing Junior School, a new two-storey 1948 sqm wing to the existing Senior School and associated site works. The proposed development will total 2620 sqm in area and consist of the provision of upgraded teaching accommodation to provide larger teaching spaces, specialist rooms and will include the re-alignment of the existing internal road, set-down, car parking facilities, bicycle parking, associated site works and drainage. The works to the Junior School comprise of a new two-storey 672 sqm wing and the modification of 4 no. existing classrooms to allow the provision of a new library, arts space, a collaboration studio, the replacement of the 4 no. classrooms and inclusion of 1 no. additional class room, associated toilets and stores. The works to the Senior School comprises a new two-storey 1948 sqm wing linking into the existing building. The new accommodation will provide 4 no. science laboratories, associated preparation rooms, a design communication graphics room, 5 no. classrooms, a multipurpose room, an office, a general purpose area, associated toilets and stores. The site is within the curtilage of a protected structure.	GRANT PERMISSION 22 March 2018
D17A/0215 Saint Gerard's School Trust Saint Gerard's School, Thornhill Road, Bray, Co Dublin (A Protected Structure)	Permission for the removal of a portion of the remaining front boundary wall to the North up to the existing pier at the main entrance gates, re-dressing the existing lowered and raking walls and the erection of a painted mild steel railings to match those already erected on the far side of the main entrance. The proposal also includes for localised repairs to the remaining wall in random stone to match the existing wall in accordance with good Conservation Practice.	GRANT PERMISSION 11 Jan 2018

Appendix B

Fassaroe Park & Ride

Fassaroe, Co. Wicklow

Screening Report for Appropriate Assessment

Doherty Environmental Consultants Ltd.

July 2023

Fassaroe Park & Ride

N11, Fassaroe, Co. Wicklow

Screening Report for Appropriate Assessment

Document Stage	Document Version	Prepared by
Final	1	Pat Doherty MSc, MCIEEM

Table of Contents

1.0 INTRODUCTION

Doherty Environmental Consultants (DEC) Ltd. has been commissioned by CSEA Consulting Engineers on behalf of the NTA to undertake a Screening Report in support of an Appropriate Assessment (AA), under Article 6 of the EU Habitats Directive, for a proposed Park and Ride development at Fassaroe, N11, Co. Wicklow. The location of the proposed site is shown on Figure 1.1 while an aerial view of the proposed site is shown on Figure 1.2. The proposed development layout is provided as Appendix 1.

This Screening Report for Appropriate Assessment forms Stage 1 of the Habitats Directive Assessment process and is being undertaken in order to comply with the requirements of the Habitats Directive Article 6(3). The function of this Screening Report is to identify the potential for the project to result in likely significant effects to European Sites and to provide information so that the competent authority can determine whether a Stage 2 Appropriate Assessment is required for the project.

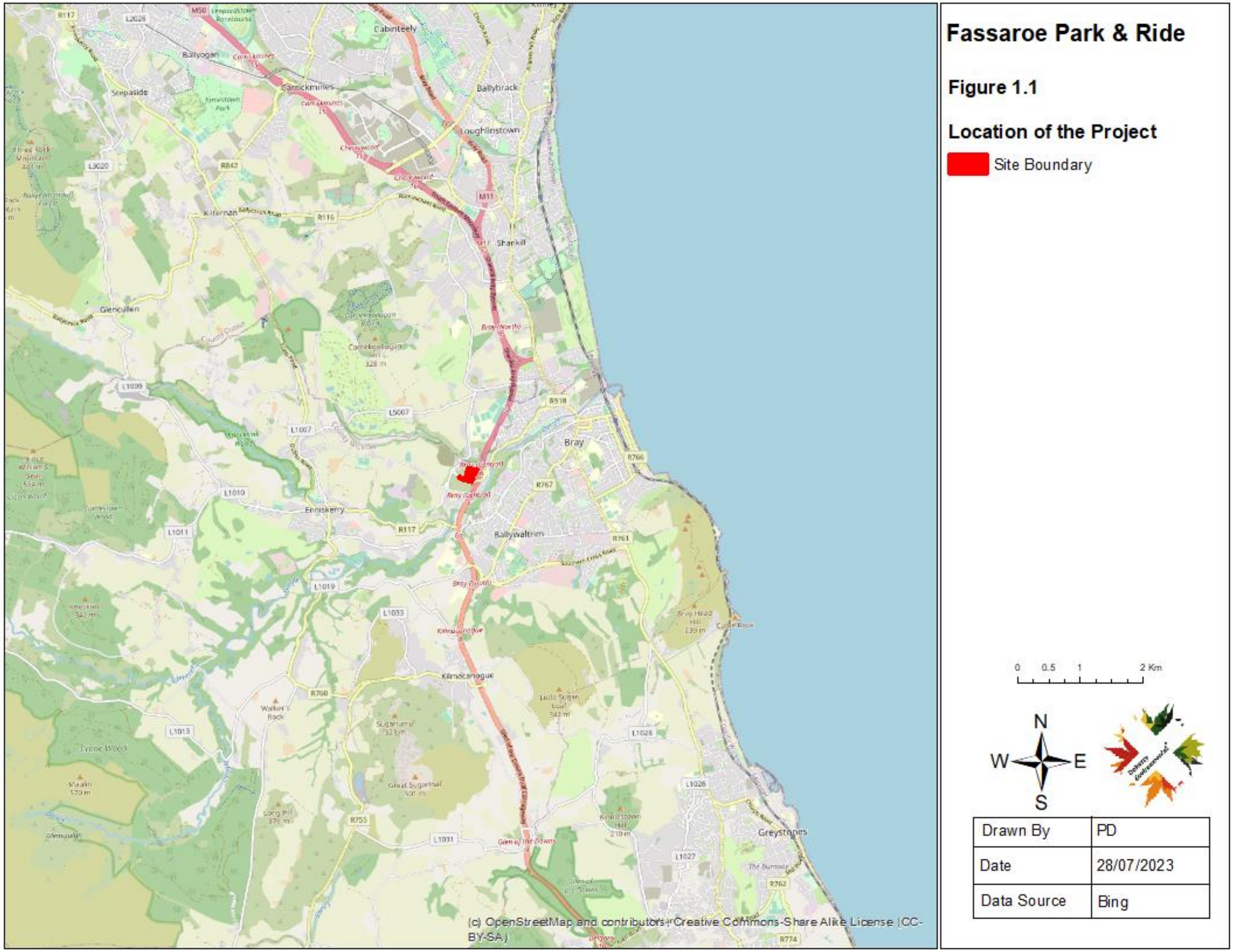
1.1 LEGISLATIVE CONTEXT

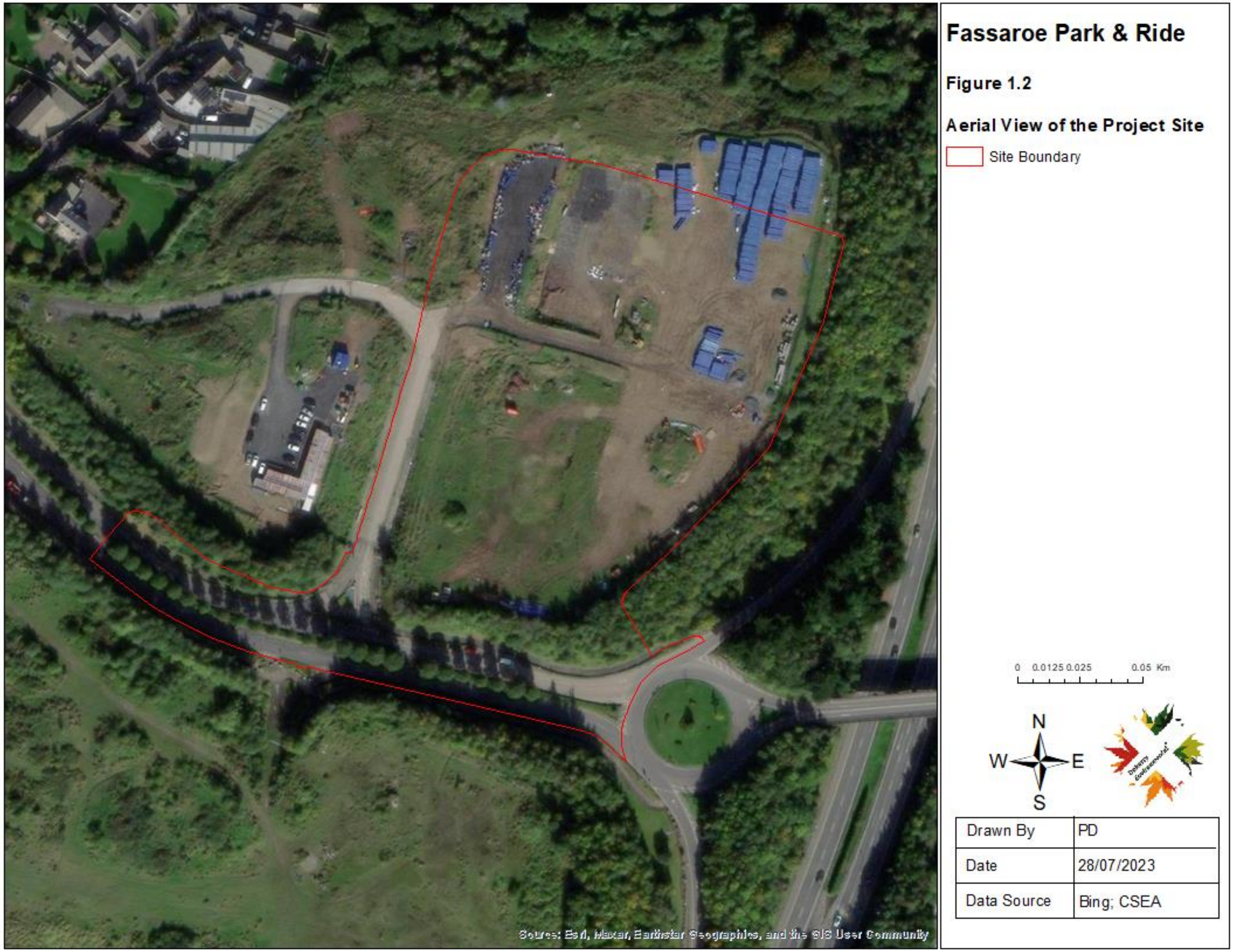
This Screening Report for Appropriate Assessment is being prepared in order to enable the competent authority to comply with Article 6(3) of Council Directive 92/43/EEC (The Habitats Directive). It is prepared to assess whether or not the project alone or in combination with other plans and projects is likely to have a significant effect on any European Site in view of best scientific knowledge and in view of the conservation objectives of the European Sites and specifically on the habitats and species for which the sites have been designated.

1.1.1 Requirement for an Assessment under Article 6 of the Habitats Directive

According to Regulation 42(1) of the European Communities (Birds and Natural Habitats) Regulations 2011 – 2015, the competent Authority has a duty to:

- Determine whether the proposed Project is directly connected to or necessary for the management of one of more European Sites; and, if not,


Fassaroe Park & Ride
Figure 1.1
Location of the Project
Site Boundary
Cabinteely
Ballybrack
Loughlinstown
Carrickmines
Stepaside
Kilternan
Shankill
Glencullen
Bray
Enniskerry
Ballywaltrim
Kilmacanogue
Greystones
0 0.5 1 2 Km
N
W
E
S
Drawn By | PD
Date | 28/07/2023
Data Source | Bing
(c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA)


Fassaroe Park & Ride
Figure 1.2
Aerial View of the Project Site
Site Boundary
0 0.0125 0.025 0.05 Km
N
W
E
S
Drawn By PD
Date 28/07/2023
Data Source Bing; CSEA
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

- Determine if the Project, either individually or in combination with other plans or projects, would be likely to have a significant effect on the Eurpoean Site(s) in view of best scientific knowledge and the Conservation Objectives of the site(s).

This Report contains a Screening for Appropriate Assessment and is intended to assess and address all issues regarding the construction and operation of the Project and to inform and allow the competent authority to comply with the Habitats Directive. Article 6(3) of the Habitats Directive defines the requirements for assessment of projects and plans for which likely significant effects on European Sites may arise. The European Communities (Birds and Natural Habitats) Regulations, 2011 – 2015 (the Habitats Regulations) transpose into Irish law Directive 2009/147/EC (the Birds Directive) and Council Directive 92/43/EEC (the Habitats Directive) lists habitats and species that are of international importance for conservation and require protection. The Habitats legislation requires competent authorities, to carry out a Screening for Appropriate Assessment of plans and projects that, alone or in combination with other plans or projects, would be likely to have significant effects on European Sites in view of best scientific knowledge and the Site's conservation objectives. This requirement is transposed into Irish Law by Part 5 of the Habitats Regulations and Part XAB of the Planning and Development Act, 2000 (as amended).

1.2 SCREENING METHODOLOGY

This Screening Report has been prepared in order to comply with the legislative requirements outlined in Section 1.1 above and aims to establish whether or not the proposed project, alone or in combination with other plans or projects, would be likely to have significant effects on European Sites in view of best scientific knowledge and the Site's conservation objectives. In this context "likely" means a risk or possibility of effects occurring that **cannot** be ruled out based on objective information and "significant" means an effect that would undermine the conservation objectives of the European sites, either alone or in-combination with other plans and projects (Office of the Planning Regulator (OPR), 2021) .

The nature of the likely interactions between the Plan and the Conservation Objectives of European Sites will depend upon the:

- the ecological characteristics of the species or habitat, including their structure, function, conservation status and sensitivity to change; *and/or*

- the character, magnitude, duration, consequences and probability of the impacts arising from land use activities associated with the plan, in combination with other plans and projects.

This Screening Report for Appropriate Assessment has been undertaken with reference to respective National and European guidance documents: Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities (DEHLG 2010) and *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites – Methodological Guidance of the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC; Office of the Planning Regulator – OPR Practice Note PN01: Appropriate Assessment Screening for Development Management,* and recent European and National case law. The following guidance documents were also of relevance during the preparation of this Screening Report:

- Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities (2010). DEHLG.

- Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites – Methodological Guidance of the Provisions of Article 6(3) and (4) of the Habitats Directive 92/42/EEC. European Commission (2001).

- Managing Natura 2000 Sites – The provisions of Article 6 of the Habitats Directive 92/43/EEC. European commission (2018).

The EC (2021) guidelines outline the stages involved in undertaking a Screening Report for Appropriate Assessment for projects. The methodology adopted during the preparation of this Screening Report is informed by these guidelines and was undertaken in the following stages:

1. Describe the project and determine whether it is necessary for the conservation management of European Sites;

2. Identify European Sites that could be influenced by the project;

3. Where European Sites are identified as occurring within the zone of influence of the project identify potential effects arising from the project and screen the potential for such effects to negatively affect European Sites identified under Point 2 above; and

4. Identify other plans or projects that, in combination with the project, have the potential to affect European Sites.

2.0 PROJECT DESCRIPTION

The proposed development comprises a car park with 388 parking spaces, including 26 designated for mobility-impaired users, 42 for electric vehicles and 39 additional spaces futured proofed for electric vehicles.

The proposal involves provision of hardstanding areas for bike shelters and lockers, active travel connections, fencing, kerbs, drainage, road markings, public lighting, CCTV, ticketing machines, and a new ESB substation and switch room.

The scheme also features area with two bus bays, two passenger shelters, and a dedicated bus turning circle within the site. A new access junction is proposed at Fassaroe Lane, incorporating a new right-turning pocket lane for accessing the facility. The existing bus bay on the northern (eastbound) carriageway of Fassaroe Lane is proposed for removal.

2.1 SURFACE WATER MANAGEMENT

2.1.1 Proposed Surface water Drainage

The surface water drainage will consist of 2 separate systems:

- The site will be drained through a series of gullies and into a piped drainage system that will ultimately be collected and conveyed through a series of proposed stormwater pipes prior to discharging into the existing storm water sewer within the R918 to the south of the site.

- To comply with the GDSDS guidelines in relation to SUDs, is proposed within the site, to promote infiltration to the groundwater where suitable. At locations where the infiltration rate is very low, a proposed perforated pipe will convey the excess runoff back to the piped drainage network.

2.2 WASTEWATER

A pre-connection enquiry (PCE) form was submitted to Irish Water on 14th December 2022 which detailed the proposed foul sewer gravity system for the site (ref CDS22008848).

The proposed development, subject to this planning application, comprises of 1No 150mm diameter gravity foul sewer line, connecting the staff toilet to the existing foul sewer within the R918 to the south of the site. As such, the overall wastewater discharge associated with the proposed development is in accordance with the demand/discharge rates based on IW Wastewater Infrastructure Code of Practice 2020.

As no industrial-specific wastewater flow will be generated from the development, the design Dry Weather Flow of the development is 300l/d.

2.3 UTILITY CONNECTIONS

Some existing utility ducts are present within the redline boundary of the scheme as described below.

A medium-pressure gas transmission main crosses the carriageway from south to north near the roundabout entry and runs towards west under the northern footway. A distribution main also runs under the southern footway with a connection line/main branching off into the site after crossing the carriageway in front of the existing site access junction. This transmission main ends 150 meters north of the junction.

Several existing water mains (150 dia, 200 dia, 600 dia, 800 dia) are present within the redline boundary with a majority of them close to the existing/proposed junction. The 600 dia main currently runs under the existing internal road for 95m meters before deviating north-west. 2 nos. of 200 dia main also run under the verge of the internal road for 130m.

Based on our initial investigation, the scheme proposals will have no major impact on these existing utilities. The design has been optimised to ensure that the sections of utilities currently running under the footpath remain separate from the mainline carriageway without the involvement of any relocation work.

The electricity will be drawn from the existing ESB pylon from the Northwest corner of the site as shown on various electrical and ducting drawing submitted with the planning application.

A new substation will be required to power the various electrical equipment within site. The location of a building to accommodate the

2.4 CONSTRUCTION PHASE

The construction of the proposed development will be carried out in the following phases:

Commencement will occur in 2024.

The follow represents the likely sequence of construction activities required for the construction of the park and ride facility:

- Site clearance and removal of footing bases and underground services where required
- Excavation of site to formation level
- Construction of the foundations
- External works, roads & footpaths

2.4.1 Construction Phase Surface Water Management

During the construction phase surface water runoff will be to ground as per the existing surface water runoff regime at the project site.

During periods of high rainfall when precipitation exceeds infiltration surface water runoff will flow to the east following the natural fall in topography to the east.

Any groundwater ingress to excavations will be pumped to a construction phase treatment train that will comprise a mobile attenuation tank and buffered outfalls over vegetated ground to the east of the project site.

If surface water discharge to the existing stormwater drain is required during construction temporary on-site settlement ponds/tanks/silt busters will be installed to ensure adequate silt removal prior to discharge the detail of this system will be presented in the CEMP.

A silt fence will be provided along the eastern boundary of the construction phase to retain any fines entrained within the surface water runoff. The outfall of the buffered outfalls will be situated to the west of the silt fence.

2.4.2 Construction & Environmental Management Plan

A Construction & Environmental Management Plan (CEMP) will be prepared for the proposed development and provided to the planning authority prior to the commencement of construction.

2.4.2.1 Resource Waste Management Plan

The Resource Waste Management Plan (RWMP) provides a Waste Management Plan for the proposed development. It is anticipated that all excavated topsoil (4,477m^3) and 2633 m^3 of subsoil will be reused on site. It is anticipated that 5,654 m^3 of subsoil material will need to be removed offsite for appropriate reuse, recovery and/or disposal. Soils for disposal from the site are classified as waste and must comply with waste management legislation. The relevant legislation is the EU council decision (2003/33/EC) which has been implemented in all member states and sets out the criteria for the acceptance of waste at Landfills.

Final certification for all materials removed off site will require to be provided by the main contractor on completion of the excavation works.

2.4.3 Construction Plant, Equipment & Materials

The following construction materials will be required for the works:

- Concrete: This will be delivered by bottle truck and placed directly in prepared forms.

- Hardcore: This will be stored in the Construction compounds and delivered to site location by dump truck.

- The materials and equipment to be stored in the construction compound will be provided in the CEMP to be submitted prior to the commencement of construction

3.0 DESCRIPTION OF THE SITE LOCATION

The proposed Park & Ride facility is located in the townland of Fassaroe, in the north-western quadrant of Junction 6 on the N11, 450 meters west of the western fringe of Bray town. The site is reasonably close (circa 250m) to the motorway and is easily accessible from the N11 via Junction-6 and the existing dual carriageway road. the project site is representative of a brownfield site that is currently being actively used as a depot for the storage of construction material and equipment.

3.1 SOILS & GEOLOGY

Site investigations have been completed at the project site (Site Investigations Ltd., 2023) and the natural ground conditions encountered in the overburden layers was dominated by brown and grey (slightly) sandy (slightly) gravelly silty clay with low cobble content soils. Gravel soil was logged at one borehole and 3 no. trial pit locations running down the middle of the site. Made ground was recorded across the site at 3 no. borehole locations and 4 no. trial pits to a maximum depth of 3.70mbgl. The made ground was logged as engineered fill consisting of brown, brown grey and black slightly sandy slightly gravelly silty clay with low cobble content and some plastic pipe fragments

3.2 HYDROGEOLOGY

Groundwater details were surveyed during site investigation works. Groundwater was recorded at 3 no. borehole locations at 9.2mbgl, 4.6mbgl and 6.8mbgl. No groundwater ingresses were recorded in the trial pits during the site investigations.

There is always considerable uncertainty as to the likely rates of water ingress into excavations in clayey soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water.

Furthermore, water levels noted on the borehole and trial pit logs do not generally give an accurate indication of the actual groundwater conditions as the borehole or trial pit is rarely left open for sufficient time for the water level to reach equilibrium.

Also, during boring procedures, a permeable stratum may have been sealed off by the borehole casing, or water may have been added to aid drilling. Therefore, an extended period of groundwater monitoring using any constructed standpipes is required to provide more accurate information regarding groundwater conditions. Finally, groundwater levels vary with time of year, rainfall or nearby construction.

As discussed previously, groundwater was only recorded in the boreholes at depths greater than 4.60mbgl. There is always considerable uncertainty as to the likely rates of water ingress into excavations in cohesive soil and man0made soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water. Based on this information at the exploratory hole locations to date, it is considered likely that any shallow ingress (less than 2.00mbgl) into excavations will be slow to medium. If granular soils are encountered in shallow excavations, then the possibility of water ingressing into an excavation increase with higher ingress rates. If groundwater is encountered during excavations then mechanical pumps will be required to remove the groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches. Any groundwater ingress to excavations will be pumped to a construction phase treatment train that will comprise a mobile attenuation tank and buffered outfalls over vegetated ground to the east of the project site.

3.3 HYDROLOGY

The project site is located within the Dargle River surface water catchment (IE10_03) and the Dargle sub-catchment (Dargle_SC_010). This surface water catchment is principally drained by the Dargle River, which discharges to the sea north of Bray. There are no surface watercourses occurring within or bounding the project site. The Dargle River is located approximately 250m to the east of project site, on the eastern (and opposite) side of the M11. The County Brook Stream is located approximately 115m to the north of the project site.

The project will be connected to the receiving surface water environment during the operation phase via the proposed surface water drainage pathway. As noted in Section 2.1 above it is proposed to direct surface water runoff generated at the project site to the an existing surface water pipe along the R918 to the south of the project site. This surface water pipe conveys surface water to the east and eventually discharges to the River Dargle.

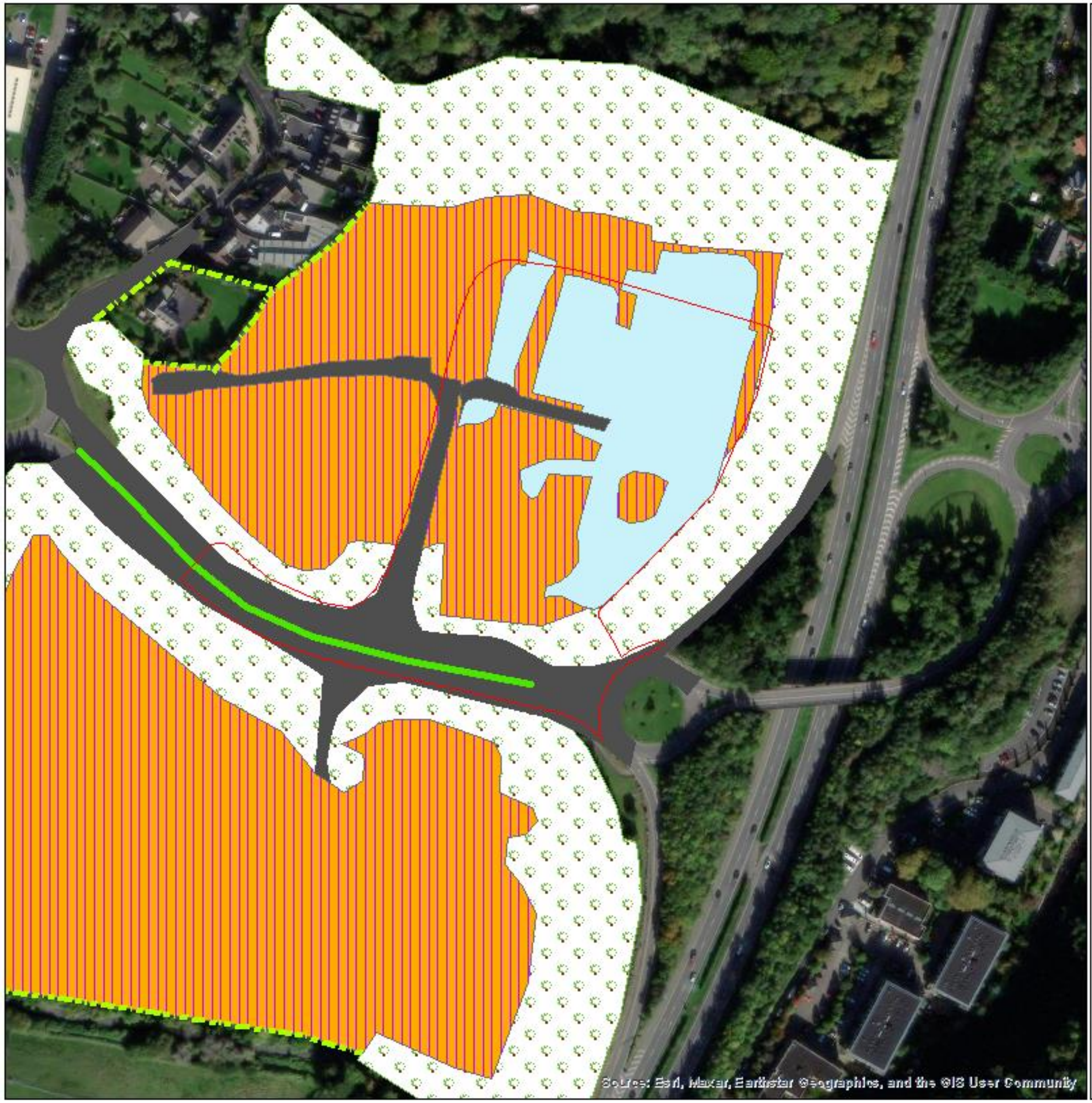
3.4 BIODIVERSITY

3.4.1 Habitats

The habitats occurring at the project site are dominated by spoil and bare ground (ED2), recolonising bare ground (ED3) and landscape planted broad-leaved woodland (WD1). Artificial surfaces in the form of existing roads and access tracks occur within the project site..

As described in Section 3.3 above there are no aquatic habitats occurring within or immediately adjacent to the project site.

A review of historical aerial imagery from 1995 indicates that the project site was previously used for agricultural purposes, most likely as arable land (BC1). Immature woodland, likely associated with recent woodland landscape planting associated with the M11 is shown to the southeast of the project site boundary. The 2000 aerial imagery indicates the presence of improved agricultural grassland dominating the site. broad-leaved woodland associated with the landscaping of the M11 is shown to the southeast of the Site Option boundary, while a treeline is shown forming the boundary of the Site Option along the slip roads to the east and north of the Site Option. The 2005 imagery indicate a significant change in the land cover at this Site Option with grassland surface removed and a denuded bare ground (ED2) surface dominating the cover within the site. Much of the treeline along the eastern and northern slip road boundaries and the broad-leaved woodland to the southeast was also removed at the time the 2005 imagery was recorded.



Fassaroe Park & Ride

Figure 3.1

Habitat Map

- Site Boundary
- Hedgerows WL1
- Treelines WL2
- Spoil Bare Ground ED2
- Recolonising Bare Ground ED3
- Artificial Surfaces BL3
- Broadleaved Woodland WD1

0 0.02 0.04 0.08 Km

N W E S

Drawn By	PD
Date	28/07/2023
Data Source	Bing

3.4.2 Fauna

No breeding or resting sites for non-volant mammals occur within or bounding the project site. The project site supports a range of commonly occurring bird species.

Bat activity was also recorded at the project site during baseline bat surveys.

4.0 IS THE PROJECT NECESSARY FOR THE CONSERVATION MANAGEMENT OF EUROPEAN SITES

The project has been described in Section 2 of the Screening Report and it is clear from the description provided that the project is not directly connected with or necessary for the future conservation management of any European Sites.

5.0 IDENTIFICATION OF EUROPEAN SITES WITHIN THE ZONE OF INFLUENCE OF THE PROJECT

Current guidance (OPR, 2021) informing the approach to screening for Appropriate Assessment defines the zone of influence of a proposed development as the geographical area over which it could affect the receiving environment in a way that could have significant effects on the Qualifying Interests of a European site. It is recommended that this is established on a case-by-case basis using the Source-Pathway-Receptor (SPR) framework. In order to identify the European Sites that could be located within the zone of influence, the current digital mapping (shapefile) of European Sites in Ireland[1], as published by the NPWS, was reviewed to identify the European Sites that could conceivably be connected to the project site via pathways.

All European Sites occurring in the wider surrounding area were identified and these sites are shown on Figure 5.1 and Figure 5.2 below. The qualifying features of interest/special

[1] **Current SAC shapefile layer dated April 2022; current SPA shapefile layer dated October 2021**

conservation interests of these European Sites are provided as Appendix 2 to this screening report.

As can be seen in Figures 5.1 & 5.2 no European Sites are occurring at or in the immediate vicinity of the project site. The nearest European Sites is the Ballyman Glen SAC, located over 500m to the northwest of the project site.

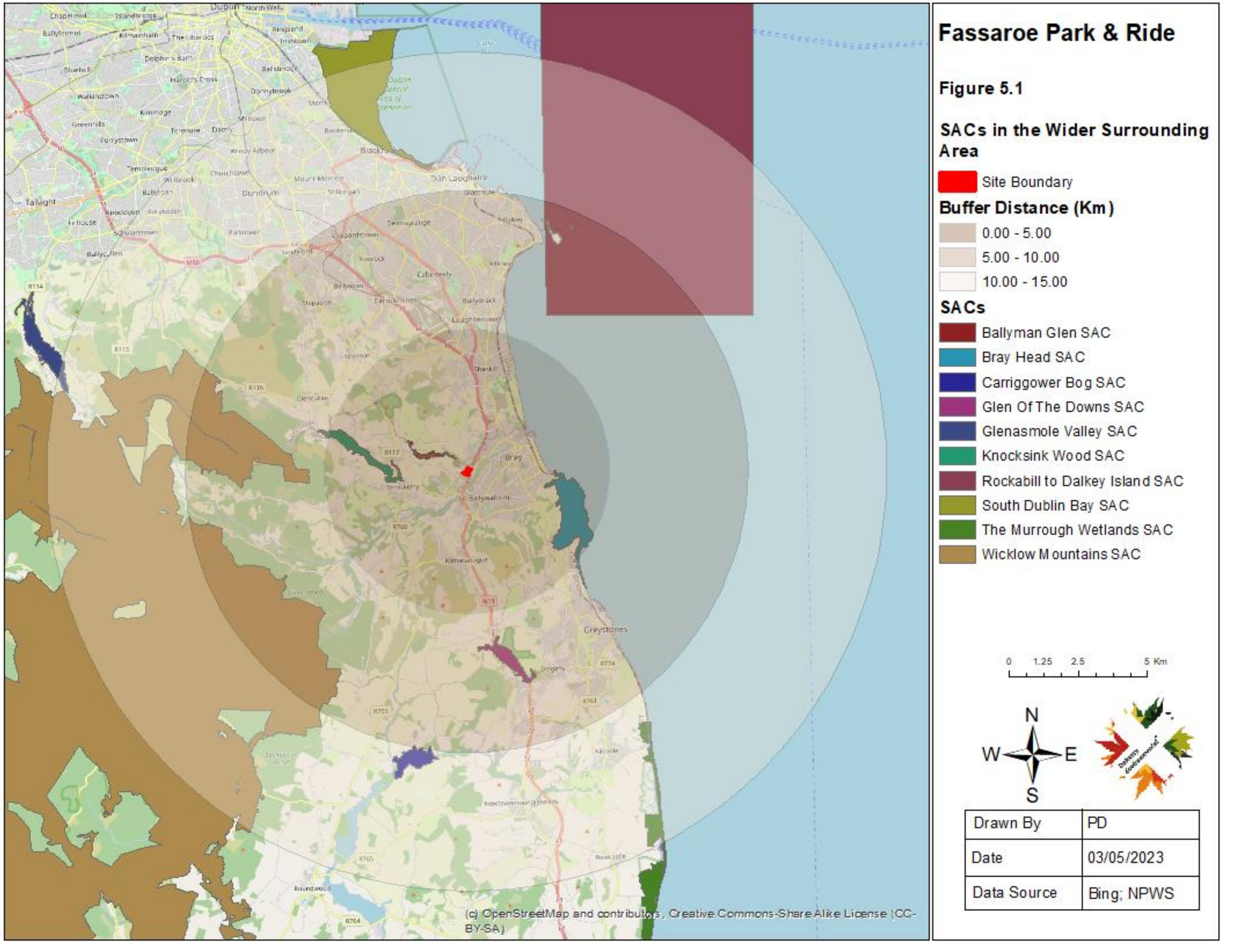
As the nearest European Site is buffered from the project site by a distance of 500m, the project will not have the potential to result in direct impacts to European Sites, such as loss, habitat damage or disturbance to Annex 1 qualifying habitats or physical interaction with Annex 2 qualifying species/special conservation interest bird species within the boundary of the European Site. Thus, this Screening exercise focuses on investigating whether it can or cannot be excluded, on the basis of objective information, that the project will have the potential to result in indirect effects to European Sites (i.e. impacts via emission pathways or interaction with mobile species outside of European Sites).

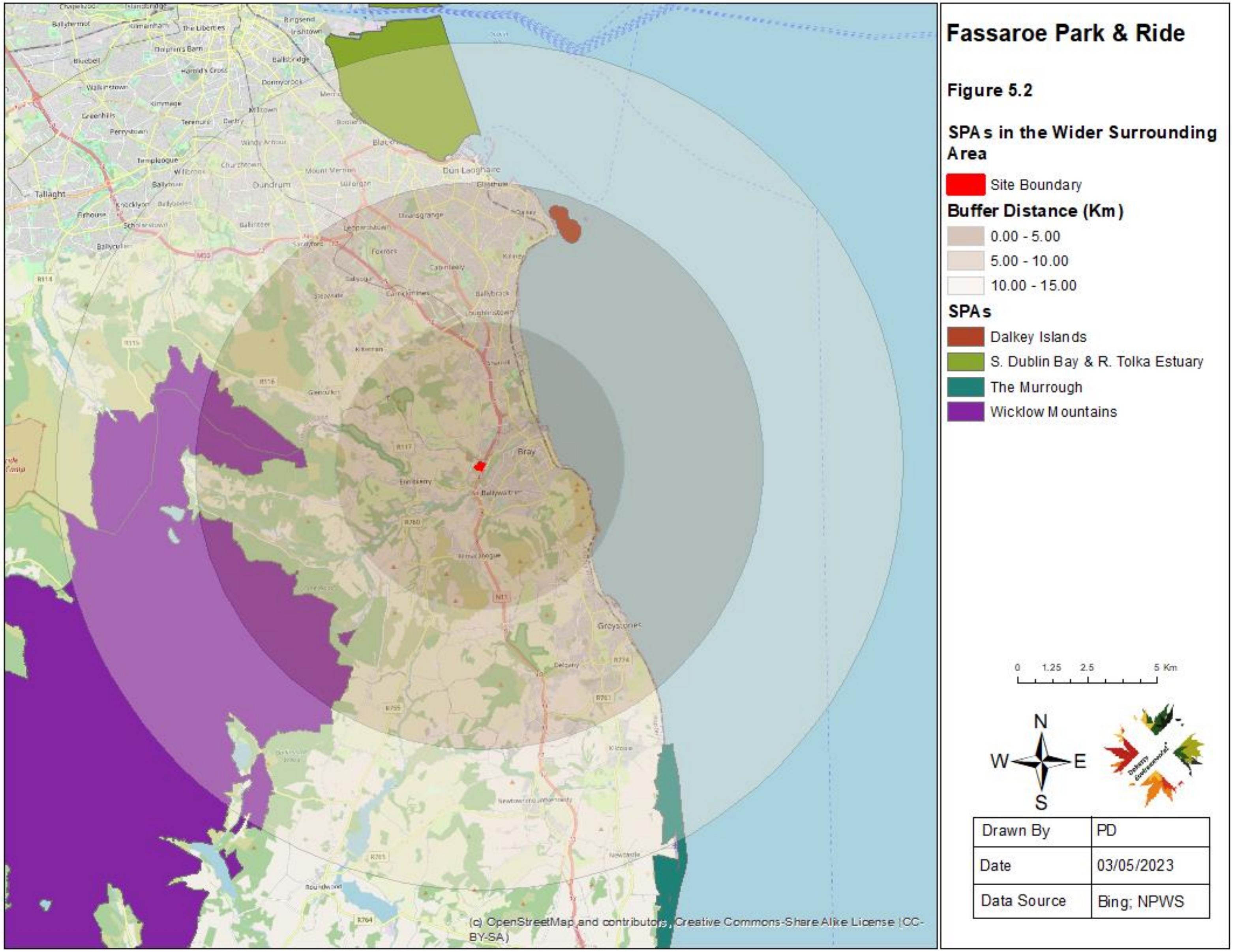
Using the SPR framework the project, as described in Section 2 of this Screening Report, represents the source of potential impacts to European Sites.

Potential pathways are restricted to any potential emission pathways connecting the project site to European Sites. An examination of the presence or absence of emission pathways and mobile species pathways connecting the project site to European Sites in the wider surrounding area is provided in Section 5.1 below.

The receptors represent European Sites and their associated qualifying features of interest.

European Sites and their associated qualifying features are likely to occur in the zone of influence of the project only where pathways establish a link between the project and a European Site downstream


Fassaroe Park & Ride
Figure 5.1
SACs in the Wider Surrounding Area
Site Boundary
Buffer Distance (Km)
0.00 - 5.00
5.00 - 10.00
10.00 - 15.00
SACs
Ballyman Glen SAC
Bray Head SAC
Carriggower Bog SAC
Glen Of The Downs SAC
Glenasmole Valley SAC
Knocksink Wood SAC
Rockabill to Dalkey Island SAC
South Dublin Bay SAC
The Murrough Wetlands SAC
Wicklow Mountains SAC
0 1.25 2.5 5 Km
N
W
E
S
Drawn By PD
Date 03/05/2023
Data Source Bing; NPWS
(c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA)


Fassaroe Park & Ride
Figure 5.2
SPAs in the Wider Surrounding Area
Site Boundary
Buffer Distance (Km)
0.00 - 5.00
5.00 - 10.00
10.00 - 15.00
SPAs
Dalkey Islands
S. Dublin Bay & R. Tolka Estuary
The Murrough
Wicklow Mountains
0 1.25 2.5 5 Km
N
W
E
S
Drawn By PD
Date 03/05/2023
Data Source Bing; NPWS
(c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA)
Bray
Greystones
Dun Laoghaire
Dundrum
Tallaght

5.1 EXAMINATION OF PATHWAYS

Using the SPR framework, the project, as described in Section 2 of this Screening Report, represents the source of potential indirect impacts to European Sites. The construction and operation of new development projects can, in theory, generate the following emissions:

- Emissions to surface water
- Emissions to groundwater
- Noise and vibration emissions
- Emissions to air
- Light emissions;
- Visual emissions;
- Mobile species pathway; and
- Human Disturbance Pathway

Whether each of these potential pathways occur in the context of the current project and connect the project to any European Sites in the wider surrounding area is examined in the following bullet points:

5.1.1 Hydrological Pathway

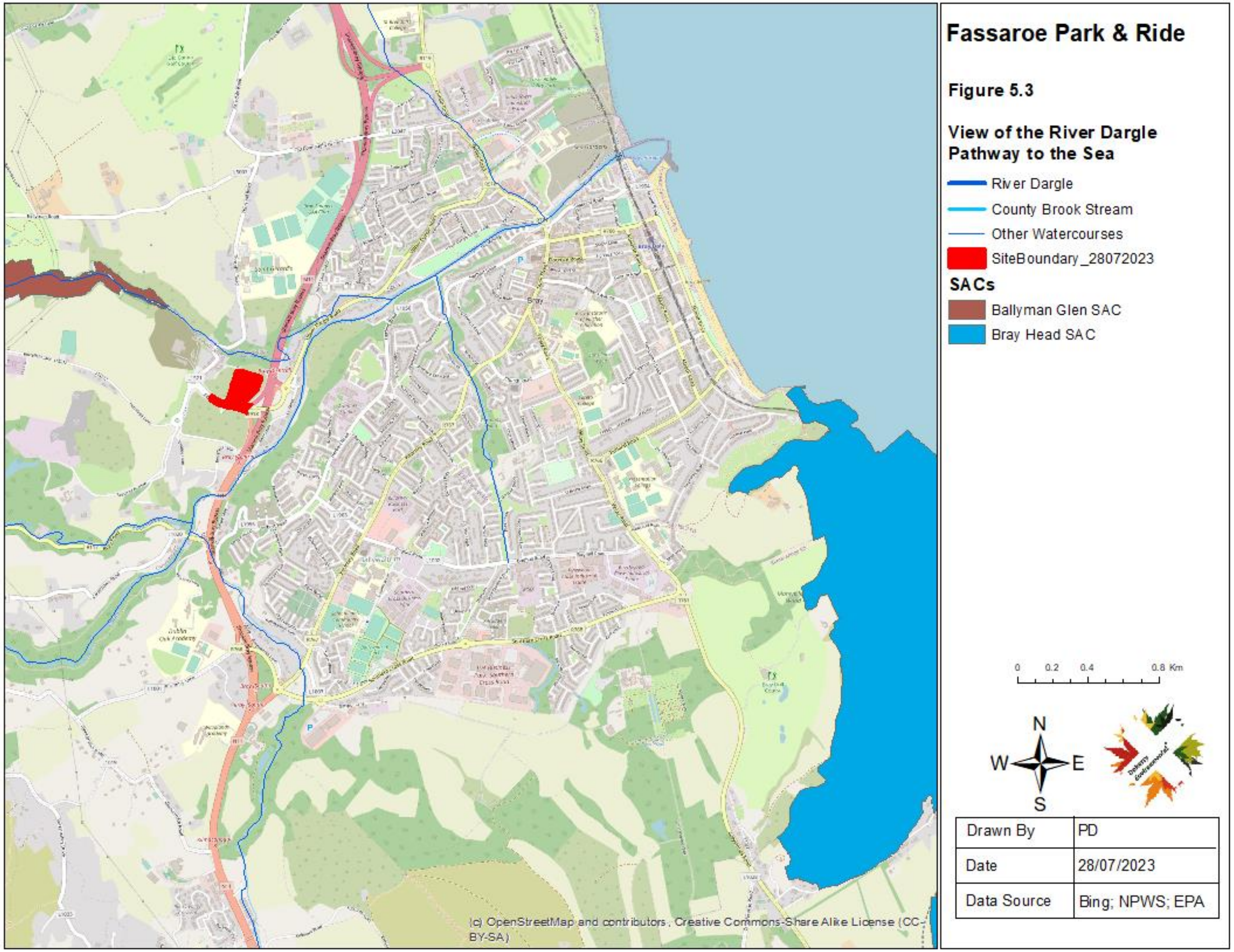
There are no watercourses or drains occurring at or bounding the project site. There are no baseline hydrological pathways connecting the project site to the wider environment. During the construction phase of the project site all surface water generated at the project site will be drained to ground. During the operation phase surveys will be directed to the existing surface water sewer pipe network along the R918 to the south of the site. The surface water runoff at the project site will eventually be drained via this existing sewer network to the River Dargle to the east of the site. The River Dargle discharges to the sea approximately 3km downstream of the project site. Figure 5.3 shows the River Dargle pathway to the sea at Bray Harbour. No European Sites occur at or in the vicinity of the mouth of the River Dargle at Bray Harbour.

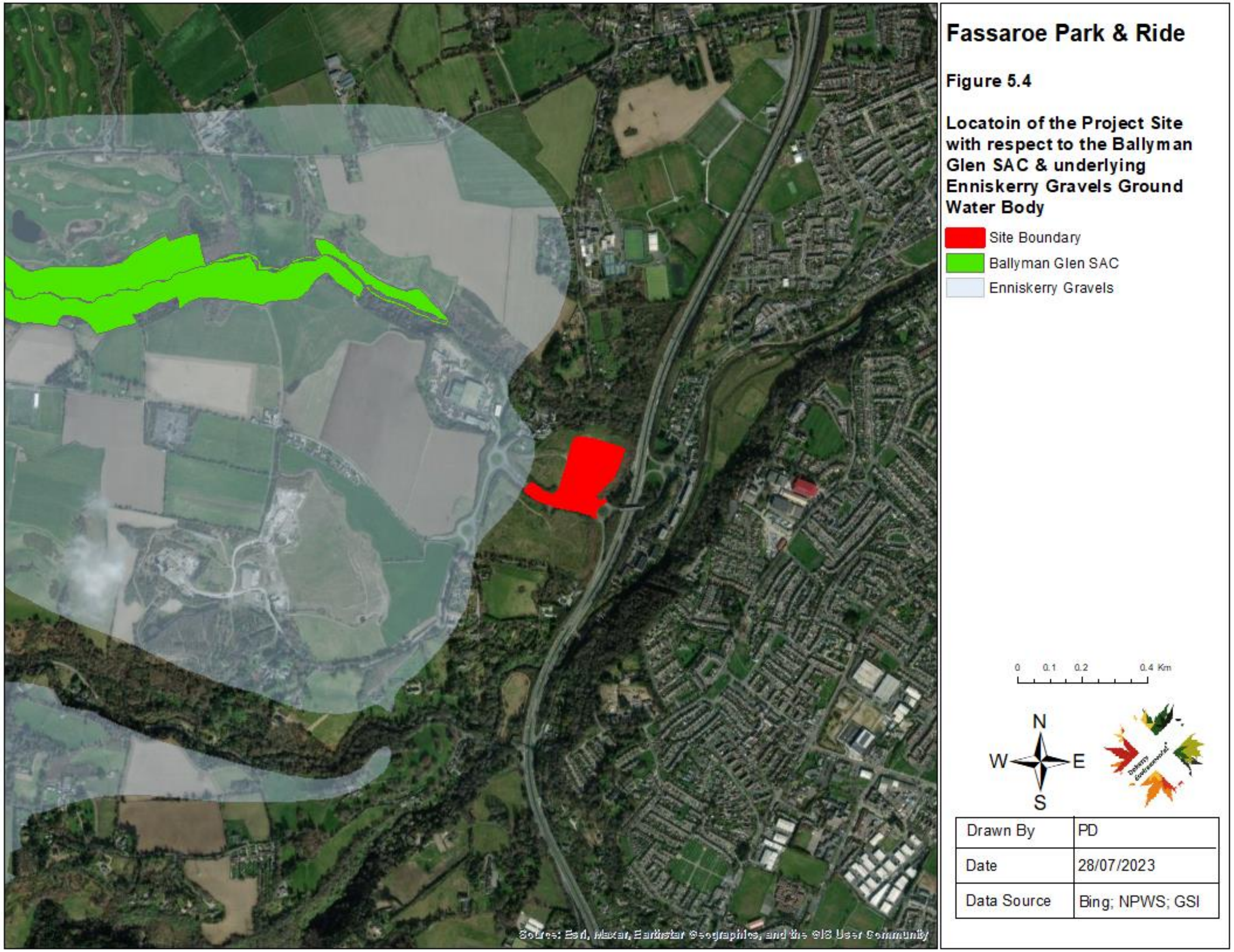
The nearest European Site to Bray Harbour is the Bray Head SAC, located approximately 1.5km to the south of the harbour. This SAC is designated for its role in supporting terrestrial cliff and dry heath habitats that are not influenced by coastal water quality. There is no hydrological pathway connecting the project to this SAC or any other European Sites in the wider surrounding area.

5.1.2 Groundwater Pathway

All surface water generated during the construction phase will drain to ground within the project site via infiltration to ground. AS noted in Section 3.2 above the construction phase may also result in groundwater infiltration to excavations, with the potential to trigger interactions between this phase of the project and underlying groundwater. In the event that groundwater ingress to excavations arise, then such waters will be required to be pumped from the excavations During the operation phase the car park will be designed with permeable paving to promote infiltration and drainage of surface water to ground. Only in instances of high precipitation when rainfall exceeds infiltration will surface water by directed as runoff to the surface water drainage pathway described above.

It is noted that the Ballyman Glen SAC, which is located approximately 500m to the west of the project site is designated for its role in supporting the Annex 1 qualifying habitats petrifying springs and alkaline fens. Both of these habitats are dependent on groundwater processes and are sensitive to changes in groundwater regimes and quality. The Ballyman Glen SAC is located within the Enniskerry Gravels groundwater body (IE_EA_G_038). The project site is located within a separate groundwater body, namely the Wicklow groundwater body (IE_EA_G_076). The location of the project site with respect to the Ballyman Glen SAC and the underlying Enniskerry Gravels groundwater body is shown on Figure 5.4. The GSI characterisation report for the Wicklow groundwater body, in which the project site is located, states that the topographic slope will influence the hydraulic gradient in the underlying aquifer. The topography at the project site falls to the east, in the opposite direction of the Ballyman Glen SAC and the Enniskerry Gravels groundwater body. As such groundwater baseflows will be to east, away from this SAC and the associated groundwater dependent petrifying spring and fen habitats.


Fassaroe Park & Ride
Figure 5.3
View of the River Dargle Pathway to the Sea
River Dargle
County Brook Stream
Other Watercourses
SiteBoundary_28072023
SACs
Ballyman Glen SAC
Bray Head SAC
0 0.2 0.4 0.8 Km
N
W
E
S
Drawn By
PD
Date
28/07/2023
Data Source
Bing; NPWS; EPA
(c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA)



Fassaroe Park & Ride
Figure 5.4
Locatoin of the Project Site with respect to the Ballyman Glen SAC & underlying Enniskerry Gravels Ground Water Body
Site Boundary
Ballyman Glen SAC
Enniskerry Gravels
0 0.1 0.2 0.4 Km
N
W
E
S
Drawn By PD
Date 28/07/2023
Data Source Bing; NPWS; GSI
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

In addition, previous detailed hydrogeological investigations (RPS, 2022a, 2022b) completed for the Fassaroe Masterplan Phase 1 Strategic Housing Development (An Bord Pleanála Ref. No. TA27.313314), located to the west of the project site, found that groundwater baseflows flow along existing contours. Given that:

The project site is located downslope and at lower elevations to the Ballyman Glen SAC and underlying Enniskerry Gravels groundwater body;

The topography at the project site falls to the east, away from the Ballyman Glen SAC and underlying Enniskerry Gravels groundwater body;

The flow direction of groundwater will follow surface topography (i.e. to the east, away from the Ballyman Glen SAC and underlying Enniskerry Gravels groundwater body);

The presence of a groundwater pathway between the project site and the Ballyman Glen SAC and all other European Sites can be ruled out.

It is further noted that given the location of the project site in a separate groundwater body catchment to the Ballyman Glen SAC, there will be no potential for the provision of the car park and associated artificial surface to undermine recharge in the Enniskerry Gravels groundwater body that underpins the hydrogeological regime relied upon by the petrifying spring and alkaline fen habtats of this SAC.

5.1.3 Air Pathway

Guidance outlined by Holman et al. (2014), provides a risk assessment for ecological impacts arising from air emissions associated with the construction and development projects. European Sites including SACs and SPAs are ranked as highly sensitive sites and the risk to high sensitive sites ranges from high (at less than 20m from source) and medium (at less than 50m from source). Given the location of the nearest European Sites is over 500m from the project site, the project site lies well outside the 50m zone of influence of air emissions and as such any air emissions generated at the project site will not have the potential to result in likely significant effects to European Sites in the wider surrounding area.

5.1.4 Noise & Vibration

Noise and vibration emissions are considered to have the potential to result in negative impacts to biodiversity up to a 300m distance from the emission source. This distance is based on the maximum noise disturbance zone of 300m for wetland bird species, as specified by Cutts et al. (2013)[2]. Noise and vibration effects for other qualifying species of SACs as well as qualifying habitats of European Sites are less than 300m. For mammal species listed as qualifying features of interest for SACs in the surrounding area this distance is set at 150m, as per the NRA (2009). For qualifying aquatic species a potential noise and vibration impact pathway will only arise where works such as piling or blasting are proposed at instream or bankside locations within adjoining SACs. No such proposals form part of the proposed development. There are no European Sites occurring within 300m of the proposed development and the potential for noise and vibration emissions to function as a pathway is ruled out.

5.1.5 Light

Given the distance of the project site from the nearest European Sites of over 500m and its screening from the SAC by existing industrial facilities, road corridors and mature treelines, hedgerows and woodland habitats, there will be no potential for the project to result in light emission to the Ballyman Glen SAC, which is the nearest European Sites to the project or any other European Sites further afield. As such the potential for a light emission pathway to connect the project site to European Sites is ruled out.

5.1.6 Visual Disturbance

Given the distance of the project site from the nearest European Sites of over 500m and its screening from the SAC by existing industrial facilities, road corridors and mature treelines,

[2] It is noted Nature Scotland (2022) published disturbances zones for bird species at a greater distance than 300m. However unlike Cutt et al. (2013) who specifically examined disturbance effects generated by noise stimuli, the potential disturbance stimuli set out in the Nature Scotland publication are not concerned specifically with noise stimuli. As such the Cutts et al. (2013) publication and maximum noise disturbance distance is relied upon.

hedgerows and woodland habitats, there will be no potential for the project to result in visual emission to the Ballyman Glen SAC, which is the nearest European Sites to the project or any other European Sites further afield. As such the potential for a visual emission pathway to connect the project site to European Sites is ruled out.

5.1.7 Mobile Species Pathway

The Wicklow Mountains SAC, located approximately 6km to the west of the project site, is the nearest SAC that includes a mobile species, namely otter, as a qualifying feature of interest. No other SACs in the wider surrounding area are designated for their role in supporting mobile species. The project site does not supported any habitats that are suitable for otters and this species does not rely on the project site for breeding, foraging or resting. As such no mobile species pathway is established by the project site and SACs in the wider surrounding area.

All SPAs in the wider surrounding area support mobile species in the form of the special conservation interest bird species for which they are designated. The nearest SPA to the project site is the Wicklow Mountains SPA. This SPA is designated for its role in supporting raptors in the form of Peregrine and Merlin. These species rely on upland habitats, conifer plantations, cliffs and tall structures for breeding and foraging. No suitable habitat for these species occurs at the project and these species do not rely on the project site.

All other SPAs in the wider surrounding area are designated for their role in supporting coastal waterbirds. The habitat occurring at the project site, which is representative of spoil and bare ground and bare ground, that is currently used as a storage area for construction materials and subject to ongoing and onsite human activity renders the site unsuitable for supporting the special conservation interest bird species and waterbirds populations of these coastal SPAs.

In light of the above the project site is identified as a site that is not relied upon by mobile species of European Sites in the wider surrounding area and as such the potential for a mobile species pathway to connect the project site to European Sites is ruled out.

5.1.8 Human Disturbance Pathway

Human disturbance, ex-situ of a project site, to a European Sites can arise as a result of land use activities generated by a project. An example of such an indirect impact is an increase in human presence and associated pressures within a European Sites. New developments in areas outside of, but proximate to European Sites, can result in an increase in the presence of people within European Sites, such as for recreational activities. However given the nature of the project, which will not generate increased levels of human activity within surrounding European Sites this example of a human disturbance pathway will not arise.

6.0 EXAMINATION OF LIKELY SIGNIFICANT EFFECTS

The absence of any potential impact pathways identified in Section 5 above will ensure that this project does not have the potential, either alone or in combination with other projects, to result in likely significant effects to European Sites or the local environment surrounding the project site. A Screening Matrix, in line with European Commission (2021) guidelines is provided below in Table 6.1.

Table 6.1: Screening of the Project's potential to negatively affect European Sites

Assessment Criteria	
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on European Sites by virtue of:	
Size and Scale	The project is small is size and scale, comprising the provision of a public transport infrastructure development in a landholding of approximately 3.3 Ha in size.
Land-take	The project does not involve any land-take from European Sites.

Distance from the nearest European Sites or key features of the site	The project site is located over 500m from the nearest European Site, the Ballyman Glen SAC.
Resource requirements	No resources associated with any European Sites will be required for, or utilized by the proposed project.
Emissions	**Wastewater Discharge** All wastewater generated at the project site will be directed to the existing municipal wastewater treatment plant for treatment prior to discharge to the receiving environment. Irish Water have confirmed that availability of sufficient capacity to treat all wastewater generated during the operation phase of the project. **Surface Water Drainage** The project will not result in the emission of surface water to any watercourse that could drain such waters to European Site. There is no surface water emission pathway connecting the project to European Sites. **Groundwater** The project will not result in the emission of water to any groundwater body that could in turn result in the drainage of base flows to European Sites. There is no groundwater emission pathway connecting the project to European Sites. The provision of the car parking surface will not result in any potential decrease in hydraulic recharge of the groundwater body of the European Sites in the wider surrounding area. The nearest European Sites is Ballyman Glen SAC and as this is located in a separate

	groundwater body, there will be no potential for the project to result in changes to groundwater recharge in this groundwater body. **Air** All European Sites are located outside the zone of influence for air emissions that could be generated by the project. **Noise & Vibration** All European Sites are located outside the zone of influence for noise and vibration emissions that could be generated by the project. **Light** All European Sites are located outside the zone of influence for light emissions that could be generated by the project. **Visual Emissions** All European Sites are located outside the zone of influence for visual emissions that could be generated by the project. **Mobile species pathway** The project site does not offer suitable habitat for mobile species pathway of any European Sites in the wider surrounding area and such species do not rely on the project site for breeding, resting or foraging. **Human Disturbance** The project will not result in any changes or increases of human activity within European Sites occurring in the wider surrounding area.

Excavation requirements	Excavations will be required on site during the construction phase. These excavations will be restricted to the project site will not present any risk to the European Sites in the wider surrounding area.
Transportation	The project will result in an overall reduction in private car usage and the distance travelled by private car. This will have the potential to result in overall benefits for transportation, traffic management and climate.
Duration of construction, operation etc.	The construction phase of the project will be completed over the short term within a period of 12 months. The project will be designed for a >50-year lifetime.
In-Combination Effects	As there are no pathways connecting the project site to European Sites in the wider surrounding area and given that all such European Sites have been identified as lying outside the zone of influence of the project, there will be no potential for the project to combine with other plans and projects to result in likely significant effects to conservation status of European Sites and their qualifying features of interest in the surrounding area. For instance it is noted that a planning application has been lodged with An Bord Pleanála for a large scale Strategic Housing Development (SHD) to the west of the project site. This SHD is located adjacent to the Ballyman Glen SAC and the potential for adverse impact to this SAC as a result of the SHD have been identified in the Natura Impact Statement prepared for the planning application. Pathways for impacts to this SAC as a result of the SHD include surface water emissions; groundwater emissions and changes to hydrological regime; and increase human presence in the SAC during the operation phase. The current project will not have the potential to combine with these pathways to result in cumulative adverse effects to this SAC. There are no

	surface water pathways connecting the project to this SHD and/or the SAC. There are no groundwater pathways connecting the project to this SHD and/or the SAC. The project during the operation phase will function as a park and ride facility which entails users parking private cars to connect with public transport services for onward journeys. Such use will not result in any increase in human presence within the Ballyman Glen SAC and nor will it have the potential to combine with potential increases in human presence in the SAC that could arise as a result of the SHD.
Describe any likely changes to the European Sites arising as a result of:	
Reduction of habitat area	The proposed development will not result in a reduction in area of any habitats occurring within any European Sites in the wider surrounding area.
Disturbance of key species	The proposed project will not result in disturbances to key species designated as qualifying features of interest for surrounding European Sites.
Habitat or species fragmentation	The project will not have the potential to result in habitat or species fragmentation within any European Sites occurring in the wider surrounding area.
Reduction in species density	The project will not result in a reduction in the densities of any key species supported by surrounding European Sites
Changes in key indicators of conservation status	Due to the absence of impact pathways between the project site and surrounding European Sites, the project will not result in changes to key indicators to European Sites as set out under the conservation objectives

	attributes and targets for these Sites in their published site-specific conservation objectives.
Describe any likely impacts on the European Sites as a whole in terms of:	
Interference with key relationships that define the structure and function of the site	The project will not have the potential to interfere with the key relationships that define the structure and function of European Sites.
Provide indicators of significance as a result of the identification of effects set out above in terms of: Loss Fragmentation Disruption Disturbance Change to key elements of the Site (e.g. water quality etc.)	There will be loss or fragmentation of, or disturbance or disruption to, European Sites occurring in the wider surrounding area.
Describe from the above the elements of the project or plan or combination of elements, where the above impacts are likely to be significant or where the scale of magnitude of impacts is not known.	
It has been concluded that likely significant effects to the European Sites will not arise as a result of the project. Therefore, a Stage 2 Appropriate Assessment is not required.	

7.0 SCREENING STATEMENT CONCLUSION: FINDING OF NO SIGNIFICANT EFFECTS

During the Screening of the project 14 European Sites occur in the wider area surrounding the project site., the nearest of which is the Ballyman Glen SAC, located over 500m to the west. All other European Sites are located at greater distance from the project site.

Given that no European Sites occur within or bounding the project site a source-pathway-receptor model was used to identify the presence of any European Sites in the wider surrounding area occurring within the zone of influence of the project. The examination based on the source-pathway-receptor model found that no pathways connect the project site to the any European Sites occurring in the wider area surrounding the project site and there will be no potential for the project to interact with them or their qualifying features of interest/special conservation interests. Given the absence of any pathways and any European Sites within the zone of influence of the project, there will be no potential for the project to combine with other plans, projects or existing pressures to result in cumulative adverse effects to European Sites in the wider surrounding area.

In light of the findings of this report it is the considered view of the authors of this Screening Report for Appropriate Assessment that it can be concluded by Wicklow County Council that the project is not likely, alone or in-combination with other plans or projects, to have a significant effect on any European Sites in view of their Conservation Objectives and on the basis of best scientific evidence and there is no reasonable scientific doubt as to that conclusion.

This Screening has resulted in a Finding of No Significant Effects and as such a Stage II Appropriate Assessment is not required.

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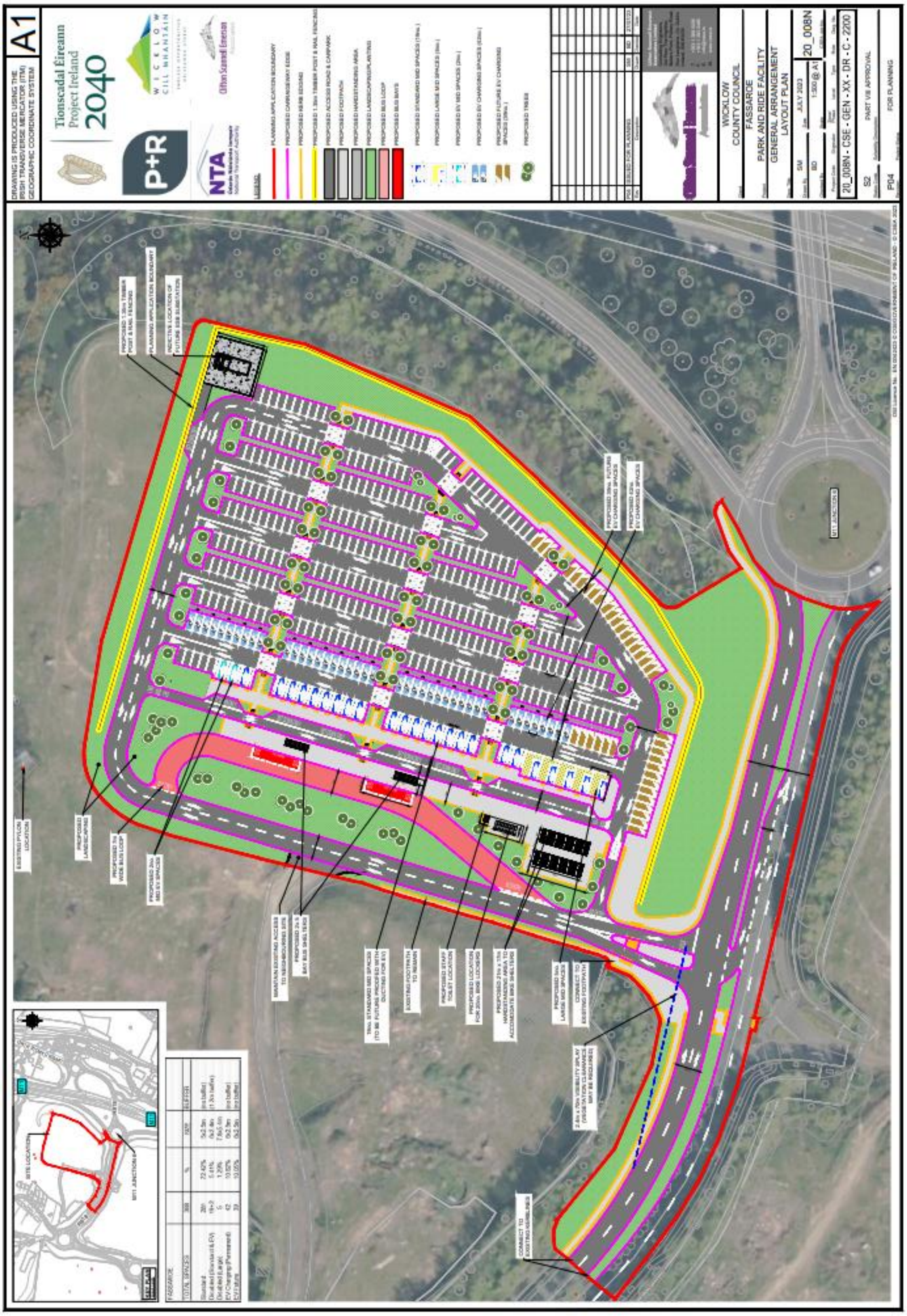
APPENDIX 1: SITE LAYOUT



APPENDIX 2: QUALIFYING FEATURES OF INTEREST

European Site	Features of Interest
Ballyman Glen SAC	Petrifying springs with tufa formation (Cratoneurion) [7220]
	Alkaline fens [7230]
Knocksink Woods SAC	etrifying springs with tufa formation (Cratoneurion) [7220]
	Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]
	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
Bray Head SAC	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]
	European dry heaths [4030]
Glen of the Downs SAC	Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]
Rockabill to Dalkey Island SAC	Reefs [1170]
	Phocoena phocoena (Harbour Porpoise) [1351]
Carriggower Bog SAC	Transition mires and quaking bogs [7140]
Wicklow Mountains SAC	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110]
	Natural dystrophic lakes and ponds [3160]
	Northern Atlantic wet heaths with Erica tetralix [4010]
	European dry heaths [4030]
	Alpine and Boreal heaths [4060]
	Calaminarian grasslands of the Violetalia calaminariae [6130]
	Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]
	Blanket bogs (* if active bog) [7130]
	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110]
	Calcareous rocky slopes with chasmophytic vegetation [8210]
	Siliceous rocky slopes with chasmophytic vegetation [8220]
	Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]
	Lutra lutra (Otter) [1355]

European Site	Features of Interest
Glenasmole Valley SAC	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]
	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410]
	Petrifying springs with tufa formation (Cratoneurion) [7220]
Wicklow Mountains SPA	Merlin (Falco columbarius) [A098]
	Peregrine (Falco peregrinus) [A103]
Dalkey Island SPA	Roseate Tern (Sterna dougallii) [A192]
	Common Tern (Sterna hirundo) [A193]
	Arctic Tern (Sterna paradisaea) [A194]
The Murrough SPA	Red-throated Diver (Gavia stellata) [A001]
	Greylag Goose (Anser anser) [A043]
	Light-bellied Brent Goose (Branta bernicla hrota) [A046]
	Wigeon (Anas penelope) [A050]
	Teal (Anas crecca) [A052]
	Black-headed Gull (Chroicocephalus ridibundus) [A179]
	Herring Gull (Larus argentatus) [A184]
	Little Tern (Sterna albifrons) [A195]
	Wetland and Waterbirds [A999]
South Dublin Bay & Tolka Estuary SPA	Light-bellied Brent Goose (Branta bernicla hrota) [A046]
	Oystercatcher (Haematopus ostralegus) [A130]
	Ringed Plover (Charadrius hiaticula) [A137]
	Grey Plover (Pluvialis squatarola) [A141]
	Knot (Calidris canutus) [A143]
	Sanderling (Calidris alba) [A144]
	Dunlin (Calidris alpina) [A149]
	Bar-tailed Godwit (Limosa lapponica) [A157]
	Redshank (Tringa totanus) [A162]
	Black-headed Gull (Chroicocephalus ridibundus) [A179]
	Roseate Tern (Sterna dougallii) [A192]
	Common Tern (Sterna hirundo) [A193]
	Arctic Tern (Sterna paradisaea) [A194]
	Wetland and Waterbirds [A999]

Ecological Impact Assessment

Fassaroe Park & Ride

Fassaroe, Co. Wicklow

Doherty Environmental Consultants Ltd

July 2023

Fassaroe Park & Ride

N11, Fassaroe, Co. Wicklow

July 2023

Document Stage	Document Version	Prepared by
Final	1	Pat Doherty MSc, MCIEEM

This report has been prepared by Doherty Environmental Consultants Ltd. with all reasonable skill, care and diligence. Information report herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is prepared for the NTA. and we accept no responsibility to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

Table of Contents

1.0 INTRODUCTION

Doherty Environmental Consultants (DEC) Ltd. has been commissioned by CSEA Consulting Engineers on behalf of the NTA to undertake an Ecological Impact Assessment (EcIA) for a proposed Park and Ride development at Fassaroe, N11, Co. Wicklow. The location of the proposed site is shown on Figure 1.1 while an aerial view of the proposed site is shown on Figure 1.2. The proposed development layout is provided as Appendix 1.

1.1 LEGISLATION

Flora and fauna in Ireland is protected at a national level by the Wildlife Act, 1976 and the Wildlife (Amendment) Act, 2000 and the Flora (Protection) Order, 1999 (SI 94/1999). They are also protected at a European level by the EU Habitats Directive (92/43/EEC) and the EU Birds Directive (79/409/EEC).

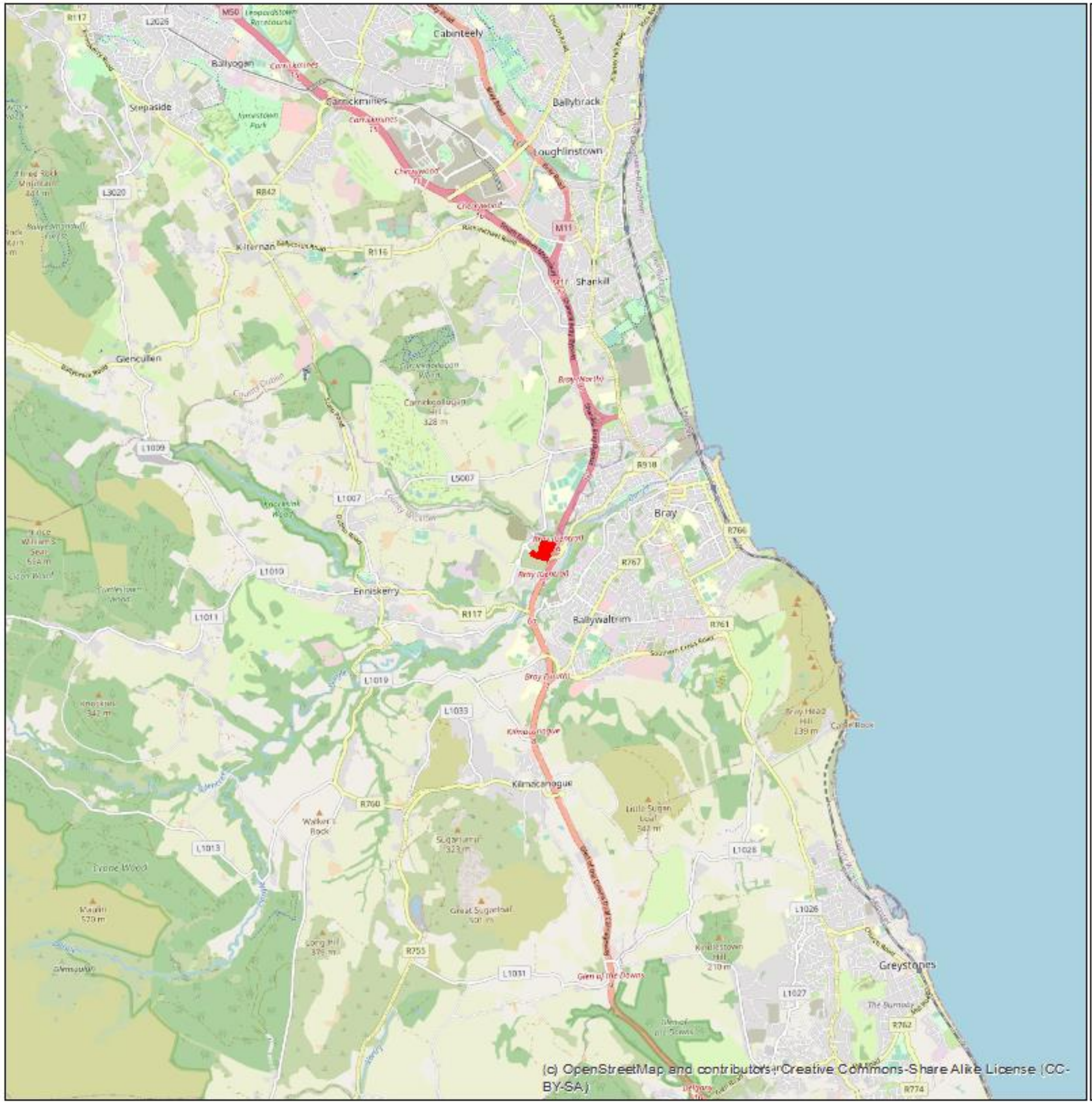
The transposition of the EU Habitats Directive by the European Communities (Natural Habitats) Regulations 1997 – 2011 (referred to as the Habitat Regulations) provides the legal basis for the protection of habitats and species of European importance in Ireland.

The legislative protection of habitats and species provided by the Habitats Directive has been implemented in Ireland and throughout Europe through the establishment of a network of designated conservation areas known as the Natura 2000 (N2K) network (with individual sites being referred to as Natura 2000 Sites). The N2K network includes sites designated as Special Areas of Conservation (SACs), under the EU Habitats Directive and Special Protection Areas (SPAs) designated under the EU Birds Directive. SACs are designated in areas that support habitats listed on Annex I and/or species listed on Annex II of the Habitats Directive. SPAs are designated in areas that support: 1% or more of the all-Ireland population of bird species listed on Annex I of the EU Birds Directive; 1% or more of the population of a migratory species; and more than 20,000 waterfowl. Under the National Habitat Regulations all designated Natura 2000 Sites are referred to as European Sites.

The Wildlife Act 1976 (as amended) also provides for the statutory designation of nature conservation areas. These areas are referred to under the Wildlife Acts as Natural Heritage Areas and are designated in areas that support habitats and/or species of national importance.

Other relevant national legislation concerning the protection of flora, fauna and fisheries include the:

- Planning Act 2010;
- European Communities (Quality of Salmonid Waters) Regulations, 1988;
- The Freshwater Fish Directive 1978 (78/659/EEC); and
- The Surface Water Regulations, 2009.



Drawn By	PD
Date	28/07/2023
Data Source	Bing

Fassaroe Park & Ride

Figure 1.2

Aerial View of the Project Site

Site Boundary

0 0.0125 0.025 0.05 Km

N
W E
S

Drawn By	PD
Date	28/07/2023
Data Source	Bing; CSEA

2.0 PROJECT DESCRIPTION

The proposed development comprises a car park with 388 parking spaces, including 26 designated for mobility-impaired users, 42 for electric vehicles and 39 additional spaces futured proofed for electric vehicles.

The proposal involves provision of hardstanding areas for bike shelters and lockers, active travel connections, fencing, kerbs, drainage, road markings, public lighting, CCTV, ticketing machines, and a new ESB substation and switch room.

The scheme also features area with two bus bays, two passenger shelters, and a dedicated bus turning circle within the site. A new access junction is proposed at Fassaroe Lane, incorporating a new right-turning pocket lane for accessing the facility. The existing bus bay on the northern (eastbound) carriageway of Fassaroe Lane is proposed for removal.

2.1 SURFACE WATER MANAGEMENT

2.1.1 Proposed Surface water Drainage

The surface water drainage will consist of 2 separate systems:

- The site will be drained through a series of gullies and into a piped drainage system that will ultimately be collected and conveyed through a series of proposed stormwater pipes prior to discharging into the existing storm water sewer within the R918 to the south of the site.
- To comply with the GDSDS guidelines in relation to SUDs, is proposed within the site, to promote infiltration to the groundwater where suitable. At locations where the infiltration rate is very low, a proposed perforated pipe will convey the excess runoff back to the piped drainage network.

2.2 WASTEWATER

A pre-connection enquiry (PCE) form was submitted to Irish Water on 14th December 2022 which detailed the proposed foul sewer gravity system for the site (ref CDS22008848).

The proposed development, subject to this planning application, comprises of 1No 150mm diameter gravity foul sewer line, connecting the staff toilet to the existing foul sewer within the R918 to the south of the site. As such, the overall wastewater discharge associated with the proposed development is in accordance with the demand/discharge rates based on IW Wastewater Infrastructure Code of Practice 2020.

As no industrial-specific wastewater flow will be generated from the development, the design Dry Weather Flow of the development is 300l/d.

2.3 UTILITY CONNECTIONS

Some existing utility ducts are present within the redline boundary of the scheme as described below.

A medium-pressure gas transmission main crosses the carriageway from south to north near the roundabout entry and runs towards west under the northern footway. A distribution main also runs under the southern footway with a connection line/main branching off into the site after crossing the carriageway in front of the existing site access junction. This transmission main ends 150 meters north of the junction.

Several existing water mains (150 dia, 200 dia, 600 dia, 800 dia) are present within the redline boundary with a majority of them close to the existing/proposed junction. The 600 dia main currently runs under the existing internal road for 95m meters before deviating north-west. 2 nos. of 200 dia main also run under the verge of the internal road for 130m.

Based on our initial investigation, the scheme proposals will have no major impact on these existing utilities. The design has been optimised to ensure that the sections of utilities currently running under the footpath remain separate from the mainline carriageway without the involvement of any relocation work.

The electricity will be drawn from the existing ESB pylon from the Northwest corner of the site as shown on various electrical and ducting drawing submitted with the planning application.

A new substation will be required to power the various electrical equipment within site. The location of a building to accommodate the

2.4 CONSTRUCTION PHASE

The construction of the proposed development will be carried out in the following phases:

Commencement will occur in 2024.

The follow represents the likely sequence of construction activities required for the construction of the park and ride facility:

- Site clearance and removal of footing bases and underground services
- Excavation of site to formation level
- Construction of the foundations
- External works, roads & footpaths

2.4.1 Construction Phase Surface Water Management

During the construction phase surface water runoff will be to ground as per the existing surface water runoff regime at the project site.

During periods of high rainfall when precipitation exceeds infiltration surface water runoff will flow to the east following the natural fall in topography to the east.

Any groundwater ingress to excavations will be pumped to a construction phase treatment train that will comprise a mobile attenuation tank and buffered outfalls over vegetated ground to the east of the project site.

If surface water discharge to the existing stormwater drain is required during construction temporary on-site settlement ponds/tanks/silt busters will be installed to ensure adequate silt removal prior to discharge the detail of this system will be presented in the CEMP.

A silt fence will be provided along the eastern boundary of the construction phase to retain any fines entrained within the surface water runoff. The outfall of the buffered outfalls will be situated to the west of the silt fence.

2.4.2 Construction & Environmental Management Plan

A Construction & Environmental Management Plan (CEMP) will be prepared for the proposed development and provided to the planning authority prior to the commencement of construction.

2.4.2.1 Construction Waste Management Plan

The Resource Waste Management Plan (RWMP) provides a Waste Management Plan for the proposed development. It is anticipated that all excavated topsoil (4,477m^3) and 2633 m^3 of subsoil will be reused on site. It is anticipated that 5,654 m^3 of subsoil material will need to be removed offsite for appropriate reuse, recovery and/or disposal. Soils for disposal from the site are classified as waste and must comply with waste management legislation. The relevant legislation is the EU council decision (2003/33/EC) which has been implemented in all member states and sets out the criteria for the acceptance of waste at Landfills.

Final certification for all materials removed off site will require to be provided by the main contractor on completion of the excavation works.

2.4.3 Construction Plant, Equipment & Materials

The following construction materials will be required for the works:

- Concrete: This will be delivered by bottle truck and placed directly in prepared forms.

- Hardcore: This will be stored in the Construction compounds and delivered to site location by dump truck.

- The materials and equipment to be stored in the construction compound will be provided in the CEMP to be submitted prior to the commencement of construction

3.0 METHODS

3.1 EXTENDED PHASE 1 HABITAT SURVEY

Multidisciplinary ecological surveys of the project site were undertaken by DEC Ltd during August and September 2022. The methodology used during this survey was based on the Heritage Councils *Best Practice Guidance for Habitat Survey and Mapping* (2011). The classification of habitats recorded during the field survey is based on the Heritage Council's *A Guide to Habitats in Ireland*.

The *Guide to Habitats in Ireland* classifies habitats according to a hierarchical framework with Level 1 habitats representing broad habitat groups, Level 2 representing habitat sub-groups and Level 3 representing individual habitat types. The Phase I Field Survey focused on identifying habitats to Level 3 of the *Guide to Habitats in Ireland*.

The annotation of vegetation occurring within sites was undertaken using the DAFOR scale. This scale refers to plant species in terms of dominance, abundance, frequency, occasional and rare (DAFOR). Plant nomenclature in this report follows Webb (1996) for vascular plants and Smith (2004) for mosses.

A survey for field signs indicating the presence of otters or other protected non-volant mammal species such as Irish stoat and badgers was undertaken during the field surveys. This survey was undertaken during the daytime and particular attention was given to habitat features normally associated with otters. Any mammal field signs typical of otter activity were recorded during the surveys. These field signs, as described in Neal & Cheeseman [(1)] and Bang & Dahlstrom [(2)], include:

- mammal breeding and resting places, such as setts, holts, couches, lairs;
- pathways;
- prints;
- spraints and faecal deposits;
- latrines (and dung pits used as territorial markers);
- prey remains and feeding signs (snuffle holes);
- hair; and
- scratch marks.

All bird species seen using the site (as opposed to simply flying over it) were recorded.

An appraisal of habitats occurring within the project site for their potential to support bat species was completed during the field surveys in July 2021. These appraisals involved the inspection of tree on site and the one remaining structure on site during the daytime for field signs indicating the presence of bats, roost emergence surveys and bat activity surveys on site.

Dedicated bat activity surveys were completed on site. This involved continuous static detector bat activity survey at the project site between the 23rd August and 1st September inclusive. One Song Meter SM4 Full Spectrum bat detector was deployed on site to monitoring bat activity continuously during the monitoring completed between these dates. The static bat detector was

(1) Neal, E., & Cheeseman, C., (1996). 'Badgers'. Poyser Natural History, London.

(2) Bang, P., & Dahlstrom, P., 'Animal Tracks and Signs'. Oxford University Press, Oxford.

positioned towards the centre of the project site. Figure 4.3 shows the location of the static bat detector (as well as the location taken up during the roost emergence surveys). The static detector was mounted at a height of 3m above the ground and was set to recorded bat activity continuously throughout each night of the monitoring period, with recording commencing at 30 minutes prior to sunset and 30 minutes after sunrise.

Bat calls recorded by the SM4 Bat detectors during the automatic bat monitoring sessions were analysed using Kaleidoscope Pro (v. 5.4.1) software. Kaleidoscope automatic bat identification software was used to assign bat calls to species level. Bat calls assigned to Myotis species were grouped together under the Myotis genus.

3.2 ECOLOGICAL EVALUATION

Commentary on the ecological value of habitats is provided in Section 4 of this report.

The nature conservation value of habitats and ecological sites occurring within the proposed site are based upon an established geographic hierarchy of importance as outlined by the National Roads Authorities (NRA, 2009). The outline of this geographic hierarchy is provided below and this has been used to determine ecological value in line with the ecological valuation examples provided by the NRA (see NRA, 2009). The geographic evaluation hierarchy is as follows:

- International Sites (Rating A);
- National Importance (Rating B);
- County Importance (Rating C);
- Local Importance (higher value) (Rating D); and
- Local Importance (lower value) (Rating E)

The evaluation of bat activity recorded during static monitoring surveys follows the approach outlined by Kepel (2011) who assigned bat activity based on bat passes per hour as follows:

Pipistrelle species and Leisler's bat: Low = <3.5 passes per hour; Moderate = 3.6 – 6.5 passes per hour; High = >6.5 passes per hour

All Other Bat species: Low = <4.0 passes per hour; 4.1 to 10 passes per hour; high = >10 passes per hour.

These categories are apply to the median bat pass per hour per night recorded during monitoring. The median bat pass per hour per night has been recommended by Lintott & Matthews (2018) as the most accurate representation of bat activity as bat activity levels between nights can be highly variable.

3.3 IMPACT ASSESSMENT

The ‘zone of influence’ for a development is the area over which ecological features may be subject to significant impacts as a result of the Development and associated activities. The Zone of Influence (ZoI), or distance over which a likely significant effect may occur will differ across the Ecological Receptors identified for the proposed Development, depending on the potential impact pathway(s). The results of both the desk study and the suite of ecological field surveys undertaken has established the habitats and species present at and surrounding the Site. The ZoI is then informed and defined by the sensitivities of each of the ecological receptors present, in conjunction with the nature and potential impacts associated with the Development.

The ZoI of the proposed development in relation to terrestrial habitats is generally limited to the footprint of the proposed development, and the immediate environs. Disturbances to the hydrological regime of wetland/aquatic habitats from impact sources can often result in impacts occurring at distances beyond the immediate adjacent areas of the impact source. For instance the distances over which aqueous pollutants are likely to remain at concentrations that have potential to result in perturbations to water quality and associated wetland/terrestrial habitats is difficult to quantify. The potential for such effects to occur are also highly site-specific and related to the predicted magnitude of any pollution event. The impact of a pollution event will depend on the volumes of discharged waters, concentrations and types of pollutants (in the case of the proposed development these being comprised of sediment, hydrocarbons, cement-based products and other related construction solutions), volumes of receiving waters, and the sensitivity of the ecology of the receiving waters. With respect to the Development, this includes all freshwater habitats and fauna at and downstream of the Development that have been identified as ecological receptors.

The ZoI for terrestrial mammals in terms of potential impacts to breeding and resting places is 150m from the Development. This distance is in line with the maximum distance for potential disturbance to terrestrial mammals (otters and badgers) as specified by TII guidance documentation (NRA, 2009 a & b).

The ZoI for birds is species-specific and relates to the assemblage of avifauna recorded at project site and their sensitivity to disturbance. Goodship & Furness (2022) have published a review of disturbance distances for a range of bird species listed on Annex 1 of the EC Birds Directive. The habitat occurring at project site is not suitable for many of these species e.g. waders, geese etc.. However suitable breeding and foraging habitat for songbirds/passerines occur in woodland habitat beyond the eastern and northern boundaries of the project site. The only passerine species for which Goodship & Furness (2022) have assigned disturbance distances are crested tit and crossbill. For the purposes of this assessment and defining the ZoI for birds the disturbance distance for crested tit and crossbill is applied for the range of passerines occurring at project site.

The disturbance distance sensitivity assigned for passerines (based on crested tit and crossbill) is <50m. In light of the above the ZoI of the proposed development for birds is up to 50m.

The ZoI for herpetofauna is considered to be limited to the direct habitat loss arising from the Development.

3.3.1 Identification & Characterisation of Effects

When describing the scale of ecological impacts reference should be made to the following characteristics:

- Positive or negative
- Extent: the size of the affected area/habitat and/or the proportion of a population affected by the effect
- Duration: the period of time over which the impact will occur. The EPA's guidelines on information to be included in Environmental Impact Assessment Reports (EPA, 2022) sets out the following terms for defining the duration of an impact: Momentary Effects - effects lasting from seconds to minutes; Brief Effects - effects lasting less than a day; Temporary Effects - effects lasting less than a year; Short-term Effects - effects

lasting one to seven years; Medium-term Effects - effects lasting seven to fifteen years; Long-term Effects - effects lasting fifteen to sixty years; Permanent Effects - effects lasting over sixty years.

- Frequency & Timing: how often the effect will occur; particularly in the context of relevant life-stages or seasons; and,
- Reversibility: will the effect be permanent or temporary. Will an impact reverse, either spontaneously or as a result of a specific action.

The assessment describes those characteristics relevant to understanding the ecological effect and determining the significance, and as such it does not need to incorporate all stated characteristics (CIEEM, 2018 v.1.1).

3.3.2 Significant Effects on Ecological Receptors

For the purpose of Ecological Impact Assessment, a 'significant effect', is an effect to an ecological feature from an impact, that either supports or undermines biodiversity conservation objectives for those ecological features which have been identified as important. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy). As such, effects can be considered significant in a wide range of geographic scales from international to local. Consequently, 'significant effects' should be qualified with reference to the appropriate geographic scale (CIEEM, 2018 v.1.1).

In order to predict likely ecological impacts and effects, the assessor must take account of the relevant aspects of the ecosystem structure and function, which include (CIEEM, 2018 v.1.1):

- The resources available (e.g. territory, prey availability, habitat connectivity etc.);
- Environmental processes (e.g. eutrophication, drought, flooding etc.);
- Ecological processes and relationships (e.g. population / vegetation dynamics, food webs etc.);
- Human influences (e.g. fertilisation, turbary, grazing, burning etc.);
- Historical context (natural range, trends etc.);
- Ecosystem properties (e.g. the carrying capacity, fragility etc.); as well as,

- Other environmental influences such as air quality, hydrology, water quality, nutrient inputs and salinity etc.

The determination of significance is made in line with the terminology set out in the EPA's guidelines on information to be included in Environmental Impact Assessment Reports. These criteria are as follows:

- No change – no discernible change in the ecology of the affected features
- Imperceptible effect - An effect capable of measurement but without noticeable consequences
- Not Significant - An effect which causes noticeable changes in the character of the
- environment but without significant consequences.
- Slight effect - An effect which causes noticeable changes in the character of the
- environment without affecting its sensitivities.
- Moderate effect - An effect that alters the character of the environment that is consistent
- with existing and emerging trends.
- Significant effect - An effect which, by its character, its magnitude, duration or intensity alters
- a sensitive aspect of the environment
- Very Significant - An effect which, by its character, magnitude, duration or intensity
- significantly alters most of a sensitive aspect of the environment
- Profound effect - An effect which obliterates sensitive characteristics

3.3.3 Integrity

The integrity of an ecological receptor refers to the coherence of the ecological structure and function that enables the ecological receptor to be sustained (NRA, 2009). The term 'integrity' is most often used when determining impact significance in relation to designated areas for nature conservation (e.g. SACs, SPAs or pNHA/NHAs) but can often be the most appropriate method to use for non-designated areas of biodiversity value where the component habitats and/or species exist with a defined ecosystem at a given geographic scale.

An impact on the integrity of an ecological site or ecosystem is considered to be significant if it moves the condition of the ecosystem away from a favourable condition: removing or changing the processes that support the sites' habitats and/or species; affect the nature, extent, structure and functioning of component habitats; and/or, affect the population size and viability of component species.

3.3.4 Conservation Status

An impact on the conservation status of a habitat or species is considered to be significant if it will result in a change in conservation status.

As per the definitions provided in the EU Habitats Directive, the conservation status of a habitat is favourable when:

- Its natural range and areas it covers within that range are stable or increasing
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future
- The conservation status of its typical species is favourable as defined below under species

The conservation status of a species is favourable when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis

According to the TII/CIEEM methodology, if it is determined that the integrity and/or conservation status of an ecological feature will be impacted on, then the level of significance of that impact is related to the geographical scale at which the impact will occur (i.e. local, county, national, international). In some cases, an impact may not be significant at the geographic scale at which the ecological feature has been valued but may be significant at a lower geographical level. For example, a particular impact may not be considered likely to have a negative effect on the overall conservation status of a habitat which is considered to be internationally important. However, an impact may occur at a lower geographic scale on this internationally important habitat. Under such a scenario, such an impact on an internationally important habitat is considered to be significant only at the lower scale e.g. local, county, rather

4.0 DESCRIPTION OF THE RECEIVING ENVIRONMENT

4.1 SITE OVERVIEW

The proposed Park & Ride facility is located in the townland of Fassaroe, in the north-western quadrant of Junction 6 on the N11, 450 meters west of the western fringe of Bray town. The site is reasonably close (circa 250m) to the motorway and is easily accessible from the N11 via Junction-6 and the existing dual carriageway road. the project site is representative of a brownfield site that is currently being actively used as a depot for the storage of construction equipment and materials.

4.2 SOILS & GEOLOGY

Site investigations have been completed at the project site (Site Investigations Ltd., 2023) and the natural ground conditions encountered in the overburden layers was dominated by brown and grey (slightly) sandy (slightly) gravelly silty clay with low cobble content soils. Gravel soil was logged at one borehole and 3 no. trial pit locations running down the middle of the site. Made ground was recorded across the site at 3 no. borehole locations and 4 no. trial pits to a maximum depth of 3.70mbgl. The made ground was logged as engineered fill consisting of brown, brown grey and black slightly sandy slightly gravelly silty clay with low cobble content and some plastic pipe fragments

4.3 HYDROGEOLOGY

Groundwater details were surveyed during site investigation works. Groundwater was recorded at 3 no. borehole locations at 9.2mbgl, 4.6mbgl and 6.8mbgl. No groundwater ingresses were recorded in the trial pits during the site investigations.

There is always considerable uncertainty as to the likely rates of water ingress into excavations in clayey soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water.

Furthermore, water levels noted on the borehole and trial pit logs do not generally give an accurate indication of the actual groundwater conditions as the borehole or trial pit is rarely left open for sufficient time for the water level to reach equilibrium.

Also, during boring procedures, a permeable stratum may have been sealed off by the borehole casing, or water may have been added to aid drilling. Therefore, an extended period of groundwater monitoring using any constructed standpipes is required to provide more accurate information regarding groundwater conditions. Finally, groundwater levels vary with time of year, rainfall or nearby construction.

As discussed previously, groundwater was only recorded in the boreholes at depths greater than 4.60mbgl. There is always considerable uncertainty as to the likely rates of water ingress into excavations in cohesive soil and man0made soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water. Based on this information at the exploratory hole locations to date, it is considered likely that any shallow ingress (less than 2.00mbgl) into excavations will be slow to medium. If granular soils are encountered in shallow excavations, then the possibility of water ingressing into an excavation increase with higher ingress rates. If groundwater is encountered during excavations then mechanical pumps will be required to remove the groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches. Any groundwater ingress to excavations will be pumped to a construction phase treatment train that will comprise a mobile attenuation tank and buffered outfalls over vegetated ground to the east of the project site.

4.4 HYDROLOGY

The project site is located within the Dargle River surface water catchment (IE10_03) and the Dargle sub-catchment (Dargle_SC_010). This surface water catchment is principally drained by the Dargle River, which discharges to the sea north of Bray. There are no surface watercourses occurring within or bounding the project site. The Dargle River is located approximately 250m to the east of project site, on the eastern (and opposite) side of the M11. The County Brook Stream is located approximately 115m to the north of the project site.

The project will be connected to the receiving surface water environment during the operation phase via the proposed surface water drainage pathway. As noted in Section 2.1 above it is proposed to direct surface water runoff generated at the project site to an existing surface water pipe along the R918 to the south of the project site. This surface water pipe conveys surface water to the east and eventually discharges to the River Dargle.

The Water Framework Directive status of the River Dargle downstream of the R918 is currently classified as being at Good status. The current Water Framework Directive risk status assigned to the Fargle_SC_010 is *At Risk.* The Water Framework Directive Cycle 2 report for the Dargle _SC_010, published in 2019, identified the following pressures for this stretch of the River Dargle, which are restricted to hydromorphological pressures in the form of dams, barriers, locks and weirs and channelisation.

4.5 DESKTOP ANALYSIS

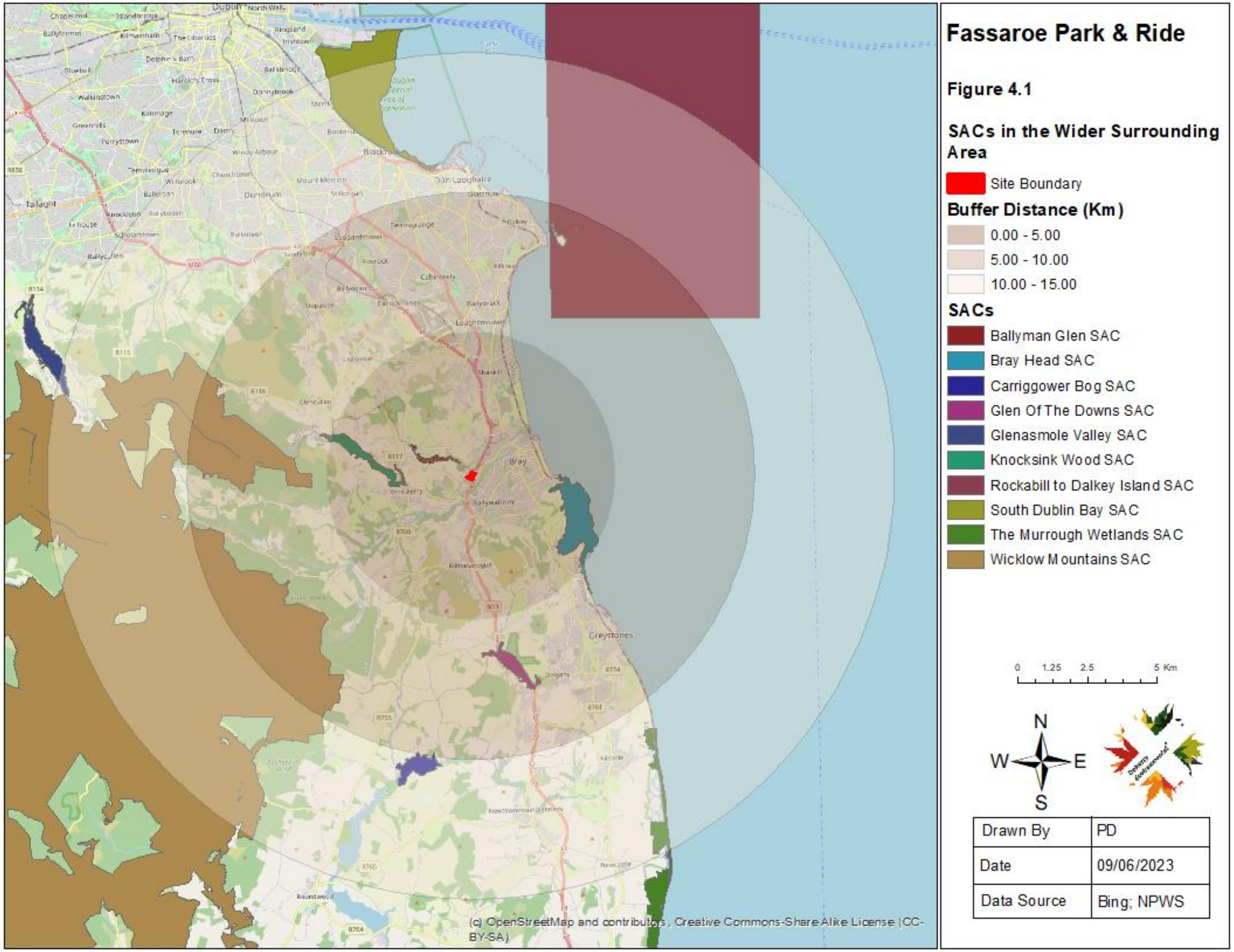
4.5.1 Designated Conservation Areas

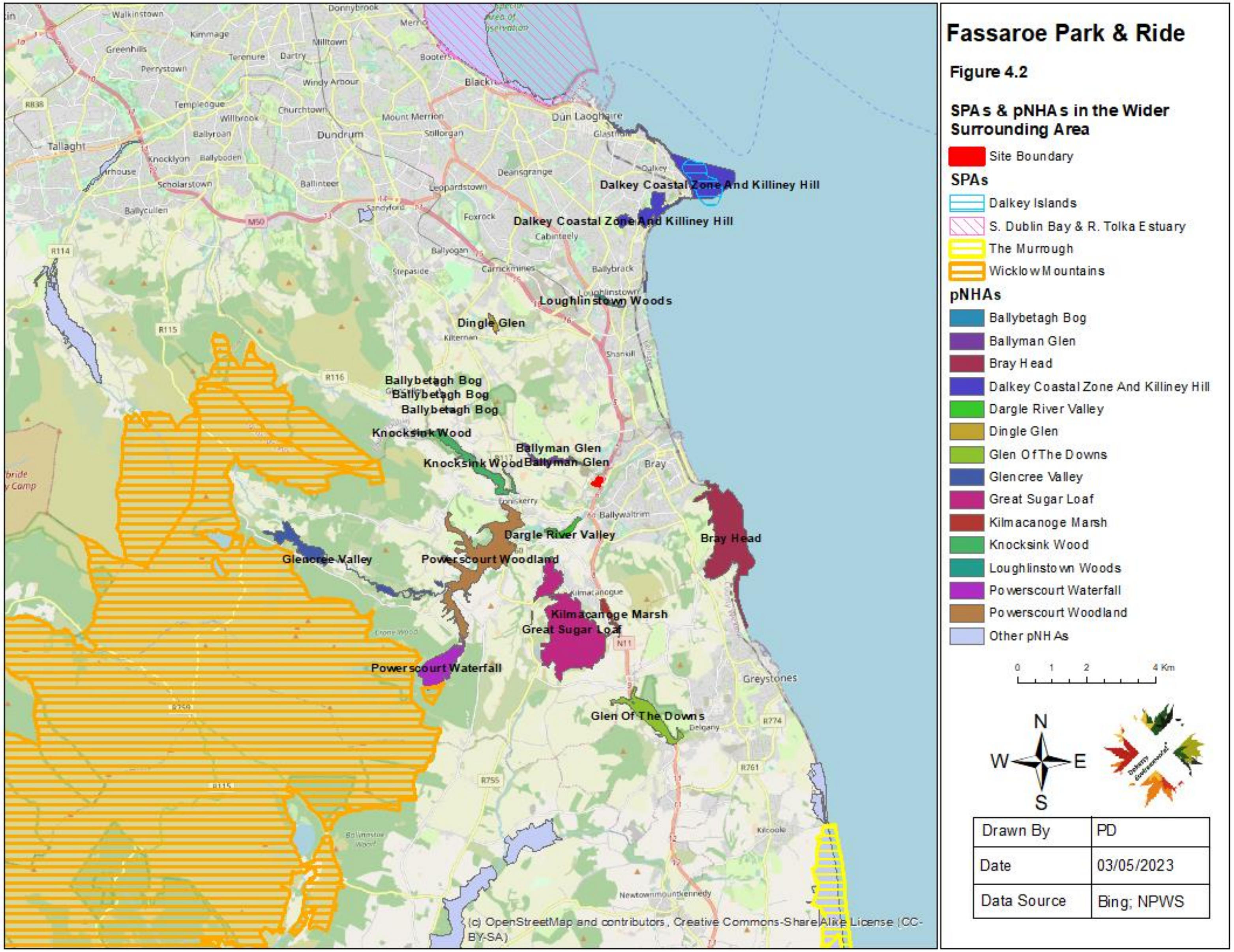
The project site is not located within or immediately adjacent to any designated conservation areas. All European Sites occurring in the wider surrounding area were identified and these sites are shown on Figure 4.1 and Figure 4.2 below. As can be seen in Figures 5.1 & 5.2 no European Sites are occurring at or in the immediate vicinity of the project site. The nearest European Sites is the Ballyman Glen SAC, located over 500m to the northwest of the project site. The Ballyman Glen SAC is also listed as a proposed Natural Heritage Area and this is the nearest pNHA to the project site. The next closest pNHA, that is not designated as SAC, to the project site is the Dargle River Valley pNHA, located approximately 1km to the south of the project site.

There are no NHAs occurring in the wider area surrounding the project site.

None of the European Sites and listed pNHAs occurring in the wider area surrounding the project site are connected to the project site via pathways. Further details examining the potential for connections between the project site and these designated conservation areas and the lack thereof, are set out in the Screening Report for Appropriate Assessment prepared for the project.

As noted above the project site is located within the Dargle SC_010 sub-catchment. The River Dargle is located approximately 240m to the southeast of the project site. The River Dargle is designated as a Salmonid Water under the European Communities (Quality of Salmonid Waters) Regulations, 1988.


Fassaroe Park & Ride
Figure 4.1
SACs in the Wider Surrounding Area
Site Boundary
Buffer Distance (Km)
0.00 - 5.00
5.00 - 10.00
10.00 - 15.00
SACs
Ballyman Glen SAC
Bray Head SAC
Carriggower Bog SAC
Glen Of The Downs SAC
Glenasmole Valley SAC
Knocksink Wood SAC
Rockabill to Dalkey Island SAC
South Dublin Bay SAC
The Murrough Wetlands SAC
Wicklow Mountains SAC
0 1.25 2.5 5 Km
N
W
E
S
Drawn By
PD
Date
09/06/2023
Data Source
Bing; NPWS
(c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA)


Fassaroe Park & Ride
Figure 4.2
SPAs & pNHAs in the Wider Surrounding Area
Site Boundary
SPAs
Dalkey Islands
S. Dublin Bay & R. Tolka Estuary
The Murrough
Wicklow Mountains
pNHAs
Ballybetagh Bog
Ballyman Glen
Bray Head
Dalkey Coastal Zone And Killiney Hill
Dargle River Valley
Dingle Glen
Glen Of The Downs
Glencree Valley
Great Sugar Loaf
Kilmacanoge Marsh
Knocksink Wood
Loughlinstown Woods
Powerscourt Waterfall
Powerscourt Woodland
Other pNHAs
0 1 2 4 Km
N
S
E
W
Drawn By PD
Date 03/05/2023
Data Source Bing; NPWS
Dalkey Coastal Zone And Killiney Hill
Loughlinstown Woods
Dingle Glen
Ballybetagh Bog
Knocksink Wood
Ballyman Glen
Dargle River Valley
Bray Head
Glencree Valley
Powerscourt Woodland
Kilmacanoge Marsh
Great Sugar Loaf
Powerscourt Waterfall
Glen Of The Downs
Greystones
Bray
(c) OpenStreetMap and contributors, Creative Commons-ShareAlike License (CC-BY-SA)

4.5.2 Protected Species Records

A search of the National Biodiversity Data Centre (NBDC) for records of rare and/or threatened species previously identified in the vicinity of the project site was completed in July 2023. The project site and the area immediately surrounding the project site (as shown on Figure 4.3) was searched for records of rare, threatened and/or protected species occurring within this area.

Figure 4.3: Polygon Area (shown in red) searched for records of Rare, Threatened and/or Protected Species

No records for rare, threatened or protected species are held for the area of search as shown on Figure 4.3.

4.6 SURVEY RESULTS

4.6.1 Habitats

The following Sub-Sections describe the habitats occurring within and immediately adjacent to the project site. Each habitat described below has been identified to Level 3 of Fossitt's *Guide to Habitats in Ireland*. The alpha-numeric code for each habitat is also provided alongside the habitat name (e.g. hedgerow WL1). The locations and extent of each habitat described below are illustrated in Figure 4.4: Habitat Map.

The habitats occurring at the project site are dominated by spoil and bare ground (ED2), recolonising bare ground (ED3) and landscape planted broad-leaved woodland (WD1). Artificial surfaces in the form of existing roads and access tracks occur within the project site.

As described in Section 4.4 above there are no aquatic habitats occurring within or immediately adjacent to the project site.

A review of historical aerial imagery from 1995 indicates that the project site was previously used for agricultural purposes, most likely as arable land (BC1). Immature woodland, likely associated with recent woodland landscape planting associated with the M11 is shown to the southeast of the project site boundary. The 2000 aerial imagery indicates the presence of improved agricultural grassland dominating the site. Broad-leaved woodland associated with the landscaping of the M11 is shown to the southeast of the project site boundary, while a treeline is shown forming the boundary of the site along the slip roads to the east and north. The 2005 imagery indicate a significant change in the land cover at and surrounding the project site with grassland surface removed and a denuded bare ground (ED2) surface dominating the cover within the site. Much of the treeline along the eastern and northern slip road boundaries and the broad-leaved woodland to the east was also removed at the time the 2005 imagery was recorded.

4.6.1.1.1 Nature Conservation Value

The project site is comprised of artificial habitats that are subject to high levels of current human activity. The recolonising bare ground and spoil and bare ground habitats that make up


Fassaroe Park & Ride
Figure 4.4
Habitat Map
Site Boundary
Bat Monitoring Point
Hedgerows WL1
Treelines WL2
Spoil Bare Ground ED2
Recolonising Bare Ground ED3
Artificial Surfaces BL3
Broadleaved Woodland WD1
0 0.02 0.04 0.08 Km
N
W
E
S
Drawn By
PD
Date
28/07/2023
Data Source
Bing
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

the project site are of low ecological value. The broad-leaved woodland to the east of the project site is of local importance (higher value), whilst the broad-leaved woodland occurring to the north of the site is representative of a more long-standing native woodland habitat of county importance.

4.6.2 Invasive Species

No non-native invasive species, such as *Fallopia japonica*, *Gunnera tinctoria* or *Impatiens glandulifera* were identified on site during site field surveys. *Buddleja davidii* was recorded at the project site. *Buddleja davidii* is listed as a moderate impact invasive species by the NBDC.

There are historical records held by the NBDC for the presence of Giant Hogweed (*Heracleum mantegazzianum*) in the surrounding area. No specimens of this species were recorded on site during site surveys. The record notes associated with these historical records for this species in the surrounding area indicate that the location of these specimens were associated with the River Dargle.

4.6.3 Fauna

An overview of the fauna supported by the site is outlined in the following sections. The nature conservation value of the site in supporting populations of fauna is also outlined in the following sub-section.

4.6.3.1 Non-Volant Mammals

No definitive evidence of protected mammals such as otter or badger was noted within or immediately bounding the project site. The woodland habitats to the north and east of the project site are likely to support smaller mammals.

4.6.3.2 Volant Mammals – Bat

There are no structures occurring within the project site and as such there is no potential for bats to roost within the project site. There are no mature trees occurring within the project site. all vegetation occurring within the site is immature and devoid of any preferred tree roost features. Given the absence of structures and suitable trees within the project site there is no potential for bat roosts to occur.

At least five bat species were recorded during bat surveys at the project site. These species include Leisler's bat, Common pipistrelle, Soprano pipistrelle, brown long-eared bat and Myotis species. The number of bat passes per night per species recorded during static monitoring is provided in Table 4.1, while Table 4.2 provides the median bat pass per hour per night.

Table 4.1: No. Bat Passes Recorded per Night during Static Bat Monitoring

Date	MYOSPP	NYCLEI	PIPPIP	PIPPYG	PLEAUR	Total/Night
20220823	0	61	18	23	2	104
20220824	1	23	4	22	3	53
20220825	0	24	10	18	2	54
20220826	0	19	9	18	1	47
20220827	0	12	2	33		47
20220828	0	23	3	24	1	51
20220829	0	41	17	14	2	74
20220830	2	33	4	12	2	53
20220831	0	38	14	18	1	71
20220901	0	10	6	23	1	40
Total/Spp	**3**	**284**	**87**	**205**	**15**	**594**

Myonat = Natterer's Bat; Nyclei – Leisler's bat; Pippip = Common pipistrelle; Pippyg = Soprano pipistrelle; Pleaur = brown long-eared bat

Table 5.4.2: Median Bat Pass/Hour/Night & Bat Activity Categories

Species	Myotis species	NYCLEI	PIPPIP	PIPPYG	PLEAUR
Median Pass/Hour/Night	0.00	2.35	0.75	2	0.15
Bat Activity Category (as per Kepel)	Low	Low	Low	Low	Low

The analysis of the monitoring shows that activity was low for Myotis species, moderate for Leisler's bat, and high for Common pipistrelle, Soprano pipistrelle and brown long-eared bat.

Low median levels of bat activity were recorded for all bats during the bat monitoring completed between the 23rd August and 1st September 2023. Pipistrelle species in the form of Common pipistrelle and Soprano pipistrelle as well as Leisler's bat dominated activity during the activity monitoring. These species of bats recorded during surveys are all widespread and abundant in Ireland and are generally encountered during bat activity surveys (NPWS, 2019).

4.6.3.3 Birds

A range of bird species were seen and heard on site during the site field surveys completed in July and August 2021. Species recorded include robin, blackbird, great tit, coal tit, blue tit, chaffinch, song thrush, dunnock, rook, starling, house sparrow, pheasant, swallow and wood pigeon.

Robin, blackbird, greenfinch, great tit, blue tit, chaffinch, dunnock, rook, starling, and wood pigeon were recorded throughout the site along the northern and eastern boundaries and within the woodland to the south of the proposed development footprint.

Swallows, which is a species of medium conservation concern, were observed foraging throughout the site but were not identified as breeding on site. Only one structure occurs at the project site and no swallow nests were observed at this structure during field surveys. As such this species was not considered to breed at the project site.

The British Trust for Ornithology (BTO) provides guidance for establishing the breeding status of bird species. The classification of breeding status ranges from non-breeding, possible breeding, probable breeding to confirmed breeding. The presence of the songbird species listed above within suitable woodland breeding habitat to the north and east of the project site during the August survey is indicative of probable earlier breeding activity during the 2022 breeding season. The majority of the species observed are of low conservation concern (green-listed species), with starling, greenfinch and swallow being of medium conservation concern (amber-listed listed).

5.0 IMPACT ASSESSMENT

5.1 CONSTRUCTION PHASE

5.1.1 Designated Conservation Areas

There will be no direct impacts to designated conservation areas occurring in the surrounding area. The nearest conservation area to the project site is the Ballyman Glen SAC and pNHA, located approximately 500m to the south of the project site. The Screening Report for Appropriate Assessment, provided as part of the planning application documentation, has examined in detail the potential for the project to result in likely significant effects to this SAC & pNHA and all other European Sites and has concluded that, given the absence of pathways, there will be no potential for the project, alone or in-combination with other plans or projects, to result in likely significant effects to this SAC & pNHA and any other European Sites.

Furthermore given the absence of pathways connecting the project site to other pNHAs in the wider surrounding area there will be no potential for the project to result in likely significant effects to these sites.

As noted above the River Dargle is designated as a Salmonid Water. During the construction phase all waters generated on site will drain to ground. Given the results of the hydrogeological investigations completed at the project site, as summarised in Section 4.3 above, there will be no pathway, surface water or groundwater, connecting the project site to the River Dargle and the construction phase will not pose a risk to the water quality of the River Dargle.

5.1.2 Habitat Loss

The footprint of the proposed development will be restricted to recolonising bare ground and spoil and bare ground habitats. This will result in the conversion of these habitats to areas of hardstanding. These habitats are of low ecological value (Rating E). The loss of these areas of disturbed ground to the footprint of the project will represent an impact of permanent and imperceptible significance.

There will be no loss of woodland bounding the project site to the east and north..

5.1.3 Disturbance to/Loss of Habitat for Terrestrial Mammals

No breeding sites or resting places of protected terrestrial non-volant mammals such as badgers were noted within or immediately adjacent to the project site and the construction phase of the project will not have the potential to result in significant disturbance to non-volant terrestrial mammals.

Any inappropriate siting of lighting during construction, may have the potential to indirectly impact on bat species that utilise the project site for foraging and/or commuting. Given the built-up nature of the wider surrounding environment (and the presence of artificial lighting to the south, east and west, the local bat population would be expected to be habituated to artificial light spill, especially as the most common species recorded within the subject lands i.e. Leisler's bat, soprano pipistrelle and common pipistrelle bat, are some of the least sensitive species to artificial light spill

5.1.4 Impacts to Birds

The clearance of the site and any recolonising vegetation within the project site during the breeding bird season will have the potential to result in the destruction of nest and nest or fatality to chicks.

Given the disturbed nature of the site, the local bird population supported by the project site is likely to be well habituated to human activity and the construction works associated with the project are not predicted to have the potential to result in significant disturbance to birds.

5.1.5 Spread of Non-Native Invasive Species

During site surveys the only non-native species recorded on site was *Buddleja davidii*. The construction phase of the project has the potential to result in the spread of these species in the wider vicinity of the project site. In addition, the potential exists for site operatives and machinery to result in the inadvertent spread of non-native plant species on site, should clothing, plant and machinery be contaminated with these species prior to entry on site.

5.2 OPERATION PHASE

5.2.1 Designated Conservation Areas

There will be no direct impacts to designated conservation areas occurring in the surrounding area. The nearest conservation area to the project site is the Ballyman Glen SAC and pNHA, located approximately 500m to the south of the project site. The Screening Report for Appropriate Assessment, provided as part of the planning application documentation, has examined in detail the potential for the project to result in likely significant effects to this SAC & pNHA and all other European Sites and has concluded that, given the absence of pathways, there will be no potential for the project, alone or in-combination with other plans or projects, to result in likely significant effects to this SAC & pNHA and any other European Sites.

Furthermore given the absence of pathways connecting the project site to other pNHAs in the wider surrounding area there will be no potential for the project to result in likely significant effects to these sites.

As noted above the River Dargle is designated as a Salmonid Water. During the operation phase there will be a pathway connecting the project site to the River Dargle, via the surface water drainage network that will convey surface water from the project site to an existing storm water sewer to the east of the R918. This storm water sewer presumable drains storm water to the River Dargle. During the operation phase the potential will exist for surface water runoff from areas of hardstanding such as car parking areas and access roads to be contaminated in the event of fuel leaks or accidental spills. For instance, Revitt et al. (2014) demonstrated the potential of car parking areas to result in a build-up of diffuse pollution loads on their surfaces with subsequent mobilization and direct discharge to receiving waters. The significance of the impact of the uncontrolled release of contaminants from the project site to the surface water network and downstream to the Dargle River, will depend upon the frequency of the release and the concentration of contaminating materials in surface water discharging from the site. In a worst-case scenario the ongoing discharge of waters with high concentrations of contaminating substances during the construction phase could over time lead to the deposition of such contaminants to the Dargle River.

The exposure of freshwater invertebrate fauna, which are the prey species of salmonids, as well as salmonid species to such contaminants can result in disturbance and stress effects. Upon detection of such contaminants mobile species may simply move away from the affected area, with the potential to result in a decline in the distribution of these species downstream along the River Dargle. For sessile benthic fauna, such as macroinvertebrate larvae, there will be no potential for escape and their exposure to contaminants may result in biological changes designed to aid survival. In some cases these benthic species may acclimatise to contaminated conditions, while in others the contaminants may lead to mortality and decreases in population density. Over time, in the event of ongoing chronic pollution, the macroinvertebrate community will change to a more species-poor pollution tolerant community that provide substandard prey resources for salmonids.

5.2.2 Habitat Loss

The operation phase of the development will not result in any further habitat loss within the project site.

5.2.3 Impacts Terrestrial Fauna

The operation phase of the project is not predicted to have the potential to result disturbance to protected terrestrial non-volant mammals or bird species. This is due to the absence of any evidence of protected terrestrial non-volant mammals within the project site during field surveys and the low value habitats within the project site for bird species.

Leisler's bat and pipistrelle species, in the form of Common pipistrelle and Soprano pipistrelle were the dominant species recorded during bat monitoring at the project site. These species are less sensitive to artificial light at night. Very low levels of activity were recorded for brown long-eared bat and Myotis species. These latter species are more sensitive. Public lighting will be provided as part of the operation phase of the project and in the event that inappropriate lighting is provided and results in excessive lighting along the edge of and over woodland habitat to the east and north, there will be potential for disturbance to suitable bat foraging habitat.

Mitigation measures are set out in Section 6 below that aim to avoid illumination of woodland edges to the east and north of the project site.

6.0 MITIGATION MEASURES

The mitigation measures outlined in the following sections aim to ensure that a best practice approach to minimising ecological disturbance during the construction phase is implemented and that the design of the project’s operational phase avoids significant effects the surrounding ecology.

6.1 ECOLOGICAL CLERK OF WORKS

An Ecological Clerk of Works (ECoW) as well as a Project Landscape Architect will be appointed prior to the commencement of construction. The ECoW will be an ecologist with experience of baseline ecological surveys, pre-construction surveys and construction phase supervision. The ECoW will be responsible for completing pre-construction surveys and supervising construction works where necessary and advising on the implementation of woodland enhancement measures.

6.2 MEASURES TO MINIMISE IMPACTS TO HABITATS

Habitat disturbance during construction work will be confined strictly to within the direct land-take of the proposed scheme.

Construction machinery will be restricted to site roads and the footprint of the proposed scheme.

Enhancement tree planting will be undertaken as part of the proposed landscaping within the project site.

The following measures will be implemented to protect water quality:

- Storage – all equipment, materials, chemicals, fuel and oil stores will be sited on impervious bases and within a secured bund of 110% of the storage capacity, within the lay down area.

- Oil and fuel stored on site for construction should be stored in designated areas. These areas shall be bunded and should be located away from surface water drainage and features.

- Refuelling of construction machinery shall be undertaken in designated areas away from surface water drainage in order to minimise potential contamination of the water environment. Spill kits shall be kept in these areas in the event of spillages.

- As fuels and oils are classed as hazardous materials, any on-site storage of fuel/oil, all storage tanks and all draw-off points will be bunded (or stored in double-skinned tanks) and located in the dedicated site compound. Provided that these requirements are adhered to and site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil wastage at the site.

- The integrity and water tightness of all the bunding structures and their resistance to penetration by water or other materials stored therein shall also be tested and demonstrated.

- All fuel oil fill areas will have an appropriate spill apron and spill kits will be provided on site.

- Vehicles and refuelling – standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Where practicable, refuelling of vehicles and machinery will be carried out on an impermeable surface in designated areas, well away from any surface waterbody.

- Maintenance – maintenance to construction plant will not be permitted on site, unless vehicles have broken down necessitating maintenance at the point of breakdown. All necessary pollution prevention measures will be put in place prior to commencement of maintenance in this instance;

- No wash down or washout of concrete trucks will be undertaken on site. The wash down or washout of trucks will take place off site in an appropriate facility.

- Any in-situ concrete work to be lined and areas bunded (where possible) to stop any accidental spillage.

- Any spoil or waste material generated from the construction process is to be temporarily stored at an approved location on site, before being removed to an accepting licensed waste disposal facility.

- All new infrastructure is to be installed and constructed to the relevant codes of practice and guidelines.

- All surface water infrastructure is to be pressure tested by an approved method during the construction phase and prior to connection to the public networks, all in accordance with Local Authority Requirements.

- Connections to the public network are be carried out to the approval and / or under the supervision of the Local Authority prior to commissioning.

- All new sewers are to be inspected by CCTV survey post construction; to identify any possible physical defects for rectification prior to operational phase.

- Care will be required for the environmental management of the site to ensure that no potential contamination issues are experienced which may impact on the overall

- Implement best practice construction methods and practices complying with relevant legislation to avoid or reduce the risk of contamination of watercourses or groundwater.

- Surface water runoff from areas stripped of topsoil and surface water collected in excavations will be directed to on-site attenuation pond where measures will be implemented to capture and treat sediment laden runoff prior to discharge of surface water at a controlled rate.

- Weather conditions and seasonal weather variations will also be taken account of when planning excavations, with an objective of minimizing soil erosion.

- Concrete batching will take place off site or in a designed area with an impermeable surface.

- Discharge from any vehicle wheel wash areas is to be directed to onsite settlement ponds.

- Hazardous construction materials shall be stored appropriately to prevent contamination of watercourses or groundwater.

- Concrete - Wet concrete operations will be carried out in dry conditions.

- Mess, sanitation and welfare facilities will be required during construction and will be located at the construction compound. Foul effluent will make use of chemical facilities with routine removal for offsite disposal.

- Where possible all spoil generated during the construction phase will be removed from site as excavated. Where spoil is required to be stored on site, the spoil stockpiles will be covered with a waterproof membrane during periods of precipitation to prevent any material from washing out. In addition, a protective berm shall be installed around any area required for spoil storage on site.

- Excavated soil material to be re-used for landscaping purposes will be stored on level ground.

- Standard dust suppression measures will be implemented during periods of dry weather. This will avoid any impacts arising from the spread of dust particles during the construction phase.

6.3 MANAGEMENT OF WASTEWATER

All wastewater generated during the operation phase will be directed to the Irish Water sewer network prior to being pumped to the municipal WWTP. A pre-connection enquiry has been made with Irish Water.

6.4 MANAGEMENT OF SURFACE WATER

In order to minimise the potential for pollution to surface waters generated on site the proposed approach to surface water management during the operation phase, as outlined in Section 2.1 above, will be implemented in full.

The management of surface water during the construction phase will adhere to the recommendations of the CIRIA guides *Control of Water Pollution from Construction Sites* (2001) and *Control of Water Pollution from Linear Construction Projects* (2006)

During construction key requirements for control of chemical pollution risk will include:

- Storage – all equipment, materials and chemicals will be stored away from any watercourse. Chemical, fuel and oil stores will be sited on impervious bases and within a secured bund of 110% of the storage capacity, within the lay down area;

- The integrity and water tightness of all the bunding structures and their resistance to penetration by water or other materials stored therein shall also be tested and demonstrated.

- All fuel oil fill areas will have an appropriate spill apron.

- Vehicles and refuelling – standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Where practicable, refuelling of vehicles and machinery will be carried out on an impermeable surface in designated areas, well away from any surface watercourse;

- Maintenance – maintenance to construction plant will not be permitted on site, unless vehicles have broken down necessitating maintenance at the point of breakdown. All necessary pollution prevention measures will be put in place prior to commencement of maintenance in this instance;

- Concrete - Wet concrete operations would not be carried out within watercourses or adjacent to watercourses. Runoff from wastewaters or contaminated storm water will be directed to drains installed as part of the surface water management plan;

- Mess, sanitation and welfare facilities will be required during construction and will be located at the construction compound. Foul effluent will make use of chemical facilities with periodic removal for offsite disposal.

During the operation phase all surface water runoff will pass through a Class 1 Hydrocarbon Interceptor and filter traps and will be controlled by a commercially available non-return hydrobrake vortex valve.

The provision of this design features will ensure that surface water emitted from the project site during the operation phase is adequately treated and will eliminate any risk of polluted surface water being discharged from the project site during operation.

6.5 MITIGATING IMPACTS TO BATS

In order to minimise the impact of the operation phase to bats, the public lighting for the project will be designed to avoid light spill on to existing woodland habitats that will surround the project to the east and north. Light columns will be positioned and designed to ensure that the minimum 1 lux contour is located outside the footprint of the woodland to the east and north of the project site. This will ensure that the lighting provided by the project will not result in a change in night time lighting in woodland habitats bounding the project site.

The proposed design will be finalised with consideration of Guidance Note 08/18 of ILP regarding Bats and Artificial Lighting. LED type Lanterns will be used throughout the development. LED fittings do not emit any ultraviolet or infra-red radiation which is desirable for bat habitats as they do not attract insects in the same manner that traditional SON/SOX fittings do. Light levels will be minimised as much as possible for this type of development and overspill to adjacent woodland habitats will be avoided.

6.6 MEASURES TO MINIMISE DISTURBANCE TO BREEDING BIRDS

Wherever possible, vegetation clearance associated with the construction phase shall be completed outside the breeding bird season, which is from 1st March to 31st August inclusive. Where vegetation clearance is required to be completed during the breeding bird season, the vegetation will be inspected by the project ECoW within 48 hours prior to the proposed clearance. In the event that bird nests are identified in vegetation during the pre-clearance survey the ECoW will recommend a suitable buffer distance surrounding the nest where vegetation clearance will not be undertaken until the nest has become inactive. The ECoW will monitor the nest to confirm its inactive status prior to the clearance of the vegetation supporting the nest.

6.7 MEASURES TO REDUCE THE SPREAD OF INVASIVE SPECIES

6.7.1 Pre-Construction Survey

A pre-construction survey will be completed within the project site to determine the presence, distribution and extent of any specimens/stands of non-native invasive plant species on site. Particular attention will be given to mapping the locations of Buddleja davidii occurring within the site project site. In addition, given the historical records for *Heracleum mantegazzianum* in the surrounding area the project site will be surveyed to confirm the continued absence of this species from the site.

6.7.2 Measures To Prevent the Movement Of Invasive Species On Site During The Construction Phase

All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) must be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the introduction and spread of high impact invasive plant species such as Japanese knotweed, Rhododendron and Himalayan Balsam (all of which currently do not occur at the project site).

All works during the construction phase will be carried out in accordance with the following guidelines:

- The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (TII, 2020);
- NRA (2008). Guidelines for the Management of Waste from National Road Construction Project. National Roads Authority;
- Biosecurity protocols available for aquatic and riparian species available on the Control of Aquatic Invasive Species and Restoration of Natural Communities in Ireland (CAISIE) www.caisie.ie, and
- All maintenance operators will carry out their works under the guidance of the Inland fisheries Ireland Biosecurity Protocol for Field Survey Work. (2011) to ensure no negative impacts are caused to other watercourses. http://www.fisheriesireland.ie/fisheries-research-1/73- biosecurity-protocol-for-field-survey-work-1.

6.7.3 Measures To Prevent the Spread of Buddleja Davidii During Vegetation Removal

All Buddleja davidii will be removed from site prior to the commencement of the construction phase. The felling of these species will be completed during the winter season when viable seed is not present on the plants. The felling operations will also coincide with the non-breeding bird season and will therefore not have the potential to result in disturbance to active nests and chicks. The root stock of Buddleja davidii will be removed from the ground during the felling operations. Felled trees shall be stockpiled locally in the vicinity of felling to minimise movement throughout the site. All *B. davidii* material will be stockpiled separate to other vegetation cleared on site and shall be removed from site for disposal.

6.8 EVALUATION OF MITIGATION MEASURES

The mitigation measures outlined above for the construction and operation phase of the project are taken from established best practice guidelines that have been successfully implemented for a wide range of project-level infrastructural developments. These measures have undergone extensive and rigorous monitoring for their effectiveness at development sites where they have previously been applied to ensure adverse environmental impacts are avoided.

The results of this monitoring and the recommendation of these measures as standard best practice guidelines is based upon their high degree of success in ensuring negative environmental impacts are avoided.

The best practice guidance that has informed the mitigation measures proposed in this assessment and that will be adhered to throughout the construction and operation of the proposed development include:

- The Good Practice Guidance notes proposed by EA/SEPA/EHS:
- PPG1: General Guide to the Prevention of Water Pollution
- PPG4: The disposal of sewage where no Main Drainage is Available
- PPG5: Works In, Near or Liable to Affect Watercourses
- PPG10: Working at Construction and Demolition Sites.
- PPG21: Pollution Incident Response Planning
- PPG26: Dealing with Spillages on Highways
- CIRIA Environmental Good Practice on Site.
- CIRIA Control of Water Pollution from Construction Sites. Technical Guidance C648.
- CIRIA SuDS Manual Technical Guidance C697.
- Development on Unstable Land. Department of Environment (DOE), UK.
- Bat Conservation Ireland: Bats and Lighting: Guidance Notes for Planners, Engineers, Architects and Developers
- Bat Conservation Trust: Bats and Lighting in the UK – Bats and the Built Environment

7.0 RESIDUAL IMPACTS

The project site will not result in any residual impacts to designated conservation areas.

There will be no residual loss of habitat of conservation value as a result of the project.

The application of mitigation measures will ensure that the construction phase will result in negligible to minor significant residual effects to fauna supported by the project site.

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Neal E. & Cheeseman C. (1996). Badgers. Poyser Natural History. London.

NRA (2006a). Guidelines for assessment of ecological impacts of National Road Schemes. National Road Authority.

Appendix C

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PARK AND RIDE, FASSAROE

NOISE ASSESSMENT

Technical Report Prepared For

Wicklow County Council

Technical Report Prepared By

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Our Reference

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Title	Senior Acoustic Consultant	Principal Acoustic Consultant
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EXECUTIVE SUMMARY

The applicant is lodging a planning application seeking to develop a new park and ride facility in Fassaroe, County Wicklow.

A baseline noise survey has been completed in the vicinity of the development site with a view to establishing a picture of the prevailing environment in the area. This data has been used to establish the receiving environment and comment on the noise levels predicted in relation to the proposed development.

Best practice guidance has been considered and noise criteria outlined in relation to the construction and operational phase associated with the proposed development.

A review of the noise levels associated with the Proposed Development in light of relevant best practice noise guidance has been completed considering:

- Construction Noise;
- Additional traffic movements on public roads;
- Vehicle activity on new site roads, and;
- Car parking on site

The relevant daytime and night criteria adopted have been satisfied in all instances assessed here. Comment has also been presented in relation to expected changes in noise levels due to the development. In all instances assessed, a ‘Not Significant’ impact is identified and therefore, based on the assessment presented here, no significant impact on residential amenity is predicted from the proposed construction or operational activities.

CONTENTS

1.0 INTRODUCTION

This noise assessment report has been prepared by AWN Consulting on behalf of the National Transport Authority. This report provides the details of the noise assessment undertaken for the proposed park and ride facility based near Fassaroe, County Wicklow.

In order to address the proposal the following methodology has been followed:

- Carry out baseline noise surveys at locations representative of nearest noise sensitive locations in the vicinity of the Proposed Development.
- Identify appropriate noise criteria in relation to the Proposed Development.
- Predict the expected noise levels from the Proposed Development noise sources to the nearest noise sensitive locations.
- Compare the predicted noise levels associated with the Proposed Development in light of the adopted noise criteria.

Appendix A presents a glossary of the acoustic terminology used in this report.

The site layout is illustrated in Figure 1.

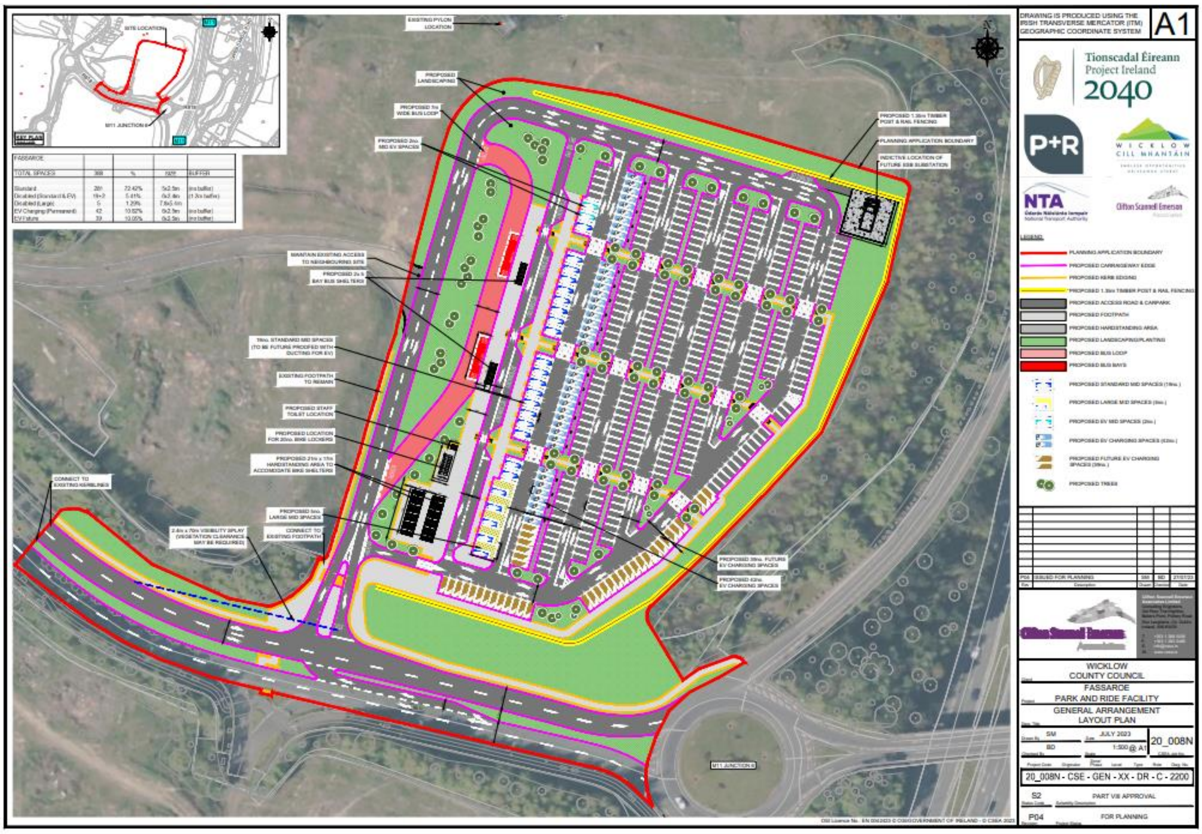

Figure 1 Site Layout

2.0 FUNDAMENTALS OF ACOUSTICS

In order to provide a broader understanding of some of the technical discussion in this report, this section provides a brief overview of the fundamentals of acoustics and the basis for the preparation of this noise assessment.

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. In order to take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels is 0dB (for the threshold of hearing) to 120dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3dB.

The frequency of sound is the rate at which a sound wave oscillates and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. Several weighting mechanisms have been proposed but the ‘A-weighting’ system has been found to provide one of the best correlations with perceived loudness. SPLs measured using ‘A-weighting’ are expressed in terms of dB(A). An indication of the level of some common sounds on the dB(A) scale is presented in Figure 2.

The ‘A’ subscript denotes that the sound levels have been A-weighted. The established prediction and measurement techniques for this parameter are well developed and widely applied. For a more detailed introduction to the basic principles of acoustics, reference should be made to an appropriate standard text[1].

1 For example, *Woods Practical Guide to Noise Control* by Ian Sharland.

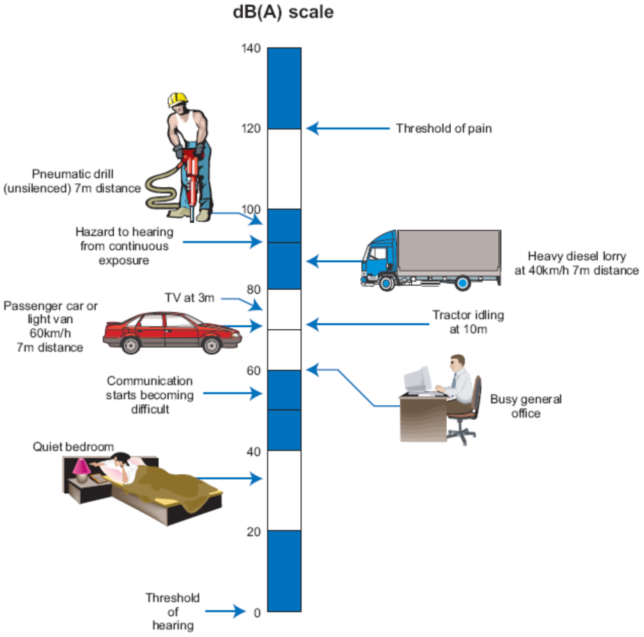

Figure 2
Level of Typical Common Sounds on the dB(A) Scale – (*TII Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes*)

3.0 DESCRIPTION OF RECEIVING ENVIRONMENT

In the first instance, it is important to make reference to the nearest noise sensitive receptors to the proposed development.

The nearest noise sensitive receptors are dwelling houses located to the west of the site (R1). Other receptors are either at greater distances to the site, or are located closer to the N11 and, hence, will experience a higher level of noise from road traffic. For this reason, the receptor location at R1 has been selected for assessment and baseline measurement purposes as a worst case scenario. The location of noise sensitive receptors relative to the proposed development and the measurement location has been indicated in Figure 3.

Figure 3 Receptor Location and Noise Monitoring Location

3.1 Environmental Noise Survey

An environmental noise survey was conducted in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO1996-2: 2017 *Acoustics - Description, Measurement and Assessment of Environmental Noise – Determination of Environmental Noise Levels.* Specific details are set out in the following sections.

3.2 Choice of Measurement Locations

One unattended noise monitoring location was selected for measurement. Figure 3 presents the measurement location (U1).

Location U1 Located adjacent to the closest residential receptors to the west of the site. The noise levels measured at this location are considered representative of those nearest receptors. An unattended meter was installed at this location.

3.3 Survey Periods

Noise measurements were conducted between 12:15 hrs on 10 November 2022 to 10:30 hrs on 15 November.

3.4 Personnel & Instrumentation

AWN installed and removed the monitoring equipment at the unattended location. The unattended noise measurements were conducted using a Rion NL-42 Sound Level Meter (S/N 575782). The measurement apparatus was check calibrated both before and after the measurement survey using a Brüel & Kjær Type 4231 Sound Level Calibrator.

3.5 Procedure

The unattended meter was set to log continuously for 15 minute periods with data being saved to the sound level meter for later analysis.

3.6 Measurement Parameters

The noise survey results are presented in terms of the following three parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{Amax} is the instantaneous maximum sound level measured during the sample period.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The “A” suffix denotes the fact that the sound levels have been “A-weighted” in order to account for the non-linear nature of human hearing.

All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

3.7 Results and Discussion

3.7.1 Location U1

Table 1 reviews the results of the noise monitoring carried out at Location U1.

Date	Period	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		$L_{Aeq,T}$	$L_{A10,T}$	$L_{A90,T}$
10/11/2022	Day*	53	54	50
	Night	50	50	45
11/11/2022	Day	54	54	50
	Night	43	45	39
12/11/2022	Day	53	54	50
	Night	46	48	41
13/11/2022	Day	54	55	51
	Night	43	44	37
14/11/2022	Day	52	53	49
	Night	46	47	41
15/11/2022	Day*	57	56	50
Average	Day	53	54	50
	Night	46	47	41

Table 1 Summary of Measured Noise Levels at Location U1

*Partial measurement of day omitted from averaged results

The average daytime (i.e. 07:00 to 23:00 hrs) noise levels over the survey period was 53 dB $L_{Aeq,16hr}$.

3.8 Additional Published Noise Data

Figure 4 presents the existing road traffic noise across the proposed development site as detailed in the Environmental noise directive (END) 2002/49/EC noise mapping (https://gis.epa.ie) for both L_{den} and L_{night} respectively. The contours indicate that the receptor locations typically experience a noise level of 55 to 59 dB L_{den}. These noise levels are typical of an urban environment location.

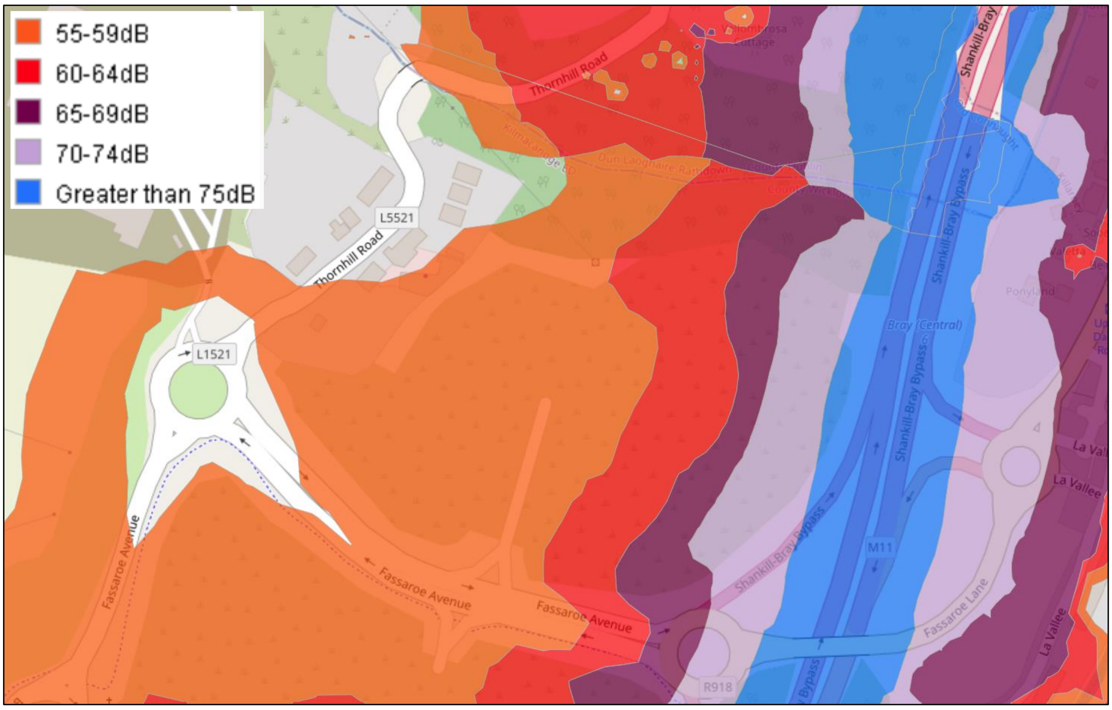

Figure 4 Noise Map of Site

4.0 REVIEW OF RELEVANT GUIDANCE

4.1 Construction Noise Impacts

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise*.

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities.

This document sets out guidance on permissible noise levels relative to the existing noise environment. Table 2 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors as recommended by BS 5228

– 1. These are cumulative levels, i.e. the sum of both ambient and construction noise levels.

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A Note A	Category B Note B	Category C Note C
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings and weekends Note D	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

Table 2 Example Threshold of Significant Effect at Dwellings
Note A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
Note B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
Note C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that this assessment method is only valid for residential properties.

This assessment process determines if a significant construction noise impact is likely. Notwithstanding the outcome of this assessment, the overall acceptable levels of construction noise set out in the Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[2], which should not be exceeded at noise sensitive locations during the construction phase of the development. Table 3 sets out these levels.

Days and Times	Noise Levels (dB re. $2x10^{-5}$ Pa)	
	$L_{Aeq(1hr)}$	L_{Amax}
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60*	65*
Saturdays 08:00 to 16:30hrs	65	75
Sundays & Bank Holidays 08:00 to 16:30hrs	60*	65*

Table 3 Maximum Permissible Noise Levels at the Facade of Dwellings during Construction
Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.

In exceptional circumstances there may be a requirement that certain construction works are carried out during night-time periods. Therefore, based on the above the following construction noise criteria are proposed for the site subject to review of planned noise survey results being reviewed in the study area:

70dB $L_{Aeq,1hr}$ at noise sensitive location
75dB $L_{Aeq,1hr}$ at commercial property

4.2 Construction Vibration Guidance

Peak particle velocity (PPV) is commonly used to assess the structural response of buildings to vibration. Reference to the following documents has been made for the purposes of this assessment in order to discuss appropriate PPV limit values.

- British Standard BS7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*, and;

2 *Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1, 25 October 2004*, Transport Infrastructure Ireland

- British Standard BS5228-2: 2009 + A1: 2014: *Code of practice for noise and vibration control on construction and open sites – Vibration*.

BS5228-2 and BS7385 advise that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero.

The recommended vibration limits in order to avoid cosmetic damage to buildings, as set out in both documents referred to above, are reproduced in Table 4. The documents note that minor structural damage can occur at vibration magnitudes which are greater than twice those presented in Table 4. Major damage to a building structure is possible at vibration magnitudes greater than four times the values set out in the Table. It should be noted that these values refer to the base of the building.

Vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
4 to 15 Hz	15 to 40 Hz	40 Hz and above
15 mm/s	20 mm/s	50 mm/s

Table 4 Transient Vibration Guide Values for Cosmetic Damage

Human response to vibration stimuli occurs at orders of magnitudes below those associated with any form of building damage, hence vibration levels lower than those indicated in Table 5 can lead to concern. BS5228-2 also provides a useful guide relating to the assessment of human response to vibration in terms of PPV. Whilst the guide values are commonly used to compare typical human response to construction works, they tend to relate closely to general levels of vibration perception from other general sources. Table 5 below summarises the range of vibration values and the associated potential effects on humans.

Vibration Level, PPV	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies. At lower frequencies people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1 mm/s	It is likely that a vibration level of this magnitude in residential environments will cause complaint.

Table 5 Guidance on Effects of Human Response to PPV Magnitudes

The standards note that single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. Where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 might be more appropriate to determine whether time varying exposure is likely to give rise to any degree of adverse comment.

4.3 Operational Noise Guidance

The key potential noise source associated with the site operation relates to traffic along the existing road network and traffic entering and exiting the car park. Given the existing road network already carries high traffic volumes, it is appropriate to consider the change in traffic noise level that may arise with and without the car park in operation.

In the absence of any Irish guidelines or standards relating to describing the effects associated with changes in road traffic noise levels, reference has been made to the

Design Manual for Roads and Bridges (2020) LA 111 Sustainability & Environmental Appraisal. Noise and Vibration Rev 2 (DMRB Noise and Vibration 2020). This document provides magnitude rating tables relating to changes in road traffic noise. Table 6 summarises the potential impact associated with defined changes in traffic noise level.

DMRB Magnitude of Change	Change in Noise Level, dB
Major	Greater than or equal to 10.0
Moderate	5 to 9.9
Minor	3.0 to 4.9
Negligible	Less than 3.0

Table 6 Significance of Change Criteria

Where changes in traffic noise levels are less than 3dB, the impact is deemed not significant. Where changes in traffic noise levels are greater than 5dB, the impact is deemed to be potentially significant.

5.0 NOISE ASSESSMENT

In order to predict the expected noise levels associated with the proposed development at nearby noise sensitive locations comment and / or predictions have been prepared considering the following expected site activities:

- Construction Noise & Vibration;
- Additional traffic movements on local roads;
- Vehicle activity on new site roads; and,
- Car parking on site

5.1 Construction Noise

The largest noise and vibration impact of the proposed development will occur during the construction phase due to the operation of various plant machinery and HGV movement to, from and around the site. However, the construction phase can be classed as a short-term phase.

Thresholds for significant noise from construction can be determined by referring to Table 1 and the baseline ambient noise levels, as outlined in the assessment criteria section. The daytime significance threshold for construction noise at the site is set at 65 dB $L_{Aeq,T}$. A night-time threshold is not included as construction work will not be taking place at night.

BS 5228-1 contains noise level data for various construction machinery. The noise levels relating to site clearance, ground excavation and loading lorries (dozers, tracked excavators and wheeled loaders) reach a maximum of 81 dB $L_{Aeq,T}$ at a distance of 10 m. For this assessment, a worst-case scenario is assumed of 3 no. such items with a sound pressure level (SPL) of 81 dB at 10 m operating simultaneously along the closest works boundary. This would result in a total noise level of 86 dB at 10 m and an equivalent combined sound power level of 114 dB L_{WA}. This worst-case scenario is the typical assumption made for developments of this size, on the basis that it is unlikely that more than 3 no. items of such plant/equipment would be operating simultaneously in such close proximity to each other.

Guidance on the approximate attenuation achieved by barriers surrounding the site is also provided in BS 5228-1. It states that when the top of the plant is just visible to the receiver over the noise barrier, an approximate attenuation of 5 dB can be assumed, while a 10 dB attenuation can be assumed when the noise screen completely hides the sources from the receiver.

This scenario can be assumed in this case due to the proximity of the noise-sensitive locations, i.e. a barrier height will be chosen so as to partially hide the source. Table 7 shows the potential noise levels calculated at various distances based on the assumed sound power level and attenuation provided by the barrier of 10 dB.

Description of Noise Source	Sound Power Level (dB L_w(A))	Calculated noise levels at varying distances (dB $L_{Aeq,T}$)				
		10	20	30	50	100
3 no. items each with SPL of 81 dB at 10 m operating simultaneously.	114	81	75	71	67	61

Table 7 Potential construction noise levels at varying distances assuming attenuation of 10 dB from site barrier

The calculated noise levels in Table 7 show that construction noise levels will be within the adopted criteria and that the impacts will likely be not significant.

5.2 Additional Traffic Movements on Public Roads

A traffic impact assessment relating to the proposed development has been prepared as part of this planning assessment. Information from this report has been used to determine the predicted change in noise levels in the vicinity of a number of roads in the area surrounding the proposed development, for the opening and design years.

For the purposes of assessing potential noise impact, it is appropriate to consider the relative increase in noise level associated with traffic movements on existing roads and junctions with and without the development. This is presented in Table 8.

Ref	Description	AADT (2024)		AADT (2029)		AADT (2039)		Maximum Change in Noise Level (dB)	Impact
		Do Nothing	Do Something	Do Nothing	Do Something	Do Nothing	Do Something		
A	N11 North Ramp	1721	1754	2467	2500	2812	2845	+0.1	Negligible
B	R918	6879	7302	7907	8369	8377	8916	+0.3	
C	N11 South Ramp	4141	4497	4301	4692	4378	4839	+0.4	
D	Fassaroe Lane	2848	3660	4036	4921	4583	5615	+0.9	
E	N11 Main	71937	71437	78979	78417	83698	83014	+0.0	

Table 8 Noise Level Changes Due To Increased Traffic on Public Roads

The results of the predictions indicate that the noise impact due to increased read traffic on existing roads will be negligible.

5.3 Vehicle Activity on New Site Roads

The site entrance will pass by receptor R1 at a distance of approximately 100m, consequently a traffic noise assessment has been undertaken to determine whether traffic along this new road and car park will have an impact on receptors in this location.

The noise level associated with an event of short duration, such as a passing vehicle movement, may be expressed in terms of its Sound Exposure Level (L_{AX}). The Sound Exposure Level can be used to calculate the contribution of an event or series of events to the overall noise level in a given period.

The appropriate formula is given below:

$$L_{Aeq,T} = L_{AX} + 10\log10(N) - 10\log10(T) + 10\log10(r_1/r_2) \quad \text{dB}$$

where:

$L_{Aeq,T}$ is the equivalent continuous sound level over the time period T (in seconds);
L_{AX} is the "A-weighted" Sound Exposure Level of the event considered(dB);
N is the number of events over the course of time period T;
r_1 is the distance at which L_{AX} is expressed;
r_2 is the distance to the assessment location.

The assumed mean value of Sound Exposure Level for cars and HGVs is in the order of 73 dB L_{AX} and 88 dB L_{AX} respectively at a distance of 5 metres. These values have been used to calculate the noise levels as a result of site traffic in isolation.

It's understood that worst case peak hour demand for the site will be 114 cars and 3 buses (6 trips total to account for the bus entering and exiting the site). Table 9 provides the calculated noise levels for the operation of the new site road at a distance of 100m where the closest receptor is located.

Predicted Peak Hour Noise Level from P&R Usage			
Number of LGV's	Number of HGV's	Calculated Noise Level dBA @ 5m from road	Calculated Noise Level dBA @ 100m from road (R1)
114	6	62	49

Table 9 Predicted Noise Levels due to Development Traffic in Isolation

5.4 Total Operational Noise Level

Table 10 presents the overall change in noise level when considering both the additional traffic on public roads and additional traffic on the new access road and car park.

Receptor	Baseline (dBA)	Change in Noise Level from Public Roads	Calculated Noise Level from New Site Road dBA at Receptor R1	Total Noise Level at Receptor	Overall Change in Noise Level dB	Overall Impact
R1	53	+1.1	49	55	+2	Negligible

Table 10 Predicted Total Noise Levels due to Development Traffic

As can be seen in Table 15, the overall calculated noise level at the closest receptor location is 55 dBA. It should be noted that these calculations are worst case, they don't account for reduction of noise over soft ground, nor do they account for the landscaping of the car park which will likely provide partial screening to the nearest receptor locations (see Figure 5). Despite this, the assessment concludes that the operational impact will be negligible and imperceptible.

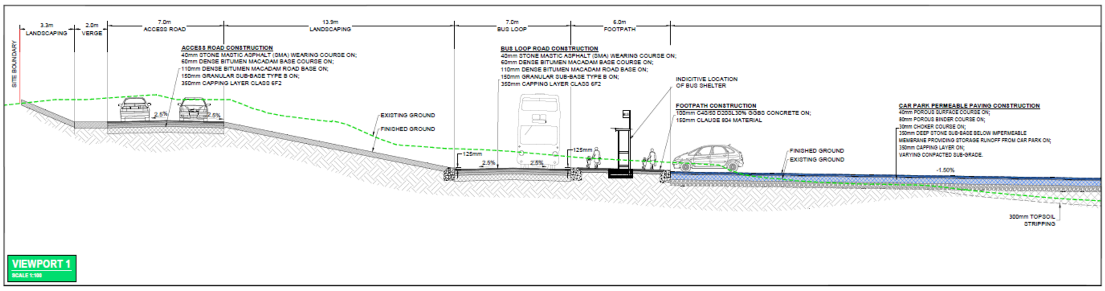

Figure 5 Section of Development Showing Landscaping

8.0 CONCLUSIONS

The applicant is lodging a planning application seeking to develop a new park and ride facility in Fassaroe.

The relevant criteria adopted have been satisfied in all instances assessed here. Comment has also been presented in relation to expected changes in noise levels due to the development.

During the construction phase predictions indicate that construction noise levels will be within the adopted criteria and that impacts will be not significant.

In all operational instances a negligible impact is identified and therefore, based on the assessment presented here, no significant impact on residential amenity is predicted from the proposed operations.

APPENDIX A
GLOSSARY OF ACOUSTIC TERMINOLOGY

ambient noise — The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.

background noise — The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).

broadband — Sounds that contain energy distributed across a wide range of frequencies.

dB — Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μPa).

dB L_{pA} — An ‘A-weighted decibel’ - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. ‘A’–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

Hertz (Hz) — The unit of sound frequency in cycles per second.

impulsive noise — A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background.

$L_{Aeq,T}$ — This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T).The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.

L_{AFN} — The A-weighted noise level exceeded for N% of the sampling interval. Measured using the “Fast” time weighting.

L_{AFmax} — is the instantaneous slow time weighted maximum sound level measured during the sample period (usually referred to in relation to construction noise levels).

$L_{Ar,T}$ — The Rated Noise Level, equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and impulsiveness of the sound.

L_{AF90} — Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the “Fast” time weighting.

APPENDIX A
GLOSSARY OF ACOUSTIC TERMINOLOGY

L_{AT}(DW) equivalent continuous downwind sound pressure level.

L_{fT}(DW) equivalent continuous downwind octave-band sound pressure level.

L_{day} L_{day} is the average noise level during the day time period of 07:00hrs to 19:00hrs

L_{night} L_{night} is the average noise level during the night-time period of 23:00hrs to 07:00hrs.

low frequency noise LFN - noise which is dominated by frequency components towards the lower end of the frequency spectrum.

noise Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a person exposed to it, or any sound that could cause actual physiological harm to a person exposed to it, or physical damage to any structure exposed to it, is known as noise.

noise sensitive location NSL – Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.

octave band A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.

rating level See $L_{Ar,T}$.

sound power level The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per m^2 where:

$$Lw = 10 Log \frac{P}{P_0} \text{ dB}$$

Where: p is the rms value of sound power in pascals; and P_0 is 1 pW.

sound pressure level The sound pressure level at a point is defined as:

$$Lp = 20 Log \frac{P}{P_0} \text{ dB}$$

APPENDIX A
GLOSSARY OF ACOUSTIC TERMINOLOGY

specific noise level A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS 4142, there is a more precise definition as follows: 'the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval ($L_{Aeq,\ T}$)'.

tonal Sounds which cover a range of only a few Hz which contains a clearly audible tone i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'.

$^1/_3$ octave analysis Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one–third of an octave each.

Appendix D

PARK & RIDE M11 JUNCTION 6 (FASSAROE)

AIR QUALITY

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CONTENTS

1.0 INTRODUCTION

This chapter assesses the likely significant air quality impacts associated with the proposed development at the Park & Ride M11 Junction 6 (Fassaroe).

This chapter will provide an overview of the existing air quality conditions in the proposed development site, identify the relevant air quality standards and guidelines, describe the sources of air pollution associated and potential impacts of the proposed development, define mitigation measures that will be implemented to minimise the potential air quality impacts, and define the residual effects of the proposed development after the implementation of mitigation measures.

2.0 METHODOLOGY

2.1 CRITERIA FOR RATING OF IMPACTS

2.1.1 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.

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 2022 (S.I. No. 739 of 2022), which incorporate European Commission Directive 2008/50/EC which has set limit values for a number of pollutants with the limit values for NO_2, PM_{10} and $PM_{2.5}$ being relevant to this assessment (see Table 1). Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent daughter directives (including 1999/30/EC and 2000/69/EC).

Table 1 *Ambient Air Quality Standards & TA Luft*

Pollutant	Regulation Note 1	Limit Type	Value
Dust Deposition	TA Luft (German VDI 2002)	Annual average limit for nuisance dust	350 mg/m^2/day
Nitrogen Dioxide (NO_2)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	40 µg/m^3 PM_{10}

Pollutant	Regulation Note 1	Limit Type	Value
Particulate Matter (as $PM_{2.5}$) Stage 1	2008/50/EC	Annual limit for protection of human health	25 µg/m^3 $PM_{2.5}$
Particulate Matter (as $PM_{2.5}$) Stage 2 Note 2	2008/50/EC	Annual limit for protection of human health	20 µg/m^3 $PM_{2.5}$

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

Note 2 Stage 2 indicative limit value for $PM_{2.5}$ to be applied from 1 January 2020 after review by the European Commission

In April 2023, the Government of Ireland published the Clean Air Strategy for Ireland (Government of Ireland 2023), which provides a high-level strategic policy framework needed to reduce air pollution. The strategy commits Ireland to achieving the 2021 WHO Air Quality Guidelines Interim Target (IT) 3 by 2026, the IT4 targets by 2030 and the final targets by 2040 (shown in Table 2). The strategy notes that a significant number of EPA monitoring stations observed air pollution levels in 2021 above the WHO targets; 80% of these stations would fail to meet the final $PM_{2.5}$ target of 5 µg/m^3. The strategy also acknowledges that "meeting the WHO targets will be challenging and will require legislative and societal change, especially with regard to both $PM_{2.5}$ and NO_2". Ireland will revise its air quality legislation in line with the proposed EU revisions to the CAFE Directive, which will set interim 2030 air quality standards and align the EU more closely with the WHO targets.

Table 2 WHO Air Quality Guidelines

Pollutant	**Regulation**	**Limit Type**	**IT3 (2026)**	**IT4 (2030)**	**Final Target (2040)**
NO_2	WHO Air Quality Guidelines	24-hour limit for protection of human health	50µg/m^3 NO_2	50µg/m^3 NO_2	25µg/m^3 NO_2
		Annual limit for protection of human health	30µg/ m^3 NO_2	20µg/ m^3 NO_2	10µg/m^3 NO_2
PM (as PM_{10})		24-hour limit for protection of human health	75µg/ m^3 PM_{10}	50µg/m^3 PM_{10}	45µg/m^3 PM_{10}
		Annual limit for protection of human health	30µg/ m^3 PM_{10}	20µg/ m^3 PM_{10}	15µg/m^3 PM_{10}
PM (as $PM_{2.5}$)		24-hour limit for protection of human health	37.5µg/m^3 $PM_{2.5}$	25µg/m^3 $PM_{2.5}$	15µg/m^3 $PM_{2.5}$
		Annual limit for protection of human health	15µg/m^3 $PM_{2.5}$5	10µg/m^3 $PM_{2.5}$	5µg/m^3 $PM_{2.5}$

2.1.2 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust which are less than 10 microns and the EU ambient air quality standards outlined in Section 2.1.1 have set ambient air quality limit values for PM_{10} and $PM_{2.5}$ for protection of human health.

Larger dust particles can give rise to dust that causes a nuisance, in Ireland there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development.

However, guidelines for dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/m^2/day averaged over a one-year period at any receptors outside the site boundary. The TA-Luft standard has been applied for the purpose of this assessment based on recommendations from the EPA in Ireland in the document titled 'Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (EPA, 2006). The document recommends that the Bergerhoff limit of 350 mg/m^2/day be applied to the site boundary of quarries. This limit value can be implemented with regard to dust impacts from construction of the proposed development.

2.2 CONSTRUCTION PHASE

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2014) outlines an assessment method for predicting the impact of dust emissions from demolition, earthworks, construction and haulage activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development in order to predict the likely risk of dust impacts in the absence of mitigation measures and to determine the level of site-specific mitigation required. Transport Infrastructure Ireland (TII) recommends the use of the IAQM guidance (2014) in the TII guidance document *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022a).

The major dust generating activities are divided into four types within the IAQM guidance (2014) to reflect their different potential impacts. These are: -

- Demolition.
- Earthworks.
- Construction.
- Trackout (movement of heavy vehicles).

The magnitude of each of the four categories is divided into Large, Medium or Small scale depending on the nature of the activities involved. The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities. This allows the level of site-specific mitigation to be determined.

Construction phase traffic also has the potential to impact air quality. The TII guidance *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022a), 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. While the guidance is specific to infrastructure projects the approach can be applied to any development that causes a change in traffic.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- Daily average speed change by 10 kph or more;
- Peak hour speed change by 20 kph or more;
- A change in road alignment by 5m or greater.

Clifton Scannell Emerson Associates Consulting Engineers have prepared a Traffic Impact Assessment for the proposed development and Chapter 12 of the environmental report, it has been determined by Clifton Scannell Emerson Associates Consulting Engineers that the construction stage traffic will not increase by 1,000 AADT, or 200 HDV AADT, the development will not result in speed changes or changes in road alignment, therefore the traffic does not meet the above scoping criteria. As a result, a detailed air quality assessment of construction stage traffic emissions has been scoped out from any further assessment as there is no potential for significant impacts to air quality.

2.3 OPERATIONAL PHASE

Operational phase traffic has the potential to impact local air quality as a result of increased vehicle movements associated with the proposed development. The TII scoping criteria detailed in Section 2.2 were used to determine if any road links are affected by the proposed development and require inclusion in a detailed air dispersion modelling assessment. Clifton Scannell Emerson Associates Consulting Engineers have prepared a Traffic Impact Assessment for the proposed development and Chapter 12 of environmental report, it has been determined by Clifton Scannell Emerson Associates Consulting Engineers that the proposed development will result in the operational phase traffic increasing by more than 1,000 AADT on a small number of road links. Therefore, in accordance with the TII scoping criteria a detailed air dispersion modelling assessment of operational phase traffic emissions was conducted.

The impact to air quality as a result of changes in traffic is assessed at sensitive receptors in the vicinity of affected roads. The TII guidance (2022a) states a proportionate number of representative receptors which are located in areas which will experience the highest concentrations or greatest improvements as a result of the proposed development are to be included in the modelling. The TII criteria state that receptors within 200m of impacted road links should be assessed; roads which are more than 200m from a receptor will not impact pollutant concentrations at that receptor. The TII guidance (2022a) defines sensitive receptor locations as: residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present. A total of 5 no. high sensitivity residential receptors (R1 – R5) were included in the modelling assessment (see Figure 1).

The TII guidance (2022a) states that modelling should be conducted for NO_2 and PM_{10} for the base, opening and design years for both the do minimum (do nothing) and do something scenarios. The modelling of PM_{10} can be used to show that the project does not impact on the $PM_{2.5}$ limit value as if compliance with the PM_{10} limit is achieved then compliance with the $PM_{2.5}$ limit will also be achieved. Modelling of operational NO_2 and PM_{10} concentrations has been conducted for the do nothing and do something scenarios using the TII Road Emissions Model (REM) online calculator tool (TII, 2022b).

The following inputs are required for the REM tool: receptor locations, light duty vehicle (LDV) annual average daily traffic movements (AADT), annual average daily heavy duty vehicles (HDV AADT), annual average traffic speeds, road link lengths, road type, project county location and pollutant background concentrations. The *Default* fleet mix option was selected along with the *Intermediate Case* fleet data base selection, as per TII Guidance (TII, 2022b). The *Intermediate Case* assumes a linear interpolation between the *Business as Usual* case – where current trends in vehicle ownership continue and the *Climate Action Plan (CAP)* case – where adoption of low emission light duty vehicles occurs.

Using this input data the model predicts the road traffic contribution to ambient ground level concentrations at the identified sensitive receptors using generic meteorological data. The TII REM uses county-based Irish fleet composition for different road types, for different European emission standards from pre-Euro to Euro 6/VI with scaling factors to reflect improvements in fuel quality, retrofitting, and technology conversions. The TII REM also includes emission factors for PM_{10} emissions associated with brake and tyre wear (TII, 2022b). The predicted road contributions are then added to the existing background concentrations to give the predicted ambient concentrations. The 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 document *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022a) details a methodology for determining air quality impact significance criteria for road schemes which can be applied to any project that causes a change in traffic. The degree of impact is determined based on the percentage change in pollutant concentrations relative to the do nothing scenario. The TII significance criteria are outlined in Table 4.9 of *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106* (TII, 2022a) and reproduced in Table 3 below. These criteria have been adopted for the proposed development to predict the impact of NO_2 and PM_{10} emissions as a result of the proposed development.

Table 3 *Air Quality Significance Criteria*

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Standard Value (AQLV)			
	1%	2-5%	6-10%	>10%
75% or less of AQLV	Neutral	Neutral	Slight	Moderate
76 – 94% of AQLV	Neutral	Slight	Moderate	Moderate
95 – 102% of AQLV	Slight	Moderate	Moderate	Substantial
103 – 109% of AQLV	Moderate	Moderate	Substantial	Substantial
110% or more of AQLV	Moderate	Substantial	Substantial	Substantial

Source: TII (2022a) Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106

<u>Traffic Data Used in Modelling Assessment</u>

Traffic flow information detailed in Table 4 was obtained from Clifton Scannell Emerson Associates Consulting Engineers for the purposes of this assessment. Data for the Base Year 2022 and the Do Nothing and Do Something scenarios for the opening year 2024 and design year 2039 were provided. A conservative growth factor has been applied to the traffic data to allow for cumulative development within the area. Specific cumulative developments were also investigated but it was found that there were no specific permitted developments that would lead to cumulative traffic impacts due to their increased distance from the site (see Traffic Impact Assessment and Chapter 12 for further details).

The modelling assessment has been undertaken for road links as impacts on Fassaroe Lane met the TII scoping criteria and that were within 200m of receptors. Background concentrations have been included as per Section 4.2 of this chapter based on available EPA background monitoring data (EPA, 2022).

Table 4 *Traffic Data used in Air Modelling Assessment*

Road Name	Speed (kph)	Base Year 2022	Opening Year 2024		Design Year 2039	
			Do Nothing	Do Something	Do Nothing	Do Something
		LDV AADT (HDV AADT)	LDV AADT (HDV AADT)	LDV AADT (HDV AADT)	LDV AADT (HDV AADT)	LDV AADT (HDV AADT)
N11 North Ramp	80	1516 (206)	1516 (206)	1510 (244)	2620 (192)	2614 (231)
R918	80	6436 (443)	6436 (443)	6781 (521)	7948 (429)	8411 (505)
N11 South Ramp	120	3900 (241)	3900 (241)	4219 (279)	4140 (239)	4564 (275)
Fassaroe Lane	50	2304 (544)	2304 (544)	2959 (701)	4074 (509)	4956 (659)
N11 Main	120	66488 (3330)	68362 (3575)	67824 (3612)	78628 (5070)	77924 (5090)

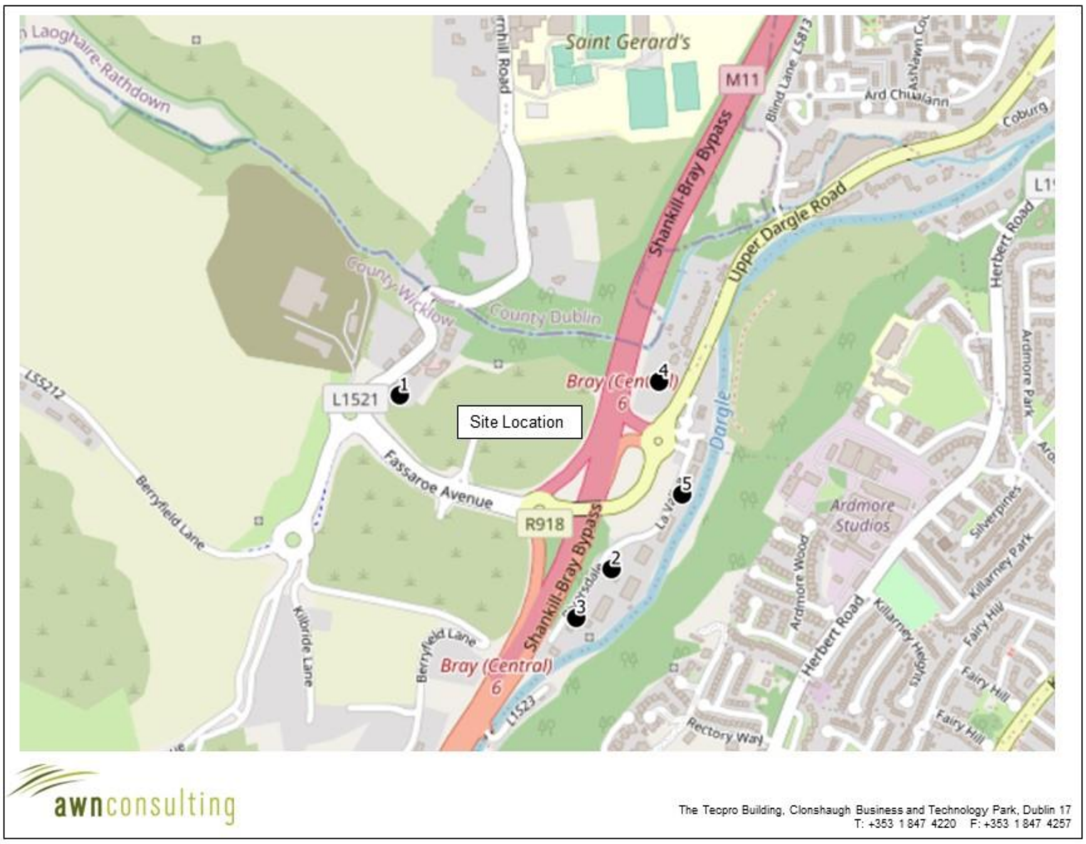

Figure 1 *Sensitive Receptors included in Operational Phase Air Quality Modelling Assessment*

3.0 DIFFICULTIES IN COMPILING THE ASSESSMENT

There were no significant difficulties encountered in compiling the specified information for this assessment.

4.0 RECEIVING ENVIRONMENT

4.1 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) (WHO, 2006). 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_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Dublin Airport meteorological station, which is located approximately 26 km north of the site. Dublin Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 2). For data collated during five representative years (2017 - 2021), the predominant wind direction is westerly to south-westerly; the mean wind speed over the long term 30 year averaging period 1981 - 2010 is 5.5 m/s (Met Eireann, 2023).

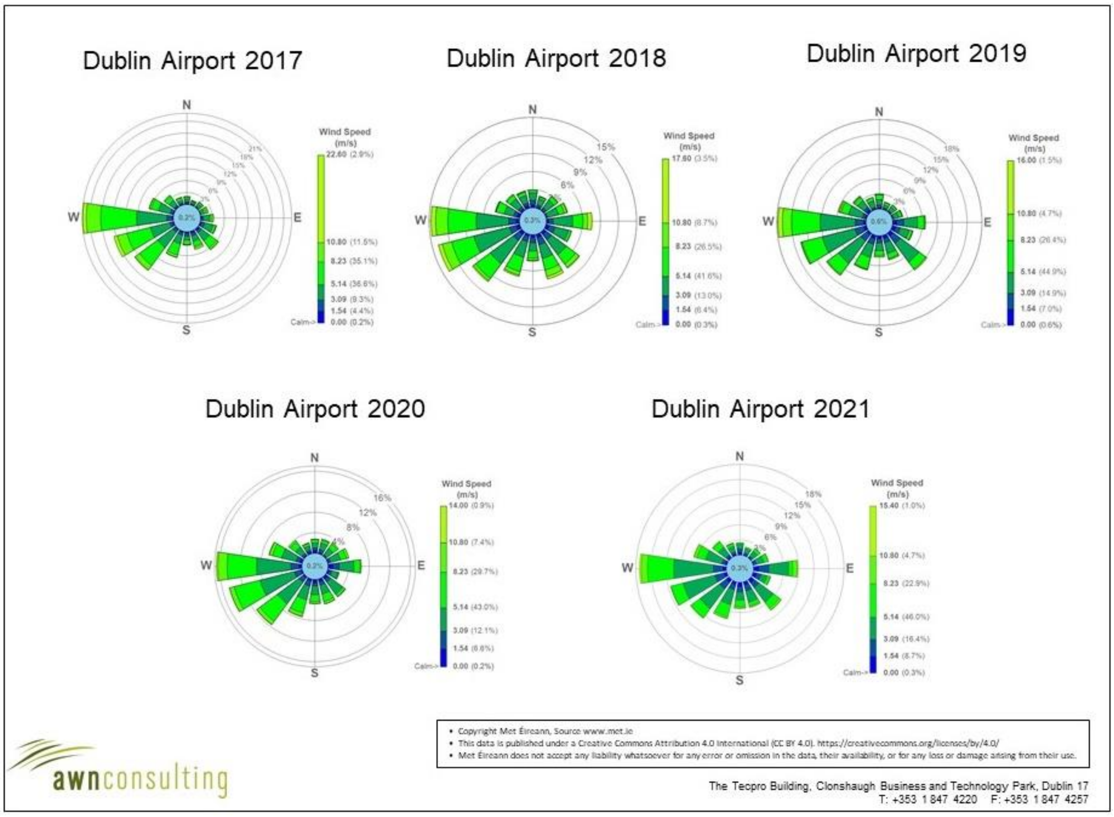

Figure 2 *Dublin Airport Windrose 2017 – 2021 (Met Eireann, 2023)*

4.2 BASELINE AIR QUALITY

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent EPA published annual report on air quality "*Air Quality In Ireland 2021*" (EPA 2022) details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes as outlined within the EPA document titled 'Air Quality In Ireland 2021' (EPA 2022). 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, the area of the proposed development is on the boundary between Zone A and Zone D. As the location is on the boundary and close to a major source of background air emissions (N11) a conserative approach will be taken for baseline air quality. This will result in the use of suburban Zone A stations as the baseline.

In 2020 the EPA reported (EPA, 2021) that Ireland was compliant with EU legal air quality limits at all locations, however this was largely due to the reduction in traffic due to Covid-19 restrictions. The EPA *Air Quality in Ireland 2020* report details the effect that the Covid-19 restrictions had on air monitoring stations, which included reductions of up to 50% at some monitoring stations which have traffic as a dominant source. For this reason, data from 2020 have been included in the baseline section for representative purposes only and previous long-term data has been used to determine baseline levels of pollutants in the vicinity of the proposed development.

NO_2

Long-term NO_2 monitoring was carried out at the Zone A suburban locations of Rathmines, Ballyfermot, Dun Laoghaire and Swords for the period 2017 - 2021 (EPA, 2022). Long term average concentrations are significantly below the annual average limit of 40 µg/m^3 for the suburban locations. Average results range from 11 – 22 µg/m^3 (Table 5). The NO_2 concentrations in Rathmines for this five year period suggests an overall average of 17 µg/m^3 as a background concentration. Based on the above information a conservative estimate of the current background NO_2 concentration for the region of the proposed development is 17 µg/m^3.

Table 5 *Background NO_2 Concentrations In Zone A Locations (µg/m^3)*

Station	Station Classification	Averaging Period Note 1	Year				
			2017	2018	2019	2020	2021
Rathmines	Suburban Background	Annual Mean NO_2 (µg/m^3)	17	20	22	13	14
		99.8th%ile 1-hr NO_2 (µg/m^3)	86	87	102	81	69
Ballyfermot	Suburban Background	Annual Mean NO_2 (µg/m^3)	17	17	20	12	13
		99.8th%ile 1-hr NO_2 (µg/m^3)	112	101	101	83	73
Dun Laoghaire	Suburban Background	Annual Mean NO_2 (µg/m^3)	17	19	15	14	16
		99.8th%ile 1-hr NO_2 (µg/m^3)	101	91	91	78	73
Swords	Suburban Background	Annual Mean NO_2 (µg/m^3)	14	16	15	11	11
		99.8th%ile 1-hr NO_2 (µg/m^3)	79	85	80	65	63

Note 1 Annual average limit value of 40 µg/m^3 and hourly limit value of 200 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).

PM_{10}

Continuous PM_{10} monitoring was carried out at the Zone A locations of Rathmines, Dun Laoghaire, Ballyfermot and Phoenix Park from 2017 - 2021. These showed an upper average limit of no more than 16 µg/m^3 (Table 6). Levels range from 9 – 16 µg/m^3 over the five year period with at most 9 exceedances of the 24-hour limit value of 50 µg/m^3 in Rathmines in 2019 (35 exceedances are permitted per year) (EPA, 2022). Sufficient data is available for the urban background location in the Phoenix Park to observe long-term trends in the data. Data from 2017 – 2021 suggests an upper average annual mean value of at most 10 µg/m^3 as a background concentration at the

Phoenix Park location. Based on the EPA data, a conservative estimate of the current background PM_{10} concentration in the region of the proposed development is 12 µg/m³.

Table 6 *Background PM_{10} Concentrations In Zone A Locations (µg/m³)*

Station	Station Classification	Averaging Period	Year				
			2017	2018	2019	2020	2021
Ballyfermot	Suburban Background	Annual Mean PM_{10} (µg/m³)	12	16	14	12	12
		24-hr Mean > 50 µg/m³ (days)	1	0	7	2	0
Dún Laoghaire	Suburban Background	Annual Mean PM_{10} (µg/m³)	12	13	12	12	11
		24-hr Mean > 50 µg/m³ (days)	2	0	2	0	0
Rathmines	Suburban Background	Annual Mean PM_{10} (µg/m³)	13	15	15	11	12
		24-hr Mean > 50 µg/m³ (days)	5	2	9	2	0
Phoenix Park	Urban Background	Annual Mean PM_{10} (µg/m³)	9	11	11	10	10
		24-hr Mean > 50 µg/m³ (days)	1	0	2	0	0

Note 1 Annual average limit value of 40 µg/m³ and 24-hour limit value of 50 µg/m³ (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022).

$PM_{2.5}$

Monitoring of both PM_{10} and $PM_{2.5}$ takes place at the station in Rathmines which allows for the $PM_{2.5}/PM_{10}$ ratio to be calculated. Average $PM_{2.5}$ levels in Rathmines over the period 2017 – 2021 ranged from 9 – 10 µg/m³, with a $PM_{2.5}/PM_{10}$ ratio ranging from 0.60 – 0.75 (EPA, 2022). Based on this information, a conservative ratio of 0.8 was used to generate an existing $PM_{2.5}$ concentration in the region of the development of 9.6 µg/m³.

Based on the above information the air quality in the suburban Dublin area is generally good, with concentrations of the key pollutants generally well below the relevant limit values. However, the EPA have indicated that road transport emissions are contributing to increased levels of NO_2 with the potential for breaches in the annual NO_2 limit value in future years at locations within urban centres and roadside locations. In addition, burning of solid fuels for home heating is contributing to increased levels of particulate matter (PM_{10} and $PM_{2.5}$). The EPA predict that exceedances in the particulate matter limit values are likely in future years if burning of solid fuels for residential heating continues (EPA, 2022).

The current background concentrations have been used in the operational phase air quality assessment for both the opening and design year as a conservative approach in order to predict pollutant concentrations in future years. This is in line with the TII methodology (TII, 2022a).

4.3 SENSITIVITY OF THE RECEIVING ENVIRONMENT

In line with the UK Institute of Air Quality Management (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction'* (2014) prior to assessing the impact of dust from a proposed development the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are areas where people are present for short periods or where the public would not expect a high level of amenity.

In terms of receptor sensitivity to dust soiling, there are less than 10 no. high sensitivity residential properties within 100 m of the proposed development site boundary. Therefore, the overall sensitivity of the area to dust soiling impacts is considered low based on the IAQM criteria outlined in Table 7.

Table 7 *Sensitivity of the Area to Dust Soiling Effects on People and Property*

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	**Low**	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity based on type (residential receptors are classified as high sensitivity) and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the proposed development is 12 µg/m^3 and are less than 10 no. residential properties within 100 m of the proposed development boundary. Based on the IAQM criteria outlined in Table 8, the worst-case sensitivity of the area to human health is considered medium.

Table 8 *Sensitivity of the Area to Dust Related Human Health Impacts*

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)				
			<20	<50	<100	<200	<350
High	< 24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	**Low**	Low	Low
Medium	< 24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	< 24 µg/m^3	>1	Low	Low	Low	Low	Low

The IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to dust-related ecological impacts. Dust emissions can coat vegetation leading to a reduction in the photosynthesising ability of the plant as well as other effects. The guidance states that dust impacts to vegetation can occur up to 50 m from the site and 50 m from site access roads, up to 500m for the site entrance. There are no designated ecological sites within 50 m of the site or 500 m of the site entrance therefore there is no potential for impacts.

5.0 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development will consist of the redevelopment of the site to provide for:

- Four hundred (400) private car parking spaces including disabled and electric vehicle spaces.
- Bus-stops with passenger shelters.
- Good quality pedestrian and cycle infrastructure.
- A new site access junction onto the adjacent road to facilitate seamless access from/to the motorway.

A full description of the development is available in section 3 of the EIAR screening report. The sections below outline the characteristics of the proposed development as they relate to air quality. The following describes the primary sources of potential air and the primary sources of potential air quality impacts during the construction and operational phase.

5.1 CONSTRUCTION PHASE

During the construction stage the main source of air quality impacts will be as a result of fugitive dust emissions from site activities. Dust emissions will primarily occur as a result of demolition works, site preparation works, earthworks and the movement of trucks on site and exiting the site.

Construction stage traffic also has the potential to impact air quality through vehicle exhaust emissions. Clifton Scannell Emerson Associates Consulting Engineers have prepared a Traffic Impact Assessment for the proposed development and Chapter 12 of this environmental report. The construction stage traffic has been reviewed in line with the TII screening criteria (Section 2.2) and it was determined that a detailed air quality modelling assessment of construction stage traffic was not required due to the low level changes in traffic.

5.2 OPERATIONAL PHASE

The primary sources of air emissions in the operational context are deemed long term and will involve the change in traffic flows in the local areas which are associated with the development. There are small number of road links in close proximity to the proposed development that will experience a change in traffic volumes that meet the TII screening criteria (Section 2.2). Therefore, a detailed air quality modelling assessment of operational phase traffic emissions was conducted.

6.0 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

6.1 DO NOTHING SCENARIO

Under the Do Nothing Scenario no construction works will take place and the identified impacts of fugitive dust and particulate matter emissions will not occur. Impacts from increased traffic volumes and associated air emissions will also not occur. The ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from new developments in the surrounding area, changes in road traffic, etc.). The Do Nothing scenario for the operational phase is assessed within Section 6.3 and was assessed to be neutral. Therefore, overall the Do Nothing scenario can be considered neutral in terms of air quality.

6.2 CONSTRUCTION PHASE

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. While construction dust tends to be deposited within 350 m of a construction site, the majority of the deposition occurs within the first 50 m. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. A review of Dublin Airport meteorological data (see Section 8.3.1) indicates that the prevailing wind direction is westerly to south-westerly and wind speeds are generally moderate in nature. In addition, dust generation is considered negligible on days where rainfall is greater than 0.2 mm. A review of historical 30 year average data for Dublin Airport indicates that on average 191 days per year have rainfall over 0.2 mm (Met Eireann, 2023) and therefore it can be determined that over 50% of the time dust generation will be reduced.

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 4.3). As per Section 2.2 the major dust generating activities are divided into four types within the IAQM guidance to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (movement of heavy vehicles).

Demolition

There is no demolition associated with the proposed development.

Earthworks

Earthworks primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

Large: Total site area > 10,000 m^2, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved >100,000 tonnes;

Medium: Total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8 m in height, total material moved 20,000 – 100,000 tonnes;

Small: Total site area < 2,500 m^2, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 20,000 tonnes, earthworks during wetter months.

The site area is between 2,500 m^2 – 10,000 m^2. Therefore, the dust emission magnitude for the proposed earthwork activities can be classified as medium. As outlined in Table 9 and combined with the sensitivity from Section 3.3, this results in an overall low risk of dust soiling impacts and human health impacts as a result of the proposed earthworks activities.

Table 9 *Risk of Dust Impacts – Earthworks*

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	**Low Risk**	Negligible

Source (IAQM, 2014) Guidance on the Assessment of Dust from Demolition and Construction

<u>Construction</u>

Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

Large: Total building volume > 100,000 m^3, on-site concrete batching, sandblasting;

Medium: Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), on-site concrete batching;

Small: Total building volume < 25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

The dust emission magnitude for the proposed construction activities can be classified as small with some passenger shelters, bike shelter and lockers and driver welfare facilities. The construction processes will have low dust potential due to elements being preconstructed. As outlined in Table 10 and combined with the sensitivity from Section 3.3, this results in an overall negligible risk of dust soiling impacts and human health impacts as a result of the proposed construction activities.

Table 10 *Risk of Dust Impacts – Construction*

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	**Negligible**

Source (IAQM, 2014) Guidance on the Assessment of Dust from Demolition and Construction

Trackout

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

Large: > 50 HGV (> 3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100 m;

Medium: 10 - 50 HGV (> 3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100 m;

Small: < 10 HGV (> 3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.

During the peak excavation phase there will be a maximum of 50 outward HGV movements per day. In addition there is some areas of up to 100m of unpaved road on site. Therefore, the dust emission magnitude for the proposed trackout can be classified as medium. As outlined in Table 11 and combined with the sensitivity from Section 4.3, this results in an overall low risk of dust soiling impacts and human health impacts as a result of the proposed trackout activities.

Table 11 *Risk of Dust Impacts – Trackout*

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	**Low Risk**	Negligible

Source (IAQM, 2014) Guidance on the Assessment of Dust from Demolition and Construction

Summary of Dust Emission Risk

The risk of dust impacts as a result of the proposed development are summarised in Table 12 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

There is at most a high risk of dust soiling impacts and a medium risk of human health impacts associated with the proposed works therefore dust mitigation measures associated with low risk sites will be implemented to ensure there are no significant impacts at nearby sensitive receptors. In the absence of mitigation, dust impacts are predicted to be ***short-term, direct, negative*** and ***slight***.

Table 12 *Summary of Dust Impact Risk used to Define Site-Specific Mitigation*

Potential Impact	Dust Emission Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Emission Magnitude	N/A	Medium	Small	Medium
Dust Soiling Risk	N/A	Low Risk	Negligible Risk	Low Risk
Human Health Risk	N/A	Low Risk	Negligible Risk	Low Risk

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase. Particularly due to the movements of HGVs and construction workers accessing the site. It is estimated that on average 10 no. staff will be working on the site during the construction phase. The construction stage traffic was reviewed in line with the TII assessment criteria in Section 2.2 to determine whether a detailed air quality assessment of traffic emissions was required. As the construction stage traffic did not meet the screening criteria, a detailed air quality assessment of construction stage traffic emissions was screened out. It can be concluded that construction phase traffic emissions will have a ***short-term, localised, neutral*** and ***non-significant*** impact on air quality.

6.3 OPERATIONAL PHASE

The potential impact of the proposed development has been assessed by modelling emissions from the traffic generated as a result of the development. The traffic data includes the Do Nothing and Do Something scenarios (see Section 2.3). The impact of NO_2 and PM_{10} emissions for the opening and design years 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 TII guidance PE-ENV-01106 (TII, 2022a) details a methodology for determining air quality impact significance criteria for TII road schemes and infrastructure projects however, this significance criteria can be applied to any development that causes a change in traffic. The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the 'Do-Nothing' scenario, which assumes that the proposed development is not in place in future years, in order to determine the degree of impact.

The results of the assessment of the impact of the proposed development on NO_2 in the opening year 2024 and design year 2039 are shown in Table 13. The annual average concentration is in compliance with the limit value at the worst-case receptors in 2024 and 2039. Concentrations of NO_2 are at most 54% of the annual limit value in 2024 and 2039. There are predicted to be some increases in traffic between the opening and design years therefore, any decrease in concentration is due to increased uptake in electric vehicles and lower vehicle exhaust emissions. In addition, the TII guidance (2022a) states that the hourly limit value for NO_2 of 200 µg/m^3 is unlikely to be exceeded at roadside locations unless the annual mean is above 60 µg/m^3. As predicted NO_2 concentrations are significantly below 60 µg/m^3 (Table 13) it can be concluded that the short-term NO_2 limit value will be complied with at all receptor locations.

The impact of the proposed development on annual mean NO_2 concentrations can be assessed relative to "Do Nothing (DN)" levels. NO_2 concentrations at the receptors assessed will increase as a result of the proposed development when compared with the Do-Nothing scenario. There will be at most an increase of 0.07 µg/m^3 at receptor R1, this is a 0.1% change from baseline conditions. There are some reductions in concentrations at receptors 3 and 4 due to uptake of the park and ride facility. Where the predicted annual mean concentrations are less than 75% of the air quality standard (see Table 1) and there is a less than 5% change in concentrations compared with the Do-Nothing scenario then the impact is considered neutral as per the TII significance criteria (see Table 3). Therefore, the impact of the proposed development on NO_2 concentrations is neutral.

In relation to changes in PM_{10} concentrations as a result of the proposed development, the results of the assessment can be seen in Table 14 for the opening year 2023 and design year 2039. The annual average concentration is in compliance with the limit value at the worst-case receptors in 2024 and 2039. Concentrations of PM_{10} are at most 34% of the annual limit value in 2024 and 2039. In addition, the proposed development will not result in any exceedances of the daily PM_{10} limit value of 50 $\mu g/m^3$. The impact of the proposed development on annual mean PM_{10} concentrations can be assessed relative to “Do Nothing (DN)” levels. PM_{10} concentrations at the receptors assessed will increase as a result of the proposed development when compared with the Do-Nothing scenario. There will be at most an increase of 0.05 $\mu g/m^3$ at receptor R2, this is a 0.4% change from baseline conditions. As with NO_2, where the predicted annual mean concentrations are less than 75% of the air quality standard (see Table 1) and there is a less than 5% change in concentrations compared with the Do-Nothing scenario then the impact is considered neutral as per the TII significance criteria (see Table 3). Therefore, the impact of the proposed development on PM_{10} concentrations is neutral.

Overall, the potential impact of the proposed development on ambient air quality in the operational stage is considered ***long-term, localised, neutral, imperceptible*** and ***non-significant***.

Table 13 *Annual Mean NO_2 Concentrations ($\mu g/m^3$)*

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description	DN	DS	DS-DN	Description
1	17.2	17.3	0.07	Neutral	17.1	17.1	0.02	Neutral
2	20.7	20.7	0.01	Neutral	18.2	18.2	0.00	Neutral
3	21.8	21.7	-0.01	Neutral	18.5	18.5	0.00	Neutral
4	20.5	20.5	0.00	Neutral	18.1	18.1	-0.01	Neutral
5	18.1	18.1	0.04	Neutral	17.4	17.4	0.01	Neutral

Table 14 Annual Mean PM_{10} Concentrations ($\mu g/m^3$)

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description	DN	DS	DS-DN	Description
1	12.2	12.2	0.05	Neutral	12.2	12.3	0.06	Neutral
2	13.2	13.2	0.01	Neutral	13.2	13.3	0.02	Neutral
3	13.4	13.4	0.00	Neutral	13.4	13.4	0.00	Neutral
4	13.0	13.0	0.00	Neutral	13.0	13.0	0.00	Neutral
5	12.6	12.6	0.03	Neutral	12.7	12.7	0.04	Neutral

7.0 REMEDIAL AND MITIGATION MEASURES

7.1 CONSTRUCTION PHASE

The proposed development has been assessed as having a high risk of dust soiling impacts and a medium risk of dust related human health impacts during the construction phase as a result of demolition, earthworks, construction and trackout activities (see Section 6.2). Therefore, the following dust mitigation measures shall be implemented during the demolition and construction phases of the proposed development. These measures are appropriate for sites with a high risk of dust impacts and aim to ensure that no significant nuisance occurs at nearby sensitive receptors. The mitigation measures draw on best practice guidance from Ireland (DCC, 2018), the UK (IAQM (2014), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). Specific attention has been given to the measures required by Dublin City Council in their document *Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition* (DCC, 2018). These measures will be incorporated into the overall Construction Environmental Management Plan (CEMP) prepared for the site. The measures are divided into different categories for different activities.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before works commence on site. Community engagement includes explaining the nature and duration of the works to local residents and businesses.
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details.

Site Management

- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions. Dry and windy conditions are favourable to dust suspension therefore mitigations must be implemented if undertaking dust generating activities during these weather conditions.
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicles / Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15 kph haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.

- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.
- During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate to ensure moisture content is high enough to increase the stability of the soil and thus suppress dust.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure 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.
- Ensure 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.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

- A speed restriction of 15 kph will be applied as an effective control measure for dust for on-site vehicles.
- Street and footpath cleaning must be undertaken during the demolition and ground works phase to minimise dust emissions. This can be carried out using water-assisted dust sweeper(s). If sweeping using a road sweeper is not possible due to the nature of the surrounding area then a suitable smaller scale street cleaning vacuum will be used.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

Monitoring

- Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results in the site inspection log. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

- Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the demolition and ground works phases of the proposed development is required to ensure mitigation measures are working satisfactorily. This can be carried out 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^2/day during the monitoring period of 30 days (+/- 2 days).

7.2 OPERATIONAL PHASE

No mitigation is proposed for the operational phase of the proposed development as impacts to air quality will be neutral and non-significant.

8.0 MONITORING

8.1 CONSTRUCTION PHASE

During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions. The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised.

Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the demolition and ground works phases of the proposed development is required to ensure mitigation measures are working satisfactorily. This can be carried out 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^2/day during the monitoring period of 30 days (+/- 2 days).

8.2 OPERATIONAL PHASE

There is no monitoring recommended for the operational phase of the development as impacts to air quality is predicted to be imperceptible.

9.0 RESIDUAL EFFECTS OF THE PROPOSED DEVELOPMENT

9.1 CONSTRUCTION PHASE

9.1.1 Air Quality

When the dust mitigation measures detailed in the mitigation section of this report (Section 7.1) are implemented, the residual effect of fugitive emissions of dust and particulate matter from the site will be ***short term, direct, negative*** and ***slight*** in nature, posing no nuisance at nearby receptors.

9.1.2 Human Health

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the residual effect of construction of the proposed development will be ***short term, direct, negative*** and ***imperceptible*** with respect to human health.

9.2 OPERATIONAL PHASE

9.2.1 Air Quality

Air dispersion modelling of operational traffic emissions associated with the proposed development was carried out using the TII REM tool. The modelling assessment determined that the change in emissions of NO_2 and PM_{10} at nearby sensitive receptors as a result of the proposed development will be neutral. Therefore, the operational phase impact to air quality is ***long-term, localised, neutral, imperceptible*** and ***non-significant***.

9.2.2 Human Health

Emissions of air pollutants are predicted to be significantly below the ambient air quality standards which are based on the protection of human health. Therefore, impacts to human health are ***long-term, direct, neutral***, ***imperceptible*** and ***non-significant***.

10.0 CUMULATIVE IMPACTS

A full list of developments that are currently permitted or under construction within the surrounding area are identified in Appendix A and discussed in section 3.2 and 5.10 of the EIAR screening report.

10.1 CONSTRUCTION PHASE

According to the IAQM guidance (2014) should the construction phase of the proposed development coincide with the construction phase of any other development within 350 m then there is the potential for cumulative construction dust impacts to nearby sensitive receptors.

There is the potential for cumulative construction dust impacts should the construction phases overlap with that of the proposed development. However, the dust mitigation measures outlined in Section 7.1 will be applied throughout the construction phase of the proposed development which will avoid significant cumulative impacts on air quality. With appropriate mitigation measures in place, the predicted cumulative impacts on air quality associated with the construction phase of the proposed development are deemed short-term, direct, localised, negative and slight.

10.2 OPERATIONAL PHASE

There is the potential for cumulative impacts to air quality during the operational phase due to traffic associated with other existing and permitted developments within the area. The traffic data provided for the operational stage air quality assessment included cumulative traffic. A conservative growth factor was applied to the traffic data to allow for cumulative development within the area in the wider context. In addition, specific cumulative developments were also investigated as part of the traffic assessment, but it was found that there were no specific permitted developments that would lead to cumulative traffic impacts due to their increased distance from the site (see Traffic Impact Assessment in Appendix F for further details). Therefore, the cumulative operational phase impact is assessed within Section 6.3 and was found to have a neutral impact on air quality. The cumulative operational stage impact is long-term, localised, direct, neutral, imperceptible and non-significant.

11.0 REFERENCES

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UK Office of Deputy Prime Minister (2002) Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance

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Appendix E

PARK & RIDE M11 JUNCTION 6 (FASSAROE)

CLIMATE

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CONTENTS

1.0 INTRODUCTION

This assessment considers the likely significant climate impacts associated with the proposed Project at the Park & Ride M11 Junction 6 (Fassaroe).

This assessment will provide an overview of the existing climate baseline, identify the relevant climate policies and guidelines, describe the sources of greenhouse gases (GHGs) associated with the proposed Project and potential impacts of the proposed Project, define mitigation measures that will be implemented to minimise the potential climate impacts, and define the residual effects of the proposed Project after the implementation of mitigation measures. The vulnerability of the proposed Project to climate change has also been considered.

2.0 METHODOLOGY

2.1 CRITERIA FOR RATING OF IMPACTS

2.1.1.1 Climate Agreements and Policies

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the Act). The purpose of the Act was to enable Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050'* (3. (1) of No. 46 of 2015). This is referred to in the Act as the 'national transition objective'. The Act made provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The first Climate Action Plan (CAP) was published by the Irish Government in June 2019 (Government of Ireland, 2019). The Climate Action Plan 2019 outlined the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlined the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The 2019 CAP also detailed the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The Government published the second Climate Action Plan in November 2021 (Government of Ireland, 2021a) and a third update in December 2022 (Government of Ireland, 2022) with an Annex of Actions published in March 2023.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019, and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in December 2019, followed by the publication of the Climate Action and Low Carbon Development (Amendment) Act 2021 (hereafter referred to as the 2021 Climate Act) in March 2021. The Climate Act was signed into Law on the 23rd of July 2021, giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 Climate Act (Government of Ireland, 2021b) is to provide for the approval of plans "*for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050*". The 2021 Climate Act will also "*provide for carbon budgets and a decarbonisation target range for certain sectors of the economy*". The 2021 Climate Act defines the carbon budget as "*the total amount of greenhouse gas emissions that are permitted during the budget period*".

In relation to carbon budgets, the 2021 Climate Action and Low Carbon Development (Amendment) Act states '*A carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Climate Change Advisory Council, finalised by the Minister and approved by the Government for the period of 5 years commencing on the 1 January 2021 and ending on 31 December 2025 and for each subsequent period of 5 years (in this Act referred to as a 'budget period')*'. The carbon budget is to be produced for 3 sequential budget periods, as shown in Table 1 The carbon budget can be revised where new obligations are imposed under the law of the European Union or international agreements or where there are significant developments in scientific knowledge in relation to climate change. In relation to the sectoral emissions ceiling, the Minister for the Environment, Climate and Communications (the Minister for the Environment) shall prepare and submit to government the maximum amount of Greenhouse Gas (GHG) emissions that are permitted in different sectors of the economy during a budget period and different ceilings may apply to different sectors. The sectorial emission ceilings for 2030 were published in July 2022 and are shown in Table 2. Transport has a 50% reduction requirement and a 2030 emission ceiling of 6 $MtCO_{2eq}$[1].

Table 1 *5-Year Carbon Budgets 2021-2025, 2026-2030 and 2031-2025*

Sector	Reduction Required	2018 Emissions ($MtCO_2eq$)
2021-2025	295 Mt CO_{2eq}	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200 Mt CO_{2eq}	Reduction in emissions of 8.3% per annum for the second budget period.
2031-2035	151 Mt CO_{2eq}	Reduction in emissions of 3.5% per annum for the third provisional budget.

Table 2 *Sectoral Emission Ceilings 2030*

Sector	Reduction Required	2018 Emissions ($MtCO_{2eq}$)	2030 Emission Ceiling ($MtCO_{2eq}$)
Electricity	75%	10.5	3
Transport	50%	12	6
Buildings (Commercial and Public)	45%	2	1
Buildings (Residential)	40%	7	4
Industry	35%	7	4
Agriculture	25%	23	17.25
Other (F-Gases, Waste and Petroleum refining)	50%	2	1

[1] Mt CO_{2eq} denotes million tonnes carbon dioxide equivalent.

In December 2022, CAP23 was published (Government of Ireland 2022). This is the first CAP since the publication of the carbon budgets and sectoral emissions ceilings, and it aims to implement the required changes to achieve a 51% reduction in carbon emissions by 2030. The CAP has six vital high impact sectors where the biggest savings can be made: renewable energy, energy efficiency of buildings, transport, sustainable farming, sustainable business and change of land-use. CAP23 states that the decarbonisation of Ireland's manufacturing industry is key for Ireland's economy and future competitiveness. There is a target to reduce the embodied carbon in construction materials by 10% for materials produced and used in Ireland by 2025 and by at least 30% for materials produced and used in Ireland by 2030. CAP23 states that these reductions can be brought about by product substitution for construction materials and reduction of clinker content in cement. Cement and other high embodied carbon construction elements can be reduced by the adoption of the methods set out in the Construction Industry Federation 2021 report Modern Methods of Construction. In order to ensure economic growth can continue alongside a reduction in emissions, the IDA Ireland will also seek to attract businesses to invest in decarbonisation technologies.

€11 billion on new public transport infrastructure will be spent by 2030 in order to achieve the CAP23 goals including €60 million on greenways and €360 million on walking and cycling infrastructure. Key transport actions are considered using a 'Avoid-Shift-Improve' framework:

- *developing services, communities, and infrastructure in such a manner as to AVOID the need to travel as much as we do today.*
- *improving the relative attractiveness of sustainable travel modes such as Public Transport, Cycling and Walking, to SHIFT away from car use; this will facilitate increased use of lower-carbon modes and reduce the percentage of total journeys that are made by private car (modal share) from over to 70% (today) to just over 50% in 2030; and*
- *complement these measures by increasing the proportion of EVs in our car fleet to 30% by 2030, which will IMPROVE the efficiency of the national car fleet; electrification of the freight and public transport sector will also be key.*

CAP23 aims to reduce the dependency on private cars and reduce the total distance driven across all car journeys by 20%. This will be made possible by 70% of people in rural Ireland having buses that provide at least 3 trips to the nearby town daily by 2030 and ensuring that walking, cycling and public transport to account for 50% of our journeys. By 2030, there is an aim that 1 in 3 cars will be electric, in addition an annual increase in the percentage of biofuel in fossil fuels (E10:B12 by 2025 and E10:B20 by 2030) will be required. E10 is unleaded petrol blended 10% ethanol, B20 is up to 12% biodiesel blended into diesel. Use of Park and Rides aims to assist the shift towards public transport use and shifting away from full journeys being completed by private vehicles.

In April 2023 the Government published a draft Long-term Strategy on Greenhouse Gas Emissions Reductions (Government of Ireland 2023). This strategy provides a long-term plan on how Ireland will transition towards net carbon zero by 2050, achieving the interim targets set out in the Climate Action Plan. The strategy will be updated on the basis of a second round of public consultation throughout 2023 with an updated strategy published after this is complete.

2.1.1.2 Climate Assessment Significance Criteria

The climate assessment is divided into two distinct sections – a greenhouse gas assessment (GHGA) and a climate change risk assessment (CCRA).

- Greenhouse Gas Emissions Assessment (GHGA) – Quantifies the GHG emissions from a project over its lifetime. The assessment compares these emissions to relevant carbon budgets, targets and policy to contextualise magnitude.
- Climate Change Risk Assessment (CCRA) – Identifies the impact of a changing climate on a project and receiving environment. The assessment considers a projects vulnerability to climate change and identifies adaptation measures to increase project resilience.

The significance criteria for each assessment are described below.

Significance Criteria for GHGA

The Transport Infrastructure Ireland (TII) guidance document entitled *PE-ENV-01104 Climate Guidance for National Roads, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document* (TII 2022a) outlines a recommended approach for determining the significance of both the construction and operational phases of a development. The approach is based on comparing the '*Do Something*' scenario and the net project GHG emissions (i.e. *Do Something – Do Minimum*) to the relevant carbon budgets (Department of the Taoiseach 2022). With the publication of the Climate Action Act in 2021, sectoral carbon budgets have been published for comparison with the Net CO_2 project GHG emissions from the proposed Project. The Transport sector emitted approximately 12 $MtCO_{2eq}$ in 2018 and has a ceiling of 6 $MtCO_{2eq}$ in 2030 which is a 50% reduction over this period (see Table 2).

The significance of GHG effects set out in PE-ENV-01104 (TII, 2022a) is based on IEMA guidance (IEMA, 2022) which is consistent with the terminology contained within Figure 3.4 of the EPA's (2022) 'Guidelines on the information to be contained in Environmental Impact Assessment Reports'.

The 2022 IEMA Guidance (IEMA, 2022) sets out the following principles for significance:

- When evaluating significance, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative or negligible;

- Where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project's residual emissions at all stages; and

- Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project's remaining emissions should be considered.

TII (TII 2022a) states that professional judgement must be taken into account when contextualising and assessing the significance of a project's GHG impact. In line with IEMA Guidance (IEMA, 2022), TII state that the crux of assessing significance is "*not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*".

Significance is determined using the criteria outlined in Table 3 (derived from Table 6.7 of PE-ENV-01104 (TII 2022a)) along with consideration of the following two factors:

- The extent to which the trajectory of GHG emissions from the project aligns with Ireland's GHG trajectory to net zero by 2050; and
- The level of mitigation taking place.

Table 3 *GHGA Significance Criteria*

Effects	Significance level Description	Description
Significant adverse	Major adverse	• The project's GHG impacts are not mitigated. • The project has not complied with do-minimum standards set through regulation, nor provided reductions required by local or national policies; and • No meaningful absolute contribution to Ireland's trajectory towards net zero.
	Moderate adverse	• The project's GHG impacts are partially mitigated. • The project has partially complied with do-minimum standards set through regulation, and have not fully complied with local or national policies; and • Falls short of full contribution to Ireland's trajectory towards net zero.
Not significant	Minor adverse	• The project's GHG impacts are mitigated through 'good practice' measures. • The project has complied with existing and emerging policy requirements; and • Fully in line to achieve Ireland's trajectory towards net zero.
	Negligible	• The project's GHG impacts are mitigated beyond design standards. • The project has gone well beyond existing and emerging policy requirements; and • Well 'ahead of the curve' for Ireland's trajectory towards net zero.
Beneficial	Beneficial	• The project's net GHG impacts are below zero and it causes a reduction in atmosphere GHG concentration. • The project has gone well beyond existing and emerging policy requirements; and • Well 'ahead of the curve' for Ireland's trajectory towards net zero, provides a positive climate impact.

Significance Criteria for CCRA

The CCRA involves an initial screening assessment to determine the vulnerability of the proposed Project to various climate hazards. The vulnerability is determined by combining the sensitivity and the exposure of the proposed Project to various climate hazards.

Vulnerability = Sensitivity x Exposure

The vulnerability assessment takes any proposed mitigation into account. Table 4 details the vulnerability matrix; vulnerabilities are scored on a high, medium and low scale. Where residual medium or high vulnerabilities exist the assessment may need to be progressed to a detailed climate change risk assessment and further mitigation implemented to reduce risks.

Table 4 *Vulnerability Matrix*

		Exposure		
		High (3)	Medium (2)	Low (1)
Sensitivity	High (3)	9 - High	6 – High	3 - Medium
	Medium (2)	6 - High	4 - Medium	2 - Low
	Low (1)	3 - Medium	2 – Low	1 - Low

2.1.2 Construction Phase

As per the EU guidance document *Guidance on Integrating Climate Change and* Biodiversity into Environmental Impact Assessment (European Commission, 2013) the climate baseline is first established with reference to EPA data on annual GHG emissions (see Section 4.0). The impact of the proposed Project on climate is determined in relation to this baseline. As per the IEMA guidance (2022) where expected emissions will not increase by over 1% compared with the baseline scenario then no further assessment is required as there is no potential for significant impacts to climate. The construction stage activities and potential for GHG emissions have been reviewed as part of the construction stage climate assessment and a qualitative assessment conducted.

PE-ENV-01104 (TII 2022a) recommends the calculation of the construction stage embodied carbon using the TII Online Carbon Tool (TII, 2022b). Embodied carbon refers to the sum of the carbon needed to produce a good or service. It incorporates the energy needed in the mining or processing of raw materials, the manufacturing of products and the delivery of these products to site. The TII Online Carbon Tool (TII, 2022b) uses emission factors from recognized sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013), UK National Highways Carbon Tool v2.4 and UK Government 2021 Greenhouse Gas Reporting Conversion Factors. The tool aligns with PAS 2080. The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that will be used over the entire construction / maintenance phase. This assessment includes the transport of materials and worker's travel.

The TII Online Carbon Tool (TII, 2022b) has been commissioned by TII to assess GHG emissions associated with road or rail projects using Ireland-specific emission factors and data.

2.1.3 Operational Phase

2.1.3.1 Climate Change Vulnerability Assessment

The operational phase assessment involves determining the vulnerability of the proposed Project to climate change. This involves an analysis of the sensitivity and exposure of the development to climate hazards which together provide a measure of vulnerability.

PE-ENV-01104 (TII, 2022a) states that the CCRA is guided by the principles set out in the overarching best practice guidance documents:

- EU (2021) Technical guidance on the climate proofing of Infrastructure in the Period 2021-2027 (European Commission, 2021); and

- The Institute of Environmental Management and Assessment, Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2nd Edition) (IEMA, 2020).

The baseline environment information provided in Section 4.0, future climate change modelling and input from other experts working on the proposed Project (i.e. hydrologists) should be used in order to assess the likelihood of a climate risk.

The initial stage of an assessment is to establish a scope and boundary for the assessment taking into account the following criteria:

- Spatial boundary: As per PE-ENV-01104 (TII, 2022a), the study area with respect to the GHGA is Ireland's Climate budget. The study area with respect to the CCRA can be considered the project boundary and its assets. The study area will be influenced by current and future baselines (Section 4.0). This study area is influenced by the input of other experts within the EIAR team;

- Climate hazards: The outcomes of the climate screening i.e. vulnerability assessment and baseline assessment; and

- Project receptors: TII state that the project receptors are the asset categories considered in the climate screening. In addition, any critical connecting infrastructure and significant parts of the surrounding environment e.g. water bodies that should be considered as a part of the indirect, cumulative and in combination impact assessment should also be considered project receptors.

Technical guidance on the climate proofing of infrastructure in the period 2021-2027 (European Commission, 2021a) outlines an approach for undertaking a climate change risk assessment where there is a potentially significant impact on the proposed Project due to climate change. The risk assessment assesses the likelihood and consequence of the impact occurring, leading to the evaluation of the significance of the impact. The role of the climate consultant in assessing the likelihood and impact is often to facilitate the climate change risk assessment process with input from the design team or specific specialists such as hydrology.

The climate screening risk assessment or vulnerability assessment is carried out by determining the sensitivity and exposure of the project to climate change. Firstly the project asset categories must be assigned a level of sensitivity to climate hazards irrespective of the project location (example: Sea level rise will affect seaport projects regardless of specific location). PE-ENV-01104 (TII, 2022a) provide the below list of asset categories and climate hazards to be considered. The asset categories will vary for project type and need to be determined on a project-by-project basis.

- **Asset categories** - Pavements; drainage; structures; utilities; landscaping; signs, light posts, buildings, and fences.

- **Climate hazards** - Flooding (coastal, pluvial, fluvial); extreme heat; extreme cold; wildfire; drought; extreme wind; lightning and hail; landslides; fog.

The sensitivity is based on a High, Medium or Low rating with a score of 1 to 3 assigned as per the criteria below.

- **High sensitivity:** The climate hazard will or is likely to have a major impact on the asset category. This is a sensitivity score of 3.

- **Medium sensitivity:** It is possible or likely the climate hazard will have a moderate impact on the asset category. This is a sensitivity score of 2.

- **Low sensitivity:** It is possible the climate hazard will have a low or negligible impact on the asset category. This is a sensitivity score of 1.

Once the sensitivities have been identified the exposure analysis is undertaken. The exposure analysis involves determining the level of exposure of each climate hazard at the project location irrespective of the project type for example: flooding could be a risk if the project location is next to a river in a floodplain. Exposure is assigned a level of High, Medium or Low as per the below criteria.

- **High exposure:** It is almost certain or likely this climate hazard will occur at the project location i.e. might arise once to several times per year. This is an exposure score of 3.

- **Medium exposure:** It is possible this climate hazard will occur at the project location i.e. might arise a number of times in a decade. This is an exposure score of 2.

- **Low exposure:** It is unlikely or rare this climate hazard will occur at the project location i.e. might arise a number of times in a generation or in a lifetime. This is an exposure score of 1.

Once the sensitivity and exposure are categorised, a vulnerability analysis is conducted by multiplying the sensitivity and exposure to calculate the vulnerability, as shown in Table 4.

2.1.3.2 Greenhouse Gas Emissions including Traffic Emissions

Emissions from road traffic associated with the proposed Project have the potential to emit carbon dioxide (CO_2) which will impact climate.

The UK Highways Agency DMRB guidance document in relation to climate impact assessments *LA 114 Climate* (UK Highways Agency, 2019) contains the following scoping criteria to determine whether a detailed climate assessment is required for a proposed project during the operational stage. If any of the road links impacted by the proposed Project meet or exceed the below criteria, then further assessment is required.

- A change of more than 10% in AADT;
- A change of more than 10% to the number of heavy-duty vehicles; and
- A change in daily average speed of more than 20 km/hr.

There are a small number of road links that will experience a change of over 10% in the AADT during the operational phase as a result of the proposed Project. As a result a detailed assessment of traffic related carbon dioxide (CO_2) emissions was conducted.

PE-ENV-01104 (TII, 2022a) states that road traffic related emissions information should be obtained from an Air Quality Practitioner to show future user emissions during operation without the development in place. The Air Quality Practitioner calculated the traffic related emissions through the use of the TII REM tool (TII, 2022c) which includes detailed fleet predictions for age, fuel technology, engine size and weight based on available national forecasts. The output is provided in terms of CO_2eq for the base year 2022, opening year 2024 and design year 2039. Both the Do Nothing and Do Something scenarios are quantified in order to determine the degree of change in emissions as a result of the proposed Project. Traffic data was obtained from Clifton Scannell Emerson Associates Consulting Engineers for the purpose of this assessment. Inputs include light duty vehicle (LDV) annual average daily traffic movements (AADT), annual average daily heavy-duty vehicles (HDV AADT), annual average traffic speeds, road link lengths, road type and project county location. Further details are provided in the Air Quality Appendix. The traffic data used in the operational phase modelling assessment is detailed in Table 5.

Table 5 *Traffic Data used in Operational Phase Modelling Assessment*

Road Name	Speed (kph)	Base Year 2022	Opening Year 2024		Design Year 2039	
			Do Nothing	Do Something	Do Nothing	Do Something
		LDV AADT (HDV AADT)	LDV AADT (HDV AADT)	LDV AADT (HDV AADT)	LDV AADT (HDV AADT)	LDV AADT (HDV AADT)
N11 North Ramp	80	1516 (206)	1516 (206)	1510 (244)	2620 (192)	2614 (231)
R918	80	6436 (443)	6436 (443)	6781 (521)	7948 (429)	8411 (505)
N11 South Ramp	120	3900 (241)	3900 (241)	4219 (279)	4140 (239)	4564 (275)
Fassaroe Lane	50	2304 (544)	2304 (544)	2959 (701)	4074 (509)	4956 (659)
N11 Main	120	66488 (3330)	68362 (3575)	67824 (3612)	78628 (5070)	77924 (5090)

3.0 DIFFICULTIES IN COMPILING THE ASSESSMENT

There were no significant difficulties encountered in compiling the specified information for this assessment.

4.0 RECEIVING ENVIRONMENT

PE-ENV-01104 (TII, 2022a) states that a baseline climate scenario should identify, consistent with the study area for the project, GHG emissions without the project for both the current and future baseline.

Ireland declared a climate and biodiversity emergency in May 2019 and in November 2019 there was European Parliament approval of a resolution declaring a climate and environment emergency in Europe. This, in addition to Ireland's current failure to meet its EU binding targets under Regulation 2018/842 (European Union 2018) results in changes in GHG emissions either beneficial or adverse being of more significance than previously considered prior to these declarations.

Data published in 2022 (EPA, 2023) predicts that Ireland exceeded (without the use of flexibilities) its 2021 annual limit set under EU's Effort Sharing Decision (ESD) (EU 2018/842) by 3.29 million tonnes CO_2 equivalent (Mt CO_{2eq}). As shown in Table 6 the sector with the highest emissions in 2021 is agriculture at 38% of the total, followed by transport at 17.7%. Ireland's greenhouse gas emissions increased by 5% in 2021 compared to 2020. For 2021 (EPA, 2023), total national emissions were estimated to be 62.11 Mt CO_{2eq} as shown in Table 6 (EPA, 2022b).

The future baseline with respect to the GHGA can be considered in relation to the future climate targets which the assessment results will be compared against. In line with TII (TII, 2022a) and IEMA Guidance (IEMA, 2022) the future baseline is a trajectory towards net zero by 2050, "*whether it* [the project] *contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*".

The future baseline will be determined by Ireland meeting its targets set out in the CAP23, and future CAPs, alongside binding 2030 EU targets. In order to meet the commitments under the Paris Agreement, the European Union (EU) enacted '*Regulation (EU) 2018/842 on binding annual GHG emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013'* (hereafter referred to as the Regulation) (European Union, 2018). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. The ETS is an EU-wide scheme which regulates the GHG emissions of larger industrial emitters including electricity generation, cement manufacturing and heavy industry. The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS scheme and thus includes GHG emissions from transport, residential and commercial buildings and agriculture.

Table 6 *Total National GHG Emissions in 2021*

Category	2021 Kilotonnes CO_{2eq}	% of Total GHG emissions
Waste	943	1.5%
Energy Industries	10,272	16.5%
Residential	6,917	11.1%
Manufacturing Combustion	4,624	7.4%
Commercial Services	836	1.3%
Public Services	659	1.1%
Transport	10,989	17.7%
Industrial Processes	2,477	4.0%
F-gases	766	1.2%
Agriculture	23,626	38.0%
Total	62,110	100.00%

Impacts as a result of climate change will evolve with a changing future baseline, changes have the potential to include increases in global temperatures and increases in the number of rainfall days per year. Therefore, it is expected that the baseline climate will evolve over time and consideration is needed with respect to this within the design of the proposed Project.

Ireland has seen increases in the annual rainfall in the north and west of the country, with small increases or decreases in the south and east including in the region where the proposed Project will be located (EPA, 2021b). The EPA have compiled a list of potential adverse impacts as a result of climate change including the following which may be of relevance to the proposed Project (EPA, 2021b):

- More intense storms and rainfall events;
- Increased likelihood and magnitude of river and coastal flooding;

- Water shortages in summer in the east;
- Adverse impacts on water quality; and
- Changes in distribution of plant and animal species.

The EPA's State of the Irish Environment Report (Chapter 2: Climate Change) (EPA, 2020c) notes that projections show that full implementation of additional policies and measures, outlined in the 2019 Climate Action Plan, will result in a reduction in Ireland's total GHG emissions by up to 25 per cent by 2030 compared with 2020 levels. Climate change is not only a future issue in Ireland, as a warming of approximately 0.8°C since 1900 has already occurred. The EPA state that it is critically important for the public sector to show leadership and decarbonise all public transport across bus and rail networks to the lowest carbon alternatives. The report (EPA, 2020c) underlines that the next decade needs to be one of major developments and advances in relation to Ireland's response to climate change in order to achieve these targets and that Ireland must accelerate the rate at which it implements GHG emission reductions. The report states that mid-century mean annual temperatures in Ireland are projected to increase by between 1.0°C and 1.6°C (subject to the emissions trajectory). In addition, heat events are expected to increase by mid-century (EPA, 2020c). While individual storms are predicted to have more severe winds, the average wind speed has the potential to decrease (EPA, 2020c).

TII's Guidance document PE-ENV-01104 (TII 2022a) states that for future climate change a moderate to high Representative Concentration Pathways (RCP) should be adopted. RPC4.5 is considered moderate while RPC8.5 is considered high. Representative Concentration Pathways (RCPs) describe different 21st century pathways of GHG emissions depending on the level of climate mitigation action undertaken.

Future climate predictions undertaken by the EPA have been published in 'Research 339: High-resolution Climate Projections for Ireland – A Multi-model Ensemble Approach (EPA 2020d). The future climate was simulated under both Representative Concentration Pathway 4.5 (RCP4.5) (medium-low) and RCP8.5 (high) scenarios. This study indicates that by the middle of this century (2041–2060). Mid-century mean annual temperatures are projected to increase by 1 to 1.2°C and 1.3 to 1.6°C for the RCP4.5 and RCP8.5 scenarios, respectively, with the largest increases in the east. Warming will be enhanced at the extremes (i.e. hot days and cold nights), with summer daytime and winter night-time temperatures projected to increase by 1 to 2.4°C. There will be a substantial decrease of approximately 50% which is projected for the number of frost and ice days. Summer heatwave events are expected to occur more frequently, with the largest increases in the south. In addition, precipitation is expected to become more variable, with substantial projected increases in the occurrence of both dry periods and heavy precipitation events. Climate change also has the potential to impact future energy supply which will rely on renewables such as wind and hydroelectric power. Wind turbines need a specific range of wind speeds to operate within and droughts or low ground water levels may impact hydroelectric energy generating sites. More frequent storms have the potential to damage the communication networks requiring additional investment to create resilience within the network.

The EPA's Critical Infrastructure Vulnerability to Climate Change report (EPA, 2021b) assesses the future performance of Irelands critical infrastructure when climate is considered. With respect to road infrastructure, fluvial flooding and coastal inundation/coastal flooding are considered the key climate change risks with snowstorm and landslides being medium risks. Extreme winds and heatwaves/droughts are considered low risk to road infrastructure. One of the key outputs of the research was a framework that will provide quantitative risk-based decision support for climate change impacts and climate change adaptation analysis for infrastructure.

5.0 CHARACTERISTICS OF THE PROPOSED PROJECT

The proposed Project will consist of the redevelopment of the site to provide for:

- Four hundred (400) private car parking spaces including disabled and electric vehicle spaces.
- Bus-stops with passenger shelters.
- Good quality pedestrian and cycle infrastructure.
- A new site access junction onto the adjacent road to facilitate seamless access from/to the motorway.

A full description of the development is available in Chapter 2 (Description of the Proposed Project). The sections below outline the characteristics of the proposed Project as they relate to climate. The following describes the primary sources of potential climate impacts during the construction and operational phase.

5.1.1 Construction Phase

During the construction stage the main source of climate impacts will be as a result of GHG emissions and embodied carbon associated with the proposed construction materials and activities for the proposed P&R.

5.1.2 Operational Phase

During the operational phase vehicle emissions from traffic accessing the site has the potential to release CO_2 and other GHGs which will impact climate. In addition, the vulnerability of the proposed Project in relation to future climate change must be considered during the operational phase.

6.0 POTENTIAL IMPACTS OF THE PROPOSED PROJECT

6.1.1 Do Nothing Scenario

Under the Do-Nothing Scenario no demolition or construction works will take place and the site will remain as it currently is. The climate baseline will continue to develop in line with the identified trends (see Section 4.0). This scenario is considered neutral in relation to climate.

6.1.2 Construction Phase

6.1.2.1 Greenhouse Gas Assessment

There is the potential for the release of a number of greenhouse gas emissions to the atmosphere during the construction of the proposed Project.

The embodied carbon within the construction materials has been calculated. This calculation was based on the online TII Carbon tool (TII, 2022b) and the breakdown of the activities between the different phases of the proposed Project has been assessed. As shown in Table 7, the assessment indicates that the key sources of GHG emissions are associated with the embodied carbon of the construction materials and construction waste.

The proposed Project is estimated to result in total construction phase GHG emissions of 4,994 tonnes embodied CO_2eq for the product and construction processes and maintenance over a 60-year lifecycle. The majority of the embodied carbon relates to road surfacing materials and its ongoing maintenance. This is equivalent to an annualised total of 0.12% of the 2030 industrial sector budget or 0.0021% when annualised over the lifespan of the proposed Project.

Table 7 *Construction Stage Greenhouse Gas Emissions*

Activity	Tonnes CO_2eq
Pre-Construction	1.1
Embodied Carbon	4,948.1
Construction Activities	42.2
Construction Waste	2.8
Total	4,994
As % of 2030 industrial sectoral budget	0.12%
As % of 2030 industrial sectoral budget (annualised over 60 years)	0.0021%

6.1.2.2 Climate Change Risk Assessment

Examples of potential climate impacts during operation are included in Annex D (Climate proofing and environmental impact assessment) of the technical guidance on the climate proofing of infrastructure (European Commission, 2021a). Potential impacts of climate change of the proposed Project include:

- Flood Risk due to increased precipitation, and intense periods of rainfall. This includes fluvial and pluvial flooding;
- Increased temperatures potentially causing drought, wildfires and prolonged periods of hot weather;
- Reduced temperatures resulting in ice or snow;
- Geotechnical impacts; and
- Major Storm Damage – including wind damage.

Each of these potential risks are considered with respect to the operational phase of the proposed Project as detailed in Section 6.1.3.2. During the construction phase no assessment is required however consideration will be given to the project's vulnerability to climate impacts. During construction, the Contractor will be required to mitigate against the effects of extreme rainfall / flooding through site risk assessments and method statements. The Contractor will also be required to mitigate against the effects of extreme wind / storms, temperature extremes through site risk assessments and method statements. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures. Temperatures can affect the performance of some materials, and this will require consideration during construction.

During construction, the Contractor will be required to mitigate against the effects of fog, lighting and hail through site risk assessments and method statements.

6.1.3 Operational Phase

6.1.3.1 Climate and Traffic Emissions

There is the potential for increased traffic volumes to impact climate. The change in traffic was reviewed against the DMRB screening criteria outlined in Section 2.1.3.2 (UK Highways Agency, 2019) and a detailed climate assessment of traffic emissions was conducted.

The predicted concentrations of CO_2 for the future years of 2024 and 2039 are detailed in Table 8. These are significantly less than the 2024 and 2030 targets set out under EU legislation (targets beyond 2030 are not available). It is predicted that in 2024 the proposed Project will decrease CO_2 emissions by 0.00002% of the EU 2024 target. Similarly low decreases in CO_2 emissions are predicted to occur in 2039 with emissions decreasing by 0.00010% of the EU 2030 target. However, it should be noted that these emission changes are only associated with the roads in close proximity to the P&R and therefore do not indicate the full extend of the potential benefits of the proposed P&R.

Table 8 *Climate Traffic Impact Assessment*

Year	Scenario	CO_{2eq} (tonnes/annum)
2024	Do Nothing	11,848
	Do Something	11,839
2039	Do Nothing	12,975
	Do Something	12,944
Increment in 2024		-9
Increment in 2039		-32
Emission Ceiling (Tonnes) 2024		40,113,372
Emission Ceiling (Tonnes) 2030		33,381,312
Impact in 2024 (%)		-0.00002%
Impact in 2039 (%)		-0.00010%

Note 1 Target under *Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013*

6.1.3.2 Climate Change Vulnerability Assessment

In order to determine the vulnerability of the proposed Project to climate change the sensitivity and exposure of the development to various climate hazards must first be determined. The following climate hazards have been considered in the context of the proposed Project: flooding (coastal, pluvial, fluvial); extreme heat; extreme cold; wildfire; drought; extreme wind; lightning, hail, landslides and fog. Wildfire and landslides were not considered relevant to the proposed Project due to the project location and have been screened out of the assessment.

The sensitivity of the proposed Project to the above climate hazards is assessed irrespective of the project location. Table 9 details the sensitivity of the proposed Project on a scale of high (3), medium (2) and low (1). Once the sensitivity has been established the exposure of the proposed Project to each of the climate hazards is determined, this is the likelihood of the climate hazard occurring at the project location and is also scored on a scale of high (3), medium (2) and low (1). The product of the sensitivity and exposure is then used to determine the overall vulnerability of the proposed Project to each of the climate hazards as per Table 4. The results of the vulnerability assessment are detailed in Table 9 below.

Table 9 *Climate Change Vulnerability Assessment*

Climate Hazard	Sensitivity	Exposure	Vulnerability
Flooding (coastal, pluvial, fluvial)	2 (Medium)	1 (Low)	2 (Low Risk)
Extreme Heat	1 (Low)	2 (Medium)	2 (Low Risk)
Extreme Cold	2 (Medium)	2 (Medium)	4 (Medium Risk)
Drought	2 (Medium)	2 (Medium)	4 (Medium Risk)
Extreme Wind	1 (Low)	2 (Medium)	2 (Low Risk)
Lightning & Hail	1 (Low)	1 (Low)	1 (Low Risk)
Fog	1 (Low)	1 (Low)	1 (Low Risk)

There is a medium risk with respect to drought and extreme cold due to the vulnerability of landscaping at the site to be impacted by extreme cold or drought conditions. The site is predicted to have a medium exposure to extreme heat and winds in high-risk future climate scenarios.

A flood risk assessment conducted for the proposed location notes that the probability of flooding from rivers and the sea is low (less than 1:1000) for both river and coastal flooding which would be equivalent to Flood Zone C. The risks of flooding are low and the assessment concludes that the surface water discharge from the site does not adversely affect or increase the flood risk to adjacent or downstream sites.

The drainage design will account for a 20% increase in flows for all return periods up to 100 years. The drainage design will factor all rainfall intensities by 1.1 to account for a 10% increase in design rainfall. Additionally, the time series rainfall will be modified in accordance with the Greater Dublin Strategic Drainage Study climate change policy document to ensure that the drainage system is designed to handle the projected rainfall patterns.

The proposed Project will be drained with the help of a traditional gully and piped drainage system into an underground attenuation tank that will ultimately be discharged into the existing storm water network on Fassaroe Lane. Unlike above-ground water tanks, which are exposed to changing weather conditions throughout the year, underground systems like the proposed one are less susceptible to extreme cold spells. The hydrobrake in the tank will control the release of excess rainwater at a controlled rate, minimizing the risk of freezing. To comply with the GDSDS guidelines in relation to SUDs, a series of rain gardens are also proposed across the site, to promote infiltration to the groundwater where suitable. At locations where the infiltration rate is very low, a proposed perforated pipe will convey the excess runoff back to the piped drainage network."

In relation to extreme temperatures, both extreme heat and extreme cold, these have the potential to impact the proposed Project infrastructure. However, high quality, durable materials will be selected for the proposed Project to reduce the maintenance required due to impacts from freeze/thaw actions due to low temperatures. Residual risks will be reviewed during detailed design to ensure mitigation is robust. In addition, the TII Climate Adaptation Strategy 2022 and Department of Transports Climate Change Sectoral Adaptation Plan, including future iterations, will ensure that resilience to climate vulnerabilities are considered during the operational phase of the proposed Project.

7.0 REMEDIAL AND MITIGATION MEASURES

7.1.1 Construction Phase

Embodied carbon of materials and construction activities will be the primary source of climate impacts during the construction phase. Mitigation of embodied material include:

- Creating a construction program which allows for sufficient time to determine reuse and recycling opportunities for demolition wastes.
- Appointing a suitably competent demolition contractor who will undertake a pre-demolition audit detailing resource recovery best practice and identify materials/building components that can be reused/recycled.
- Where possible, adoption of the methods set out in the Construction Industry Federation 2021 report Modern Methods of Construction.
- Materials will be reused on site within the new build areas where possible.

During the construction phase the following best practice measures shall be implemented on site to prevent significant GHG emissions and reduce impacts to climate:

- Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods.
- Ensure all plant and machinery are well maintained and inspected regularly.
- Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.
- Sourcing materials locally where possible to reduce transport related CO_2 emissions.

7.1.2 Operational Phase

A number of measures have been incorporated into the design of the development in order to mitigate against the impacts of future climate change. For example, adequate attenuation and drainage have been incorporated into the design of the development to avoid potential flooding impacts as a result of increased rainfall events in future years. These measures have been considered when assessing the vulnerability of the proposed Project to climate change (see Section 6.1.3.2).

The proposed Project has been designed to reduce the impact on climate as a result of modal shift from private vehicles to public transport. The transfer of a proportion of these single occupancy car trips onto public transport would not only reduce carbon emissions, but also reduce congestion along this corridor The P&R will also provide secure bike parking to facilitate use of active transport options for the initial stage of the journey.

All lighting uses energy-efficient light-emitting diode (LED) technology. Further mitigation measures will be put in place during detailed design in line with the TII Sustainability Implementation Plan (TII 2021).

8.0 RESIDUAL EFFECTS OF THE PROPOSED PROJECT

The proposed Project will result in some impacts to climate through the release of GHGs. TII state that the crux of assessing significance is "*not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*". The proposed Project has proposed some best practice mitigation measures and is committing to reducing climate impacts by providing greater accessibility to public transport in the form of a P&R. The beneficial impacts of the modal shift are not fully modelled within this assessment. As per the assessment criteria in Table 3 the impact of the proposed Project in relation to GHG emissions is considered ***long-term, minor adverse*** and ***not significant*** however should the modal shift be significant there is the potential for the proposed Project to ***be long-term***, ***beneficial*** and ***significant***.

9.0 CUMULATIVE IMPACTS

With respect to the requirement for a cumulative assessment PE-ENV-01104 (TII, 2022a) states that *"for GHG Assessment is the global climate and impacts on the receptor from a project* are not geographically constrained, the normal approach for cumulative assessment in EIA is not considered applicable."

However, by presenting the GHG impact of a project in the context of its alignment to Ireland's trajectory of net zero and any sectoral carbon budgets, this assessment will demonstrate the potential for the project to affect Ireland's ability to meet its national carbon reduction target. Therefore, the assessment approach is considered to be inherently cumulative.

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Appendix F

Clifton Scannell Emerson
Associates

Traffic and Transport Assessment

Fassaroe Park & Ride

Client: National Transport Authority

Date: 08/08/2023

Job Number: 20_008N

Civil Engineering | Structural Engineering | Transport Engineering | Environmental Engineering | Project Management | Health and Safety

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Executive Summary

CSEA has been appointed by the National Transport Authority's (NTA) Park and Ride Development Office (PRDO) to prepare a Traffic and Transport Assessment for the development of a high-quality Park and Ride facility in the northwest of Junction 6, located 20 km south of Dublin City on the M11/N11 radial corridor. The site is reasonably close (circa 250m) to the motorway and is easily accessible from the N11 via Junction-6 and the existing dual carriageway road. The existing left-in/left-out junction located on the dual carriageway road (Fassaroe lane) is proposed to be converted into a priority junction where both left and right turn movements will be allowed to access the Park and Ride site, and only left turn movement will be allowed to exit the Park and Ride facility.

The proposed Park and Ride facility site covers a total area of 33,007 sq. meters. The development of the proposed Park and Ride facility complies with the policy set down in Wicklow County Development Plan 2022-2028. The number of car parking proposed on the site is based on the demand analysis, using East Regional Model (ERM), conducted along N11 near south of Junction 6 by Park and Ride Development Office (PRDO). An overview of the proposed parking is presented in the table below.

Car Parking	388 no. spaces, including 26 no. disabled spaces and 42 no. electric charging spaces
Cycle Parking	40 no. bicycle parking Sheffield stands, 20 no. bike lockers

Table 1 *Summary of Parking Provision*

It will consist of a new car parking area with 388 car parking spaces, set-down areas, and taxi ranks with dedicated access. A new bus standing area is proposed with a dedicated turning circle, 2 new bus bays and 2 passenger shelters. 40 no. bicycle parking Sheffield stands, 20 no. bike lockers will also be provided within the site to cater for cyclists accessing the facility.

It is anticipated that the proposed development will become operational by 2024.

The estimated daily usage of the proposed Park and Ride facility is 340 no. car trips in the year of opening 2024 (based on the demand analysis using ERM conducted by PRDO). The peak hours in the vicinity of the site are determined to be 08:00-09:00 AM and 17:00-18:00 PM, and the overall trips are likely to be concentrated around the peak hours due to the nature of the development's operations. Three buses per hour in each direction are proposed to service Park and Ride site during the peak periods.

Classified Junction Turning Counts were carried out at the priority double roundabout interchange- Junction 6 along M11 on Thursday 29th September 2022 between 07:00 to 19:00. The survey was undertaken by IDASO on behalf of CSEA. In this study, for traffic modelling purpose, different labels are assigned to different junctions on which the traffic impact assessment is performed. The western roundabout at the intersection of N11, Fassaroe Lane and R918 ramp is referred to as J6-A and the eastern roundabout at the intersection of R918, N11, Upper Dargle Road and La Vallee is referred to as J6-B.

2024 Opening- Year	Junction will operate within capacity and at the best level of Service (A). J6-A: 3.72 seconds delay in AM Peak; 2.80 seconds delay in PM Peak. J6-B: 7.87 seconds delay in AM Peak; 6.49 seconds delay in PM Peak
2029 Future-Year	Junction will operate within capacity and at the best level of Service (A). J6-A: 3.71 seconds delay in AM Peak; 3.02 seconds delay in PM Peak. J6-B: 8.85 seconds delay in AM Peak; 6.77 seconds delay in PM Peak
2039 Future-Year	Junction will operate within capacity and at the best level of Service (A). J6-A: 3.75 seconds delay in AM Peak; 3.26 seconds delay in PM Peak. J6-B: 9.43 seconds delay in AM Peak; 7.28 seconds delay in PM Peak

Table 2 *Summary of Junction 6 Analysis with Proposed Development*

The modelling results obtained shows that the junction will operate at a Level of Service A, with or without this proposed development.

While the performance of the junction does become slightly lower, as would be expected with the opening of the proposed development, it should be noted that the impact of the development is minor and that the reduced performance of the junction is for the most part due to background traffic growth.

On that basis, the traffic impact of the operational phase of the proposed development can be described as ***long-term***, ***neutral*** and ***imperceptible***. During construction stage the impact of the proposed development is expected to be ***short-term***, ***negative*** and ***not significant***.

1 Introduction

1.1 Overview

CSEA has been appointed by the National Transport Authority's (NTA) Park and Ride Development Office (PRDO) to prepare a Traffic and Transport Assessment for the development of a high-quality Park and Ride facility in the northwest of Junction 6, located 20 km south of Dublin City on the M11/N11 radial corridor. The site is reasonably close (circa 250m) to the motorway and is easily accessible from the N11 via Junction-6 and the existing dual carriageway road Fassaroe Lane. The existing left-in/left-out junction located on the dual carriageway road (Fassaroe lane) is proposed to be converted into a priority junction where both left and right turn movements will be allowed to access the Park and Ride site, and only left turn movement will be allowed to exit the Park and Ride facility.

The proposed Park and Ride facility site covers a total area of 33,007 sq. meters. It will consist of a new car parking area with 388 car parking spaces, set-down areas and taxi ranks with dedicated access. A new bus standing area is proposed with a dedicated turning circle, 2 new bus bays and 2 passenger shelters. 40 no. bicycle parking Sheffield stands and 20 no. bike lockers will also be provided within the site to cater for cyclists accessing the facility.

It is anticipated that the proposed development will become operational by 2024.

1.2 Need for Transport Assessment

Table 1.4 of the Traffic Management Guidelines (DoT/ DoEHLG/ DTO, 2003) and Table 2.1 of TII's Traffic and Transport Assessment Guidelines (PE-PDV-02045), May 2014 sets out thresholds above which a Transport Assessment is automatically required (duplicated in Figure 1-1, below).

Table 2.1 Traffic Management Guidelines Thresholds For Transport Assessments

Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road.
Traffic to and from the development exceeds 5% of the traffic flow on the adjoining road where congestion exists or the location is sensitive.*
Residential development in excess of 200 dwellings.
Retail and leisure development in excess of 1,000m$^{2.}$
Office, education and hospital development in excess of 2,500m^2.
Industrial development in excess of 5,000m^2.
Distribution and warehousing in excess of 10,000m^2.

* In locations that experience particularly heavy congestion and when traffic flows from a proposed development are less than 5% of the traffic flows on the adjoining road, a Transport Assessment may still be required. When in doubt, the requirement for a Transport Assessment should always be scoped with the relevant local authority.

Figure 1-1 *Threshold for Transport Assessments*

The traffic to and from the development is expected to be more than 10% of the traffic flow on the adjoining road, therefore a Traffic and Transport Assessment has been undertaken to assess the impacts associated with the proposal. More details on trip generation from the proposed Park and Ride facility can be found in **Section 5.3**.

2 Methodology

This report has been prepared taking the following documents into account:

- Project Ireland 2040 – National Planning Framework;
- Wicklow County Development Plan 2022-2028;
- TII Traffic and Transport Assessment Guidelines, 2014;
- TII Geometric Design of Junctions DN-GEO-03060, June 2017;
- TII Project Appraisal Guidelines for National Roads Unit 5.3 - Travel Demand Projections
- Greater Dublin Area Transport Strategy 2022-2042
- Fassaroe Phase 1 SHD Development, EIAR, RPS, April 2022

The methodology used to conduct the assessment is as follows:

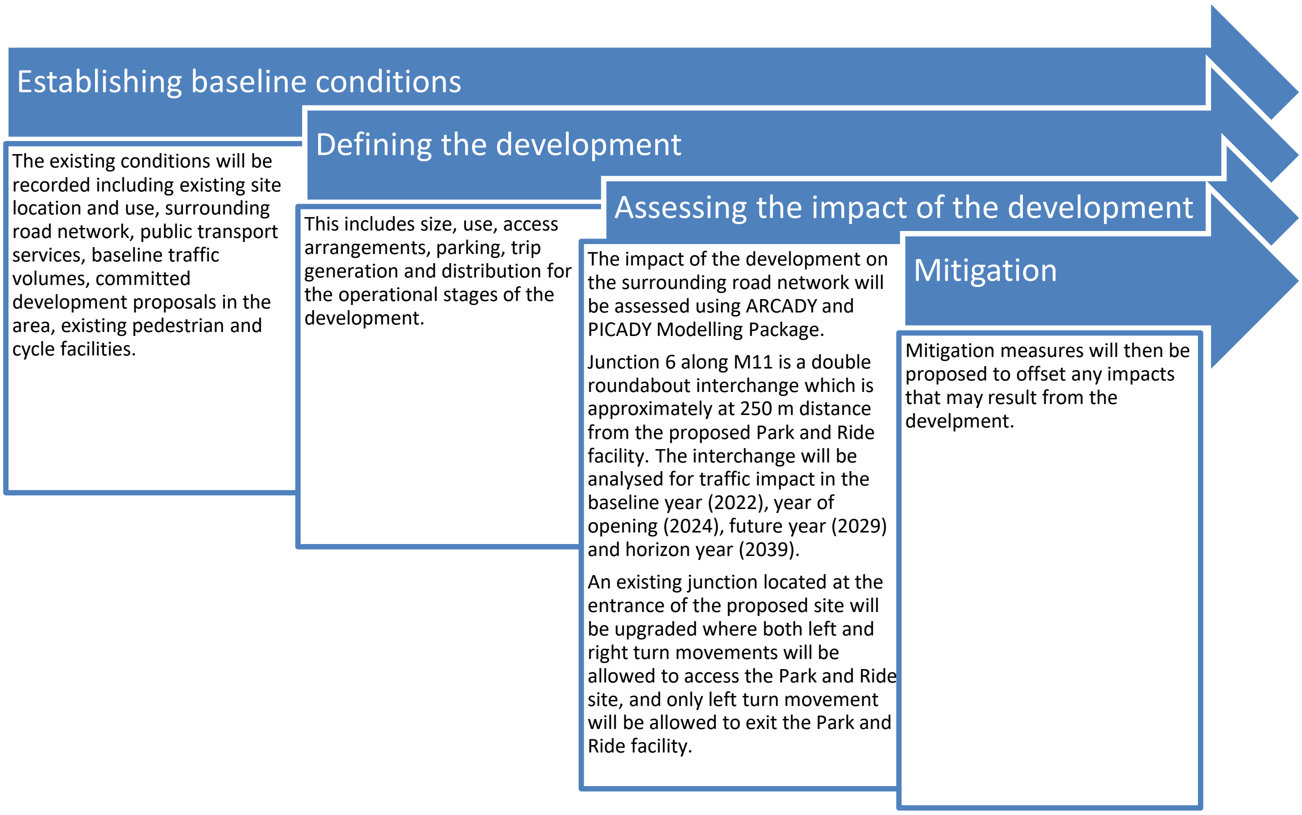
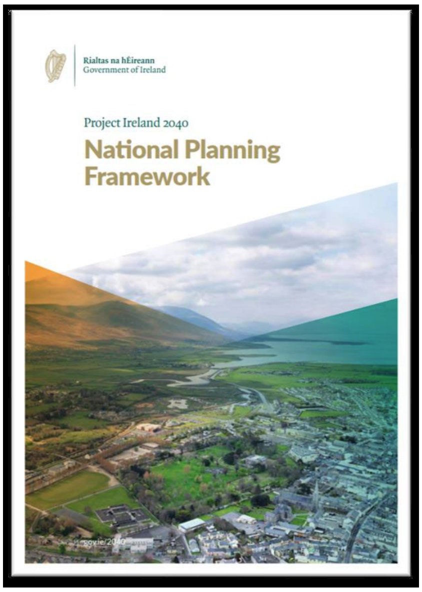


Figure 2-1 Methodology

3 Relevant Policy

3.1 Project Ireland 2040 – National Planning Framework



The development of the proposed Park and Ride facility complies with the following policy set down in the Project Ireland 2040 – National Planning Framework.

National Strategic Outcome 4: Sustainable Mobility - Public Transport: Expand attractive public transport alternatives to car transport to reduce congestion and emissions and enable the transport sector to cater for the demands associated with longer term population and employment growth in a sustainable manner.

Deliver the key public transport objectives of the Transport Strategy for the Greater Dublin Area 2016-2035 by investing in projects such as New Metro Link, DART Expansion Programme, BusConnects in Dublin and key bus-based projects in the other cities and towns.

3.2 Wicklow County Development Plan (2022-2028)

The development of the proposed Park & Ride facility complies with the following policy set down in Wicklow County Development Plan 2022-2028:

CPO 11.29: To support tourist/visitor park and ride facilities at appropriate locations that will facilitate access to upland amenity areas as may be identified in the Glendalough and Wicklow Mountains National Park Masterplan, or by strategies / plans of the Wicklow Outdoor Recreation Committee, Wicklow Tourism or other tourism agencies.

Sustainable Transportation-12.2.2 Park & Ride Facilities

The purpose of a 'Park and Ride' facility is to encourage car commuters to drive or cycle to a specific location with a car and secure bicycle park close to a high quality public transport service and to transfer to public transport, thereby reducing congestion and promoting public transport. Park and Ride sites often use valuable land adjacent to high-capacity public transport stations/stops which might be better used to provide intensive development, and therefore careful consideration will be given to ensure optimal locations, at the edge of or just outside town centres, that are attractive to users and developed for such use. The NTA has established a dedicated Park and Ride design office. Wicklow County Council is working with the NTA to determine locations for park and ride facilities along primary routes such as the M11/N11.

CPO 12.1: Through coordinated land-use and transport planning, to reduce the demand for vehicular travel and journey lengths by facilitating initiatives like carpooling and park and ride.

CPO 12.21: To promote the development of transport interchanges and 'nodes' where a number of transport types can interchange with ease. In particular: to facilitate the development of park and ride facilities at appropriate locations along strategic transport corridors which will be identified through the carrying out of required coordinated, plan-led transport studies and consultation with the appropriate transport agencies and/or Regional Authority.

CPO 16.28: To encourage carpooling and facilitate park and ride facilities for public transport.

3.3 Greater Dublin Area Transport Strategy (2022-2042)

Section 9.5.1 of Greater Dublin Area Transport Strategy (2022-2042), published by NTA, describes the overall proposed Park and Ride strategy for the Greater Dublin Area. As per the strategy: *A Park & Ride Development Office was established within the NTA in February 2020 as recommended in the Climate Action Plan 2019. Through this office a set of recommendations for the development of park and ride facilities have been developed. Those recommendations have been incorporated into the Transport Strategy and the locations selected for potential development are shown in Figure 9.1* (**Figure 3-1** in this report).

GDA transport strategy states that: *Appropriately located and designed Park & Ride facilities can enable these people to access public transport and enhance their options to reach a wide range of destinations in a sustainable manner and increase the usage of public transport, thereby maximising the value of investment in existing and new schemes.*

As per *Measure INT4-Park & Ride: It is the intention of the NTA to secure the development of a network of regional level bus and rail based Park and Ride facilities in the GDA at appropriate locations where the national road network meets, or is in close proximity to, high capacity bus and rail services.*

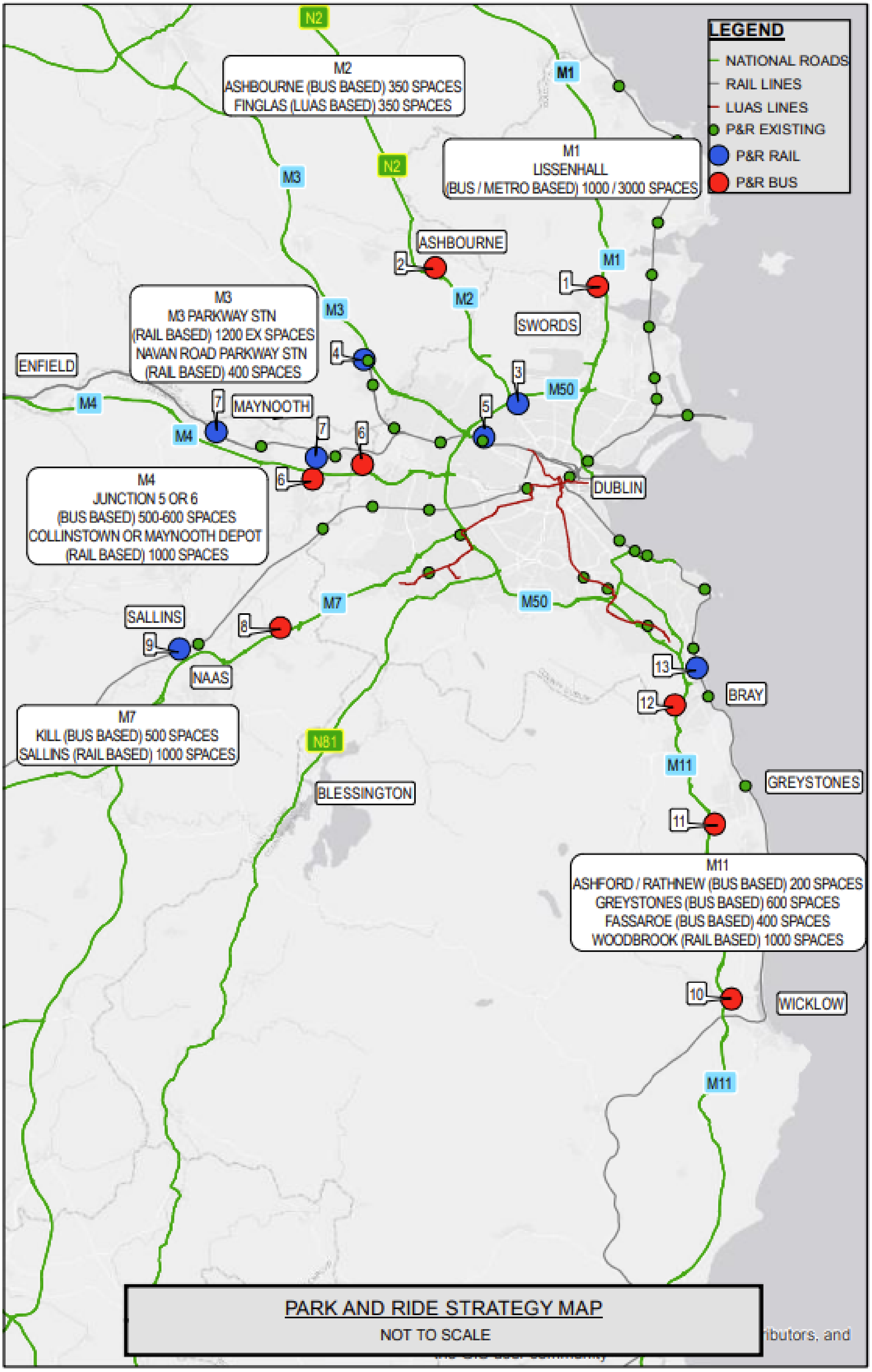


Figure 3-1: *Park and Ride Strategy Map- GDA Transport Strategy*

4 Existing Conditions

4.1 Existing Site Location and Use

The proposed Park and Ride site is located to the northwest of Junction 6-M11, approximately 450 meters west of the western fringe of Bray town and 230 meters from M11. The Park and Ride site is currently a privately owned land with an area of 4.6 hectares. This land is contained within the Fassaroe Development strategy and is currently zoned as Employment in the Bray Municipal District Local Area Plan 2018-2024.

The proposed Park and Ride site is a part of the 13 strategic locations selected for the provision of new Park and Ride facilities in the Greater Dublin Area. The proposed site will provide a new car parking area along with set down area for taxis, bike shelters and bus standing area. The objective of the proposal it to facilitate good public transport connectivity from the site to Dublin City Centre and vice versa, by allowing people to access the site via different modes of transport and taking the dedicated bus service. This is discussed in further detail in **Section 5**.

The site is well connected with the existing road network and can be accessed via Junction 6- M11 followed by Fassaroe Lane which is a dual carriageway road beside the proposed Park and Ride. Junction 6 is a priority double roundabout interchange connecting M11 with Fassaroe lane, R918 and access roads to residential areas. **Figure 4-1** below, illustrates the site location in relation to the surrounding road network.

Figure 4-1 *Site Location*

4.2 Existing Road network

The proposed Park and Ride site is well connected to the existing road network via the following road links:

- Fassaroe Lane- a dual carriageway road beside the proposed Park and Ride site
- M11 via Fassaroe Lane and Junction 6- M11/N11 radial corridor connects Dublin City to Rosslare Port and is of strategic importance nationally;
- R918 via Junction 6; a regional road that connects M11 to Upper Dargle Road

4.3 Existing Public Transport Services

Buses are the most convenient mode of public transport servicing the site. Currently, bus priority is provided in both directions on the N11 between Loughlinstown and the N11's northern extent at Mount Merrion Avenue, where it continues onto the R138. Bus priority is also provided in both directions along the R138 between this point and Dublin's City Centre. Bus Éireann 2/X2, 133, 133x, and Wexford Bus 740 currently pass Junction-6 throughout the day connecting the hinterland (Wicklow, Wexford) and Dublin City through the Dublin suburban area. Currently, these buses do not have a stop in the area close to the proposed site.

Bray Bus 185 and Dublin Bus 145 stop at the nearby bus stops in the area and operate from morning till night. Bus 185 connects Bray station to Enniskerry and operates from 06:55 to 23:30 during a weekday with 30 minutes average frequency. Bus 145 connects Heuston Station to Dublin City (Kilmacanogue) and operates from 06:20 to 23:25 on a weekday with an average frequency of 10 minutes. Bray DART station is located approximately three kilometres from the proposed Park and Ride site.

4.4 Existing Traffic Volumes

4.4.1 2022 Traffic Survey

Classified Junction Turning Counts were carried out at the priority double roundabout interchange-Junction 6 along M11 on Thursday 29th September 2022 between 07:00 to 19:00. The survey was undertaken by IDASO on behalf of CSEA. **Figure 4-2** below illustrates the location of the survey in relation to the proposed development site. In this study, for traffic modelling purpose, different labels are assigned to different junctions on which the traffic impact assessment is performed. The western roundabout at the intersection of N11, Fassaroe Lane and R918 ramp is referred to as J6-A and the eastern roundabout at the intersection of R918, N11, Upper Dargle Road and La Vallee is referred to as J6-B.

Junction 2 will be utilized as an entrance to the proposed Park and Ride site, and is proposed to be upgraded. Traffic flow through Junction 2 is estimated using the proposed Park and Ride facility's trip generation data. More details on Junction 2 can be found in **Section 5.4**.

Figure 4-2 *Survey Location*

Following the analysis of the survey results for the junctions mentioned above (J6-A and J6-B), it was determined that the network AM peak hour occurs between 08:00-09:00hrs and, while the network PM peak hour occurs between 17:00-18:00 hrs. The survey results for these junctions are summarised within **Table 4-1** and **Table 4-2** below. Traffic flow through Junction 2 is determined in **Section 7.6**27 using the trip generation data for the proposed Park and Ride facility. Traffic figures presented in the below are in Passenger Car Units (PCUs) with the following factors assumed: *medium goods vehicles 1.5, bus 2.0, and HGV 2.3. Source: TII, Project Appraisal Guidelines for National Roads Unit 5.2 (October 2016).*

Junction Arm	Approach flows J6-A PCUs	
	AM Peak (08:00-09:00)	PM Peak (17:00-18:00)
N11- North	0	0
R198	222	223
N11- South	480	482
Fassaroe Lane	343	345
Total Flows	1,045	1,050

Table 4-1 *Traffic Survey Results 2022 Survey- J6-A*

Junction Arm	Approach flows J6-B PCUs	
	AM Peak (08:00-09:00)	PM Peak (17:00-18:00)
Upper Dargle Road	310	330

Junction Arm	Approach flows J6-B PCUs	
	AM Peak (08:00-09:00)	PM Peak (17:00-18:00)
La Vallee	104	104
R198	700	702
N11	151	152
Total Flows	1,265	1,288

Table 4-2: *Traffic Survey Results 2022 Survey- J6-B*

Figure 4-3 and **4.4** below, illustrate the turning proportions at each arm for Junction 6-A and 6-B respectively.

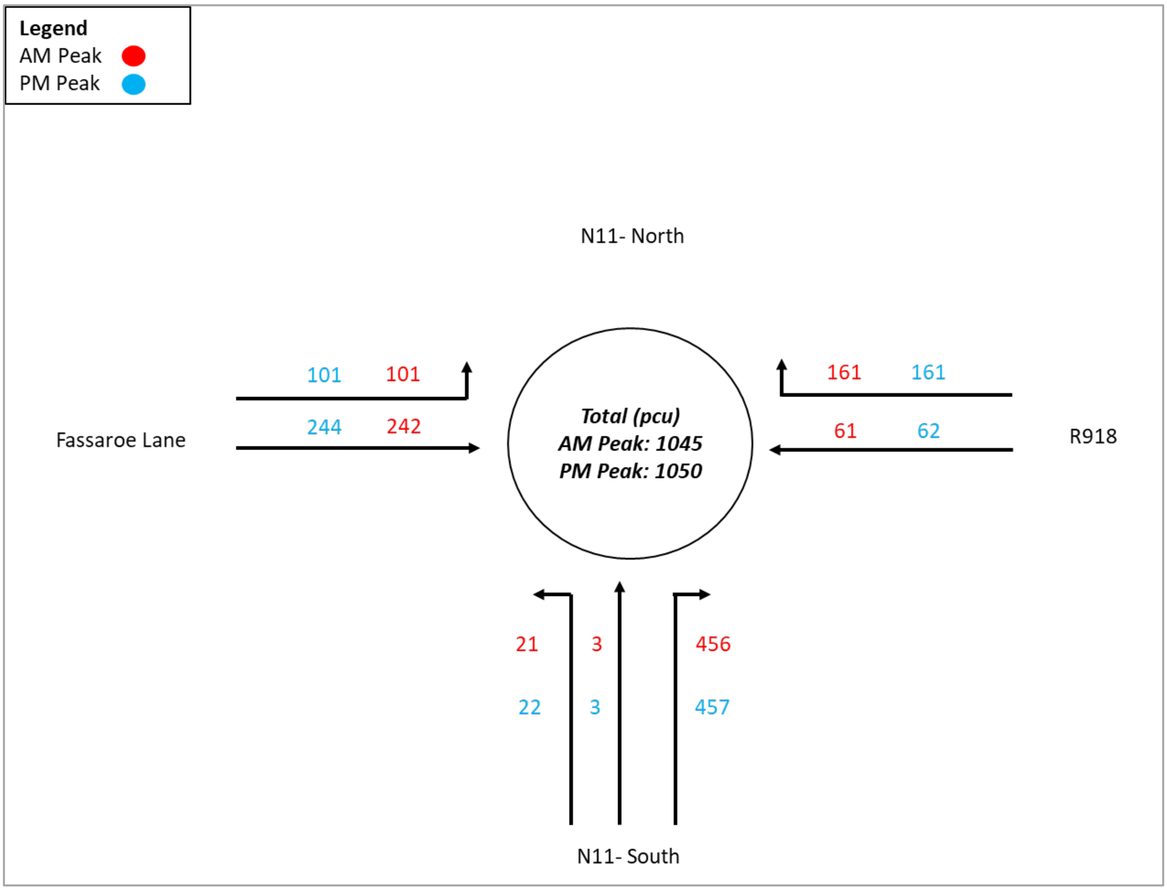


Figure 4-3 *Traffic Survey Turning Proportions at Junction 6-A 2022 Survey*

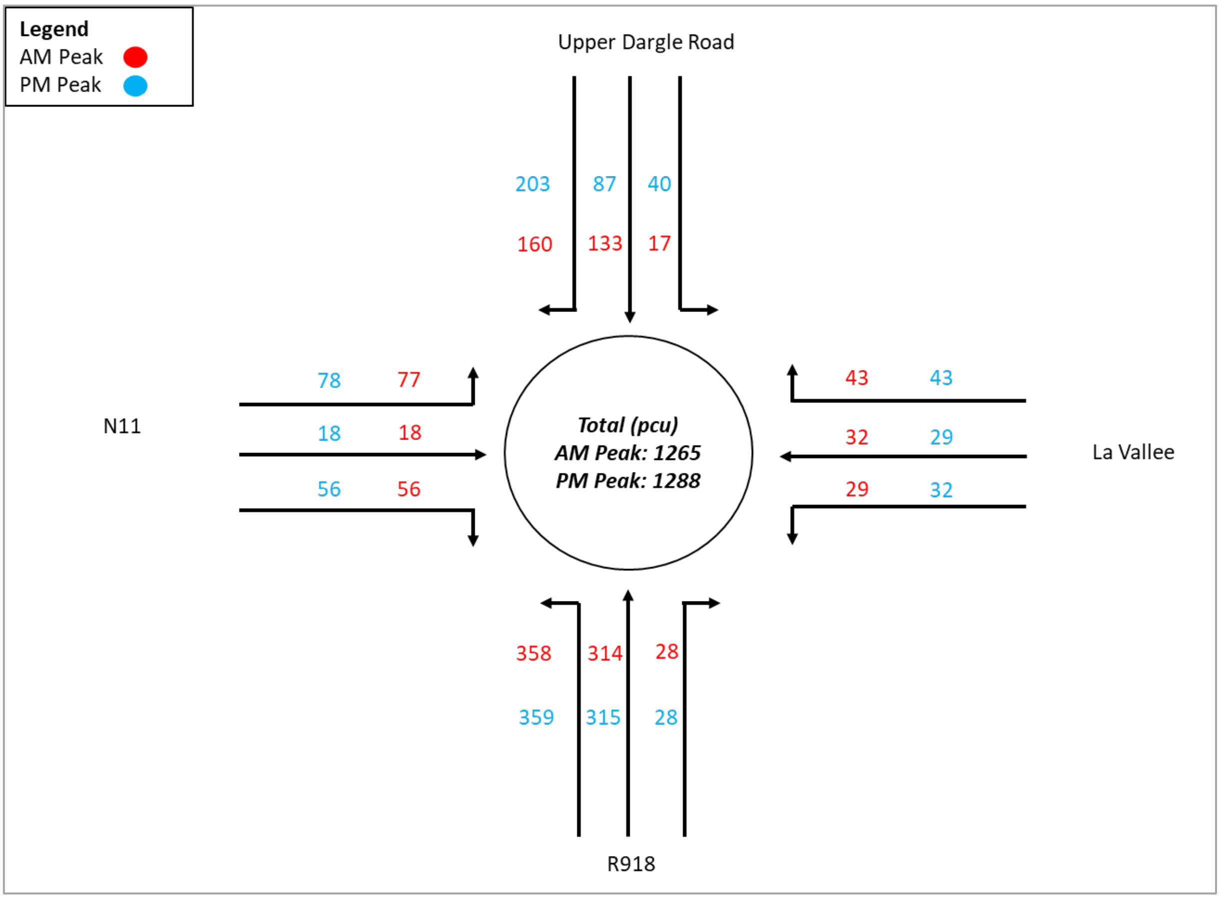


***Figure 4-4**: Traffic Survey Turning Proportions at Junction 6-B 2022 Survey*

4.5 Committed Developments in the Vicinity of the Site

4.5.1 Fassaroe Phase 1 SHD

Cosgrave Property Group is proposing a Strategic Housing Development in Fassaroe, Bray, Co. Wicklow which spans over 78.5 ha area. The planning application submitted relating to the SHD phase 1 has an associated planning reference of *sh202204*. The proposed Phase 1 development includes a mix of residential, commercial, community, recreation and amenity use to provide a mixed-use development that maximises opportunities for active and sustainable travel in accordance with “15-minute neighbourhood” principles.

The proposed development comprises of 650 no. mixed residential units (houses and apartments), 1,143 m2 of retail, 360 m2 café and 733 m2 of creche. A total of 688 car parking spaces and 966 bicycle parking spaces will be provided as a part of the residential units. The proposed development is currently undergoing different stages of approval and assessments and is expected to be fully operational by 2026.

The site is located adjacent to the N11/ M11 with access achievable via Junction 6 Fassaroe interchange. As a part of this proposal, a 2.4 km long road link will be developed which would connect N11 to Ballyman Road. Additionally, pedestrian/cycle route including bridge across the N11 to Upper Dargle Road will be provided. The proposal also includes provisions for public bus services in line with demand towards Bray (DART and Bray bus interchange) and towards the Luas at Cherrywood / Brides Glen.

Although the planning application includes only 650 residential units in Phase 1 SHD, it is expected that in 15 years from the opening of this development, additional 550 residential units will be developed.

4.6 *Existing pedestrian and cyclist facilities*

4.6.1 Pedestrian facilities

The proposed Park and Ride site will be accessed via Fassaroe Lane arm of Junction 6-A and an existing left in/left out junction at the entrance of the site which is proposed to be upgraded. Fassaroe Lane is a dual carriageway road with a verge in the middle. An existing footpath is present on one side of this road, and a shared pedestrian and cyclist path on the other side. A courtesy crossing through an opening in the verge is also present close to the entrance of the site. Segregated footpaths are missing along N11 arm of the western roundabout of Junction 6 (J6-A). R918, which marks the ramp of the interchange, has segregated footpath on both sides of the road for a small stretch. Upper Dargle Road and La Vallee arms of the eastern roundabout of Junction 6 (J6-B) lead into residential areas where they have segregated footpaths on both sides of the road.

4.6.2 Cyclist facilities

The proposed Park and Ride site is located adjacent to the Fassaroe Lane which has a two-way cycle track on one side of the road, opposite to the site entrance, and a shared cyclist and pedestrian path on the other side. Junction 6 does not have any cyclist facilities along the approaches, circulatory and interchange. Upper Dargle Road and La Vallee arms of the eastern roundabout of Junction 6 (J6-B) lead into residential areas where they have segregated cycle paths on one side of the road.

As a part of the proposal, new active travel connections (pedestrian and cycle) with a crossing facility have been proposed on Fassaroe Lane linking the existing infrastructure to the Park & Ride as part of the junction improvement. New realigned northern footways have been proposed that will replace the existing ones in a like-for-like manner. This has been discussed in detail in **Section 5.2** of this report.

5 Proposed Development

5.1 General Description and Use

The proposed development comprises of a park and ride facility located in the north-western quadrant of Junction 6 on N11, 450 meters west of the western fringe of Bray town. The site is reasonably close (circa 250m) to the motorway and is easily accessible from the N11 via Junction-6 and the existing dual carriageway road named Fassaroe Lane.

The proposed site is a part of the 13 strategic park and ride facilities to be provided by NTA Park and Ride Development Office in the Greater Dublin Area. The overall objectives of the proposed Park and Ride development are:

- To maximise the opportunities provided by on-going investment in public transport infrastructure and services, particularly in relation to the commencement of service of new public transport projects.
- To provide the appropriate type and scale of Park and Ride at the right locations, with connectivity to the road and public transport networks and design that supports integration with the surrounding walking and cycling network.
- Reduce reliance on the private car, reduce distances travelled by car and ensure Park and Ride facilitates greater use of sustainable modes.
- Deliver an enhanced customer experience through safe, secure, and user-friendly facilities that consider opportunities for interchange and to address barriers to public transport use.

As a strategic Park & Ride, this facility aims to intercept motorway car traffic that originates in catchment areas further south of Junction 6 location and transfer them to a bus suitable for their destination at the facility.

The proposed Park and Ride facility will consist of a new parking area with a total of 388 car parking spaces, including 26 no. mobility impaired parking spaces and 44 no. e-car charging spaces (including 2 EV MID spaces). Along with this, a new bus standing area, set down areas, taxi ranks, and bike shelters and lockers will be provided. More details on the breakdown of parking in the proposed area can be found in **Section 6** of this report.

The development includes the provision of access arrangements to serve the site, landscaping, boundary treatments, lighting, services, and all associated and ancillary works.

5.2 Access Arrangements

5.2.1 Vehicular Access

Vehicular access to the proposed Park and Ride development will be majorly via Junction 6 followed by Fassaroe Lane. A dedicated bus service will be provided for the people from the Park and Ride site to Dublin city centre and vice versa. The proposed site consists of a wide bus loop with bus bays and shelters on the side. The proposed site also has dedicated set down areas and taxi ranks. The proposed site will provide an internal network of roads to facilitate smooth and safe movement of cars, buses, taxis, cyclists, and pedestrians. The parking area can be accessed at the northern end of the proposed site from the new internal access road. A separate egress point will be located at the southwest edge of the car park, circa 35m north of the new main access junction (J2). **Figure 5-1** below illustrates the plan of the proposed site with major facilities and access points.

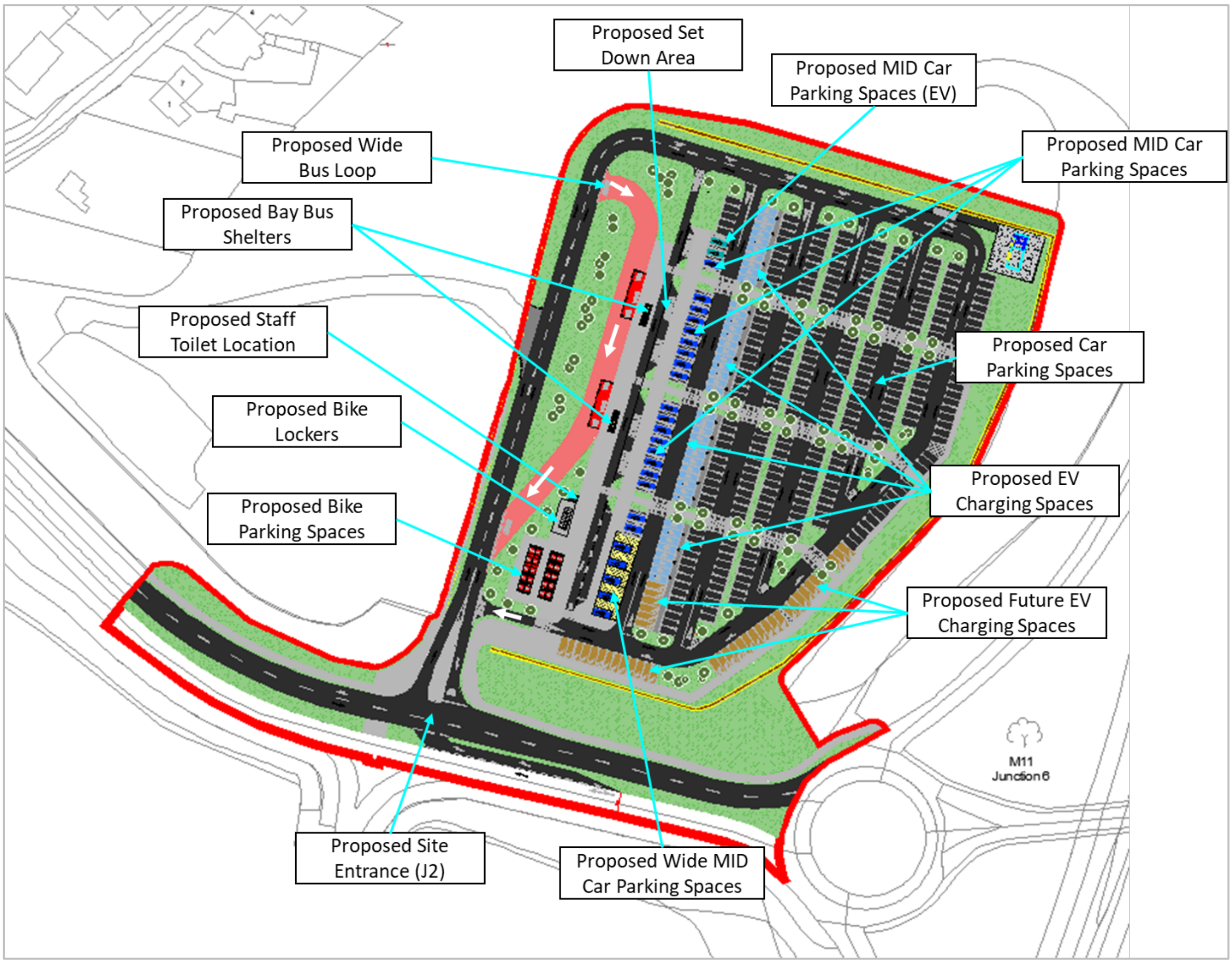


Figure 5-1 *Proposed Site Plan*

5.2.2 Pedestrian/ Cyclists Access

Existing pedestrian and cyclist facilities are present along the Fassaroe Lane, however, as part of the scheme, new realigned and standardised northern footway has been proposed that will replace the existing ones in a like-for-like manner. New active travel connections (pedestrian and cycle) with a crossing facility have been proposed on Fassaroe Lane linking the existing infrastructure to the Park & Ride as part of the (J2) junction improvement.

Inside the proposed Park and Ride site, well connected and standardised footpaths are proposed with minimum width of 2 meters for pedestrians to safely access the services within the facility such as car parking, bus services etc. **Figure 5-2** below illustrates the provision for pedestrians/cyclists inside the sites.

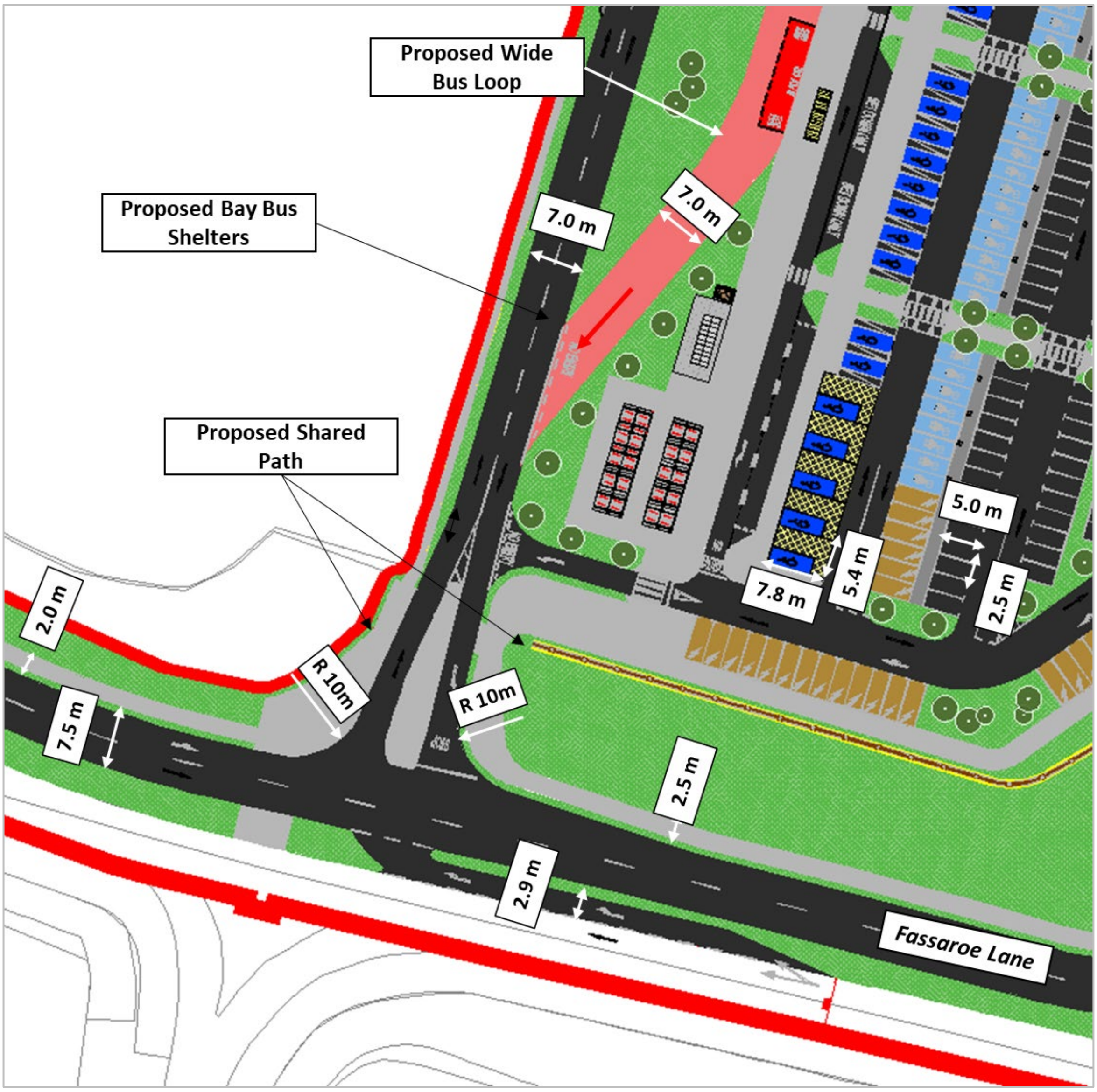


Figure 5-2 *Pedestrian/ Cyclist Access to the Proposed Site*

5.3 Trip Generation

Vehicular trip rates were estimated for the proposed Park and Ride site using the data provided by Park and Ride Development Office (PRDO). Demand analysis using East Regional Model was performed by PRDO along N11, south of Junction 6 to estimate the number of trips attracted by the proposed Park and Ride facility for different years. Over the demand, it is assumed that there would be an additional 20% of the number of car trips for drop-offs/pick-ups to/from the Park and Ride site. A bus service plan is also proposed to provide dedicated Park and Ride bus services from this location to Dublin city centre and vice versa. During peak hour, the frequency of the bus service is expected to be 1 in 20 minutes in each direction.

The number of arriving and departing trips expected during the peak hours of the day in the year of opening (YoO 2024), YoO+5 and YoO+15 is shown in **Table 5-1**.

Trip Generation								
Year of Assessment	AM Peak 08:00-09:00				PM 17:00-18:00			
	Incoming		Outgoing		Incoming		Outgoing	
	Trips	% HV	Trips	% HV	Trips	% HV	Trips	% HV
YoO 2024	88	7%	20	30%	19	32%	83	7%
YoO+5 (2029)	92	7%	20	30%	21	29%	95	6%
YoO+15 (2039)	100	6%	22	27%	25	24%	120	5%

Table 5-1: *Proposed Development Estimated Trip Generation-Vehicles*

5.4 Proposed Junction- Junction 2

The existing left-in/left-out junction present along Fassaroe Lane at the entrance of the proposed Park and Ride site will be upgraded to a priority junction where both left and right turn movements will be allowed to access the Park and Ride site, and only left turn movement will be allowed to exit the Park and Ride facility. The junction will be operational with the proposed Park and Ride Site in 2024. **Figure 5-3** presents the proposed layout of the junction.

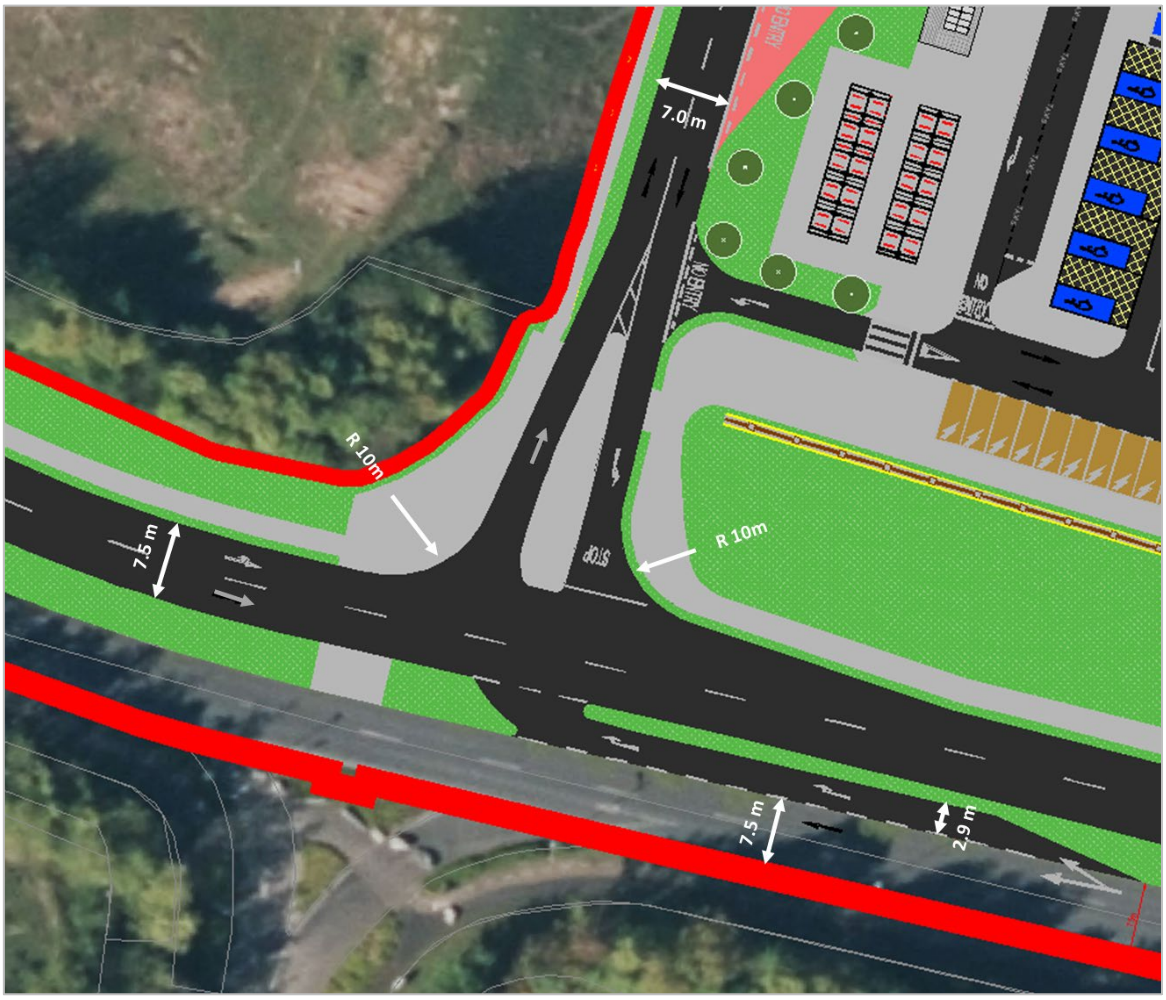


Figure 5-3: *Proposed layout of Junction 2*

A new 45m long and 3m wide right-turning lane will be constructed on Fassaroe Lane as part of the proposed junction by realigning the existing central reserve and the eastbound carriageways towards the north to facilitate the local widening. The new junction will be constructed in line with the requirements of Section 5.6.4 of the Geometric Design of Junctions published by Transport Infrastructure Ireland (Ref. No. DN-GEO-03060).

6 Parking

Wicklow County Council Plan 2022-2028 states that *"The purpose of a 'Park and Ride' facility is to encourage car commuters to drive or cycle to a specific location with a car and secure bicycle park close to a high-quality public transport service and to transfer to public transport, thereby reducing congestion and promoting public transport."* The development plan also focuses on transition to EV by prioritising EV parking and effectively managing parking to make public transport, walking, and cycling more attractive option. One of the objectives (CPO 12.58) of the development plan is- "*Provision shall be made in all new / expanded developments for Age Friendly and Disabled parking (and associated facilities such as signage, dished kerbs etc), at a suitable and convenient location for users."*

6.1 Car Parking Provision

The proposed Park and Ride facility site covers a total area of 33,007 sq. meters with possibility of future expansion. It will consist of a new car parking area with 388 car parking spaces and set-down areas and taxi ranks with dedicated access. The proposed scheme shall provide 42 no. parking and charging points for Electric Vehicles (excluding EV MID spaces). This represents more than 10% of the total parking capacity of the facility which is in line with the recommendation set out in the *Wicklow County Development Plan 2022-2028*. In addition, 39 no. standard parking spaces (~10%) will be futureproofed with ducting etc. to facilitate easy conversion to EV parking in the future.

The proposed scheme shall provide 26 no. parking spaces for mobility-impaired users which represents ~5% of the total parking capacity of the facility. Two (2 no.) of these spaces will be equipped with electric vehicle charging capability and 5 are large spaces (7.8m x 5.4 m). All standard parking bays within the proposed development will have dimensions of 2.5m x 5.0m. The parking area can be accessed at the northern end of the proposed site from the new internal access road. A separate egress point will be located at the southwest edge of the car park, circa 35m north of the new main access junction.

It is unlikely that the Park and Ride facility would be fully occupied (there may be some unoccupied disabled and electric vehicle charging spaces, and typically a proportion of spaces within a car park are made redundant due to drivers in adjacent spaces parking incorrectly). Given the nature of the proposed development, most of the trips to and from Park and Ride facility will be made during the AM and PM peak hours.

From the demand analysis conducted by PRDO using ERM, for the year of opening (2024) it is estimated that 68 cars will access the site during the AM Peak, and 64 cars will exit the site during the PM peak. It is assumed that an additional 20% of the number of cars parked will be the demand for pick-ups and drop-offs. Therefore, this makes the number of cars entering the site as 82 for the AM Peak and 77 for the PM Peak. Overall, the estimated daily usage of the proposed Park and Ride facility is expected to be 340. This would result in approximately 1-2 cars entering the site every minute, 1 car exiting every 4-5 minutes and 1 bus entering and exiting the site every 10 minutes during the AM peak hour, with similar numbers moving in the opposite direction in the PM peak hour.

6.2 Cycle parking provision

New active travel connections (pedestrian and cycle) with a crossing facility have been proposed on Fassaroe Lane linking the existing infrastructure to the Park and Ride as part of the junction improvement. As part of the scheme, new realigned northern footways have been proposed that will replace the existing ones in a like-for-like manner.

40 no. bicycle parking Sheffield stands, 20 no. bike lockers will also be provided within the site to facilitate cyclists wishing to avail this facility.

6.3 Public Transport

The proposed Park and Ride site consists of a new bus standing area with a dedicated turning circle, two new bus bays and two passenger shelters. The proposed bus turning circle will be 7 metres wide and 60 metres long, sufficient in length to safely accommodate 2 coaches. A bus service plan will also be proposed to provide dedicated Park and Ride bus services from this location to Dublin city centre and vice versa. This service would be an express service, with minimal stops to help improve journey times further. The proposed frequency of the service are presented in the table below:

Time period	Bus Frequency	Number of buses
07:00-10:00	1 in 20 min	9
10:00-16:00	1 in 40 min	9
16:00-19:00	1 in 20 min	9
19:00-23:00	1 in 40 min	6
Total buses in one direction		33

Table 6-1: *Proposed Bus Service Frequency in one direction*

7 Traffic Growth Forecasting

7.1 Introduction

This section of the TTA Report sets out the approach pursued in estimating the baseline traffic growth in the road network in the vicinity of the site. The contents within this section present the estimated traffic volumes at the relevant junction in future years without and with the development in place. Furthermore, this chapter also presents the estimated development traffic distribution throughout the network.

7.2 Baseline Traffic Growth Forecasting

In order to understand the impact of the development proposals on the local road network, it is first necessary to understand the without development or 'do-nothing' scenario for the base year (2022), the year of opening (YoO, 2024), future year (YoO+5, 2029), and horizon year (YoO+15, 2039). Traffic levels in the do-nothing scenario comprises of base year's background traffic flows and traffic flow from the committed developments.

Existing traffic flows on the surrounding road network was determined via surveys discussed in **Section 4.4**. For this assessment, the existing traffic was not grown utilising the growth factors from Transport Infrastructure Ireland (TII) *Project Appraisal Guidelines for National Roads.* This is because the vehicular traffic is expected to decrease in the future considering different policies that are being followed in regards with shift towards more sustainable modes of transport. Moreover, PRDO considered a growth in vehicular traffic expected to utilise the Park and Ride site in different future years in the demand analysis. Apart from this, growth of committed developments in the future years is also included in the traffic flowing through Junction 6. Therefore, the baseline traffic is assumed to be the same in all assessment years. **Table 4-1** and **Table 4-2** presents the baseline traffic flows across Junction 6A and 6B.

7.3 Committed Developments

As discussed in section 4.5.1, Cosgrave Property Group is proposing a Strategic Housing Development in Fassaroe, Bray, Co. Wicklow which spans over 78.5 ha area. The planning application submitted relating to the SHD phase 1 has an associated planning reference of *sh202204*. The proposed Phase 1 development includes a mix of residential, commercial, community, recreation and amenity use to provide a mixed-use development that maximises opportunities for active and sustainable travel in accordance with "15-minute neighbourhood" principles. The proposed development is currently undergoing different stages of approval and assessments and is expected to be fully operational by 2026.

The site is located adjacent to the N11/ M11 with access achievable via Junction 6 Fassaroe interchange. Although the planning application includes only 650 residential units in Phase 1 SHD, it is expected that in 15 years from the opening of this development (by 2041), additional 550 residential units will be developed.

The traffic flow from the development was estimated by the property development's relevant team using TRICS for different hours of the day. For this TTA, same data has been used and the traffic flow for the relevant peaks hours at Junction 6 is considered and is presented in **Table 7-1** below. It should be noted that all the additional units from Phase 1 of this SHD are expected to become operational by 2041. However, a worst case scenario for traffic has been assumed and the additional units have been included as a part of the horizon year (2039) transport and traffic assessment of the proposed Park and Ride facility.

	Assessment Period	Junction 6A (Tot. PCUs)	Junction 6B (Tot. PCUs)
2029 (Phase 1)	**AM Peak (07:00-08:00)**	188	69
	PM Peak (17:00-18:00)	188	125
2039 (Phase 1 + additional units)	**AM Peak (07:00-08:00)**	274	100
	PM Peak (17:00-18:00)	275	182

Table 7-1: *Committed Development Traffic Through Relevant Junctions*

7.4 Trip Distribution

Vehicular traffic expected to utilise the proposed Park and Ride site is estimated by performing a demand analysis using East Regional Model on N11 near Junction 6 for different years. As discussed in **Section 5** of this report, the traffic utilising the proposed Park and Ride site will access/exit the site using Junction 6A (Western Roundabout), 6B (Eastern Roundabout), and Junction 2. Based on this, the following assumptions for trip distribution in the road network have been made for all the trips to/from the Park and Ride site and the committed development:

1. Fassaroe Park and Ride facility is one of the 3 road-based Park and Ride facilities proposed along N11 to attract on route car users going to the Dublin City Centre. This facility is expected to attract car users coming from the south of Junction 6 along N11. Therefore, it is assumed that all the car traffic utilising Park and Ride facility will and enter/exit the site through Junction 2 and Junction 6 via Fassaroe Lane arm.
2. Additional 20% of the total number of Park and Ride car traffic will be pick-up and drop-off traffic. Therefore, these trips will be counted twice in each peak hour in the demand utilised for traffic modelling.
3. It is assumed that 100% of the Park and Ride car traffic will enter the site using N11 South arm of Junction 6A, and exit using the R918 followed by N11 arm of Junction 6B.
4. Three buses are proposed to service the Park and Ride site during AM peak and PM peak hours in each direction. It is assumed that the buses going towards Dublin City Centre will access/exit the site using N11 arm of Junction 6A. The buses which will be returning from the city will access/exit the site using R918, and N11 arm of Junction 6B.
5. Cosgrave Property Group is proposing a Strategic Housing Development in Fassaroe, Bray, Co. Wicklow. A certain proportion of the traffic generated from this development will pass through Junction 6. The committed development’s traffic flow and its distribution is referenced from the data available on the development on Co. Wicklow’s planning permission website.
6. For traffic modelling of Junction 2, it is assumed that all the traffic turning in to the Fassaroe Lane arm from Junction 6 will go straight, except for the traffic accessing the Park and Ride facility. Traffic entering the Park and Ride facility would turn right from the Fassaroe lane to enter the site. Traffic exiting the Park and Ride facility would only be allowed to turn left from the facility into Fassaroe Lane to go towards Junction 6A.

7.5 Do-Nothing Traffic Flows

Taking in consideration the trip distribution assumptions presented in preceding sections, the figures presented in **Table 7-1** have been added to the background traffic forecast presented in **Table 4-1** and **Table 4-2** to estimate the turning movements at junctions in the ‘do-nothing’ scenario future years, i.e., 2024, 2029, and 2039. The total do-nothing approach flows are presented in **Table 7-2** and **Table 7-3**, which follows. Do Nothing flows for Junction 2 are irrelevant, as there is no development on the site in this scenario, and the junction will be upgraded and utilised to access the Park and Ride site in Do Something scenarios.

Assessment Period	Do-Nothing Traffic Through Junction 6A (PCUs)		
	YoO (2024)	YoO+5 (2029)	YoO+15 (2039)
AM Peak (08:00-09:00)	1046	1234	1320
PM Peak (17:00-18:00)	775	963	1050

Table 7-2: *Junction 6A Do-Nothing Traffic Flows (PCUs)*

Clifton Scannell Emerson Associates

Assessment Period	Do-Nothing Traffic Through Junction 6B (PCUs)		
	YoO (2024)	YoO+5 (2029)	YoO+15 (2039)
AM Peak (08:00-09:00)	1265	1334	1365
PM Peak (17:00-18:00)	1159	1284	1341

Table 7-3:*Junction 6B Do-Nothing Traffic Flows (PCUs)*

7.6 *Proposed Development Trip Generation*

The vehicle trip generation estimated for the proposed development and presented in section 5.3 of this Report (Table 5-1**:** Proposed Development Estimated Trip Generation-Vehicles

) has been expanded to Passenger Car Units with the following factors assumed: *medium goods vehicles 1.5, bus 2.0, and HGV 2.3. Source: TII, Project Appraisal Guidelines for National Roads Unit 5.2 (October 2016).*

Table 7-4, sets out the development trip generation in PCUs.

Assessment Period	Proposed Development Trip Generation (PCUs)		
	YoO (2024)	YoO+5 (2029)	YoO+15 (2039)
AM Peak (08:00-09:00)	108	112	122
PM Peak (17:00-18:00)	102	116	145

Table 7-4: *Proposed Development Traffic Generation (PCUs)*

As the proposed development will operate as a Park and Ride facility, there will be bus services running in/out of the site throughout the day. Both car and bus traffic will likewise be more concentrated around the AM and Peak hours.

7.7 *Mode Split*

The proposed development is a Park and Ride facility with car parking, bicycle parking, car drop off area and bus shelter area. Some trips to the site may be made via public transport, car drop-off, walking or on bicycle. Using the demand analysis on N11 around the South of Junction 6, number of cars utilising this Park and Ride facility has been estimated. For a worst case scenario, it has been assumed that all the demand attracted by this Park and Ride facility will access the site using cars. Additional 20% of the total car trips would be drop-offs, and rest of the car users will park in the facility to access the bus service to the Dublin City.

7.8 *Do-Something Traffic Flows*

As the proposed Park and Ride site will be accessed via Junction 2 and Junction 6, 100% of the development trip generation discussed in **Section 7.6** has been added to the do-nothing traffic flows presented in **Section 7.5** to estimate the 'do-something' traffic volumes for the junctions under study. The traffic figures for 2024, 2029 and 2039 with the proposed development in place are presented within **Table 7-5**, **Table 7-6** and **Table 7-7**, which follows.

Assessment Period	Do-Something Traffic Through Junction 2 (PCUs)		
	YoO (2024)	YoO+5 (2029)	YoO+15 (2039)
AM Peak (08:00-09:00)	545	738	833
PM Peak (17:00-18:00)	478	681	797

Table 7-5: *Do-Something Traffic Flows (PCUs) for Junction 2*

Assessment Period	Do-Something Traffic Through Junction 6A (PCUs)		
	YoO (2024)	YoO+5 (2029)	YoO+15 (2039)
AM Peak (08:00-09:00)	1165	1358	1453
PM Peak (17:00-18:00)	889	1092	1208

Table 7-6: *Do-Something Traffic Flows (PCUs) for Junction 6A*

Assessment Period	Do-Something Traffic Through Junction 6B (PCUs)		
	YoO (2024)	YoO+5 (2029)	YoO+15 (2039)
AM Peak (08:00-09:00)	1291	1361	1393
PM Peak (17:00-18:00)	1248	1385	1467

Table 7-7: *Do-Something Traffic Flows (PCUs) for Junction 6B*

The traffic figures presented above have been used as an input to the capacity analysis undertaken to assess the traffic impacts of the proposed Park and Ride facility on Junction 2, Junction 6A and 6B. This is discussed within **Section 8** of this Report.

8 Proposed Development Traffic Impact

8.1 Introduction

This section of the TTA Report sets out the approach pursued in assessing the proposed Park and Ride facility's traffic impacts and its findings. The industry standard ARCADY modelling software has been used for predicting capacities, queues, and delays of priority double roundabout Junction 6 (6A and 6B).

8.2 Analysis Scope, Assessment Years and Time Periods, and Assessment Scenarios

Analysis Scope

The analysis presented within this Report has focused on assessing the impact of the proposed Park and Ride facility on the priority double roundabout Junction 6 (6A and 6B).

Assessment Years and Time Periods

As recommended by TII's TTA Guidelines, four assessment years are considered, namely: base year (2022), year of opening (YoO) which is assumed to be 2024; future year (YoO+5) i.e., 2029, and a horizon year (YoO+15), i.e., 2039. The assessment will focus on the critical time periods for the local road network i.e., the AM peak (07:00-08:00hrs) and the PM peak period (17:00hrs-18:00hrs) for assessing the proposed development's traffic impact.

Assessment Scenarios

The following scenarios have been developed in assessing the proposed development's traffic impacts:

- **Do-Nothing Scenario**: To assess the traffic impact of the development proposals on the local road network, it is first necessary to establish background traffic conditions without the proposed development, also referred to as the 'do-nothing' scenario. Such background traffic flows have been determined from the traffic survey detailed in **Section 4.4** of this Report and discussed in **Section 7.5**. The committed development traffic presented in **Section 7.3** has been accounted for in the do-nothing scenario.
- **Do-Something Scenario**: The with-development or 'do-something' scenario represents traffic conditions following the completion and the start of operation of the proposed Park and Ride site, i.e., do-nothing plus additional traffic expected to utilise the Park and Ride facility. The estimated do-something traffic flows are presented within **Section 7.8** of this Report.

8.3 Traffic Modelling Software and Outputs

Traffic Modelling Software

The industry standard ARCADY traffic modelling software has been used to assess the existing double roundabout (Junction 6A and 6B) under study, and predict its capacities, queues, and delays for different scenarios. The industry standard PICADY traffic modelling software has been used to assess the proposed junction (Junction 2) under study, and predict its capacities, queues, and delays for different Do-Something scenarios. ARCADY (Junctions 10 software) is used for modelling the impact of traffic flows on priority roundabouts and PICADY is used for modelling the impact of traffic flows on priority junctions. Such models analyse the junctions with respect to their geometry and traffic flows and calculate key performance indicators such as Ratio to Flow Capacity (RFC) for the models.

Traffic Modelling Outputs.

Outputs obtained from the ARCADY and PICADY models are listed below:

- <u>Queue Length (PCU)</u>: The values are the total number of queueing vehicles on the arm in PCUs.

- Junction Delay (seconds): This is the total delay experienced by a quantity of traffic at a particular junction in a given time period.
- Ration of Flow to Capacity (RFC): The RFC provides a basis for judging the acceptability of junction designs and typically an RFC of less than 0.85 is considered to indicate satisfactory performance.
- LOS (Level of Service) – is a qualitative measure used to relate the quality of motor vehicle traffic service. It is a term used to qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, manoeuvrability, delay, and safety. There are six LOS ranging from A (free flow) to F (Forced or breakdown flow).

8.4 Modifications to Road Network

Junction 6 is a priority double roundabout interchange connecting M11 with Fassaroe lane, R918 and access roads to residential areas. The layout of the existing roundabout can be seen in **Figure 4-2**. To study the traffic impacts of the proposed Park and Ride site on this roundabout, the two inter-connected roundabouts are modelled independently as two standard roundabouts. The Western Roundabout is referred to as Junction 6A and the Eastern Roundabout is referred to as Junction 6B. The results showing the performances of both the models are discussed in **Section 8.5** below.

8.5 Traffic Modelling Results

8.5.1 Junction- 6A

Junction 6A is considered here to be the Western Roundabout of Junction 6. Traffic Modelling results obtained for this roundabout in different scenarios are presented below.

8.5.1.1 AM Peak

Comparison of the junction's performance for the different AM Peak scenarios are shown in **Table 8-1** below. ARCADY modelling results have been included within Appendix B of this Report.

Assessment Year	AM Peak (08:00 - 09:00 hrs)				
	Scenario	Max Ratio of Flow to Capacity (RFC)	Maximum Queue (PCU)	Level of Service (LOS)	Junction Delay (Seconds)
Year of Opening 2024	Do-Nothing	0.37	0.6	A	3.39
	Do-Something	0.44	0.8	A	3.72
Year of Opening +5 2029	Do-Nothing	0.38	0.6	A	3.37
	Do-Something	0.46	0.9	A	3.71
Year of Opening + 15 2039	Do-Nothing	0.39	0.7	A	3.38
	Do-Something	0.47	0.9	A	3.75

Table 8-1: *AM Peak Traffic Modelling Results for J6A*

The results obtained for the AM Peak traffic modelling show that the junction is expected to perform within acceptable levels in all assessed years and scenarios. The Level of Service remains A for all the scenarios. A maximum RFC of 0.44 with an overall delay of 3.72 seconds were obtained in the do-something scenario of the year of opening 2024.

8.5.1.2 PM Peak

Comparison of the junction's performance for the different PM Peak scenarios are shown in **Table 8-2** below. ARCADY modelling results have been included within Appendix B of this Report.

Assessment Year	PM Peak (17:00 - 18:00 hrs)				
	Scenario	Max Ratio of Flow to Capacity (RFC)	Maximum Queue (PCU)	Level of Service (LOS)	Junction Delay (Seconds)
Year of Opening 2024	Do-Nothing	0.27	0.4	A	2.78
	Do-Something	0.28	0.4	A	2.80
Year of Opening +5 2029	Do-Nothing	0.3	0.4	A	3.00
	Do-Something	0.32	0.5	A	3.02
Year of Opening + 15 2039	Do-Nothing	0.31	0.5	A	3.22
	Do-Something	0.34	0.5	A	3.26

Table 8-2: *PM Peak Traffic Modelling Results for J6A*

The results obtained for the 'do-something' scenarios presented above show that, with the proposed Park and Ride in place, the junction will continue to operate successfully in all future years. In the year of opening (2024), the maximum RFC obtained was 0.28. The maximum queue for this scenario is expected to be 0.4 pcu. The overall delay obtained for this scenario is 2.80 seconds with LOS as A.

On that basis, the traffic impact of the proposed development can be described as ***long-term, neutral,*** and ***imperceptible.*** Detailed modelling results of all the scenarios are included as Appendix B of this Report.

8.5.2 Junction- J6B

Junction 6B is considered to be the Eastern Roundabout of Junction 6. Traffic Modelling results obtained for this roundabout in different scenarios are presented below.

8.5.2.1 AM Peak

Comparison of the junction's performance for the different AM Peak scenarios are shown in **Table 8-3**. ARCADY modelling results have been included within Appendix B of this Report.

Assessment Year	AM Peak (08:00 - 09:00 hrs)				
	Scenario	Max Ratio of Flow to Capacity (RFC)	Maximum Queue (PCU)	Level of Service (LOS)	Junction Delay (Seconds)
Year of Opening 2024	Do-Nothing	0.69	2.2	A	7.43
	Do-Something	0.7	2.4	A	7.87
Year of Opening +5 2029	Do-Nothing	0.72	2.7	A	8.27
	Do-Something	0.74	2.9	A	8.85
	Do-Nothing	0.74	2.9	A	8.73

Year of Opening + 15 2039	**Do-Something**	0.76	3.2	A	9.43

Table 8-3: *AM Peak Traffic Modelling Results for J6B*

The results obtained for the AM Peak traffic modelling show that the junction is expected to perform within acceptable levels in all assessed years and scenarios. The Level of Service remains A for all the scenarios. A maximum RFC of 0.70 with an overall delay of 7.87 seconds were obtained for the do-something scenario in the do something scenario of year of opening 2024.

8.5.2.2 PM Peak

Comparison of the junction's performance for the different PM Peak scenarios are shown in **Table 8-4** below. ARCADY modelling results have been included within Appendix B of this Report.

Assessment Year	PM Peak (17:00 - 18:00 hrs)				
	Scenario	Max Ratio of Flow to Capacity (RFC)	Maximum Queue (PCU)	Level of Service (LOS)	Junction Delay (Seconds)
Year of Opening 2024	**Do-Nothing**	0.56	1.3	A	5.43
	Do-Something	0.64	1.8	A	6.49
Year of Opening +5 2029	**Do-Nothing**	0.57	1.4	A	5.50
	Do-Something	0.67	2	A	6.77
Year of Opening + 15 2039	**Do-Nothing**	0.58	1.4	A	5.55
	Do-Something	0.7	2.3	A	7.28

Table 8-4: *PM Peak Traffic Modelling Results for J6B*

The results obtained for the 'do-something' scenarios presented above show that, with the proposed Park and Ride in place, the junction will continue to operate successfully in all future years. In the year of opening (2024), the maximum RFC obtained was 0.64. The maximum queue for this scenario is expected to be 1.8 pcu. The overall delay obtained for this scenario is 6.49 seconds with LOS as A.

Junction 6A and 6B are separated by R918 arm, and the distance between these roundabouts is approximately around 300 meters. The detailed results from traffic modelling (refer Appendix B) show that the maximum queue obtained on the arm separating the two junctions (R918) is significantly below the maximum capacity. Therefore, the assumption to model the two roundabouts independently holds valid here.

On that basis, the traffic impact of the proposed development can be described as ***long-term, neutral,*** and ***imperceptible.*** Detailed modelling results of all the scenarios are included as Appendix B of this Report.

8.5.3 Junction- J2

Junction 2 is the proposed priority junction which will be used to access the proposed Park and Ride site. Traffic modelling results of this junction are discussed in detail below.

8.5.3.1 AM Peak

Comparison of the junction's performance for the different AM Peak scenarios are shown in **Table 8-5**. PICADY modelling results have been included within Appendix B of this Report.

Assessment Year	AM Peak (08:00 - 09:00 hrs)				
	Scenario	Max Ratio of Flow to Capacity (RFC)	Maximum Queue (PCU)	Level of Service (LOS)	Junction Delay (Seconds)
Year of Opening 2024	**Do-Something**	0.18	0.2	A	1.74
Year of Opening +5 2029	**Do-Something**	0.19	0.3	A	1.41
Year of Opening + 15 2039	**Do-Something**	0.21	0.3	A	1.39

Table 8-5: *AM Peak Traffic Modelling Results for J2*

The results obtained for the AM Peak traffic modelling show that the junction is expected to perform within acceptable levels in all assessed years and scenarios. The Level of Service remains A for all the scenarios. A maximum RFC of 0.18 with an overall delay of 1.74 seconds were obtained in the do-something scenario of the year of opening 2024.

8.5.3.2 PM Peak

Comparison of the junction's performance for the different AM Peak scenarios are shown in **Table 8-6**. PICADY modelling results have been included within Appendix B of this Report.

Assessment Year	PM Peak (17:00 - 18:00 hrs)				
	Scenario	Max Ratio of Flow to Capacity (RFC)	Maximum Queue (PCU)	Level of Service (LOS)	Junction Delay (Seconds)
Year of Opening 2024	**Do-Something**	0.14	0.2	A	1.66
Year of Opening +5 2029	**Do-Something**	0.16	0.2	A	1.34
Year of Opening + 15 2039	**Do-Something**	0.21	0.3	A	1.44

Table 8-6: *PM Peak Traffic Modelling Results for J2*

The results obtained for the PM Peak traffic modelling show that the junction is expected to perform within acceptable levels in all assessed years and scenarios. The Level of Service remains A for all the scenarios. A maximum RFC of 0.14 with an overall delay of 1.66 seconds were obtained in the do-something scenario of the year of opening 2024.

On that basis, the traffic impact of the proposed development can be described as ***long-term, neutral,*** and ***imperceptible.*** Detailed modelling results of all the scenarios are included as Appendix B of this Report.

8.6 Other Impacts Associated with the Proposed Development

8.6.1 Environmental Impact

The proposed development will not generate a significant volume of additional vehicular traffic during construction or operational phases. The level of traffic increase is not likely to have any adverse transport-related environmental effects in terms of noise, air quality, vibrations, etc. The environmental impact of the construction period will be ***short-term*** and ***not significant*** in nature.

8.6.2 Construction Stage Impact

The potential impacts resulting from construction works for the proposed development are outlined in **Table 8-5** below. It should be noted that these impacts would be ***short-term, negative,*** and ***not significant,*** and are not expected to result in significant residual impact.

Activities	Potential Impact	Significance of Effects	Duration of Effects
Transportation of site machinery and materials	• Delay and inconvenience to existing traffic on the road network. • Noise/disturbance to other properties in the area. • Dust raised by construction traffic. • Dirt and mud dragged onto the road by construction traffic.	**Moderate**	**Temporary**

Table 8-7: *Potential Impacts During Construction Stage*

9 Road Safety

9.1 Effect of Proposed Development

9.1.1 Internal Traffic

The proposed Park and Ride site is accessible via the Fassaroe Lane, followed by an existing priority junction proposed to be upgraded. The car parks, set down area for car drop-offs/pick-ups and bus shelters inside the proposed site are accessible through an internal road network which has been designed to give clear, legible routes for pedestrians, cyclists, and motorists to enter and exit. The proposed internal road network is designed to facilitate all future traffic movements.

9.1.2 External Traffic

Design of the proposed car parks, set down area and bus shelters accesses onto the internal road and Fassaroe Lane will ensure adequate sightlines for all road users.

10 Remedial and Mitigation Measures

10.1 Operational Stage

10.1.1 Vehicular Traffic

The existing left-in/left-out junction present along Fassaroe Lane at the entrance of the proposed Park and Ride site will be upgraded to a priority junction where both left and right turn movements will be allowed to access the Park and Ride site, and only left turn movement will be allowed to exit the Park and Ride facility. The junction will be operational with the proposed Park and Ride Site in 2024. A new 45m long and 3m wide right-turning lane will be constructed on Fassaroe Lane as part of the proposed junction by realigning the existing central reserve and the eastbound carriageways towards the north to facilitate the local widening.

10.1.2 Active Modes

During the operational phase of the development the following measures will be put in place to improve pedestrian and cyclist facilities:

1. Internal road markings through the carparks to highlight pedestrian routes.
2. Dropped kerbs at building entrances to enable easier access.
3. 40 no. bicycle parking Sheffield stands, 20 no. bike lockers will be provided within the site to facilitate cyclists wishing to avail this facility.

10.2 *Construction Stage*

During the construction phase of the development, the following measures will be put in place to reduce the impact on the surrounding environment:

1. The contractor will be required to provide wheel cleaning facilities, and regular cleaning of the Fassaroe Lane road will be carried out.
2. Temporary car parking facilities for the construction workforce will be provided within the site and the surface of the car park will be prepared and finished to a standard sufficient to avoid mud spillage onto adjoining roads.
3. Monitoring and control of construction traffic will be ongoing during construction works.

11 Conclusion

The proposed Park and Ride facility site covers a total area of 33,007 sq. meters. It will consist of a new car parking area with 388 car parking spaces, set-down areas and taxi ranks with dedicated access. A dedicated bus service will be provided for the people from the Park and Ride site to Dublin city centre and vice versa. A new bus standing area is proposed with a dedicated turning circle, 2 new bus bays and 2 passenger shelters. 40 no. bicycle parking Sheffield stands, and 20 no. bike lockers will also be provided within the site to cater for cyclists accessing the facility.

The proposed site is a part of the 13 strategic park and ride facilities to be provided by NTA's Park and Ride Development Office in the Greater Dublin Area. The overall objectives of the proposed Park and Ride development are:

- To maximise the opportunities provided by on-going investment in public transport infrastructure and services, particularly in relation to the commencement of service of new public transport projects.
- To provide the appropriate type and scale of Park and Ride at the right locations, with connectivity to the road and public transport networks and design that supports integration with the surrounding walking and cycling network.
- Reduce reliance on the private car, reduce distances travelled by car and ensure Park and Ride facilitates greater use of sustainable modes.
- Deliver an enhanced customer experience through safe, secure, and user-friendly facilities that consider opportunities for interchange and to address barriers to public transport use.

The proposed site is reasonably close (circa 250m) to the motorway and will be accessed majorly from the N11 via Junction 6 followed by the existing dual carriageway road- Fassaroe Lane. As a part of the proposal, the existing left-in/left-out junction located on the dual carriageway road (Fassaroe lane) will be upgraded into a priority junction where both left and right turn movements will be allowed to access the Park and Ride site, and only left turn movement will be allowed to exit the Park and Ride facility.

It is anticipated that the proposed development will become operational by 2024.

The estimated daily usage of the proposed Park and Ride facility is 340 no. car trips in the year of opening 2024 (the numbers are based on the demand analysis using ERM conducted by PRDO). The peak hours in the vicinity of the site are determined to be 08:00-09:00 AM and 17:00-18:00 PM, and the overall trips are likely to be concentrated around the peak hours due to the nature of the development's operations. Three buses per hour in each direction are proposed to service to/from the Park and Ride site during the peak periods.

During the opening year (2024), the proposed development will have the following traffic impacts on Junction 6. *(Note: The impact of other committed developments has been taken into consideration while performing traffic analysis):*

- Overall junction delay on the Western Roundabout (6A) is expected to increase by 10% and 1% respectively during the AM and PM peak hours;
- On the Eastern Roundabout (6B) the junction delay is expected to increase by 6% and 20%; respectively during the AM and PM peak hours;
- Mean max-queues on the Fassaroe Lane arm is expected to increase by 0.2 pcu during the AM peak and 0.1 pcu during the PM peak from the year of opening 2024 to the horizon year 2029;
- Mean max-queues on the R918 arm of the western roundabout is expected to increase by 0.1 pcu during the AM peak and 0.3 pcu during the PM peak from the year of opening 2024 to the horizon year 2029. On the eastern roundabout R918 arm, the mean max-queue is expected to increase by 1 pcu during both the peak hours.

The modelling results obtained shows that the junction will operate at a Level of Service A, with or without this proposed development. While the performance of the junction does become slightly lower, as would be expected with the opening of the proposed development, it should be noted that the impact of the development is minor and that the reduced performance of the junction is for the most part due to background traffic growth.

On that basis, the traffic impact of the operational phase of the proposed development can be described as ***long-term***, ***neutral*** and ***imperceptible***.

During construction stage the impact of the proposed development is expected to be ***short-term***, ***negative*** and ***not significant***.

Appendices

Appendix A: Survey Data

IDASO

Survey Name: Ride Development Office: Request for Quotations for Traffic Surveys in at 5 locations on the M4, M7 and N/M11

Site: Site 2.1

Location: Northbound on-ramp to N11/R918/Northbound off-ramp of N11/ Fassaroe Lane

Date: Thu 29-Sep-2022

	A => A										
TIME	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**	**P/C**
07:00	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
09:00	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
10:00	0	0	0	0	0	0	0	0	0	0	0
10:15	0	0	0	0	0	0	0	0	0	0	0
10:30	0	0	0	0	0	0	0	0	0	0	0
10:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
11:00	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0

H/TOT	0	0	0	0	0	0	0	0	0	0	0
12:00	0	0	0	0	0	0	0	0	0	0	0
12:15	0	0	0	0	0	0	0	0	0	0	0
12:30	0	0	0	0	0	0	0	0	0	0	0
12:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
13:00	0	0	0	0	0	0	0	0	0	0	0
13:15	0	0	0	0	0	0	0	0	0	0	0
13:30	0	0	0	0	0	0	0	0	0	0	0
13:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
14:00	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
15:00	0	0	0	0	0	0	0	0	0	0	0
15:15	0	0	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	0	0	0	0
18:30	0	0	0	0	0	0	0	0	0	0	0
18:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
12 TOT	0	0	0	0	0	0	0	0	0	0	0

A => B									A => C					
M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	TAXI	LGV	OGV1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

							A => D							
OGV2	**PSV**	**TOT**	**PCU**	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**	**P/C**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

B => A									B => B					
M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	TAXI	LGV	OGV1
1	22	0	2	0	0	0	25	24.4	0	0	0	0	0	0
0	18	0	5	0	0	0	23	23	0	0	0	0	0	0
1	26	1	6	2	0	0	36	36.4	0	0	0	0	0	0
0	40	0	6	1	0	0	47	47.5	0	0	0	0	0	0
2	106	1	19	3	0	0	131	131.3	0	0	0	0	0	0
0	43	1	3	0	0	0	47	47	0	0	0	0	0	0
0	34	2	4	1	0	0	41	41.5	0	0	0	0	0	0
2	34	0	3	0	0	0	39	37.8	0	0	0	0	0	0
0	32	1	2	0	0	0	35	35	0	0	0	0	0	0
2	143	4	12	1	0	0	162	161.3	0	0	0	0	0	0
0	23	0	3	1	0	0	27	27.5	0	0	1	0	0	0
0	26	0	4	0	0	0	30	30	0	0	1	0	0	0
0	19	0	0	1	0	0	20	20.5	0	0	0	0	0	0
0	14	1	1	1	0	0	17	17.5	0	0	0	0	0	0
0	82	1	8	3	0	0	94	95.5	0	0	2	0	0	0
0	8	0	3	0	0	0	11	11	0	0	1	0	0	0
0	14	0	2	2	0	0	18	19	0	0	1	0	0	0
0	5	1	2	0	0	0	8	8	0	0	0	0	0	0
0	14	2	2	0	0	0	18	18	0	0	0	0	2	0
0	41	3	9	2	0	0	55	56	0	0	2	0	2	0
1	11	0	2	0	1	0	15	15.7	0	0	1	0	0	0
0	11	0	1	2	0	0	14	15	0	0	1	0	1	0
0	10	0	2	0	0	0	12	12	0	0	0	0	0	0
0	15	1	1	2	0	0	19	20	0	0	1	0	0	0

1	47	1	6	4	1	0	60	62.7	0	0	3	0	1	0
0	12	0	4	0	0	0	16	16	0	0	1	0	0	0
0	9	0	2	1	0	0	12	12.5	0	0	0	0	0	0
1	10	0	4	1	0	0	16	15.9	0	0	0	0	0	0
0	10	2	2	1	0	0	15	15.5	0	0	0	0	0	0
1	41	2	12	3	0	0	59	59.9	0	0	1	0	0	0
0	16	0	0	0	0	0	16	16	0	0	1	0	1	0
1	16	0	1	0	0	0	18	17.4	0	0	0	0	0	0
0	13	0	3	0	0	0	16	16	0	0	0	0	0	0
0	12	0	1	0	0	0	13	13	0	0	1	0	0	0
1	57	0	5	0	0	0	63	62.4	0	0	2	0	1	0
0	21	0	1	0	0	0	22	22	0	0	0	0	0	0
2	11	1	1	2	0	0	17	16.8	0	0	1	0	0	0
0	14	1	1	0	0	0	16	16	0	0	0	0	0	0
0	18	0	2	0	0	0	20	20	0	0	0	0	0	0
2	64	2	5	2	0	0	75	74.8	0	0	1	0	0	0
0	11	0	2	0	0	0	13	13	0	0	0	0	0	0
0	15	0	2	0	0	0	17	17	0	0	0	0	0	0
0	20	0	2	0	0	0	22	22	0	0	2	0	0	0
0	11	0	2	0	0	0	13	13	0	0	1	0	0	0
0	57	0	8	0	0	0	65	65	0	0	3	0	0	0
0	14	1	2	0	0	0	17	17	0	0	1	0	0	0
0	18	1	3	0	0	0	22	22	0	0	2	0	0	0
0	19	0	2	0	0	0	21	21	0	0	0	0	0	0
0	11	0	1	0	0	0	12	12	0	0	0	0	0	0
0	62	2	8	0	0	0	72	72	0	0	3	0	0	0
1	11	1	1	1	0	0	15	14.9	0	0	0	0	0	0
0	22	0	3	0	0	0	25	25	0	0	0	0	0	0
0	22	0	1	0	0	0	23	23	0	0	0	0	0	0
0	19	0	2	0	0	0	21	21	0	0	1	0	0	0
1	74	1	7	1	0	0	84	83.9	0	0	1	0	0	0
0	13	0	2	0	0	0	15	15	0	0	0	0	0	0
0	15	0	1	0	0	0	16	16	0	0	0	0	0	0
0	14	1	1	0	0	0	16	16	0	0	0	0	0	0
0	9	0	2	0	0	0	11	11	0	0	0	0	0	0
0	51	1	6	0	0	0	58	58	0	0	0	0	0	0
10	825	18	105	19	1	0	978	982.8	0	0	18	0	4	0

				B => C										
OGV2	**PSV**	**TOT**	**PCU**	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**	**P/C**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
0	0	4	4	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0

0	0	4	4	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	3	3	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	3	3	0	0	0	0	0	0	0	0	0	0	1
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	3	3	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	1	1	1	0	0	0	0	0	0	0	1	0.2	0
0	0	1	1	1	0	0	0	0	0	0	0	1	0.2	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	22	22	1	0	0	0	0	0	0	0	1	0.2	7

B => D									C => A					
M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	TAXI	LGV	OGV1
0	7	0	1	2	1	0	11	13.3	0	0	0	0	0	0
0	5	0	1	1	3	0	10	14.4	0	0	0	0	1	0
0	4	0	6	2	3	0	18	20.5	0	0	2	0	2	0
0	5	0	3	1	1	0	11	12	0	0	1	0	1	0
0	21	0	11	6	8	0	50	60.2	0	0	3	0	4	0
0	1	0	2	1	5	0	9	16	0	0	0	0	0	0
0	7	1	3	0	2	0	13	15.6	0	0	1	0	0	0
0	4	0	2	2	2	0	10	13.6	0	0	1	0	0	0
0	7	0	0	0	4	0	11	16.2	0	0	1	0	0	0
0	19	1	7	3	13	0	43	61.4	0	0	3	0	0	0
0	4	0	2	1	1	0	8	9.8	0	0	0	0	0	0
0	6	0	1	1	2	0	10	13.1	0	0	0	0	0	0
0	5	0	1	2	1	1	10	13.3	0	0	0	0	0	0
0	4	0	2	1	5	0	12	19	0	0	1	0	0	0
0	19	0	6	5	9	1	40	55.2	0	0	1	0	0	0
0	4	0	3	1	2	0	10	13.1	0	0	0	0	0	0
0	4	0	0	1	1	0	6	7.8	0	0	1	0	0	0
0	4	0	3	2	4	0	13	19.2	0	0	0	0	0	0
0	6	0	0	0	4	0	10	15.2	0	0	0	0	0	0
0	18	0	6	4	11	0	39	55.3	0	0	1	0	0	0
0	8	0	2	4	1	0	15	18.3	0	0	1	0	0	0
0	4	0	1	1	2	0	8	11.1	0	0	0	0	0	0
0	1	1	0	0	3	0	5	8.9	0	0	1	0	0	0
0	4	1	2	0	4	0	11	16.2	0	0	0	0	0	0

0	17	2	5	5	10	0	39	54.5	0	0	2	0	0	0
0	4	0	1	4	1	0	10	13.3	0	0	1	0	0	0
0	4	0	0	1	3	0	8	12.4	0	0	1	0	0	0
0	7	0	3	1	2	0	13	16.1	0	0	3	0	0	0
0	1	0	1	2	2	0	6	9.6	0	0	1	0	0	0
0	16	0	5	8	8	0	37	51.4	0	0	6	0	0	0
0	9	0	2	0	1	0	12	13.3	0	0	1	0	0	0
0	5	0	1	0	1	0	7	8.3	0	0	0	0	0	0
0	5	0	1	1	0	0	7	7.5	0	0	0	0	0	0
0	4	0	2	0	3	0	9	12.9	0	0	0	0	0	1
0	23	0	6	1	5	0	35	42	0	0	1	0	0	1
0	10	0	3	2	3	0	18	22.9	0	0	0	0	0	0
1	1	0	0	4	3	0	9	14.3	0	0	1	0	0	0
0	3	0	1	2	3	0	9	13.9	0	0	0	0	0	0
0	10	0	0	2	1	0	13	15.3	0	0	0	0	0	0
1	24	0	4	10	10	0	49	66.4	0	0	1	0	0	0
0	2	0	2	1	2	0	7	10.1	0	0	0	0	2	0
0	0	0	3	3	2	0	9	12.3	0	0	0	0	0	0
0	7	0	2	0	1	0	10	11.3	0	0	0	0	0	0
0	8	0	1	2	0	0	11	12	0	0	1	0	0	0
0	17	0	8	6	5	0	37	45.7	0	0	1	0	2	0
0	10	0	0	2	1	0	13	15.3	0	0	0	0	0	0
0	4	0	2	1	5	0	12	19	0	0	0	0	0	0
0	5	0	0	0	1	0	6	7.3	0	0	0	0	0	0
0	5	0	0	0	3	0	8	11.9	0	0	1	0	0	0
0	24	0	2	3	10	0	39	53.5	0	0	1	0	0	0
0	9	1	0	0	0	0	10	10	0	0	1	0	0	0
0	9	0	0	0	0	0	9	9	0	0	0	0	0	0
0	3	0	3	0	1	0	9	8.7	0	1	0	0	0	0
0	9	0	0	1	2	0	12	15.1	0	0	0	0	0	0
0	30	1	3	1	3	0	40	42.8	0	1	1	0	0	0
0	9	0	0	0	0	0	9	9	0	0	0	0	0	0
1	14	0	0	0	0	0	15	14.4	0	0	0	0	0	0
0	4	0	1	0	2	0	7	9.6	0	0	0	0	0	0
0	4	0	0	0	0	0	4	4	0	0	0	0	0	0
1	31	0	1	0	2	0	35	37	0	0	0	0	0	0
2	259	4	64	52	94	1	483	625.4	0	1	21	0	6	1

				C => B										
OGV2	**PSV**	**TOT**	**PCU**	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**	**P/C**
0	0	0	0	0	0	21	0	2	1	0	0	24	24.5	0
0	0	1	1	1	0	26	1	7	0	0	1	36	36.2	0
0	0	4	4	0	0	39	1	5	0	0	1	46	47	0
0	0	2	2	1	1	46	0	9	3	0	0	60	60.1	0
0	0	7	7	2	1	132	2	23	4	0	2	166	167.8	0
0	0	0	0	0	0	51	0	2	0	0	1	54	55	0
0	0	1	1	0	0	114	2	10	2	1	3	132	137.3	0
0	0	1	1	0	0	95	2	8	2	0	1	108	110	0
0	0	1	1	0	0	131	2	13	5	0	0	151	153.5	0
0	0	3	3	0	0	391	6	33	9	1	5	445	455.8	0
0	0	0	0	0	0	72	1	3	0	1	1	78	80.3	0
0	0	0	0	0	0	72	0	9	1	0	2	84	86.5	0
0	0	0	0	0	0	51	0	9	2	0	1	63	65	0
0	0	1	1	0	0	36	1	1	4	0	0	42	44	0
0	0	1	1	0	0	231	2	22	7	1	4	267	275.8	0
0	0	0	0	0	0	38	1	3	1	0	0	43	43.5	0
0	0	1	1	1	1	40	1	2	1	0	0	46	45.1	0
0	0	0	0	1	0	35	2	6	1	0	2	47	48.7	0
0	0	0	0	0	0	50	1	6	2	0	1	60	62	0
0	0	1	1	2	1	163	5	17	5	0	3	196	199.3	0
0	0	1	1	0	0	37	0	4	1	2	0	44	47.1	0
0	0	0	0	0	0	47	3	1	2	0	0	53	54	0
0	0	1	1	0	1	53	1	5	6	0	1	67	70.4	0
0	0	0	0	1	0	45	0	2	0	0	1	49	49.2	0

0	0	2	2	1	1	182	4	12	9	2	2	213	220.7	0
0	0	1	1	1	0	44	0	3	1	0	1	50	50.7	0
0	0	1	1	0	0	46	1	5	3	0	0	55	56.5	0
0	0	3	3	0	0	51	1	11	0	0	1	64	65	0
0	0	1	1	2	0	61	0	5	2	0	1	71	71.4	0
0	0	6	6	3	0	202	2	24	6	0	3	240	243.6	0
0	0	1	1	7	0	48	1	3	4	1	0	64	61.7	0
0	0	0	0	1	0	40	0	5	2	1	0	49	50.5	0
0	0	0	0	1	0	44	1	5	2	1	1	55	57.5	0
0	0	1	1.5	0	1	57	0	9	2	0	2	71	73.4	0
0	0	2	2.5	9	1	189	2	22	10	3	3	239	243.1	0
0	0	0	0	0	0	56	0	3	3	0	0	62	63.5	0
0	0	1	1	0	0	54	1	3	2	1	1	62	65.3	0
0	0	0	0	0	0	65	0	6	2	1	1	75	78.3	0
0	0	0	0	1	1	67	1	6	1	0	1	78	78.1	0
0	0	1	1	1	1	242	2	18	8	2	3	277	285.2	0
0	0	2	2	1	0	61	2	6	3	0	0	73	73.7	0
0	0	0	0	0	0	60	0	7	3	0	1	71	73.5	0
0	0	0	0	0	0	54	1	7	2	0	1	65	67	0
0	0	1	1	0	1	62	1	7	3	0	1	75	76.9	0
0	0	3	3	1	1	237	4	27	11	0	3	284	291.1	0
0	0	0	0	0	0	55	0	6	0	1	1	63	65.3	0
0	0	0	0	2	0	50	0	9	0	1	0	62	61.7	0
0	0	0	0	0	1	64	0	14	0	0	1	80	80.4	0
0	0	1	1	0	1	64	0	4	0	0	1	70	70.4	0
0	0	1	1	2	2	233	0	33	0	2	3	275	277.8	0
0	0	1	1	0	0	67	0	11	2	1	1	82	85.3	0
0	0	0	0	0	0	82	0	8	1	0	0	91	91.5	0
0	0	1	0.4	1	0	63	0	8	1	1	2	76	79	0
0	0	0	0	0	2	64	0	3	0	0	1	70	69.8	0
0	0	2	1.4	1	2	276	0	30	4	2	4	319	325.6	0
0	0	0	0	0	0	87	3	2	0	0	1	93	94	0
0	0	0	0	1	0	55	1	6	2	0	1	66	67.2	0
0	0	0	0	1	0	35	2	6	0	0	0	44	43.2	0
0	0	0	0	1	0	54	1	4	0	0	1	61	61.2	0
0	0	0	0	3	0	231	7	18	2	0	3	264	265.6	0
0	0	29	28.9	25	10	2709	36	279	75	13	38	3185	3251.4	0

		C => C										C => D		
M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	TAXI	LGV	OGV1
0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
0	0	0	0	0	0	0	0	0	1	0	1	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	6	0	2	0
0	0	0	0	0	0	0	0	0	1	0	12	0	3	1
0	0	0	0	0	0	0	0	0	0	0	4	0	1	0
0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
0	0	0	0	0	0	0	0	0	0	0	3	0	1	1
0	0	0	0	0	0	0	0	0	0	0	2	0	1	1
0	0	0	0	0	0	0	0	0	0	0	10	0	3	4
0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
0	0	0	0	0	0	0	0	0	1	1	5	0	0	0
0	0	0	0	0	0	0	0	0	0	1	3	0	2	4
0	0	0	0	0	0	0	0	0	0	0	2	0	1	0
0	0	0	0	0	0	0	0	0	1	2	15	0	3	4
0	0	0	0	0	0	0	0	0	0	0	3	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	4	0	1	2
0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
0	0	0	0	0	0	0	0	0	0	0	9	0	2	6
0	0	0	0	0	0	0	0	0	0	0	4	0	1	2
0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
0	0	0	0	0	0	0	0	0	1	0	4	0	1	1
0	0	0	0	0	0	0	0	0	0	0	1	0	1	1

0	0	0	0	0	0	0	0	0	1	0	10	0	4	4
0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
0	0	0	0	0	0	0	0	0	0	0	2	0	0	3
0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
0	0	0	0	0	0	0	0	0	0	0	7	0	1	2
0	0	0	0	0	0	0	0	0	0	0	18	0	1	5
0	0	0	0	0	0	0	0	0	0	0	2	0	1	0
0	0	0	0	0	0	0	0	0	0	0	3	0	1	0
0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
0	0	0	0	0	0	0	0	0	0	0	3	0	2	2
0	0	0	0	0	0	0	0	0	0	0	12	0	4	2
0	0	0	0	0	0	0	0	0	0	0	2	0	0	4
0	0	0	0	0	0	0	0	0	0	0	5	0	1	0
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	3	0	0	1
0	0	0	0	0	0	0	0	0	0	0	11	0	1	5
0	0	0	0	0	0	0	0	0	0	0	1	0	2	1
0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
0	0	0	0	0	0	0	0	0	0	0	4	0	0	2
0	0	0	0	0	0	0	0	0	0	0	3	0	0	1
0	0	0	0	0	0	0	0	0	0	0	15	0	2	4
0	0	0	0	0	0	0	0	0	0	1	1	0	2	0
0	0	0	0	0	0	0	0	0	0	0	3	0	1	1
0	0	0	0	0	0	0	0	0	0	0	2	0	1	0
0	0	0	0	0	0	0	0	0	0	0	6	0	1	0
0	0	0	0	0	0	0	0	0	0	1	12	0	5	1
0	0	0	0	0	0	0	0	0	0	1	3	0	1	0
0	0	0	0	0	0	0	0	0	0	0	6	0	0	1
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	6	0	0	0
0	0	0	0	0	0	0	0	0	0	1	16	0	1	1
0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
0	0	0	0	0	0	0	0	0	0	0	10	0	1	0
0	0	0	0	0	0	0	0	0	0	0	9	0	1	0
0	0	0	0	0	0	0	0	0	0	0	9	0	1	0
0	0	0	0	0	0	0	0	0	0	0	32	0	3	0
0	0	0	0	0	0	0	0	0	3	4	172	0	32	37

								D => A						
OGV2	**PSV**	**TOT**	**PCU**	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**	**P/C**
0	0	5	5	0	0	4	0	0	0	0	0	4	4	0
1	0	4	5	0	0	4	0	0	0	2	0	6	8.6	0
0	0	1	1	0	0	3	0	1	1	4	0	9	14.7	0
1	0	9	10.3	0	1	11	0	2	5	3	0	22	27.8	1
2	0	19	21.3	0	1	22	0	3	6	9	0	41	55.1	1
0	0	5	5	0	0	15	0	2	2	2	0	21	24.6	0
0	0	3	4	0	0	26	0	0	1	2	0	29	32.1	0
0	0	5	5.5	0	0	23	0	1	1	2	0	27	30.1	0
1	0	5	6.8	0	0	7	0	2	2	1	0	12	14.3	0
1	0	18	21.3	0	0	71	0	5	6	7	0	89	101.1	0
1	0	6	7.3	0	0	1	0	2	1	4	0	8	13.7	0
3	0	10	12.5	0	0	5	0	3	0	4	0	12	17.2	0
0	0	10	11.4	0	0	1	0	1	2	3	0	7	11.9	0
0	0	3	3	0	0	1	1	4	1	4	0	11	16.7	0
4	0	29	34.2	0	0	8	1	10	4	15	0	38	59.5	0
2	0	7	10.1	0	0	1	0	0	2	0	0	3	4	0
1	0	4	6.8	0	0	4	0	1	0	2	0	7	9.6	0
0	0	7	8	0	0	3	0	1	0	2	0	6	8.6	0
0	0	2	2	0	0	0	0	0	1	3	0	4	8.4	0
3	0	20	26.9	0	0	8	0	2	3	7	0	20	30.6	0
2	0	9	12.6	0	0	4	0	3	0	4	0	11	16.2	0
0	0	2	2	0	0	5	0	0	3	2	0	10	14.1	0
1	0	8	9	0	1	4	0	1	1	3	0	10	13.8	0
1	0	4	5.8	0	0	4	0	2	1	2	0	9	12.1	0

4	0	23	29.4	0	1	17	0	6	5	11	0	40	56.2	0
1	0	6	7.3	0	0	3	1	1	0	3	0	8	11.9	0
1	0	6	8.8	0	0	1	0	1	1	2	0	5	8.1	0
0	0	4	4	0	0	4	0	2	2	3	0	11	15.9	0
0	0	10	11	0	0	2	0	1	4	1	0	8	11.3	0
2	0	26	31.1	0	0	10	1	5	7	9	0	32	47.2	0
1	0	4	5.3	0	0	3	0	1	0	5	0	9	15.5	0
2	0	6	8.6	0	0	3	0	1	1	0	0	5	5.5	0
1	0	5	6.3	0	0	1	0	1	1	2	0	5	8.1	0
1	0	8	10.3	0	0	3	0	1	0	1	0	5	6.3	0
5	0	23	30.5	0	0	10	0	4	2	8	0	24	35.4	0
1	0	7	10.3	0	1	0	1	2	2	4	0	10	15.6	0
1	0	7	8.3	0	0	3	0	0	2	3	0	8	12.9	0
2	0	3	5.6	0	0	2	0	1	3	1	0	7	9.8	0
0	0	4	4.5	0	0	4	0	3	2	3	0	12	16.9	0
4	0	21	28.7	0	1	9	1	6	9	11	0	37	55.2	0
1	0	5	6.8	0	0	4	0	1	4	1	0	10	13.3	0
1	0	8	9.3	0	0	9	0	1	1	3	0	14	18.4	0
2	0	8	11.6	0	0	9	0	0	2	2	0	13	16.6	0
1	0	5	6.8	0	0	7	0	3	1	2	0	13	16.1	0
5	0	26	34.5	0	0	29	0	5	8	8	0	50	64.4	0
0	0	4	3.4	0	1	5	0	2	1	1	0	10	11.2	0
1	0	6	7.8	0	0	5	0	1	1	0	0	7	7.5	0
1	0	4	5.3	0	1	5	0	2	1	1	0	10	11.2	1
2	0	9	11.6	0	0	3	0	1	0	0	0	4	4	0
4	0	23	28.1	0	2	18	0	6	3	2	0	31	33.9	1
2	0	7	9	0	0	10	0	0	0	3	0	13	16.9	0
0	0	7	7.5	0	0	12	0	2	0	2	0	16	18.6	0
1	0	2	3.3	0	0	9	0	1	0	2	0	12	14.6	0
2	0	8	10.6	0	0	7	0	2	1	1	0	11	12.8	0
5	0	24	30.4	0	0	38	0	5	1	8	0	52	62.9	0
0	0	4	4	0	0	6	0	1	0	1	0	8	9.3	0
0	0	11	11	1	0	5	0	0	0	0	0	6	5.2	0
0	0	10	10	0	0	4	0	0	0	1	0	5	6.3	0
1	0	11	12.3	0	0	2	0	1	1	1	0	5	6.8	0
1	0	36	37.3	1	0	17	0	2	1	3	0	24	27.6	0
40	0	288	353.7	1	5	257	3	59	55	98	0	478	629.1	2

	D => B									D => C				
M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	TAXI	LGV	OGV1
0	3	0	0	0	0	0	3	3	0	0	0	0	0	0
0	4	0	3	0	0	0	7	7	0	0	0	0	0	0
0	15	0	3	1	1	0	20	21.8	0	0	0	0	0	0
0	8	0	1	1	1	0	12	13	0	0	0	0	0	0
0	30	0	7	2	2	0	42	44.8	0	0	0	0	0	0
0	34	0	1	4	1	0	40	43.3	0	0	0	0	0	0
0	49	0	3	0	2	0	54	56.6	0	0	0	0	0	0
0	92	0	2	0	1	0	95	96.3	0	0	0	0	0	0
0	41	0	2	2	0	0	45	46	0	0	0	0	0	0
0	216	0	8	6	4	0	234	242.2	0	0	0	0	0	0
0	12	0	3	2	1	0	18	20.3	0	0	0	0	0	0
1	11	0	0	0	1	0	13	13.7	0	0	0	0	0	0
0	8	0	1	0	1	0	10	11.3	0	0	0	0	0	0
0	7	0	2	1	1	0	11	12.8	0	0	0	0	0	0
1	38	0	6	3	4	0	52	58.1	0	0	0	0	0	0
0	7	0	3	2	2	0	14	17.6	0	0	0	0	0	0
0	3	0	2	1	1	0	7	8.8	0	0	0	0	0	0
0	6	0	2	1	1	0	10	11.8	0	0	0	0	0	0
0	7	0	3	2	0	0	12	13	0	0	0	0	0	0
0	23	0	10	6	4	0	43	51.2	0	0	0	0	0	0
0	8	0	0	3	0	0	11	12.5	0	0	0	0	0	0
0	4	0	3	1	0	0	8	8.5	0	0	0	0	0	0
0	11	0	1	1	0	0	13	13.5	0	0	0	0	0	0
0	11	0	2	1	2	0	16	19.1	0	0	0	0	0	0

0	34	0	6	6	2	0	48	53.6	0	0	0	0	0	0
0	10	0	1	1	0	0	12	12.5	0	0	0	0	0	0
0	4	0	2	2	1	0	9	11.3	0	0	0	0	0	0
0	5	0	1	1	2	0	9	12.1	0	0	0	0	0	0
0	9	0	3	1	1	0	14	15.8	0	0	0	0	0	0
0	28	0	7	5	4	0	44	51.7	0	0	0	0	0	0
1	16	0	0	1	1	0	19	20.2	0	0	0	0	0	0
0	11	0	2	1	1	0	15	16.8	0	0	0	0	0	0
1	8	0	2	0	1	0	12	12.7	0	0	0	0	0	0
0	15	0	0	0	2	0	17	19.6	0	0	0	0	0	0
2	50	0	4	2	5	0	63	69.3	0	0	0	0	0	0
0	12	0	2	1	0	0	15	15.5	0	0	0	0	0	0
0	7	0	3	1	2	0	13	16.1	0	0	0	0	0	0
0	27	0	3	0	2	0	32	34.6	0	0	0	0	0	0
0	17	0	2	1	2	0	22	25.1	0	0	0	0	0	0
0	63	0	10	3	6	0	82	91.3	0	0	0	0	0	0
0	12	0	1	0	0	0	13	13	0	0	0	0	0	0
0	6	0	3	0	2	0	11	13.6	0	0	0	0	0	0
0	22	0	2	1	0	0	25	25.5	0	0	0	0	0	0
0	77	0	1	2	4	0	84	90.2	0	0	0	0	0	0
0	117	0	7	3	6	0	133	142.3	0	0	0	0	0	0
0	17	0	5	2	2	0	26	29.6	0	0	0	0	0	0
1	14	0	4	0	1	0	20	20.7	0	0	0	0	0	0
0	15	0	4	0	0	0	20	19.2	0	0	0	0	0	0
0	21	0	3	0	0	0	24	24	0	0	0	0	0	0
1	67	0	16	2	3	0	90	93.5	0	0	0	0	0	0
1	72	0	4	0	0	0	77	76.4	0	0	0	0	0	0
2	99	0	3	0	0	0	104	102.8	0	0	0	0	0	0
0	23	1	2	0	0	0	26	26	0	0	0	0	0	0
1	17	1	1	1	1	0	22	23.2	0	0	0	0	0	0
4	211	2	10	1	1	0	229	228.4	0	0	0	0	0	0
0	25	0	4	1	0	0	30	30.5	0	0	0	0	0	0
1	22	0	3	0	1	0	27	27.7	0	0	0	0	0	0
1	16	0	0	0	0	0	17	16.4	0	0	0	0	0	0
0	13	0	3	0	0	0	16	16	0	0	0	0	0	0
2	76	0	10	1	1	0	90	90.6	0	0	0	0	0	0
10	953	2	101	40	42	0	1150	1217	0	0	0	0	0	0

								D => D					
OGV2	**PSV**	**TOT**	**PCU**	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	1	0	0	2	2.5

0	0	0	0	0	0	0	0	1	1	0	0	2	2.5
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0	0	0	3	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0	0	0	3	3
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	8	0	1	1	0	0	10	10.5

IDASO

Survey Name: 353 22526 Park and Ride Development Office: Request for Quotations for Traffic Surveys in at 5 locations on the M4, M7 and N/M11

Site: Site 2.2

Location: Upper Dargle Road/ Campus Oil Head Office/ R918/ southbound on-ramp to N11/ Southbound off-ramp of N11

Date: Thu 29-Sep-2022

	A => A										
TIME	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**	**P/C**
07:00	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	1
H/TOT	0	0	0	0	0	0	0	0	0	0	1
08:00	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
09:00	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	1	0	0	0	0	0	1	1	0
09:30	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	1	0	0	0	0	0	1	1	0
10:00	0	0	0	0	0	0	0	0	0	0	0
10:15	0	0	1	0	0	0	0	0	1	1	0
10:30	0	0	0	0	0	0	0	0	0	0	0
10:45	0	0	1	0	0	0	0	0	1	1	0
H/TOT	0	0	2	0	0	0	0	0	2	2	0
11:00	0	0	0	0	0	0	0	0	0	0	0

11:15	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	1	0	0	0	0	0	1	1	0
11:45	0	0	0	0	0	1	0	0	1	1.5	0
H/TOT	0	0	1	0	0	1	0	0	2	2.5	0
12:00	0	0	0	0	0	0	0	0	0	0	0
12:15	0	0	1	0	0	0	0	0	1	1	0
12:30	0	0	0	0	0	0	0	0	0	0	0
12:45	0	0	1	0	0	0	0	0	1	1	0
H/TOT	0	0	2	0	0	0	0	0	2	2	0
13:00	0	0	0	0	0	0	0	0	0	0	0
13:15	0	0	0	0	0	0	0	0	0	0	0
13:30	0	0	0	0	0	0	0	0	0	0	0
13:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	0	0	0	0	0	0	0
14:00	0	0	0	0	1	0	0	0	1	1	0
14:15	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	1	0	0	0	0	0	1	1	0
14:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	1	0	1	0	0	0	2	2	0
15:00	0	0	0	0	0	1	0	0	1	1.5	0
15:15	0	0	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0	0	0
15:45	0	0	1	0	0	0	0	0	1	1	0
H/TOT	0	0	1	0	0	1	0	0	2	2.5	0
16:00	0	0	1	0	0	0	0	0	1	1	0
16:15	0	0	1	0	0	0	0	0	1	1	0
16:30	0	0	3	0	0	0	0	0	3	3	0
16:45	0	0	0	0	1	0	0	0	1	1	0
H/TOT	0	0	5	0	1	0	0	0	6	6	0
17:00	0	0	1	0	1	0	0	0	2	2	0
17:15	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	1	0	0	0	0	0	1	1	2
17:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	2	0	1	0	0	0	3	3	2
18:00	0	0	0	0	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	0	0	0	0
18:30	0	0	0	0	1	0	0	0	1	1	0
18:45	0	0	0	0	0	0	0	0	0	0	0
H/TOT	0	0	0	0	1	0	0	0	1	1	0
12 TOT	0	0	15	0	4	2	0	0	21	22	3

A => B									A => C					
M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	TAXI	LGV	OGV1
0	1	0	0	0	0	0	1	1	0	1	20	0	1	0
0	3	0	2	1	0	0	6	6.5	0	0	15	0	2	0
0	6	0	0	0	0	0	6	6	3	1	22	1	5	1
0	5	1	0	0	0	0	7	6.2	1	0	29	0	5	1
0	15	1	2	1	0	0	20	19.7	4	2	86	1	13	2
0	6	0	0	0	0	0	6	6	0	0	32	1	3	0
0	3	0	0	0	0	0	3	3	0	0	33	0	4	0
0	3	1	0	0	0	0	4	4	0	1	26	1	3	1
0	4	0	0	0	0	0	4	4	0	0	26	0	2	0
0	16	1	0	0	0	0	17	17	0	1	117	2	12	1
0	4	2	0	0	0	0	6	6	0	0	22	0	3	1
0	8	0	0	1	0	1	10	11.5	0	0	21	0	4	0
0	4	0	0	0	0	0	4	4	1	0	17	1	1	1
0	4	0	1	0	0	0	5	5	0	0	14	0	2	1
0	20	2	1	1	0	1	25	26.5	1	0	74	1	10	3
0	2	0	0	0	0	0	2	2	0	0	5	0	5	0
0	2	0	0	0	0	0	2	2	0	0	11	0	2	2
0	0	0	0	0	0	0	0	0	0	0	7	1	2	0
0	3	0	0	0	0	0	3	3	0	0	18	0	2	0
0	7	0	0	0	0	0	7	7	0	0	41	1	11	2
0	3	0	1	0	0	0	4	4	0	1	13	0	1	1

0	1	0	0	0	0	0	1	1	0	0	8	0	1	2
0	5	1	0	0	0	0	6	6	0	0	8	1	2	0
0	2	1	0	0	0	0	3	3	0	0	14	1	1	2
0	11	2	1	0	0	0	14	14	0	1	43	2	5	5
0	0	0	1	0	0	0	1	1	0	0	13	0	2	0
0	9	0	0	0	0	0	9	9	0	0	11	0	2	1
0	3	0	1	0	0	0	4	4	0	1	12	0	7	1
0	4	0	1	0	0	0	5	5	0	0	9	0	3	1
0	16	0	3	0	0	0	19	19	0	1	45	0	14	3
0	4	0	0	0	0	0	4	4	0	0	22	0	1	0
1	3	0	1	0	0	0	5	4.4	0	1	11	0	1	0
0	3	0	1	0	0	0	4	4	0	0	12	0	4	0
0	7	0	0	0	0	1	8	9	0	0	13	0	0	0
1	17	0	2	0	0	1	21	21.4	0	1	58	0	6	0
0	5	0	0	0	0	0	5	5	0	0	26	0	3	1
0	4	0	0	0	0	0	4	4	0	2	9	0	0	2
0	2	0	0	0	0	0	2	2	0	0	12	1	2	1
0	5	1	0	1	0	1	8	9.5	0	0	19	0	1	0
0	16	1	0	1	0	1	19	20.5	0	2	66	1	6	4
0	5	0	0	0	0	0	5	5	0	0	10	0	3	0
0	7	0	2	0	0	0	9	9	1	0	15	0	2	0
0	3	1	0	0	0	0	4	4	0	0	20	0	1	0
0	2	0	1	0	0	0	3	3	0	0	9	1	3	0
0	17	1	3	0	0	0	21	21	1	0	54	1	9	0
0	6	0	0	0	0	0	6	6	0	0	17	1	2	0
0	3	0	0	0	0	0	3	3	0	0	13	1	2	0
0	4	0	0	0	0	0	4	4	0	0	14	0	0	0
0	8	0	1	0	0	0	9	9	0	0	12	0	1	0
0	21	0	1	0	0	0	22	22	0	0	56	2	5	0
0	12	0	0	0	0	0	12	12	0	1	15	2	1	1
0	10	0	2	0	0	0	12	12	0	0	20	1	3	0
0	7	0	1	0	0	0	10	8.4	2	0	15	1	3	0
0	8	0	0	0	0	0	8	8	1	0	21	0	2	0
0	37	0	3	0	0	0	42	40.4	3	1	71	4	9	1
0	6	0	1	0	0	0	7	7	0	0	17	1	1	0
0	3	0	0	0	0	0	3	3	0	0	17	0	1	0
0	14	0	2	0	0	0	16	16	0	0	11	0	1	0
0	5	0	1	0	0	0	6	6	0	0	10	0	1	0
0	28	0	4	0	0	0	32	32	0	0	55	1	4	0
1	221	8	20	3	0	3	259	260.5	9	9	766	16	104	21

				A => D										
OGV2	PSV	TOT	PCU	P/C	M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C
0	0	22	21.4	0	0	15	0	3	0	0	1	19	20	0
0	0	17	17	0	1	5	1	3	0	0	0	10	9.4	0
0	0	33	30.5	0	1	23	3	4	1	0	1	33	33.9	0
0	0	36	35.7	0	0	17	0	5	0	0	1	23	24	1
0	0	108	104.6	0	2	60	4	15	1	0	3	85	87.3	1
0	0	36	36	0	0	25	0	4	1	0	0	30	30.5	1
0	0	37	37	0	0	31	0	5	0	0	0	36	36	0
0	0	32	31.9	0	0	42	0	4	0	0	1	47	48	0
0	0	28	28	0	0	36	0	6	1	0	1	44	45.5	0
0	0	133	132.9	0	0	134	0	19	2	0	2	157	160	1
1	0	27	28.8	0	0	29	0	1	1	0	0	31	31.5	0
0	0	25	25	0	0	26	1	0	0	0	0	27	27	0
0	0	21	20.7	0	0	21	1	3	0	0	0	25	25	0
0	0	17	17.5	1	3	16	1	4	0	0	0	25	22.4	0
1	0	90	92	1	3	92	3	8	1	0	0	108	105.9	0
1	0	11	12.3	3	0	12	0	3	0	0	2	20	19.6	0
0	0	15	16	1	0	18	0	0	0	0	0	19	18.2	0
0	0	10	10	0	0	30	1	4	4	0	0	39	41	0
0	0	20	20	0	0	20	1	2	2	0	2	27	30	0
1	0	56	58.3	4	0	80	2	9	6	0	4	105	108.8	0
1	0	17	18.2	0	0	20	0	6	1	0	1	28	29.5	0

0	0	11	12	0	0	18	0	2	1	0	0	21	21.5	0
0	0	11	11	0	0	26	0	2	0	0	0	28	28	0
0	0	18	19	0	0	22	0	4	0	0	2	28	30	0
1	0	57	60.2	0	0	86	0	14	2	0	3	105	109	0
0	0	15	15	0	0	20	2	4	0	0	0	26	26	0
0	0	14	14.5	0	0	26	0	0	1	0	0	27	27.5	0
0	0	21	20.9	0	0	26	2	3	2	0	0	33	34	0
0	0	13	13.5	0	0	32	1	2	2	1	1	39	42.3	0
0	0	63	63.9	0	0	104	5	9	5	1	1	125	129.8	0
0	0	23	23	0	0	23	0	1	0	0	1	25	26	0
0	0	13	12.4	0	0	27	0	0	1	0	0	28	28.5	0
0	0	16	16	0	0	31	1	4	0	0	0	36	36	0
0	0	13	13	0	0	40	1	1	1	0	3	46	49.5	0
0	0	65	64.4	0	0	121	2	6	2	0	4	135	140	0
0	0	30	30.5	0	1	32	0	0	2	0	1	36	37.4	0
0	0	13	12.8	0	0	38	0	6	0	0	0	44	44	0
0	0	16	16.5	0	0	31	1	1	1	0	0	34	34.5	0
0	0	20	20	0	0	33	1	5	1	0	1	41	42.5	0
0	0	79	79.8	0	1	134	2	12	4	0	2	155	158.4	0
1	0	14	15.3	0	0	35	0	4	0	0	1	40	41	0
0	0	18	17.2	0	1	36	1	6	0	0	0	44	43.4	0
0	0	21	21	0	0	37	1	7	0	0	0	45	45	0
0	0	13	13	0	0	63	0	5	0	0	2	70	72	0
1	0	66	66.5	0	1	171	2	22	0	0	3	199	201.4	0
0	0	20	20	0	0	51	2	4	0	0	0	57	57	0
0	0	16	16	2	0	35	0	3	0	0	2	42	42.4	0
0	0	14	14	0	0	38	0	8	0	1	0	47	48.3	0
0	0	13	13	1	0	41	1	6	0	0	1	50	50.2	0
0	0	63	63	3	0	165	3	21	0	1	3	196	197.9	0
0	0	20	19.9	0	0	45	0	9	0	0	0	54	54	0
0	0	24	24	1	0	39	1	4	1	0	0	46	45.7	0
0	0	21	19.4	0	1	49	0	4	0	0	0	54	53.4	0
0	0	24	23.2	0	0	40	0	4	0	0	1	45	46	0
0	0	89	86.5	1	1	173	1	21	1	0	1	199	199.1	0
0	0	19	19	1	1	62	0	2	0	0	0	66	64.6	0
0	0	18	18	0	0	33	1	7	0	0	0	41	41	1
0	0	12	12	0	0	33	0	2	1	0	0	36	36.5	0
0	0	11	11	0	0	27	2	1	1	0	1	32	33.5	0
0	0	60	60	1	1	155	3	12	2	0	1	175	175.6	1
4	0	929	932.1	10	9	1475	27	168	26	2	27	1744	1773.2	3

B => A									B => B					
M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	TAXI	LGV	OGV1
0	2	0	0	0	0	0	2	2	0	0	0	0	0	0
0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
0	2	0	0	0	0	0	2	2	0	0	0	0	0	0
0	11	0	0	0	0	0	12	11.2	0	0	0	0	0	0
0	16	0	0	0	0	0	17	16.2	0	0	0	0	0	0
0	9	0	0	0	0	0	10	9.2	0	0	0	0	0	0
0	6	0	0	0	0	1	7	8	0	0	0	0	0	0
0	14	0	3	0	0	0	17	17	0	0	0	0	0	0
0	8	1	0	0	0	0	9	9	0	0	0	0	0	0
0	37	1	3	0	0	1	43	43.2	0	0	0	0	0	0
0	4	1	0	0	0	0	5	5	0	0	0	0	0	0
0	2	0	0	0	0	0	2	2	0	0	0	0	0	0
0	7	0	1	0	0	0	8	8	0	0	0	0	0	0
0	6	0	1	0	0	0	7	7	0	0	0	0	0	0
0	19	1	2	0	0	0	22	22	0	0	0	0	0	0
0	2	0	0	0	0	0	2	2	0	0	0	0	0	0
0	2	0	1	0	0	0	3	3	0	0	0	0	0	0
0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
0	6	0	1	0	0	0	7	7	0	0	0	0	0	0
0	0	0	2	0	0	0	2	2	0	0	0	0	0	0

0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
0	3	0	0	0	0	0	3	3	0	0	0	0	0	0
0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
0	5	0	2	0	0	0	7	7	0	0	0	0	0	0
0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
0	10	0	0	0	0	0	10	10	0	0	0	0	0	0
0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
0	13	0	0	0	0	0	13	13	0	0	0	0	0	0
1	7	0	0	0	0	1	9	9.4	0	0	0	0	0	0
0	9	0	1	0	0	0	10	10	0	0	0	0	0	0
0	4	0	0	0	0	0	4	4	0	0	0	0	0	0
0	8	0	0	0	0	0	8	8	0	0	0	0	0	0
1	28	0	1	0	0	1	31	31.4	0	0	0	0	0	0
0	5	0	1	0	0	0	6	6	0	0	0	0	0	0
0	6	0	0	0	0	0	6	6	0	0	0	0	0	0
0	2	1	0	0	0	0	3	3	0	0	0	0	0	0
0	2	0	0	0	0	0	2	2	0	0	0	0	0	0
0	15	1	1	0	0	0	17	17	0	0	0	0	0	0
0	2	0	0	0	0	0	2	2	0	0	0	0	0	0
0	4	0	0	1	0	0	5	5.5	0	0	0	0	0	0
1	1	0	2	0	0	0	4	3.4	0	0	0	0	0	0
0	2	0	0	0	0	0	2	2	0	0	0	0	0	0
1	9	0	2	1	0	0	13	12.9	0	0	0	0	0	0
0	6	0	0	0	0	0	6	6	0	0	0	0	0	0
0	5	0	0	0	0	0	5	5	0	0	0	0	0	0
0	3	0	0	0	0	0	3	3	0	0	0	0	0	0
0	2	0	1	0	0	0	3	3	0	0	0	0	0	0
0	16	0	1	0	0	0	17	17	0	0	0	0	0	0
0	10	0	1	0	0	0	11	11	0	0	0	0	0	0
0	10	0	0	0	0	0	10	10	0	0	0	0	0	0
0	4	0	1	0	0	0	5	5	0	0	0	0	0	0
0	4	0	0	0	0	0	4	4	0	0	0	0	0	0
0	28	0	2	0	0	0	30	30	0	0	0	0	0	0
0	5	0	2	0	0	0	7	7	0	0	0	0	0	0
0	8	0	1	0	0	0	10	9.2	0	0	0	0	0	0
0	7	0	0	0	0	0	7	7	0	0	0	0	0	0
0	2	0	0	0	0	0	2	2	0	0	0	0	0	0
0	22	0	3	0	0	0	26	25.2	0	0	0	0	0	0
2	214	3	18	1	0	2	243	241.9	0	0	0	0	0	0

								B => C						
OGV2	**PSV**	**TOT**	**PCU**	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**	**P/C**
0	0	0	0	0	0	6	0	1	0	0	0	7	7	0
0	0	0	0	0	0	6	0	3	0	0	0	9	9	0
0	0	0	0	0	0	6	0	2	1	0	0	9	9.5	0
0	0	0	0	0	0	17	0	1	0	0	0	18	18	0
0	0	0	0	0	0	35	0	7	1	0	0	43	43.5	0
0	0	0	0	0	0	7	0	0	0	0	0	7	7	0
0	0	0	0	0	0	9	0	0	0	0	0	9	9	0
0	0	0	0	0	1	6	0	0	0	0	0	7	6.4	0
0	0	0	0	0	0	7	0	0	0	0	0	7	7	0
0	0	0	0	0	1	29	0	0	0	0	0	30	29.4	0
0	0	0	0	0	0	2	0	0	0	0	0	2	2	0
0	0	0	0	0	0	6	0	0	0	0	0	6	6	0
0	0	0	0	0	0	5	0	0	1	0	0	6	6.5	0
0	0	0	0	0	0	3	0	0	0	0	0	3	3	0
0	0	0	0	0	0	16	0	0	1	0	0	17	17.5	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1	0
0	0	0	0	0	0	5	0	0	0	0	0	5	5	0
0	0	0	0	0	0	2	1	0	0	0	0	3	3	0
0	0	0	0	0	0	1	1	0	0	0	0	2	2	0
0	0	0	0	0	0	9	2	0	0	0	0	11	11	0
0	0	0	0	0	0	3	0	2	0	0	0	5	5	0

0	0	0	0	0	0	3	0	0	0	0	0	3	3	0
0	0	0	0	0	0	3	0	0	0	0	0	3	3	0
0	0	0	0	0	0	2	0	0	0	0	0	2	2	0
0	0	0	0	0	0	11	0	2	0	0	0	13	13	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1	0
0	0	0	0	0	0	3	0	0	0	0	0	3	3	0
0	0	0	0	0	0	3	0	0	0	0	0	3	3	0
0	0	0	0	0	0	8	0	0	0	0	0	8	8	0
0	0	0	0	0	0	2	0	0	0	0	0	2	2	0
0	0	0	0	0	0	3	1	0	0	0	0	4	4	0
0	0	0	0	0	0	2	1	0	0	0	0	3	3	0
0	0	0	0	0	0	1	1	0	0	0	0	2	2	0
0	0	0	0	0	0	8	3	0	0	0	0	11	11	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	1	0	0	0	4	4	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1	0
0	0	0	0	0	0	3	0	1	0	0	0	4	4	0
0	0	0	0	0	0	7	0	2	0	0	0	9	9	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1	0
0	0	0	0	0	0	2	0	0	0	0	0	2	2	0
0	0	0	0	0	0	2	1	0	0	0	0	3	3	0
0	0	0	0	0	0	3	0	0	0	0	0	3	3	0
0	0	0	0	0	0	8	1	0	0	0	0	9	9	0
0	0	0	0	0	0	2	0	0	0	0	0	2	2	0
0	0	0	0	0	0	5	0	1	0	0	0	6	6	0
0	0	0	0	0	0	6	0	1	0	0	0	7	7	0
0	0	0	0	0	0	3	0	0	0	0	0	3	3	0
0	0	0	0	0	0	16	0	2	0	0	0	18	18	0
0	0	0	0	0	0	2	0	0	0	0	0	2	2	0
0	0	0	0	0	0	7	0	0	0	0	0	7	7	0
0	0	0	0	0	0	8	0	0	0	0	0	8	8	0
0	0	0	0	0	0	5	0	0	0	0	0	5	5	0
0	0	0	0	0	0	22	0	0	0	0	0	22	22	0
0	0	0	0	0	0	1	0	1	0	0	0	2	2	0
0	0	0	0	0	0	4	0	0	0	0	0	4	4	0
0	0	0	0	0	0	3	1	0	0	0	0	4	4	1
0	0	0	0	0	0	2	0	1	0	0	0	3	3	0
0	0	0	0	0	0	10	1	2	0	0	0	13	13	1
0	0	0	0	0	1	179	7	15	2	0	0	204	204.4	1

		B => D										C => A		
M/C	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**
0	2	0	1	0	0	0	3	3	0	0	12	0	1	0
0	2	0	2	0	0	0	4	4	1	0	19	0	5	0
0	5	0	1	0	0	0	6	6	0	0	26	1	4	0
0	8	0	2	0	0	0	10	10	1	1	31	0	4	0
0	17	0	6	0	0	0	23	23	2	1	88	1	14	0
0	8	0	0	0	0	0	8	8	1	0	37	0	1	1
0	10	0	2	0	0	1	13	14	0	0	73	1	6	1
0	4	1	0	0	0	0	5	5	0	0	78	1	3	0
0	5	0	0	0	0	0	5	5	0	0	88	1	8	1
0	27	1	2	0	0	1	31	32	1	0	276	3	18	3
0	4	0	0	0	0	0	4	4	0	0	47	2	4	0
0	4	0	0	0	0	1	5	6	0	0	42	0	5	1
0	8	0	0	0	0	0	8	8	0	0	39	0	8	1
0	0	0	0	0	0	0	0	0	0	0	26	1	0	3
0	16	0	0	0	0	1	17	18	0	0	154	3	17	5
0	1	0	0	0	0	0	1	1	0	0	25	0	4	2
0	1	0	0	0	0	0	1	1	1	1	24	1	1	1
0	2	0	0	0	0	0	2	2	0	0	22	1	3	1
0	3	0	0	0	0	0	3	3	0	0	32	1	3	0
0	7	0	0	0	0	0	7	7	1	1	103	3	11	4
0	0	0	0	1	0	0	1	1.5	0	0	34	0	2	1

0	0	0	2	0	0	0	2	2	0	0	30	3	3	0
0	3	0	0	0	0	0	3	3	0	1	33	1	4	4
0	3	0	1	0	0	0	4	4	0	0	31	0	3	0
0	6	0	3	1	0	0	10	10.5	0	1	128	4	12	5
0	4	0	0	0	0	0	4	4	0	0	27	0	2	1
0	0	0	0	0	0	0	0	0	0	0	29	0	4	2
0	9	0	0	0	0	0	9	9	0	0	37	0	6	0
0	3	3	0	0	0	1	7	8	1	0	36	0	3	1
0	16	3	0	0	0	1	20	21	1	0	129	0	15	4
0	10	0	1	0	0	0	11	11	5	0	38	0	2	4
0	3	0	0	0	0	0	3	3	1	0	23	0	3	1
0	2	0	0	0	0	0	2	2	0	0	32	0	5	0
0	1	0	0	0	0	0	1	1	1	1	43	0	5	1
0	16	0	1	0	0	0	17	17	7	1	136	0	15	6
0	3	0	0	0	0	0	3	3	0	0	35	0	2	2
0	5	0	0	0	0	0	5	5	0	0	28	1	2	1
0	1	0	0	0	0	0	1	1	0	0	46	0	4	1
0	1	0	0	0	0	0	1	1	1	0	44	0	2	0
0	10	0	0	0	0	0	10	10	1	0	153	1	10	4
0	3	0	0	0	0	0	3	3	1	0	37	1	3	1
0	3	0	0	0	0	0	3	3	0	0	31	0	4	2
0	3	0	1	0	0	0	4	4	0	0	44	0	3	0
0	2	1	0	0	0	0	3	3	0	1	48	0	5	1
0	11	1	1	0	0	0	13	13	1	1	160	1	15	4
0	6	0	0	0	0	0	6	6	0	0	43	0	1	1
0	3	0	0	0	0	0	3	3	2	0	29	0	6	0
0	8	0	1	0	0	0	9	9	0	1	41	0	9	0
0	6	0	0	0	0	0	6	6	0	0	46	0	2	0
0	23	0	1	0	0	0	24	24	2	1	159	0	18	1
0	11	0	0	0	0	0	11	11	0	0	39	0	6	1
0	5	0	0	0	0	0	5	5	0	0	61	0	4	1
0	16	1	0	0	0	0	17	17	1	1	36	0	3	0
0	9	0	0	0	0	0	9	9	0	1	37	0	0	0
0	41	1	0	0	0	0	42	42	1	2	173	0	13	2
0	10	1	0	0	0	0	11	11	0	0	57	1	1	0
0	3	0	0	0	0	0	3	3	0	0	37	1	4	1
0	0	0	0	0	0	0	1	0.2	0	0	25	1	2	0
0	2	0	0	0	0	0	2	2	0	0	31	1	2	0
0	15	1	0	0	0	0	17	16.2	0	0	150	4	9	1
0	205	7	14	1	0	3	231	233.7	17	8	1809	20	167	39

				C => B										
OGV2	**PSV**	**TOT**	**PCU**	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**	**P/C**
0	0	13	13	0	0	2	0	0	0	0	0	2	2	0
0	1	26	26.2	0	0	4	0	1	0	0	0	5	5	0
0	0	31	31	0	0	8	0	0	0	0	0	8	8	0
0	1	38	37.6	0	0	9	0	3	0	0	0	12	12	0
0	2	108	107.8	0	0	23	0	4	0	0	0	27	27	0
0	1	41	41.7	0	0	9	0	0	0	0	0	9	9	0
0	3	84	87.5	0	0	5	0	0	0	0	0	5	5	0
1	1	84	86.3	0	0	6	0	1	0	0	0	7	7	0
0	0	98	98.5	0	0	7	0	0	0	0	0	7	7	0
1	5	307	314	0	0	27	0	1	0	0	0	28	28	0
0	1	54	55	0	0	4	0	0	0	0	0	4	4	0
0	1	49	50.5	0	0	9	0	0	0	0	1	10	11	0
0	1	49	50.5	0	0	4	0	0	0	0	0	4	4	0
0	0	30	31.5	0	0	1	0	0	0	0	0	1	1	0
0	3	182	187.5	0	0	18	0	0	0	0	1	19	20	0
0	0	31	32	0	0	2	0	1	0	0	0	3	3	0
0	0	29	28.1	0	0	2	0	0	0	0	0	2	2	0
0	1	28	29.5	0	0	1	0	0	0	0	1	2	3	0
0	1	37	38	0	0	0	0	0	0	0	0	0	0	0
0	2	125	127.6	0	0	5	0	1	0	0	1	7	8	0
0	0	37	37.5	0	0	0	0	0	0	0	0	0	0	0

0	0	36	36	0	0	0	0	1	0	0	0	1	1	0
0	1	44	46.4	0	0	2	0	0	0	0	0	2	2	0
0	1	35	36	0	0	3	0	0	0	0	0	3	3	0
0	2	152	155.9	0	0	5	0	1	0	0	0	6	6	0
0	0	30	30.5	0	0	1	0	0	0	0	0	1	1	0
0	0	35	36	0	0	9	0	0	0	0	0	9	9	0
0	1	44	45	0	0	4	0	0	0	0	0	4	4	0
0	1	42	42.7	0	0	6	0	0	0	0	0	6	6	0
0	2	151	154.2	0	0	20	0	0	0	0	0	20	20	0
0	0	49	47	0	0	3	0	0	0	0	0	3	3	0
0	0	28	27.7	0	0	2	1	0	0	0	0	3	3	0
0	1	38	39	0	0	2	0	0	0	0	0	2	2	0
0	1	52	52.1	0	0	5	0	0	0	0	1	6	7	0
0	2	167	165.8	0	0	12	1	0	0	0	1	14	15	0
0	0	39	40	0	0	1	1	0	0	0	0	2	2	0
0	0	32	32.5	0	0	4	0	0	0	0	0	4	4	0
1	1	53	55.8	0	0	4	0	0	0	0	0	4	4	0
0	1	48	48.2	0	0	1	0	0	0	0	0	1	1	0
1	2	172	176.5	0	0	10	1	0	0	0	0	11	11	0
0	0	43	42.7	0	0	2	0	1	0	0	0	3	3	0
2	0	39	42.6	0	0	1	0	1	0	0	1	3	4	0
0	1	48	49	0	0	1	0	0	0	0	0	1	1	0
0	1	56	56.9	0	0	5	0	0	0	0	0	5	5	0
2	2	186	191.2	0	0	9	0	2	0	0	1	12	13	0
0	1	46	47.5	0	0	1	0	0	0	0	0	1	1	0
1	0	38	37.7	0	0	4	0	0	0	0	0	4	4	0
0	1	52	52.4	0	0	9	0	0	0	0	0	9	9	0
0	1	49	50	0	0	5	0	0	0	0	0	5	5	0
1	3	185	187.6	0	0	19	0	0	0	0	0	19	19	0
0	0	46	46.5	0	0	9	0	0	0	0	0	9	9	0
0	0	66	66.5	0	0	8	0	1	0	0	0	9	9	0
0	1	42	41.6	0	0	6	0	1	0	0	0	7	7	0
0	1	39	39.4	0	0	5	0	0	0	0	0	5	5	0
0	2	193	194	0	0	28	0	2	0	0	0	30	30	0
0	1	60	61	0	0	4	0	0	0	0	0	4	4	0
0	1	44	45.5	0	0	9	0	0	0	0	0	9	9	0
0	0	28	28	0	0	1	0	0	0	0	0	1	1	0
0	1	35	36	0	0	4	0	0	0	0	0	4	4	0
0	3	167	170.5	0	0	18	0	0	0	0	0	18	18	0
5	30	2095	2132.6	0	0	194	2	11	0	0	4	211	215	0

C => C											C => D				
M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	TAXI	LGV	OGV1
0	0	0	0	0	0	0	0	0	0	0	8	0	1	1
0	0	0	0	0	0	0	0	0	0	0	8	1	4	0
0	0	0	0	0	0	0	0	0	0	0	20	0	4	1
0	0	0	0	0	0	0	0	0	0	0	20	0	3	4
0	0	0	0	0	0	0	0	0	0	0	56	1	12	6
0	0	0	0	0	0	0	0	0	0	0	42	0	2	3
0	0	0	0	1	0	0	1	1.5	0	0	80	1	7	0
0	0	0	1	0	0	0	1	1	0	0	109	1	4	2
0	0	0	0	0	0	0	0	0	0	0	79	0	7	6
0	0	0	1	1	0	0	2	2.5	0	0	310	2	20	11
0	0	0	0	0	0	0	0	0	0	0	34	0	4	2
0	0	0	0	0	0	0	0	0	0	0	34	0	3	0
0	0	0	0	0	0	0	0	0	0	1	16	0	2	1
0	0	0	0	0	0	0	0	0	0	0	16	0	2	2
0	0	0	0	0	0	0	0	0	0	1	100	0	11	5
0	0	0	0	0	0	0	0	0	0	0	17	1	2	1
0	0	0	0	0	0	0	0	0	0	0	19	0	3	1
0	0	0	0	0	0	0	0	0	1	0	19	1	5	1
0	0	0	1	0	0	0	1	1	0	0	22	0	6	4
0	0	0	1	0	0	0	1	1	1	0	77	2	16	7
0	1	0	0	0	0	0	1	1	0	0	12	0	2	3

0	0	0	0	0	0	0	0	0	0	0	22	0	2	3
0	0	0	0	0	0	0	0	0	0	0	23	0	2	3
0	0	0	0	0	0	0	0	0	1	0	25	0	1	1
0	1	0	0	0	0	0	1	1	1	0	82	0	7	10
0	0	0	0	0	0	0	0	0	1	0	29	0	2	1
0	0	0	0	0	0	0	0	0	0	0	11	1	2	3
0	0	0	0	0	0	0	0	0	0	0	17	0	6	1
0	0	0	0	0	0	0	0	0	1	0	24	0	5	2
0	0	0	0	0	0	0	0	0	2	0	81	1	15	7
0	0	0	0	0	0	0	0	0	2	1	31	0	1	1
0	1	0	0	0	0	0	1	1	0	0	24	0	4	1
0	0	0	0	0	0	0	0	0	0	1	19	0	2	1
0	0	0	0	0	0	0	0	0	0	0	26	0	4	2
0	1	0	0	0	0	0	1	1	2	2	100	0	11	5
0	0	0	0	1	0	0	1	1.5	0	0	33	0	2	2
0	0	0	0	0	0	0	0	0	0	0	32	0	4	2
0	1	0	0	0	0	0	1	1	0	0	40	0	4	1
0	0	0	0	0	0	0	0	0	0	1	40	0	6	2
0	1	0	0	1	0	0	2	2.5	0	1	145	0	16	7
0	0	0	0	0	0	0	0	0	0	0	36	0	3	2
0	0	0	0	0	0	0	0	0	0	0	39	1	4	1
0	0	0	0	0	0	0	0	0	0	0	29	1	7	3
0	0	0	0	0	0	0	0	0	0	0	83	1	3	4
0	0	0	0	0	0	0	0	0	0	0	187	3	17	10
0	1	0	0	0	0	0	1	1	0	0	29	0	10	1
0	1	0	0	0	0	0	1	1	0	1	28	0	7	0
0	0	0	0	0	0	0	0	0	1	0	29	0	9	0
0	0	0	0	0	0	0	0	0	0	1	31	0	5	0
0	2	0	0	0	0	0	2	2	1	2	117	0	31	1
0	0	0	0	0	0	0	0	0	0	1	86	0	10	1
0	0	0	0	0	0	0	0	0	0	1	122	1	6	0
0	0	0	0	0	0	0	0	0	0	0	43	1	6	1
0	1	0	0	0	0	0	1	1	0	2	37	2	4	1
0	1	0	0	0	0	0	1	1	0	4	288	4	26	3
0	0	0	0	0	0	0	0	0	0	0	49	2	6	1
0	0	0	0	0	0	0	0	0	1	1	29	1	5	1
0	0	0	0	0	0	0	0	0	1	1	24	0	4	0
0	0	0	0	0	0	0	0	0	1	0	28	1	7	0
0	0	0	0	0	0	0	0	0	3	2	130	4	22	2
0	6	0	2	2	0	0	10	11	10	12	1673	17	204	74

OGV2	PSV	TOT	PCU	D => A P/C	M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C
0	0	10	10.5	0	0	4	0	0	1	0	0	5	5.5	0
0	0	13	13	0	0	2	1	2	0	0	0	5	5	0
1	0	26	27.8	0	0	5	0	1	0	0	0	6	6	0
1	0	28	31.3	0	0	15	0	1	1	0	0	17	17.5	0
2	0	77	82.6	0	0	26	1	4	2	0	0	33	34	0
1	0	48	50.8	0	0	8	0	3	0	0	0	11	11	0
3	0	91	94.9	0	0	17	1	1	0	1	0	20	21.3	0
0	0	116	117	0	0	14	1	3	0	0	0	18	18	0
0	0	92	95	0	0	22	0	5	0	0	0	27	27	0
4	0	347	357.7	0	0	61	2	12	0	1	0	76	77.3	0
2	0	42	45.6	0	0	18	1	3	1	0	0	23	23.5	0
1	0	38	39.3	0	0	12	0	0	0	0	0	12	12	0
1	0	21	22.2	0	0	10	0	3	0	0	0	13	13	0
1	0	21	23.3	0	0	11	0	1	0	0	0	12	12	0
5	0	122	130.4	0	0	51	1	7	1	0	0	60	60.5	0
2	0	23	26.1	0	0	13	0	1	1	0	0	15	15.5	0
1	0	24	25.8	0	0	10	0	3	1	1	0	15	16.8	0
1	0	28	29	0	0	14	0	2	0	0	0	16	16	0
0	0	32	34	0	0	10	0	0	0	0	0	10	10	0
4	0	107	114.9	0	0	47	0	6	2	1	0	56	58.3	0
2	0	19	23.1	0	0	6	0	3	2	0	0	11	12	0

0	0	27	28.5	1	1	15	1	1	0	0	0	19	17.6	0
0	0	28	29.5	0	0	11	0	4	0	0	0	15	15	0
2	0	30	32.3	0	0	11	1	2	0	0	0	14	14	0
4	0	104	113.4	1	1	43	2	10	2	0	0	59	58.6	0
0	1	34	34.7	0	0	17	0	3	0	0	0	20	20	0
1	0	18	20.8	0	0	15	0	4	2	0	0	21	22	0
2	0	26	29.1	0	0	14	0	5	3	0	0	22	23.5	0
1	0	33	34.5	0	0	10	0	3	0	0	0	13	13	0
4	1	111	119.1	0	0	56	0	15	5	0	0	76	78.5	0
2	0	38	38.9	0	0	25	0	2	0	0	0	27	27	0
2	0	31	34.1	0	0	18	0	4	0	0	0	22	22	0
2	0	25	27.5	0	0	20	0	1	0	0	0	21	21	0
2	0	34	37.6	0	0	11	0	3	0	0	0	14	14	0
8	0	128	138.1	0	0	74	0	10	0	0	0	84	84	0
0	0	37	38	0	1	11	0	2	1	0	0	15	14.9	0
3	1	42	47.9	0	0	20	0	6	1	0	0	27	27.5	0
2	0	47	50.1	0	0	18	0	3	0	0	0	21	21	0
2	0	51	54	0	0	31	0	1	0	0	0	32	32	0
7	1	177	190	0	1	80	0	12	2	0	0	95	95.4	0
0	0	41	42	0	0	16	0	3	1	0	0	20	20.5	0
0	0	45	45.5	0	0	16	1	6	0	0	0	23	23	0
0	0	40	41.5	0	1	21	0	10	1	0	0	33	32.9	0
3	0	94	99.9	0	0	37	0	3	0	0	0	40	40	0
3	0	220	228.9	0	1	90	1	22	2	0	0	116	116.4	0
4	0	44	49.7	0	0	22	0	3	0	0	0	25	25	0
1	0	37	37.7	0	0	15	0	9	1	0	0	25	25.5	0
0	0	39	38.2	0	0	22	0	6	0	0	0	28	28	0
0	0	37	36.4	0	1	20	0	6	0	0	0	27	26.4	0
5	0	157	162	0	1	79	0	24	1	0	0	105	104.9	0
1	1	100	102.2	0	0	23	1	7	0	0	0	31	31	0
0	0	130	129.4	0	0	29	1	1	0	0	0	31	31	0
1	1	53	55.8	0	0	33	0	4	0	0	0	37	37	0
1	0	47	47.6	0	1	25	0	2	2	0	0	30	30.4	0
3	2	330	335	0	1	110	2	14	2	0	0	129	129.4	0
0	0	58	58.5	0	1	22	0	1	0	0	0	24	23.4	0
1	0	39	39.4	0	1	35	0	2	0	0	0	38	37.4	0
0	0	30	28.6	0	0	21	0	1	0	0	0	22	22	0
0	0	37	36.2	0	0	18	2	2	0	0	0	22	22	0
1	0	164	162.7	0	2	96	2	6	0	0	0	106	104.8	0
50	4	2044	2134.8	1	7	813	11	142	19	2	0	995	1002.1	0

D => B									D => C					
M/C	**CAR**	**TAXI**	**LGV**	**OGV1**	**OGV2**	**PSV**	**TOT**	**PCU**	**P/C**	**M/C**	**CAR**	**TAXI**	**LGV**	**OGV1**
0	4	0	1	0	0	0	5	5	0	0	3	0	1	2
0	0	0	0	0	0	0	0	0	0	0	3	0	1	1
0	1	0	3	0	0	0	4	4	0	0	2	0	5	2
0	6	0	0	0	0	0	6	6	0	0	3	0	3	1
0	11	0	4	0	0	0	15	15	0	0	11	0	10	6
0	4	0	0	0	0	0	4	4	0	0	3	0	2	1
0	3	0	1	0	0	0	4	4	0	0	2	0	3	0
0	3	0	0	0	0	0	3	3	0	0	5	0	1	1
0	7	0	0	0	0	0	7	7	0	0	7	0	0	0
0	17	0	1	0	0	0	18	18	0	0	17	0	6	2
0	3	0	0	0	0	0	3	3	0	0	5	0	2	1
0	5	0	0	0	0	0	5	5	0	0	5	0	1	1
0	3	0	0	0	0	0	3	3	0	0	2	0	1	1
0	4	0	0	0	0	0	4	4	0	0	1	0	0	1
0	15	0	0	0	0	0	15	15	0	0	13	0	4	4
0	2	0	0	0	0	0	2	2	0	0	6	0	2	1
0	2	1	1	0	0	0	4	4	0	0	3	0	0	1
0	3	1	0	0	0	0	4	4	0	0	1	0	2	2
0	1	0	2	0	0	0	3	3	0	0	2	0	1	0
0	8	2	3	0	0	0	13	13	0	0	12	0	5	4
0	3	0	2	0	0	0	5	5	0	0	5	0	1	3

1	4	0	0	0	0	0	5	4.4	0	0	3	0	2	1
0	2	0	0	0	0	0	2	2	0	0	2	0	0	0
0	0	0	0	0	0	0	0	0	0	0	4	1	2	0
1	9	0	2	0	0	0	12	11.4	0	0	14	1	5	4
0	2	0	0	0	0	0	2	2	0	0	3	0	2	4
0	1	0	0	0	0	0	1	1	0	0	1	0	0	1
0	2	0	0	0	0	0	2	2	0	0	2	0	0	1
0	1	0	0	0	0	0	1	1	0	0	1	0	0	2
0	6	0	0	0	0	0	6	6	0	0	7	0	2	8
0	0	0	0	0	0	0	0	0	0	0	4	0	1	0
0	4	0	0	0	0	0	4	4	0	0	3	0	1	0
0	2	0	0	0	0	0	2	2	0	0	2	0	1	1
0	2	0	0	0	0	0	2	2	0	0	3	0	2	0
0	8	0	0	0	0	0	8	8	0	0	12	0	5	1
0	1	0	0	0	0	0	1	1	0	0	2	0	1	1
0	1	0	0	0	0	0	1	1	0	1	2	0	0	3
0	1	0	0	0	0	0	1	1	0	0	2	0	0	1
0	3	0	0	0	0	0	3	3	0	0	5	0	0	2
0	6	0	0	0	0	0	6	6	0	1	11	0	1	7
0	4	0	0	0	0	0	4	4	0	0	2	0	2	1
0	3	0	0	0	0	0	3	3	0	0	2	0	3	3
0	9	0	2	0	0	0	11	11	0	0	3	0	2	0
0	4	0	1	0	0	0	5	5	0	0	4	0	0	3
0	20	0	3	0	0	0	23	23	0	0	11	0	7	7
0	1	0	0	0	0	0	1	1	0	0	5	0	0	1
0	2	0	1	0	0	0	3	3	0	0	5	0	3	1
0	4	0	2	0	0	0	6	6	0	0	4	0	0	0
0	3	0	0	0	0	0	3	3	0	0	1	0	0	0
0	10	0	3	0	0	0	13	13	0	0	15	0	3	2
0	8	0	1	0	0	0	9	9	0	0	5	0	0	0
1	4	0	1	0	0	0	6	5.4	0	0	2	0	0	0
0	6	0	1	0	0	0	7	7	0	0	0	0	1	0
0	8	0	0	0	0	0	8	8	0	0	2	0	0	1
1	26	0	3	0	0	0	30	29.4	0	0	9	0	1	1
0	2	0	1	0	0	0	3	3	0	0	4	0	0	0
0	1	0	0	0	0	0	1	1	0	1	6	0	0	0
0	5	1	0	0	0	0	6	6	0	0	4	0	1	0
0	4	0	1	0	0	0	5	5	0	0	2	0	0	0
0	12	1	2	0	0	0	15	15	0	1	16	0	1	0
2	148	3	21	0	0	0	174	172.8	0	2	148	1	50	46

				D => D									
OGV2	PSV	TOT	PCU	P/C	M/C	CAR	TAXI	LGV	OGV1	OGV2	PSV	TOT	PCU
1	0	7	9.3	0	0	0	0	0	0	0	0	0	0
3	0	8	12.4	0	0	0	0	0	0	0	0	0	0
3	0	12	16.9	0	0	0	0	0	0	0	0	0	0
1	0	8	9.8	0	0	0	0	0	0	0	0	0	0
8	0	35	48.4	0	0	0	0	0	0	0	0	0	0
5	0	11	18	0	0	0	0	0	0	0	0	0	0
2	0	7	9.6	0	0	1	0	1	0	0	0	2	2
3	0	10	14.4	0	0	0	0	0	0	0	0	0	0
3	0	10	13.9	0	0	0	0	0	0	0	0	0	0
13	0	38	55.9	0	0	1	0	1	0	0	0	2	2
0	0	8	8.5	0	0	0	0	0	0	0	0	0	0
2	0	9	12.1	0	0	0	0	0	0	0	0	0	0
1	1	6	8.8	0	0	0	0	2	0	0	0	2	2
5	0	7	14	0	0	3	0	0	0	0	0	3	3
8	1	30	43.4	0	0	3	0	2	0	0	0	5	5
1	0	10	11.8	0	0	0	0	0	0	0	0	0	0
1	0	5	6.8	0	0	1	0	0	0	0	0	1	1
4	0	9	15.2	0	0	0	0	1	0	0	0	1	1
4	0	7	12.2	0	0	0	0	0	0	0	0	0	0
10	0	31	46	0	0	1	0	1	0	0	0	2	2
1	0	10	12.8	0	0	1	0	0	0	0	0	1	1

2	0	8	11.1	0	0	0	0	0	0	0	0	0	0
3	0	5	8.9	0	0	0	0	1	0	0	0	1	1
4	0	11	16.2	0	0	0	0	0	0	0	0	0	0
10	0	34	49	0	0	1	0	1	0	0	0	2	2
1	0	10	13.3	0	0	0	0	0	0	0	0	0	0
3	0	5	9.4	0	0	0	0	0	0	0	0	0	0
2	0	5	8.1	0	0	0	0	0	0	0	0	0	0
2	0	5	8.6	0	0	1	0	0	0	0	0	1	1
8	0	25	39.4	0	0	1	0	0	0	0	0	1	1
1	0	6	7.3	0	0	1	0	0	0	0	0	1	1
1	0	5	6.3	0	0	0	0	0	0	0	0	0	0
0	0	4	4.5	0	0	0	0	0	0	0	0	0	0
3	0	8	11.9	0	0	0	0	0	0	0	0	0	0
5	0	23	30	0	0	1	0	0	0	0	0	1	1
3	0	7	11.4	0	0	0	0	0	0	0	0	0	0
3	0	9	13.8	0	0	0	0	1	0	0	0	1	1
3	0	6	10.4	0	0	0	0	0	0	0	0	0	0
1	0	8	10.3	0	0	1	0	1	0	0	0	2	2
10	0	30	45.9	0	0	1	0	2	0	0	0	3	3
1	0	6	7.8	0	0	0	0	0	0	0	0	0	0
2	0	10	14.1	0	0	0	0	0	0	0	0	0	0
1	0	6	7.3	0	0	0	0	0	0	0	0	0	0
1	0	8	10.8	0	0	0	0	0	0	0	0	0	0
5	0	30	40	0	0	0	0	0	0	0	0	0	0
0	0	6	6.5	0	1	1	0	0	0	0	0	2	1.4
5	0	14	21	0	0	0	0	0	0	0	0	0	0
1	0	5	6.3	0	0	1	0	0	1	0	0	2	2.5
3	0	4	7.9	0	0	0	0	0	0	0	0	0	0
9	0	29	41.7	0	1	2	0	0	1	0	0	4	3.9
0	0	5	5	0	0	0	0	0	0	0	0	0	0
1	0	3	4.3	0	0	1	0	0	0	0	0	1	1
0	0	1	1	0	0	0	0	0	0	0	0	0	0
2	0	5	8.1	0	0	1	0	0	0	0	0	1	1
3	0	14	18.4	0	0	2	0	0	0	0	0	2	2
0	0	4	4	0	0	0	0	0	0	0	0	0	0
0	0	7	6.4	0	0	0	0	0	0	0	0	0	0
2	0	7	9.6	0	0	1	0	0	0	0	0	1	1
0	0	2	2	0	0	0	0	0	0	0	0	0	0
2	0	20	22	0	0	1	0	0	0	0	0	1	1
91	1	339	480.1	0	1	14	0	7	1	0	0	23	22.9

Appendix B: Traffic Modelling Results

Junctions 10

ARCADY 10 - Roundabout Module

Version: 10.0.4.1693

For sales and distribution information, program advice and maintenance, contact TRL Software:
+44 (0)1344 379777 software@trl.co.uk trlsoftware.com

Filename: J6 Eastern Roundabout- No Growth Factors.j10
Path: Q:\2020 Jobs\20_008N Fassaroe\Traffic Study\Junction 6
Report generation date: 17/04/2023 14:04:38

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2022 Do Nothing									
1 - Upper Dargle Road	D1	0.3	3.48	0.25	A	D2	0.3	3.46	0.25	A
2 - La Vallee		0.1	4.67	0.13	A		0.1	4.38	0.11	A
3 - R918		2.2	10.51	0.69	B		1.3	7.56	0.56	A
4 - N11		0.1	3.21	0.12	A		0.2	2.81	0.13	A
	2024 Do Something									
1 - Upper Dargle Road	D3	0.3	3.49	0.25	A	D4	0.3	3.48	0.26	A
2 - La Vallee		0.1	4.69	0.13	A		0.1	4.41	0.11	A
3 - R918		2.4	11.23	0.70	B		1.8	9.36	0.64	A
4 - N11		0.2	3.28	0.12	A		0.2	2.87	0.13	A
	2029 Do Something									
1 - Upper Dargle Road	D5	0.3	3.56	0.25	A	D6	0.4	3.77	0.28	A
2 - La Vallee		0.2	4.79	0.13	A		0.1	4.77	0.12	A
3 - R918		2.9	12.92	0.74	B		2.0	10.13	0.67	B
4 - N11		0.2	3.31	0.14	A		0.3	3.08	0.20	A
	2039 Do Something									
1 - Upper Dargle Road	D7	0.3	3.59	0.25	A	D8	0.4	3.91	0.29	A
2 - La Vallee		0.2	4.84	0.13	A		0.1	4.95	0.12	A
3 - R918		3.2	13.92	0.76	B		2.3	11.15	0.70	B
4 - N11		0.2	3.33	0.15	A		0.3	3.20	0.24	A
	2024 Do Nothing									
1 - Upper Dargle Road	D9	0.3	3.48	0.25	A	D10	0.3	3.47	0.26	A
2 - La Vallee		0.1	4.67	0.13	A		0.1	4.39	0.11	A
3 - R918		2.2	10.51	0.69	B		1.3	7.59	0.56	A

4 - N11		0.1	3.21	0.12	A		0.2	2.81	0.13	A
	2029 Do Nothing									
1 - Upper Dargle Road	D11	0.3	3.55	0.25	A	D12	0.4	3.75	0.28	A
2 - La Vallee		0.2	4.77	0.13	A		0.1	4.74	0.12	A
3 - R918		2.7	11.97	0.72	B		1.4	7.85	0.57	A
4 - N11		0.2	3.25	0.14	A		0.3	3.03	0.20	A
	2039 Do Nothing									
1 - Upper Dargle Road	D13	0.3	3.58	0.25	A	D14	0.4	3.90	0.29	A
2 - La Vallee		0.2	4.82	0.13	A		0.1	4.93	0.12	A
3 - R918		2.9	12.76	0.74	B		1.4	7.96	0.58	A
4 - N11		0.2	3.27	0.15	A		0.3	3.16	0.23	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	16/12/2022
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\jyotsna.singh
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2022 Do Nothing	AM	ONE HOUR	08:00	09:30	15
D2	2022 Do Nothing	PM	ONE HOUR	17:00	18:30	15
D3	2024 Do Something	AM	ONE HOUR	08:00	09:30	15
D4	2024 Do Something	PM	ONE HOUR	17:00	18:30	15
D5	2029 Do Something	AM	ONE HOUR	08:00	09:30	15
D6	2029 Do Something	PM	ONE HOUR	17:00	18:30	15
D7	2039 Do Something	AM	ONE HOUR	08:00	09:30	15
D8	2039 Do Something	PM	ONE HOUR	17:00	18:30	15
D9	2024 Do Nothing	AM	ONE HOUR	08:00	09:30	15
D10	2024 Do Nothing	PM	ONE HOUR	17:00	18:30	15
D11	2029 Do Nothing	AM	ONE HOUR	08:00	09:30	15
D12	2029 Do Nothing	PM	ONE HOUR	17:00	18:30	15
D13	2039 Do Nothing	AM	ONE HOUR	08:00	09:30	15
D14	2039 Do Nothing	PM	ONE HOUR	17:00	18:30	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2022 Do Nothing, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	7.43	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.43	A

Arms

Arms

Arm	Name	Description	No give-way line
1	Upper Dargle Road		
2	La Vallee		
3	R918		
4	N11		

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Entry only	Exit only
1 - Upper Dargle Road	3.50	5.00	8.6	42.3	46.0	14.5		
2 - La Vallee	3.00	4.45	3.1	18.4	47.0	26.2		
3 - R918	3.13	4.85	5.5	28.5	40.0	19.0		
4 - N11	4.50	5.80	5.9	36.0	44.0	16.5		

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1 - Upper Dargle Road	0.601	1460
2 - La Vallee	0.506	1095
3 - R918	0.573	1273
4 - N11	0.652	1704

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2022 Do Nothing	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)

HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	310	100.000
2 - La Vallee		✓	105	100.000
3 - R918		✓	700	100.000
4 - N11		✓	151	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	17	133	160
	2 - La Vallee	43	0	29	32
	3 - R918	314	28	0	358
	4 - N11	77	18	56	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	3
	2 - La Vallee	2	0	0	3
	3 - R918	3	0	0	4
	4 - N11	1	0	39	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.25	3.48	0.3	A
2 - La Vallee	0.13	4.67	0.1	A
3 - R918	0.69	10.51	2.2	B
4 - N11	0.12	3.21	0.1	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	233	76	1414	0.165	233	0.2	3.095	A
2 - La Vallee	79	262	962	0.082	78	0.1	4.151	A
3 - R918	527	176	1172	0.450	523	0.8	5.722	A
4 - N11	114	288	1516	0.075	113	0.1	2.888	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	279	91	1405	0.198	278	0.3	3.247	A

2 - La Vallee	94	313	936	0.100	94	0.1	4.359	A
3 - R918	629	211	1152	0.546	627	1.2	7.087	A
4 - N11	136	345	1479	0.092	136	0.1	3.016	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	341	112	1392	0.245	341	0.3	3.479	A
2 - La Vallee	115	384	900	0.128	115	0.1	4.674	A
3 - R918	770	259	1125	0.685	767	2.2	10.300	B
4 - N11	166	422	1429	0.117	166	0.1	3.208	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	341	112	1392	0.245	341	0.3	3.479	A
2 - La Vallee	115	384	900	0.128	115	0.1	4.675	A
3 - R918	770	259	1124	0.685	770	2.2	10.510	B
4 - N11	166	424	1427	0.117	166	0.1	3.211	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	279	92	1405	0.198	279	0.3	3.250	A
2 - La Vallee	94	314	936	0.101	94	0.1	4.362	A
3 - R918	629	212	1151	0.546	633	1.3	7.235	A
4 - N11	136	348	1477	0.092	136	0.1	3.020	A

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	233	77	1414	0.165	234	0.2	3.102	A
2 - La Vallee	79	263	962	0.082	79	0.1	4.159	A
3 - R918	527	177	1171	0.450	528	0.9	5.814	A
4 - N11	114	291	1514	0.075	114	0.1	2.892	A

2022 Do Nothing, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	5.42	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	5.42	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2022 Do Nothing	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	326	100.000
2 - La Vallee		✓	94	100.000
3 - R918		✓	559	100.000
4 - N11		✓	177	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	40	87	199
	2 - La Vallee	30	0	22	42
	3 - R918	194	30	0	335
	4 - N11	129	29	18	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	1
	2 - La Vallee	0	0	0	0
	3 - R918	2	0	0	2

	4 - N11	2	0	29	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.25	3.46	0.3	A
2 - La Vallee	0.11	4.38	0.1	A
3 - R918	0.56	7.56	1.3	A
4 - N11	0.13	2.81	0.2	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	245	58	1425	0.172	245	0.2	3.077	A
2 - La Vallee	71	228	979	0.072	70	0.1	3.961	A
3 - R918	421	203	1156	0.364	419	0.6	4.972	A
4 - N11	133	190	1580	0.084	133	0.1	2.576	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	293	70	1418	0.207	293	0.3	3.229	A
2 - La Vallee	85	273	956	0.088	84	0.1	4.128	A
3 - R918	503	244	1133	0.443	502	0.8	5.815	A
4 - N11	159	228	1555	0.102	159	0.1	2.669	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	359	86	1408	0.255	359	0.3	3.461	A
2 - La Vallee	103	334	925	0.112	103	0.1	4.380	A
3 - R918	615	298	1102	0.559	614	1.3	7.504	A
4 - N11	195	279	1522	0.128	195	0.2	2.808	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	359	86	1408	0.255	359	0.3	3.461	A
2 - La Vallee	103	335	925	0.112	103	0.1	4.381	A
3 - R918	615	298	1102	0.559	615	1.3	7.562	A
4 - N11	195	280	1521	0.128	195	0.2	2.809	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	293	70	1418	0.207	293	0.3	3.234	A
2 - La Vallee	85	274	956	0.088	85	0.1	4.132	A
3 - R918	503	244	1133	0.444	504	0.8	5.870	A
4 - N11	159	229	1554	0.102	159	0.1	2.671	A

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	245	59	1425	0.172	246	0.2	3.084	A
2 - La Vallee	71	229	979	0.072	71	0.1	3.965	A
3 - R918	421	204	1156	0.364	422	0.6	5.019	A
4 - N11	133	192	1579	0.084	133	0.1	2.580	A

2024 Do Something, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	7.87	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.87	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2024 Do Something	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	310	100.000
2 - La Vallee		✓	105	100.000
3 - R918		✓	719	100.000
4 - N11		✓	157	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	17	133	160
	2 - La Vallee	43	0	29	32
	3 - R918	314	28	0	377
	4 - N11	77	18	62	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	3
	2 - La Vallee	2	0	0	3
	3 - R918	3	0	0	5

	4 - N11	1	0	44	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.25	3.49	0.3	A
2 - La Vallee	0.13	4.69	0.1	A
3 - R918	0.70	11.23	2.4	B
4 - N11	0.12	3.28	0.2	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	233	81	1411	0.165	233	0.2	3.103	A
2 - La Vallee	79	266	960	0.082	78	0.1	4.162	A
3 - R918	542	176	1172	0.462	538	0.9	5.864	A
4 - N11	118	288	1516	0.078	118	0.1	2.948	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	279	97	1402	0.199	278	0.3	3.257	A
2 - La Vallee	94	319	933	0.101	94	0.1	4.373	A
3 - R918	647	211	1152	0.561	645	1.3	7.353	A
4 - N11	141	345	1479	0.096	141	0.1	3.081	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	341	119	1389	0.246	341	0.3	3.492	A
2 - La Vallee	115	390	897	0.128	115	0.1	4.694	A
3 - R918	792	259	1125	0.704	788	2.4	10.959	B
4 - N11	173	422	1429	0.121	173	0.2	3.281	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	341	119	1388	0.246	341	0.3	3.492	A
2 - La Vallee	115	391	897	0.128	115	0.1	4.695	A
3 - R918	792	259	1124	0.704	792	2.4	11.225	B
4 - N11	173	424	1427	0.121	173	0.2	3.285	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	279	97	1401	0.199	279	0.3	3.259	A
2 - La Vallee	94	319	933	0.101	94	0.1	4.377	A
3 - R918	647	212	1151	0.562	651	1.4	7.534	A
4 - N11	141	348	1477	0.096	141	0.1	3.088	A

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	233	81	1411	0.165	234	0.2	3.107	A
2 - La Vallee	79	267	959	0.082	79	0.1	4.170	A
3 - R918	542	177	1171	0.462	543	0.9	5.972	A
4 - N11	118	291	1514	0.078	118	0.1	2.954	A

2024 Do Something, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	6.49	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.49	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2024 Do Something	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	329	100.000
2 - La Vallee		✓	94	100.000
3 - R918		✓	642	100.000
4 - N11		✓	183	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	3	40	87	199
	2 - La Vallee	30	0	22	42
	3 - R918	194	30	0	418
	4 - N11	129	29	24	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	1
	2 - La Vallee	0	0	0	0
	3 - R918	2	0	0	3

	4 - N11	2	0	41	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.26	3.48	0.3	A
2 - La Vallee	0.11	4.41	0.1	A
3 - R918	0.64	9.36	1.8	A
4 - N11	0.13	2.87	0.2	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	248	63	1422	0.174	247	0.2	3.090	A
2 - La Vallee	71	235	976	0.073	70	0.1	3.976	A
3 - R918	483	206	1155	0.418	480	0.7	5.440	A
4 - N11	138	192	1578	0.087	138	0.1	2.629	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	296	75	1415	0.209	296	0.3	3.246	A
2 - La Vallee	85	281	952	0.089	84	0.1	4.148	A
3 - R918	577	246	1132	0.510	576	1.0	6.618	A
4 - N11	165	231	1553	0.106	165	0.1	2.726	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	362	92	1404	0.258	362	0.3	3.485	A
2 - La Vallee	103	344	920	0.112	103	0.1	4.407	A
3 - R918	707	301	1100	0.642	704	1.8	9.228	A
4 - N11	202	282	1520	0.133	202	0.2	2.872	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	362	92	1404	0.258	362	0.3	3.485	A
2 - La Vallee	103	345	920	0.112	103	0.1	4.408	A
3 - R918	707	302	1100	0.642	707	1.8	9.364	A
4 - N11	202	283	1519	0.133	202	0.2	2.874	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	296	76	1414	0.209	296	0.3	3.251	A
2 - La Vallee	85	282	952	0.089	85	0.1	4.150	A
3 - R918	577	247	1131	0.510	580	1.1	6.719	A
4 - N11	165	232	1552	0.106	165	0.1	2.729	A

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	248	63	1422	0.174	248	0.2	3.097	A
2 - La Vallee	71	236	975	0.073	71	0.1	3.980	A
3 - R918	483	207	1154	0.419	485	0.7	5.514	A
4 - N11	138	194	1577	0.087	138	0.1	2.633	A

2029 Do Something, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	8.85	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	8.85	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2029 Do Something	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	313	100.000
2 - La Vallee		✓	105	100.000
3 - R918		✓	760	100.000
4 - N11		✓	183	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	17	136	160
	2 - La Vallee	43	0	29	32
	3 - R918	327	28	0	405
	4 - N11	77	18	88	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	3
	2 - La Vallee	2	0	0	3
	3 - R918	3	0	0	5

	4 - N11	1	0	27	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.25	3.56	0.3	A
2 - La Vallee	0.13	4.79	0.2	A
3 - R918	0.74	12.92	2.9	B
4 - N11	0.14	3.31	0.2	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	236	100	1399	0.168	235	0.2	3.139	A
2 - La Vallee	79	288	949	0.083	78	0.1	4.214	A
3 - R918	572	176	1172	0.488	568	1.0	6.145	A
4 - N11	138	298	1510	0.091	137	0.1	2.938	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	281	120	1388	0.203	281	0.3	3.306	A
2 - La Vallee	94	345	920	0.102	94	0.1	4.443	A
3 - R918	683	211	1152	0.593	681	1.5	7.896	A
4 - N11	165	357	1471	0.112	165	0.1	3.085	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	345	147	1371	0.251	344	0.3	3.561	A
2 - La Vallee	115	422	881	0.131	115	0.2	4.791	A
3 - R918	837	259	1125	0.744	831	2.9	12.487	B
4 - N11	202	436	1420	0.142	202	0.2	3.309	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	345	147	1371	0.251	345	0.3	3.562	A
2 - La Vallee	115	423	881	0.131	115	0.2	4.794	A
3 - R918	837	259	1124	0.744	836	2.9	12.925	B
4 - N11	202	438	1418	0.142	202	0.2	3.313	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	281	121	1387	0.203	282	0.3	3.308	A
2 - La Vallee	94	345	920	0.102	94	0.1	4.446	A
3 - R918	683	212	1151	0.593	689	1.5	8.159	A
4 - N11	165	361	1469	0.112	165	0.1	3.092	A

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	236	101	1399	0.168	236	0.2	3.144	A
2 - La Vallee	79	289	948	0.083	79	0.1	4.222	A
3 - R918	572	177	1171	0.489	574	1.0	6.276	A
4 - N11	138	301	1508	0.091	138	0.1	2.943	A

2029 Do Something, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	6.77	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	6.77	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2029 Do Something	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	341	100.000
2 - La Vallee		✓	94	100.000
3 - R918		✓	669	100.000
4 - N11		✓	281	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	3	40	99	199
	2 - La Vallee	30	0	22	42
	3 - R918	199	30	0	440
	4 - N11	129	29	122	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	1
	2 - La Vallee	0	0	0	0
	3 - R918	2	0	0	3

	4 - N11	2	0	6	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.28	3.77	0.4	A
2 - La Vallee	0.12	4.77	0.1	A
3 - R918	0.67	10.13	2.0	B
4 - N11	0.20	3.08	0.3	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	257	136	1378	0.186	256	0.2	3.233	A
2 - La Vallee	71	317	934	0.076	70	0.1	4.168	A
3 - R918	504	206	1155	0.436	501	0.8	5.600	A
4 - N11	212	196	1576	0.134	211	0.2	2.723	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	307	163	1362	0.225	306	0.3	3.441	A
2 - La Vallee	85	380	902	0.094	84	0.1	4.402	A
3 - R918	602	246	1132	0.532	600	1.1	6.906	A
4 - N11	253	235	1551	0.163	253	0.2	2.865	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	375	200	1340	0.280	375	0.4	3.762	A
2 - La Vallee	103	465	859	0.120	103	0.1	4.764	A
3 - R918	737	301	1100	0.670	733	2.0	9.945	A
4 - N11	310	287	1517	0.204	309	0.3	3.080	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	375	200	1339	0.280	375	0.4	3.766	A
2 - La Vallee	103	466	859	0.121	103	0.1	4.765	A
3 - R918	737	302	1100	0.670	737	2.0	10.128	B
4 - N11	310	288	1516	0.204	310	0.3	3.082	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	307	164	1361	0.225	307	0.3	3.444	A
2 - La Vallee	85	381	902	0.094	85	0.1	4.407	A
3 - R918	602	247	1131	0.532	605	1.2	7.042	A
4 - N11	253	237	1549	0.163	253	0.2	2.868	A

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	257	137	1377	0.186	257	0.2	3.241	A
2 - La Vallee	71	319	933	0.076	71	0.1	4.174	A
3 - R918	504	207	1154	0.436	505	0.8	5.687	A
4 - N11	212	198	1575	0.134	212	0.2	2.728	A

2039 Do Something, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	9.43	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	9.43	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2039 Do Something	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	315	100.000
2 - La Vallee		✓	105	100.000
3 - R918		✓	779	100.000
4 - N11		✓	194	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	17	138	160
	2 - La Vallee	43	0	29	32
	3 - R918	333	28	0	418
	4 - N11	77	18	99	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	3
	2 - La Vallee	2	0	0	3
	3 - R918	3	0	0	4

	4 - N11	1	0	23	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.25	3.59	0.3	A
2 - La Vallee	0.13	4.84	0.2	A
3 - R918	0.76	13.92	3.2	B
4 - N11	0.15	3.33	0.2	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	237	109	1394	0.170	236	0.2	3.157	A
2 - La Vallee	79	298	944	0.083	78	0.1	4.238	A
3 - R918	587	176	1172	0.501	583	1.0	6.287	A
4 - N11	146	302	1507	0.097	146	0.1	2.941	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	283	130	1382	0.205	283	0.3	3.328	A
2 - La Vallee	94	356	914	0.103	94	0.1	4.475	A
3 - R918	701	211	1152	0.608	698	1.6	8.183	A
4 - N11	175	362	1468	0.119	174	0.1	3.095	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	347	159	1364	0.254	346	0.3	3.594	A
2 - La Vallee	115	436	874	0.132	115	0.2	4.837	A
3 - R918	858	259	1125	0.763	852	3.1	13.361	B
4 - N11	214	442	1416	0.151	214	0.2	3.330	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	347	160	1364	0.254	347	0.3	3.595	A
2 - La Vallee	115	437	873	0.132	115	0.2	4.840	A
3 - R918	858	259	1124	0.763	858	3.2	13.924	B
4 - N11	214	445	1414	0.151	214	0.2	3.335	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	283	131	1381	0.205	283	0.3	3.331	A
2 - La Vallee	94	357	914	0.103	94	0.1	4.478	A
3 - R918	701	212	1151	0.608	707	1.6	8.504	A
4 - N11	175	366	1465	0.119	175	0.2	3.104	A

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	237	109	1394	0.170	237	0.2	3.164	A
2 - La Vallee	79	299	943	0.083	79	0.1	4.246	A
3 - R918	587	177	1171	0.501	589	1.1	6.432	A
4 - N11	146	305	1505	0.097	146	0.1	2.948	A

2039 Do Something, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	7.28	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.28	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2039 Do Something	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	347	100.000
2 - La Vallee		✓	94	100.000
3 - R918		✓	700	100.000
4 - N11		✓	326	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	3	40	105	199
	2 - La Vallee	30	0	22	42
	3 - R918	201	30	0	469
	4 - N11	129	29	167	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	1
	2 - La Vallee	0	0	0	0
	3 - R918	2	0	0	2

	4 - N11	2	0	4	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.29	3.91	0.4	A
2 - La Vallee	0.12	4.95	0.1	A
3 - R918	0.70	11.15	2.3	B
4 - N11	0.24	3.20	0.3	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	261	170	1357	0.192	260	0.2	3.306	A
2 - La Vallee	71	356	915	0.077	70	0.1	4.262	A
3 - R918	527	206	1155	0.456	524	0.8	5.794	A
4 - N11	246	198	1575	0.156	245	0.2	2.781	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	312	204	1337	0.233	312	0.3	3.540	A
2 - La Vallee	85	426	879	0.096	84	0.1	4.530	A
3 - R918	629	246	1132	0.556	628	1.3	7.274	A
4 - N11	293	237	1549	0.189	293	0.2	2.946	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	382	249	1310	0.292	382	0.4	3.910	A
2 - La Vallee	103	521	831	0.125	103	0.1	4.948	A
3 - R918	771	301	1100	0.701	767	2.3	10.890	B
4 - N11	359	289	1515	0.237	359	0.3	3.201	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	382	250	1310	0.292	382	0.4	3.914	A
2 - La Vallee	103	522	830	0.125	103	0.1	4.952	A
3 - R918	771	302	1100	0.701	771	2.3	11.152	B
4 - N11	359	291	1514	0.237	359	0.3	3.204	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	312	204	1337	0.233	312	0.3	3.544	A
2 - La Vallee	85	427	879	0.096	85	0.1	4.536	A
3 - R918	629	247	1131	0.556	633	1.3	7.446	A
4 - N11	293	239	1548	0.189	294	0.2	2.953	A

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	261	171	1357	0.193	262	0.2	3.314	A
2 - La Vallee	71	357	914	0.077	71	0.1	4.272	A
3 - R918	527	207	1154	0.457	529	0.9	5.897	A
4 - N11	246	199	1574	0.156	246	0.2	2.787	A

2024 Do Nothing, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	7.43	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	7.43	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2024 Do Nothing	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	310	100.000
2 - La Vallee		✓	105	100.000
3 - R918		✓	700	100.000
4 - N11		✓	151	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	17	133	160
	2 - La Vallee	43	0	29	32
	3 - R918	314	28	0	358
	4 - N11	77	18	56	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	3
	2 - La Vallee	2	0	0	3
	3 - R918	3	0	0	4

	4 - N11	1	0	39	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.25	3.48	0.3	A
2 - La Vallee	0.13	4.67	0.1	A
3 - R918	0.69	10.51	2.2	B
4 - N11	0.12	3.21	0.1	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	233	76	1414	0.165	233	0.2	3.095	A
2 - La Vallee	79	262	962	0.082	78	0.1	4.151	A
3 - R918	527	176	1172	0.450	523	0.8	5.722	A
4 - N11	114	288	1516	0.075	113	0.1	2.888	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	279	91	1405	0.198	278	0.3	3.247	A
2 - La Vallee	94	313	936	0.100	94	0.1	4.359	A
3 - R918	629	211	1152	0.546	627	1.2	7.087	A
4 - N11	136	345	1479	0.092	136	0.1	3.016	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	341	112	1392	0.245	341	0.3	3.479	A
2 - La Vallee	115	384	900	0.128	115	0.1	4.674	A
3 - R918	770	259	1125	0.685	767	2.2	10.300	B
4 - N11	166	422	1429	0.117	166	0.1	3.208	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	341	112	1392	0.245	341	0.3	3.479	A
2 - La Vallee	115	384	900	0.128	115	0.1	4.675	A
3 - R918	770	259	1124	0.685	770	2.2	10.510	B
4 - N11	166	424	1427	0.117	166	0.1	3.211	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	279	92	1405	0.198	279	0.3	3.250	A
2 - La Vallee	94	314	936	0.101	94	0.1	4.362	A
3 - R918	629	212	1151	0.546	633	1.3	7.235	A
4 - N11	136	348	1477	0.092	136	0.1	3.020	A

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	233	77	1414	0.165	234	0.2	3.102	A
2 - La Vallee	79	263	962	0.082	79	0.1	4.159	A
3 - R918	527	177	1171	0.450	528	0.9	5.814	A
4 - N11	114	291	1514	0.075	114	0.1	2.892	A

2024 Do Nothing , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	5.43	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	5.43	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2024 Do Nothing	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	329	100.000
2 - La Vallee		✓	94	100.000
3 - R918		✓	559	100.000
4 - N11		✓	177	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	3	40	87	199
	2 - La Vallee	30	0	22	42
	3 - R918	194	30	0	335
	4 - N11	129	29	18	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	1
	2 - La Vallee	0	0	0	0
	3 - R918	2	0	0	2

	4 - N11	2	0	29	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.26	3.47	0.3	A
2 - La Vallee	0.11	4.39	0.1	A
3 - R918	0.56	7.59	1.3	A
4 - N11	0.13	2.81	0.2	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	248	58	1425	0.174	247	0.2	3.083	A
2 - La Vallee	71	230	978	0.072	70	0.1	3.966	A
3 - R918	421	206	1155	0.364	419	0.6	4.980	A
4 - N11	133	192	1578	0.085	133	0.1	2.579	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	296	70	1418	0.209	296	0.3	3.237	A
2 - La Vallee	85	276	955	0.088	84	0.1	4.135	A
3 - R918	503	246	1132	0.444	502	0.8	5.829	A
4 - N11	159	231	1553	0.103	159	0.1	2.673	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	362	86	1408	0.257	362	0.3	3.471	A
2 - La Vallee	103	338	924	0.112	103	0.1	4.389	A
3 - R918	615	301	1100	0.560	614	1.3	7.533	A
4 - N11	195	282	1520	0.128	195	0.2	2.813	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	362	86	1408	0.257	362	0.3	3.472	A
2 - La Vallee	103	338	923	0.112	103	0.1	4.390	A
3 - R918	615	302	1100	0.560	615	1.3	7.592	A
4 - N11	195	283	1519	0.128	195	0.2	2.814	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	296	70	1418	0.209	296	0.3	3.241	A
2 - La Vallee	85	276	955	0.089	85	0.1	4.137	A
3 - R918	503	247	1131	0.444	504	0.8	5.882	A
4 - N11	159	232	1553	0.103	159	0.1	2.675	A

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	248	59	1425	0.174	248	0.2	3.087	A
2 - La Vallee	71	231	977	0.072	71	0.1	3.972	A
3 - R918	421	207	1154	0.365	422	0.6	5.026	A
4 - N11	133	194	1577	0.085	133	0.1	2.581	A

2029 Do Nothing , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	8.27	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	8.27	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D11	2029 Do Nothing	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	313	100.000
2 - La Vallee		✓	105	100.000
3 - R918		✓	740	100.000
4 - N11		✓	177	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	17	136	160
	2 - La Vallee	43	0	29	32
	3 - R918	327	28	0	385
	4 - N11	77	18	82	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	3
	2 - La Vallee	2	0	0	3
	3 - R918	3	0	0	4

	4 - N11	1	0	23	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.25	3.55	0.3	A
2 - La Vallee	0.13	4.77	0.2	A
3 - R918	0.72	11.97	2.7	B
4 - N11	0.14	3.25	0.2	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	236	96	1402	0.168	235	0.2	3.132	A
2 - La Vallee	79	283	951	0.083	78	0.1	4.203	A
3 - R918	557	176	1172	0.475	553	0.9	5.978	A
4 - N11	133	298	1510	0.088	133	0.1	2.884	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	281	115	1391	0.202	281	0.3	3.296	A
2 - La Vallee	94	339	923	0.102	94	0.1	4.428	A
3 - R918	665	211	1152	0.577	663	1.4	7.584	A
4 - N11	159	357	1471	0.108	159	0.1	3.026	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	345	141	1375	0.251	344	0.3	3.547	A
2 - La Vallee	115	416	884	0.130	115	0.2	4.772	A
3 - R918	814	259	1125	0.724	810	2.6	11.630	B
4 - N11	195	436	1419	0.137	195	0.2	3.242	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	345	141	1375	0.251	345	0.3	3.548	A
2 - La Vallee	115	416	884	0.130	115	0.2	4.773	A
3 - R918	814	259	1124	0.724	814	2.7	11.967	B
4 - N11	195	438	1418	0.138	195	0.2	3.246	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	281	115	1390	0.202	282	0.3	3.301	A
2 - La Vallee	94	340	922	0.102	94	0.1	4.431	A
3 - R918	665	212	1151	0.578	670	1.4	7.800	A
4 - N11	159	360	1469	0.108	159	0.1	3.034	A

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	236	96	1402	0.168	236	0.2	3.137	A
2 - La Vallee	79	285	950	0.083	79	0.1	4.211	A
3 - R918	557	177	1171	0.476	559	0.9	6.093	A
4 - N11	133	301	1508	0.088	134	0.1	2.889	A

2029 Do Nothing, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	5.50	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	5.50	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D12	2029 Do Nothing	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	341	100.000
2 - La Vallee		✓	94	100.000
3 - R918		✓	574	100.000
4 - N11		✓	275	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	3	40	99	199
	2 - La Vallee	30	0	22	42
	3 - R918	199	30	0	345
	4 - N11	129	29	116	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	1
	2 - La Vallee	0	0	0	0
	3 - R918	2	0	0	2

	4 - N11	2	0	4	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.28	3.75	0.4	A
2 - La Vallee	0.12	4.74	0.1	A
3 - R918	0.57	7.85	1.4	A
4 - N11	0.20	3.03	0.3	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	257	132	1380	0.186	256	0.2	3.225	A
2 - La Vallee	71	313	936	0.076	70	0.1	4.157	A
3 - R918	432	206	1155	0.374	430	0.6	5.053	A
4 - N11	207	196	1576	0.131	207	0.2	2.686	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	307	158	1365	0.225	306	0.3	3.430	A
2 - La Vallee	85	375	905	0.093	84	0.1	4.387	A
3 - R918	516	246	1132	0.456	515	0.8	5.951	A
4 - N11	247	235	1551	0.160	247	0.2	2.823	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	375	193	1344	0.279	375	0.4	3.747	A
2 - La Vallee	103	459	862	0.120	103	0.1	4.743	A
3 - R918	632	301	1100	0.575	630	1.4	7.786	A
4 - N11	303	288	1516	0.200	303	0.3	3.032	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	375	194	1343	0.279	375	0.4	3.750	A
2 - La Vallee	103	459	862	0.120	103	0.1	4.744	A
3 - R918	632	302	1100	0.575	632	1.4	7.853	A
4 - N11	303	288	1516	0.200	303	0.3	3.033	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	307	158	1365	0.225	307	0.3	3.436	A
2 - La Vallee	85	375	905	0.093	85	0.1	4.390	A
3 - R918	516	247	1131	0.456	518	0.9	6.014	A
4 - N11	247	236	1550	0.160	248	0.2	2.828	A

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	257	132	1380	0.186	257	0.2	3.233	A
2 - La Vallee	71	314	936	0.076	71	0.1	4.163	A
3 - R918	432	207	1154	0.374	433	0.6	5.105	A
4 - N11	207	198	1575	0.132	207	0.2	2.690	A

2039 Do Nothing , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	8.73	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	8.73	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D13	2039 Do Nothing	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	315	100.000
2 - La Vallee		✓	105	100.000
3 - R918		✓	758	100.000
4 - N11		✓	188	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	**2 - La Vallee**	**3 - R918**	**4 - N11**
From	**1 - Upper Dargle Road**	0	17	138	160
	2 - La Vallee	43	0	29	32
	3 - R918	333	28	0	397
	4 - N11	77	18	93	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	**2 - La Vallee**	**3 - R918**	**4 - N11**
From	**1 - Upper Dargle Road**	0	0	1	3
	2 - La Vallee	2	0	0	3
	3 - R918	3	0	0	4

	4 - N11	1	0	20	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.25	3.58	0.3	A
2 - La Vallee	0.13	4.82	0.2	A
3 - R918	0.74	12.76	2.9	B
4 - N11	0.15	3.27	0.2	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	237	104	1397	0.170	236	0.2	3.149	A
2 - La Vallee	79	293	946	0.083	78	0.1	4.227	A
3 - R918	570	176	1172	0.487	567	1.0	6.104	A
4 - N11	142	302	1507	0.094	141	0.1	2.889	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	283	125	1385	0.204	283	0.3	3.319	A
2 - La Vallee	94	351	917	0.103	94	0.1	4.460	A
3 - R918	681	211	1152	0.591	679	1.5	7.832	A
4 - N11	169	362	1468	0.115	169	0.1	3.038	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	347	153	1368	0.253	346	0.3	3.580	A
2 - La Vallee	115	430	877	0.131	115	0.2	4.815	A
3 - R918	834	259	1125	0.742	829	2.8	12.342	B
4 - N11	207	442	1415	0.146	207	0.2	3.265	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	347	153	1368	0.253	347	0.3	3.581	A
2 - La Vallee	115	430	877	0.131	115	0.2	4.819	A
3 - R918	834	259	1124	0.742	834	2.9	12.764	B
4 - N11	207	445	1414	0.147	207	0.2	3.269	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	283	125	1385	0.204	283	0.3	3.324	A
2 - La Vallee	94	352	917	0.103	94	0.1	4.463	A
3 - R918	681	212	1151	0.592	687	1.5	8.087	A
4 - N11	169	366	1465	0.115	169	0.1	3.044	A

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	237	105	1397	0.170	237	0.2	3.156	A
2 - La Vallee	79	294	946	0.083	79	0.1	4.235	A
3 - R918	570	177	1171	0.487	573	1.0	6.230	A
4 - N11	142	305	1505	0.094	142	0.1	2.894	A

2039 Do Nothing, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Eastern Roundabout	Standard Roundabout		1, 2, 3, 4	5.55	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	5.55	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D14	2039 Do Nothing	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Upper Dargle Road		✓	347	100.000
2 - La Vallee		✓	94	100.000
3 - R918		✓	580	100.000
4 - N11		✓	320	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	3	40	105	199
	2 - La Vallee	30	0	22	42
	3 - R918	201	30	0	349
	4 - N11	129	29	161	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - Upper Dargle Road	2 - La Vallee	3 - R918	4 - N11
From	1 - Upper Dargle Road	0	0	1	1
	2 - La Vallee	0	0	0	0
	3 - R918	2	0	0	2

	4 - N11	2	0	3	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - Upper Dargle Road	0.29	3.90	0.4	A
2 - La Vallee	0.12	4.93	0.1	A
3 - R918	0.58	7.96	1.4	A
4 - N11	0.23	3.16	0.3	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	261	166	1360	0.192	260	0.2	3.298	A
2 - La Vallee	71	351	917	0.077	70	0.1	4.250	A
3 - R918	437	206	1155	0.378	434	0.6	5.082	A
4 - N11	241	198	1575	0.153	240	0.2	2.747	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	312	198	1341	0.233	312	0.3	3.529	A
2 - La Vallee	85	420	882	0.096	84	0.1	4.515	A
3 - R918	521	246	1132	0.461	520	0.9	6.002	A
4 - N11	288	237	1549	0.186	288	0.2	2.907	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	382	243	1314	0.291	382	0.4	3.893	A
2 - La Vallee	103	515	834	0.124	103	0.1	4.926	A
3 - R918	639	301	1100	0.581	637	1.4	7.892	A
4 - N11	353	290	1515	0.233	352	0.3	3.155	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	382	243	1314	0.291	382	0.4	3.897	A
2 - La Vallee	103	515	834	0.124	103	0.1	4.929	A
3 - R918	639	302	1100	0.581	639	1.4	7.964	A
4 - N11	353	291	1514	0.233	353	0.3	3.157	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	312	199	1340	0.233	312	0.3	3.533	A
2 - La Vallee	85	421	881	0.096	85	0.1	4.521	A
3 - R918	521	247	1131	0.461	523	0.9	6.065	A
4 - N11	288	238	1549	0.186	288	0.2	2.910	A

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - Upper Dargle Road	261	166	1360	0.192	262	0.2	3.306	A
2 - La Vallee	71	353	916	0.077	71	0.1	4.261	A
3 - R918	437	207	1154	0.378	438	0.6	5.137	A
4 - N11	241	199	1574	0.153	241	0.2	2.754	A

Junctions 10

ARCADY 10 - Roundabout Module

Version: 10.0.4.1693

For sales and distribution information, program advice and maintenance, contact TRL Software:
+44 (0)1344 379777 software@trl.co.uk trlsoftware.com

Filename: J6 Western Roundabout- No Growth Factors.j10
Path: Q:\2020 Jobs\20_008N Fassaroe\Traffic Study\Junction 6
Report generation date: 17/04/2023 14:00:53

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2022 (Do Nothing)									
2 - R918		0.2	3.57	0.18	A		0.1	3.12	0.10	A
3 - N11 South	D1	0.6	4.24	0.37	A	D2	0.4	3.47	0.27	A
4 - Fassaroe Lane		0.2	2.09	0.17	A		0.2	1.79	0.13	A
	2024 Do Something									
2 - R918		0.3	3.64	0.19	A		0.1	3.21	0.11	A
3 - N11 South	D3	0.8	4.78	0.44	A	D4	0.4	3.58	0.28	A
4 - Fassaroe Lane		0.2	2.14	0.18	A		0.2	1.89	0.17	A
	2029 Do Something									
2 - R918		0.3	3.70	0.21	A		0.3	3.47	0.20	A
3 - N11 South	D5	0.9	4.97	0.46	A	D6	0.5	3.94	0.32	A
4 - Fassaroe Lane		0.4	2.31	0.26	A		0.3	1.95	0.20	A
	2039 Do Something									
2 - R918		0.3	3.74	0.22	A		0.4	3.96	0.24	A
3 - N11 South	D7	0.9	5.11	0.47	A	D8	0.5	4.21	0.34	A
4 - Fassaroe Lane		0.4	2.41	0.29	A		0.3	2.04	0.23	A
	2024 Do Nothing									
2 - R918		0.2	3.57	0.18	A		0.1	3.12	0.10	A
3 - N11 South	D9	0.6	4.24	0.37	A	D10	0.4	3.47	0.27	A
4 - Fassaroe Lane		0.2	2.09	0.17	A		0.2	1.79	0.13	A
	2029 Do Nothing									
2 - R918		0.3	3.64	0.21	A		0.2	3.41	0.19	A
3 - N11 South	D11	0.6	4.37	0.38	A	D12	0.4	3.81	0.30	A
4 - Fassaroe Lane		0.3	2.25	0.25	A		0.2	1.83	0.16	A

	2039 Do Nothing									
2 - R918	D13	0.3	3.68	0.22	A	D14	0.3	3.78	0.24	A
3 - N11 South		0.7	4.43	0.39	A		0.5	4.07	0.31	A
4 - Fassaroe Lane		0.4	2.34	0.28	A		0.2	1.90	0.17	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	16/12/2022
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\jyotsna.singh
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2022 (Do Nothing)	AM	ONE HOUR	08:00	09:30	15
D2	2022 (Do Nothing)	PM	ONE HOUR	17:00	18:30	15
D3	2024 Do Something	AM	ONE HOUR	08:00	09:30	15
D4	2024 Do Something	PM	ONE HOUR	17:00	18:30	15
D5	2029 Do Something	AM	ONE HOUR	08:00	09:30	15
D6	2029 Do Something	PM	ONE HOUR	17:00	18:30	15
D7	2039 Do Something	AM	ONE HOUR	08:00	09:30	15
D8	2039 Do Something	PM	ONE HOUR	17:00	18:30	15
D9	2024 Do Nothing	AM	ONE HOUR	08:00	09:30	15
D10	2024 Do Nothing	PM	ONE HOUR	17:00	18:30	15
D11	2029 Do Nothing	AM	ONE HOUR	08:00	09:30	15
D12	2029 Do Nothing	PM	ONE HOUR	17:00	18:30	15
D13	2039 Do Nothing	AM	ONE HOUR	08:00	09:30	15
D14	2039 Do Nothing	PM	ONE HOUR	17:00	18:30	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2022 (Do Nothing), AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.39	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.39	A

Arms

Arms

Arm	Name	Description	No give-way line
1	N11 North		
2	R918		
3	N11 South		
4	Fassaroe Lane		

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Entry only	Exit only
1 - N11 North								✓
2 - R918	3.55	4.41	4.4	94.0	51.0	17.0		
3 - N11 South	3.88	5.60	4.2	400.0	51.0	9.9	✓	
4 - Fassaroe Lane	7.37	10.80	7.9	190.0	51.0	29.8		

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1 - N11 North		
2 - R918	0.560	1339
3 - N11 South	0.611	1563
4 - Fassaroe Lane	0.821	2787

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2022 (Do Nothing)	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)

HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	223	100.000
3 - N11 South		✓	480	100.000
4 - Fassaroe Lane		✓	343	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	161	0	0	61
	3 - N11 South	3	456	0	21
	4 - Fassaroe Lane	101	242	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	37
	3 - N11 South	0	3	0	28
	4 - Fassaroe Lane	15	4	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.18	3.57	0.2	A
3 - N11 South	0.37	4.24	0.6	A
4 - Fassaroe Lane	0.17	2.09	0.2	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		524						
2 - R918	168	0	1339	0.125	167	0.2	3.333	A
3 - N11 South	361	167	1461	0.247	360	0.3	3.404	A
4 - Fassaroe Lane	258	465	2405	0.107	258	0.1	1.795	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		627						

2 - R918	200	0	1339	0.149	200	0.2	3.431	A
3 - N11 South	432	200	1441	0.300	431	0.4	3.714	A
4 - Fassaroe Lane	309	557	2330	0.132	308	0.2	1.906	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		768						
2 - R918	245	0	1339	0.183	245	0.2	3.572	A
3 - N11 South	529	245	1413	0.374	528	0.6	4.234	A
4 - Fassaroe Lane	378	682	2227	0.170	378	0.2	2.085	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		769						
2 - R918	245	0	1339	0.183	245	0.2	3.572	A
3 - N11 South	529	245	1413	0.374	529	0.6	4.242	A
4 - Fassaroe Lane	378	683	2227	0.170	378	0.2	2.085	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		628						
2 - R918	200	0	1339	0.149	200	0.2	3.432	A
3 - N11 South	432	200	1440	0.300	432	0.4	3.723	A
4 - Fassaroe Lane	309	558	2329	0.133	309	0.2	1.911	A

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		526						
2 - R918	168	0	1339	0.125	168	0.2	3.336	A
3 - N11 South	361	168	1460	0.248	362	0.3	3.416	A
4 - Fassaroe Lane	258	467	2403	0.108	259	0.1	1.800	A

2022 (Do Nothing) , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	2.78	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	2.78	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2022 (Do Nothing)	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	127	100.000
3 - N11 South		✓	357	100.000
4 - Fassaroe Lane		✓	291	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	84	0	0	43
	3 - N11 South	1	326	0	30
	4 - Fassaroe Lane	63	228	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	11
	3 - N11 South	0	3	0	25
	4 - Fassaroe Lane	17	1	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.10	3.12	0.1	A
3 - N11 South	0.27	3.47	0.4	A
4 - Fassaroe Lane	0.13	1.79	0.2	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		416						
2 - R918	95	0	1339	0.071	95	0.1	3.013	A
3 - N11 South	269	95	1505	0.179	268	0.2	3.046	A
4 - Fassaroe Lane	219	308	2534	0.087	219	0.1	1.617	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		498						
2 - R918	114	0	1339	0.085	114	0.1	3.059	A
3 - N11 South	321	114	1493	0.215	321	0.3	3.214	A
4 - Fassaroe Lane	262	369	2484	0.105	262	0.1	1.684	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		610						
2 - R918	139	0	1339	0.104	139	0.1	3.124	A
3 - N11 South	394	139	1478	0.266	393	0.4	3.475	A
4 - Fassaroe Lane	321	452	2416	0.133	321	0.2	1.786	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		610						
2 - R918	139	0	1339	0.104	139	0.1	3.124	A
3 - N11 South	394	139	1478	0.266	394	0.4	3.475	A
4 - Fassaroe Lane	321	452	2416	0.133	321	0.2	1.786	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		498						
2 - R918	114	0	1339	0.085	114	0.1	3.062	A
3 - N11 South	321	114	1493	0.215	322	0.3	3.216	A
4 - Fassaroe Lane	262	370	2483	0.105	262	0.1	1.685	A

18:15 - 18:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		417						
2 - R918	95	0	1339	0.071	95	0.1	3.014	A
3 - N11 South	269	95	1505	0.179	269	0.2	3.053	A
4 - Fassaroe Lane	219	310	2533	0.087	219	0.1	1.617	A

2024 Do Something, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.72	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.72	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2024 Do Something	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	229	100.000
3 - N11 South		✓	568	100.000
4 - Fassaroe Lane		✓	369	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	161	0	0	67
	3 - N11 South	3	456	0	109
	4 - Fassaroe Lane	107	262	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	41
	3 - N11 South	0	3	0	8
	4 - Fassaroe Lane	17	5	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.19	3.64	0.3	A
3 - N11 South	0.44	4.78	0.8	A
4 - Fassaroe Lane	0.18	2.14	0.2	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		538						
2 - R918	172	0	1339	0.129	172	0.2	3.387	A
3 - N11 South	427	172	1458	0.293	426	0.4	3.626	A
4 - Fassaroe Lane	278	465	2405	0.115	277	0.1	1.834	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		645						
2 - R918	206	0	1339	0.154	205	0.2	3.490	A
3 - N11 South	510	205	1437	0.355	510	0.6	4.040	A
4 - Fassaroe Lane	332	557	2330	0.142	331	0.2	1.953	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		789						
2 - R918	252	0	1339	0.188	252	0.3	3.638	A
3 - N11 South	625	252	1409	0.444	624	0.8	4.770	A
4 - Fassaroe Lane	406	682	2227	0.182	406	0.2	2.143	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		790						
2 - R918	252	0	1339	0.188	252	0.3	3.638	A
3 - N11 South	625	252	1409	0.444	625	0.8	4.782	A
4 - Fassaroe Lane	406	683	2227	0.182	406	0.2	2.144	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		646						
2 - R918	206	0	1339	0.154	206	0.2	3.491	A
3 - N11 South	510	206	1437	0.355	511	0.6	4.056	A
4 - Fassaroe Lane	332	558	2329	0.142	332	0.2	1.955	A

09:15 - 09:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		541						
2 - R918	172	0	1339	0.129	172	0.2	3.394	A
3 - N11 South	427	172	1458	0.293	428	0.4	3.646	A
4 - Fassaroe Lane	278	467	2403	0.116	278	0.1	1.839	A

2024 Do Something, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	2.80	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	2.80	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2024 Do Something	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	133	100.000
3 - N11 South		✓	376	100.000
4 - Fassaroe Lane		✓	380	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	84	0	0	49
	3 - N11 South	1	326	0	49
	4 - Fassaroe Lane	69	311	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	17
	3 - N11 South	0	3	0	23
	4 - Fassaroe Lane	22	2	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.11	3.21	0.1	A
3 - N11 South	0.28	3.58	0.4	A
4 - Fassaroe Lane	0.17	1.89	0.2	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		478						
2 - R918	100	0	1339	0.075	100	0.1	3.092	A
3 - N11 South	283	100	1502	0.189	282	0.2	3.104	A
4 - Fassaroe Lane	286	308	2534	0.113	286	0.1	1.677	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		572						
2 - R918	119	0	1339	0.089	119	0.1	3.142	A
3 - N11 South	338	119	1490	0.227	338	0.3	3.290	A
4 - Fassaroe Lane	342	369	2484	0.138	342	0.2	1.759	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		701						
2 - R918	146	0	1339	0.109	146	0.1	3.212	A
3 - N11 South	414	146	1474	0.281	414	0.4	3.577	A
4 - Fassaroe Lane	418	452	2416	0.173	418	0.2	1.887	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		701						
2 - R918	146	0	1339	0.109	146	0.1	3.212	A
3 - N11 South	414	146	1474	0.281	414	0.4	3.577	A
4 - Fassaroe Lane	418	452	2416	0.173	418	0.2	1.887	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		573						
2 - R918	119	0	1339	0.089	119	0.1	3.145	A
3 - N11 South	338	119	1490	0.227	339	0.3	3.293	A
4 - Fassaroe Lane	342	370	2483	0.138	342	0.2	1.763	A

18:15 - 18:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		480						
2 - R918	100	0	1339	0.075	100	0.1	3.093	A
3 - N11 South	283	100	1502	0.189	283	0.2	3.111	A
4 - Fassaroe Lane	286	310	2533	0.113	286	0.1	1.678	A

2029 Do Something, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.71	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.71	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2029 Do Something	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	258	100.000
3 - N11 South		✓	578	100.000
4 - Fassaroe Lane		✓	523	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	161	0	0	96
	3 - N11 South	3	456	0	119
	4 - Fassaroe Lane	220	303	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	25
	3 - N11 South	0	3	0	7
	4 - Fassaroe Lane	8	4	0	7

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.21	3.70	0.3	A
3 - N11 South	0.46	4.97	0.9	A
4 - Fassaroe Lane	0.26	2.31	0.4	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		569						
2 - R918	194	0	1339	0.145	193	0.2	3.411	A
3 - N11 South	435	193	1445	0.301	433	0.4	3.698	A
4 - Fassaroe Lane	393	465	2405	0.164	393	0.2	1.893	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		681						
2 - R918	232	0	1339	0.173	231	0.2	3.529	A
3 - N11 South	519	231	1421	0.365	519	0.6	4.148	A
4 - Fassaroe Lane	470	557	2330	0.202	470	0.3	2.048	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		834						
2 - R918	284	0	1339	0.212	283	0.3	3.703	A
3 - N11 South	636	283	1390	0.458	635	0.9	4.958	A
4 - Fassaroe Lane	575	682	2227	0.258	575	0.4	2.306	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		835						
2 - R918	284	0	1339	0.212	284	0.3	3.703	A
3 - N11 South	636	284	1390	0.458	636	0.9	4.973	A
4 - Fassaroe Lane	575	683	2227	0.258	575	0.4	2.307	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		683						
2 - R918	232	0	1339	0.173	232	0.2	3.531	A
3 - N11 South	519	232	1421	0.365	520	0.6	4.166	A
4 - Fassaroe Lane	470	558	2329	0.202	470	0.3	2.052	A

09:15 - 09:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		572						
2 - R918	194	0	1339	0.145	194	0.2	3.414	A
3 - N11 South	435	194	1444	0.301	436	0.5	3.719	A
4 - Fassaroe Lane	393	467	2403	0.164	394	0.2	1.895	A

2029 Do Something, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.02	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.02	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2029 Do Something	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	243	100.000
3 - N11 South		✓	401	100.000
4 - Fassaroe Lane		✓	448	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	84	0	0	159
	3 - N11 South	1	326	0	74
	4 - Fassaroe Lane	110	338	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	5
	3 - N11 South	0	3	0	14
	4 - Fassaroe Lane	13	1	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.20	3.47	0.3	A
3 - N11 South	0.32	3.94	0.5	A
4 - Fassaroe Lane	0.20	1.95	0.3	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		498						
2 - R918	183	0	1339	0.136	182	0.2	3.215	A
3 - N11 South	302	182	1452	0.208	301	0.3	3.281	A
4 - Fassaroe Lane	337	308	2534	0.133	336	0.2	1.703	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		596						
2 - R918	218	0	1339	0.163	218	0.2	3.320	A
3 - N11 South	361	218	1430	0.252	360	0.4	3.534	A
4 - Fassaroe Lane	402	369	2484	0.162	402	0.2	1.797	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		730						
2 - R918	267	0	1339	0.200	267	0.3	3.471	A
3 - N11 South	442	267	1400	0.316	441	0.5	3.941	A
4 - Fassaroe Lane	493	452	2416	0.204	492	0.3	1.946	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		730						
2 - R918	267	0	1339	0.200	267	0.3	3.471	A
3 - N11 South	442	267	1400	0.316	442	0.5	3.944	A
4 - Fassaroe Lane	493	452	2416	0.204	493	0.3	1.946	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		597						
2 - R918	218	0	1339	0.163	218	0.2	3.323	A
3 - N11 South	361	218	1429	0.252	361	0.4	3.541	A
4 - Fassaroe Lane	402	370	2483	0.162	403	0.2	1.801	A

18:15 - 18:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		500						
2 - R918	183	0	1339	0.136	183	0.2	3.221	A
3 - N11 South	302	183	1451	0.208	302	0.3	3.292	A
4 - Fassaroe Lane	337	310	2533	0.133	337	0.2	1.704	A

2039 Do Something, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.75	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.75	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D7	2039 Do Something	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	271	100.000
3 - N11 South		✓	589	100.000
4 - Fassaroe Lane		✓	594	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	161	0	0	109
	3 - N11 South	3	456	0	130
	4 - Fassaroe Lane	272	322	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	22
	3 - N11 South	0	3	0	6
	4 - Fassaroe Lane	6	4	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.22	3.74	0.3	A
3 - N11 South	0.47	5.11	0.9	A
4 - Fassaroe Lane	0.29	2.41	0.4	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		583						
2 - R918	204	0	1339	0.152	203	0.2	3.425	A
3 - N11 South	443	203	1439	0.308	441	0.5	3.748	A
4 - Fassaroe Lane	447	465	2405	0.186	446	0.2	1.930	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		698						
2 - R918	243	0	1339	0.182	243	0.2	3.551	A
3 - N11 South	529	243	1414	0.374	529	0.6	4.225	A
4 - Fassaroe Lane	534	557	2330	0.229	534	0.3	2.106	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		855						
2 - R918	298	0	1339	0.223	298	0.3	3.738	A
3 - N11 South	648	298	1381	0.469	647	0.9	5.093	A
4 - Fassaroe Lane	654	682	2227	0.294	653	0.4	2.404	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		856						
2 - R918	298	0	1339	0.223	298	0.3	3.738	A
3 - N11 South	648	298	1381	0.469	648	0.9	5.111	A
4 - Fassaroe Lane	654	683	2227	0.294	654	0.4	2.405	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		700						
2 - R918	243	0	1339	0.182	244	0.2	3.556	A
3 - N11 South	529	244	1414	0.374	530	0.6	4.244	A
4 - Fassaroe Lane	534	559	2328	0.229	534	0.3	2.109	A

09:15 - 09:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		586						
2 - R918	204	0	1339	0.152	204	0.2	3.432	A
3 - N11 South	443	204	1438	0.308	444	0.5	3.770	A
4 - Fassaroe Lane	447	467	2403	0.186	447	0.2	1.934	A

2039 Do Something , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.26	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.26	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D8	2039 Do Something	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	293	100.000
3 - N11 South		✓	416	100.000
4 - Fassaroe Lane		✓	498	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	84	0	0	209
	3 - N11 South	1	326	0	89
	4 - Fassaroe Lane	129	369	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	17
	3 - N11 South	0	3	0	20
	4 - Fassaroe Lane	22	1	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.24	3.96	0.4	A
3 - N11 South	0.34	4.21	0.5	A
4 - Fassaroe Lane	0.23	2.04	0.3	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		522						
2 - R918	220	0	1339	0.165	219	0.2	3.602	A
3 - N11 South	313	219	1429	0.219	312	0.3	3.423	A
4 - Fassaroe Lane	375	308	2534	0.148	374	0.2	1.767	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		624						
2 - R918	263	0	1339	0.196	263	0.3	3.746	A
3 - N11 South	374	263	1402	0.267	374	0.4	3.720	A
4 - Fassaroe Lane	448	369	2484	0.180	448	0.2	1.873	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		765						
2 - R918	322	0	1339	0.241	322	0.4	3.963	A
3 - N11 South	458	322	1366	0.336	458	0.5	4.209	A
4 - Fassaroe Lane	549	452	2416	0.227	548	0.3	2.043	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		765						
2 - R918	322	0	1339	0.241	322	0.4	3.965	A
3 - N11 South	458	322	1366	0.336	458	0.5	4.215	A
4 - Fassaroe Lane	549	452	2416	0.227	549	0.3	2.044	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		625						
2 - R918	263	0	1339	0.196	263	0.3	3.751	A
3 - N11 South	374	263	1402	0.267	375	0.4	3.729	A
4 - Fassaroe Lane	448	370	2483	0.180	448	0.2	1.875	A

18:15 - 18:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		524						
2 - R918	220	0	1339	0.165	221	0.2	3.607	A
3 - N11 South	313	221	1428	0.220	314	0.3	3.436	A
4 - Fassaroe Lane	375	310	2533	0.148	375	0.2	1.768	A

2024 Do Nothing , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.39	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.39	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D9	2024 Do Nothing	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	223	100.000
3 - N11 South		✓	480	100.000
4 - Fassaroe Lane		✓	343	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	161	0	0	61
	3 - N11 South	3	456	0	21
	4 - Fassaroe Lane	101	242	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	37
	3 - N11 South	0	3	0	28
	4 - Fassaroe Lane	15	4	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.18	3.57	0.2	A
3 - N11 South	0.37	4.24	0.6	A
4 - Fassaroe Lane	0.17	2.09	0.2	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		524						
2 - R918	168	0	1339	0.125	167	0.2	3.333	A
3 - N11 South	361	167	1461	0.247	360	0.3	3.404	A
4 - Fassaroe Lane	258	465	2405	0.107	258	0.1	1.795	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		627						
2 - R918	200	0	1339	0.149	200	0.2	3.431	A
3 - N11 South	432	200	1441	0.300	431	0.4	3.714	A
4 - Fassaroe Lane	309	557	2330	0.132	308	0.2	1.906	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		768						
2 - R918	245	0	1339	0.183	245	0.2	3.572	A
3 - N11 South	529	245	1413	0.374	528	0.6	4.234	A
4 - Fassaroe Lane	378	682	2227	0.170	378	0.2	2.085	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		769						
2 - R918	245	0	1339	0.183	245	0.2	3.572	A
3 - N11 South	529	245	1413	0.374	529	0.6	4.242	A
4 - Fassaroe Lane	378	683	2227	0.170	378	0.2	2.085	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		628						
2 - R918	200	0	1339	0.149	200	0.2	3.432	A
3 - N11 South	432	200	1440	0.300	432	0.4	3.723	A
4 - Fassaroe Lane	309	558	2329	0.133	309	0.2	1.911	A

09:15 - 09:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		526						
2 - R918	168	0	1339	0.125	168	0.2	3.336	A
3 - N11 South	361	168	1460	0.248	362	0.3	3.416	A
4 - Fassaroe Lane	258	467	2403	0.108	259	0.1	1.800	A

2024 Do Nothing , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	2.78	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	2.78	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D10	2024 Do Nothing	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	127	100.000
3 - N11 South		✓	357	100.000
4 - Fassaroe Lane		✓	291	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	84	0	0	43
	3 - N11 South	1	326	0	30
	4 - Fassaroe Lane	63	228	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	11
	3 - N11 South	0	3	0	25
	4 - Fassaroe Lane	17	1	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.10	3.12	0.1	A
3 - N11 South	0.27	3.47	0.4	A
4 - Fassaroe Lane	0.13	1.79	0.2	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		416						
2 - R918	95	0	1339	0.071	95	0.1	3.013	A
3 - N11 South	269	95	1505	0.179	268	0.2	3.046	A
4 - Fassaroe Lane	219	308	2534	0.087	219	0.1	1.617	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		498						
2 - R918	114	0	1339	0.085	114	0.1	3.059	A
3 - N11 South	321	114	1493	0.215	321	0.3	3.214	A
4 - Fassaroe Lane	262	369	2484	0.105	262	0.1	1.684	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		610						
2 - R918	139	0	1339	0.104	139	0.1	3.124	A
3 - N11 South	394	139	1478	0.266	393	0.4	3.475	A
4 - Fassaroe Lane	321	452	2416	0.133	321	0.2	1.786	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		610						
2 - R918	139	0	1339	0.104	139	0.1	3.124	A
3 - N11 South	394	139	1478	0.266	394	0.4	3.475	A
4 - Fassaroe Lane	321	452	2416	0.133	321	0.2	1.786	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		498						
2 - R918	114	0	1339	0.085	114	0.1	3.062	A
3 - N11 South	321	114	1493	0.215	322	0.3	3.216	A
4 - Fassaroe Lane	262	370	2483	0.105	262	0.1	1.685	A

18:15 - 18:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		417						
2 - R918	95	0	1339	0.071	95	0.1	3.014	A
3 - N11 South	269	95	1505	0.179	269	0.2	3.053	A
4 - Fassaroe Lane	219	310	2533	0.087	219	0.1	1.617	A

2029 Do Nothing , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.37	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.37	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D11	2029 Do Nothing	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	252	100.000
3 - N11 South		✓	486	100.000
4 - Fassaroe Lane		✓	496	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	161	0	0	90
	3 - N11 South	3	456	0	27
	4 - Fassaroe Lane	214	282	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	22
	3 - N11 South	0	3	0	21
	4 - Fassaroe Lane	6	4	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.21	3.64	0.3	A
3 - N11 South	0.38	4.37	0.6	A
4 - Fassaroe Lane	0.25	2.25	0.3	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		554						
2 - R918	189	0	1339	0.141	189	0.2	3.360	A
3 - N11 South	366	189	1448	0.253	365	0.4	3.458	A
4 - Fassaroe Lane	374	465	2405	0.155	373	0.2	1.856	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		663						
2 - R918	226	0	1339	0.169	226	0.2	3.474	A
3 - N11 South	437	226	1425	0.307	437	0.5	3.793	A
4 - Fassaroe Lane	446	557	2330	0.192	446	0.2	2.003	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		812						
2 - R918	277	0	1339	0.207	277	0.3	3.640	A
3 - N11 South	535	277	1394	0.384	534	0.6	4.362	A
4 - Fassaroe Lane	546	682	2227	0.245	546	0.3	2.245	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		813						
2 - R918	277	0	1339	0.207	277	0.3	3.640	A
3 - N11 South	535	277	1394	0.384	535	0.6	4.369	A
4 - Fassaroe Lane	546	683	2227	0.245	546	0.3	2.245	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		664						
2 - R918	226	0	1339	0.169	227	0.2	3.475	A
3 - N11 South	437	227	1425	0.307	438	0.5	3.806	A
4 - Fassaroe Lane	446	558	2329	0.192	447	0.2	2.005	A

09:15 - 09:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		556						
2 - R918	189	0	1339	0.141	190	0.2	3.364	A
3 - N11 South	366	190	1447	0.253	366	0.4	3.471	A
4 - Fassaroe Lane	374	467	2403	0.155	374	0.2	1.858	A

2029 Do Nothing , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.00	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.00	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D12	2029 Do Nothing	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	237	100.000
3 - N11 South		✓	380	100.000
4 - Fassaroe Lane		✓	346	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	84	0	0	153
	3 - N11 South	1	326	0	53
	4 - Fassaroe Lane	104	242	0	0

Vehicle Mix

Heavy Vehicle Percentages

	To				
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	3
	3 - N11 South	0	3	0	13
	4 - Fassaroe Lane	10	1	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.19	3.41	0.2	A
3 - N11 South	0.30	3.81	0.4	A
4 - Fassaroe Lane	0.16	1.83	0.2	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		426						
2 - R918	178	0	1339	0.133	178	0.2	3.164	A
3 - N11 South	286	178	1454	0.197	285	0.3	3.211	A
4 - Fassaroe Lane	261	308	2534	0.103	260	0.1	1.635	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		510						
2 - R918	213	0	1339	0.159	213	0.2	3.264	A
3 - N11 South	342	213	1433	0.239	342	0.3	3.443	A
4 - Fassaroe Lane	311	369	2484	0.125	311	0.1	1.711	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		625						
2 - R918	261	0	1339	0.195	260	0.2	3.408	A
3 - N11 South	419	260	1404	0.298	418	0.4	3.811	A
4 - Fassaroe Lane	381	452	2416	0.158	381	0.2	1.827	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		625						
2 - R918	261	0	1339	0.195	261	0.2	3.408	A
3 - N11 South	419	261	1404	0.298	419	0.4	3.814	A
4 - Fassaroe Lane	381	452	2416	0.158	381	0.2	1.827	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		511						
2 - R918	213	0	1339	0.159	213	0.2	3.267	A
3 - N11 South	342	213	1433	0.239	342	0.3	3.449	A
4 - Fassaroe Lane	311	370	2483	0.125	311	0.1	1.711	A

18:15 - 18:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		428						
2 - R918	178	0	1339	0.133	178	0.2	3.170	A
3 - N11 South	286	178	1454	0.197	287	0.3	3.221	A
4 - Fassaroe Lane	261	310	2533	0.103	261	0.1	1.636	A

2039 Do Nothing , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.38	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.38	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D13	2039 Do Nothing	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	265	100.000
3 - N11 South		✓	489	100.000
4 - Fassaroe Lane		✓	566	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	161	0	0	103
	3 - N11 South	3	456	0	30
	4 - Fassaroe Lane	266	300	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	19
	3 - N11 South	0	3	0	19
	4 - Fassaroe Lane	5	3	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.22	3.68	0.3	A
3 - N11 South	0.39	4.43	0.7	A
4 - Fassaroe Lane	0.28	2.34	0.4	A

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		567						
2 - R918	199	0	1339	0.149	199	0.2	3.376	A
3 - N11 South	368	199	1442	0.255	367	0.4	3.484	A
4 - Fassaroe Lane	426	465	2405	0.177	425	0.2	1.894	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		679						
2 - R918	238	0	1339	0.178	238	0.2	3.497	A
3 - N11 South	440	238	1418	0.310	439	0.5	3.830	A
4 - Fassaroe Lane	509	557	2330	0.219	509	0.3	2.060	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		831						
2 - R918	291	0	1339	0.218	291	0.3	3.675	A
3 - N11 South	539	291	1385	0.389	538	0.7	4.423	A
4 - Fassaroe Lane	624	682	2227	0.280	623	0.4	2.338	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		832						
2 - R918	291	0	1339	0.218	291	0.3	3.675	A
3 - N11 South	539	291	1385	0.389	538	0.7	4.430	A
4 - Fassaroe Lane	624	683	2227	0.280	624	0.4	2.339	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		681						
2 - R918	238	0	1339	0.178	238	0.2	3.499	A
3 - N11 South	440	238	1417	0.310	440	0.5	3.843	A
4 - Fassaroe Lane	509	558	2329	0.219	510	0.3	2.062	A

09:15 - 09:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		570						
2 - R918	199	0	1339	0.149	199	0.2	3.379	A
3 - N11 South	368	199	1441	0.256	369	0.4	3.497	A
4 - Fassaroe Lane	426	467	2403	0.177	427	0.2	1.900	A

2039 Do Nothing , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	J6 Fassaroe- Western Roundabout	Standard Roundabout		1, 2, 3, 4	3.22	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	3.22	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D14	2039 Do Nothing	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - N11 North				
2 - R918		✓	287	100.000
3 - N11 South		✓	391	100.000
4 - Fassaroe Lane		✓	372	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	84	0	0	203
	3 - N11 South	1	326	0	64
	4 - Fassaroe Lane	123	249	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1 - N11 North	2 - R918	3 - N11 South	4 - Fassaroe Lane
From	1 - N11 North	0	0	0	0
	2 - R918	1	0	0	11
	3 - N11 South	0	3	0	25
	4 - Fassaroe Lane	17	1	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1 - N11 North				
2 - R918	0.24	3.78	0.3	A
3 - N11 South	0.31	4.07	0.5	A
4 - Fassaroe Lane	0.17	1.90	0.2	A

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		432						
2 - R918	216	0	1339	0.161	215	0.2	3.445	A
3 - N11 South	295	215	1432	0.206	294	0.3	3.356	A
4 - Fassaroe Lane	280	308	2534	0.111	280	0.1	1.688	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		517						
2 - R918	258	0	1339	0.192	258	0.3	3.581	A
3 - N11 South	352	258	1406	0.250	352	0.4	3.627	A
4 - Fassaroe Lane	335	369	2484	0.135	335	0.2	1.770	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		633						
2 - R918	316	0	1339	0.236	315	0.3	3.783	A
3 - N11 South	431	315	1370	0.315	430	0.5	4.066	A
4 - Fassaroe Lane	410	452	2416	0.170	410	0.2	1.896	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		633						
2 - R918	316	0	1339	0.236	316	0.3	3.783	A
3 - N11 South	431	316	1370	0.315	431	0.5	4.070	A
4 - Fassaroe Lane	410	452	2416	0.170	410	0.2	1.897	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		517						
2 - R918	258	0	1339	0.192	258	0.3	3.586	A
3 - N11 South	352	258	1405	0.250	352	0.4	3.631	A
4 - Fassaroe Lane	335	370	2483	0.135	335	0.2	1.774	A

18:15 - 18:30

	Total							

Arm	Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1 - N11 North		433						
2 - R918	216	0	1339	0.161	216	0.2	3.449	A
3 - N11 South	295	216	1431	0.206	295	0.3	3.368	A
4 - Fassaroe Lane	280	310	2533	0.111	280	0.1	1.692	A

Junctions 10

PICADY 10 - Priority Intersection Module

Filename: Junction 2 - Access to P&R.j10
Path: Q:\2020 Jobs\20_008N Fassaroe\Traffic Study\Junction 6
Report generation date: 25/04/2023 09:25:58

Summary of junction performance

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2024									
Stream B-AC	D1	0.1	7.21	0.04	A	D2	0.2	6.53	0.14	A
Stream C-B		0.2	8.17	0.18	A		0.1	8.57	0.05	A
	2029									
Stream B-AC	D3	0.1	7.47	0.04	A	D4	0.2	6.74	0.16	A
Stream C-B		0.3	8.63	0.19	A		0.1	8.52	0.05	A
	2039									
Stream B-AC	D5	0.1	7.53	0.05	A	D6	0.3	7.05	0.21	A
Stream C-B		0.3	8.97	0.21	A		0.1	8.33	0.06	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	25/04/2023
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DOMAIN\jyotsna.singh
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2024	AM	ONE HOUR	08:00	09:30	15
D2	2024	PM	ONE HOUR	17:00	18:30	15
D3	2029	AM	ONE HOUR	08:00	09:30	15
D4	2029	PM	ONE HOUR	17:00	18:30	15
D5	2039	AM	ONE HOUR	08:00	09:30	15
D6	2039	PM	ONE HOUR	17:00	18:30	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2024, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		1.74	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	1.74	A

Arms

Arms

Arm	Name	Description	Arm type
A	untitled		Major
B	untitled		Minor
C	untitled		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Width of kerbed central reserve (m)	Has right-turn storage	Width for right-turn storage (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	16.45	✓	0.00	✓	3.00	0.0		-

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
B	One lane	4.38	35	40

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	579	0.058	0.145	0.091	0.208
B-C	739	0.062	0.156	-	-
C-B	624	0.132	0.132	-	-

The slopes and intercepts shown above include custom intercept adjustments only.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2024	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	343	100.000
B		✓	26	100.000
C		✓	176	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	0	343
	B	0	0	26
	C	83	94	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	7
	B	0	0	31
	C	34	7	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.04	7.21	0.1	A
C-A				
C-B	0.18	8.17	0.2	A
A-B				
A-C				

Main Results for each time segment

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	19	698	0.028	19	0.0	6.919	A
C-A	62			62			
C-B	70	590	0.119	70	0.1	7.390	A
A-B	0			0			
A-C	258			258			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	23	691	0.033	23	0.0	7.042	A
C-A	74			74			

C-B	84	583	0.144	84	0.2	7.703	A
A-B	0			0			
A-C	309			309			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	28	680	0.041	28	0.1	7.215	A
C-A	91			91			
C-B	103	574	0.180	103	0.2	8.159	A
A-B	0			0			
A-C	378			378			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	28	680	0.041	28	0.1	7.215	A
C-A	91			91			
C-B	103	574	0.180	103	0.2	8.165	A
A-B	0			0			
A-C	378			378			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	23	691	0.033	23	0.0	7.045	A
C-A	74			74			
C-B	84	583	0.144	84	0.2	7.714	A
A-B	0			0			
A-C	309			309			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	19	698	0.028	19	0.0	6.925	A
C-A	62			62			
C-B	70	590	0.119	71	0.1	7.411	A
A-B	0			0			
A-C	258			258			

2024, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		1.66	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	1.66	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2024	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	291	100.000
B		✓	89	100.000
C		✓	98	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	0	291
	B	0	0	89
	C	73	25	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	4
	B	0	0	7
	C	16	32	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.14	6.53	0.2	A
C-A				
C-B	0.05	8.57	0.1	A
A-B				
A-C				

Main Results for each time segment

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	67	705	0.095	66	0.1	6.046	A
C-A	55			55			
C-B	19	595	0.031	19	0.0	8.236	A
A-B	0			0			
A-C	219			219			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	80	698	0.114	80	0.1	6.245	A
C-A	66			66			
C-B	22	589	0.038	22	0.1	8.373	A
A-B	0			0			
A-C	262			262			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	98	689	0.142	98	0.2	6.529	A
C-A	81			81			
C-B	27	582	0.047	27	0.1	8.566	A
A-B	0			0			
A-C	321			321			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	98	689	0.142	98	0.2	6.532	A
C-A	81			81			
C-B	27	582	0.047	27	0.1	8.566	A
A-B	0			0			
A-C	321			321			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	80	698	0.114	80	0.1	6.248	A
C-A	66			66			
C-B	22	589	0.038	22	0.1	8.376	A
A-B	0			0			
A-C	262			262			

18:15 - 18:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	67	705	0.095	67	0.1	6.055	A

C-A	55			55			
C-B	19	595	0.031	19	0.0	8.242	A
A-B	0			0			
A-C	219			219			

2029, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		1.41	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	1.41	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D3	2029	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	496	100.000
B		✓	26	100.000
C		✓	215	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	0	496
	B	0	0	26
	C	118	98	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	5
	B	0	0	30
	C	22	7	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.04	7.47	0.1	A
C-A				
C-B	0.19	8.63	0.3	A
A-B				
A-C				

Main Results for each time segment

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	20	680	0.029	20	0.0	7.058	A
C-A	89			89			
C-B	73	575	0.128	73	0.2	7.634	A
A-B	0			0			
A-C	374			374			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	24	669	0.035	24	0.0	7.226	A
C-A	106			106			
C-B	88	565	0.155	88	0.2	8.030	A
A-B	0			0			
A-C	446			446			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	29	653	0.044	29	0.1	7.469	A
C-A	130			130			
C-B	107	552	0.195	107	0.3	8.621	A
A-B	0			0			
A-C	546			546			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	29	653	0.044	29	0.1	7.469	A
C-A	130			130			
C-B	107	552	0.195	107	0.3	8.630	A
A-B	0			0			
A-C	546			546			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	24	669	0.035	24	0.0	7.230	A
C-A	106			106			
C-B	88	565	0.155	88	0.2	8.044	A
A-B	0			0			
A-C	446			446			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	20	680	0.029	20	0.0	7.064	A

C-A	89			89			
C-B	73	575	0.128	74	0.2	7.660	A
A-B	0			0			
A-C	374			374			

2029, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		1.34	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	1.34	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D4	2029	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	346	100.000
B		✓	101	100.000
C		✓	233	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	0	346
	B	0	0	101
	C	206	27	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	3
	B	0	0	6
	C	5	29	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.16	6.74	0.2	A
C-A				
C-B	0.05	8.52	0.1	A
A-B				
A-C				

Main Results for each time segment

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	76	698	0.109	76	0.1	6.143	A
C-A	155			155			
C-B	20	590	0.034	20	0.0	8.136	A
A-B	0			0			
A-C	261			261			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	91	690	0.132	91	0.2	6.383	A
C-A	185			185			
C-B	24	583	0.041	24	0.1	8.295	A
A-B	0			0			
A-C	311			311			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	111	679	0.164	111	0.2	6.735	A
C-A	227			227			
C-B	30	574	0.052	30	0.1	8.517	A
A-B	0			0			
A-C	381			381			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	111	679	0.164	111	0.2	6.738	A
C-A	227			227			
C-B	30	574	0.052	30	0.1	8.518	A
A-B	0			0			
A-C	381			381			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	91	690	0.132	91	0.2	6.392	A
C-A	185			185			
C-B	24	583	0.041	24	0.1	8.298	A
A-B	0			0			
A-C	311			311			

18:15 - 18:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	76	698	0.109	76	0.1	6.155	A

C-A	155			155			
C-B	20	590	0.034	20	0.0	8.142	A
A-B	0			0			
A-C	261			261			

2039, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		1.39	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	1.39	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D5	2039	AM	ONE HOUR	08:00	09:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	566	100.000
B		✓	28	100.000
C		✓	239	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	**B**	**C**
From	**A**	0	0	566
	B	0	0	28
	C	134	106	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	**B**	**C**
From	**A**	0	0	4
	B	0	0	28
	C	19	6	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.05	7.53	0.1	A
C-A				
C-B	0.21	8.97	0.3	A
A-B				
A-C				

Main Results for each time segment

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	21	672	0.031	21	0.0	7.057	A
C-A	101			101			
C-B	80	568	0.140	79	0.2	7.796	A
A-B	0			0			
A-C	426			426			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	25	659	0.038	25	0.0	7.248	A
C-A	120			120			
C-B	95	557	0.170	95	0.2	8.254	A
A-B	0			0			
A-C	509			509			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	30	641	0.047	30	0.1	7.526	A
C-A	147			147			
C-B	116	542	0.215	116	0.3	8.960	A
A-B	0			0			
A-C	624			624			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	30	641	0.047	30	0.1	7.526	A
C-A	147			147			
C-B	116	542	0.215	116	0.3	8.970	A
A-B	0			0			
A-C	624			624			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	25	659	0.038	25	0.1	7.252	A
C-A	120			120			
C-B	95	557	0.170	95	0.2	8.274	A
A-B	0			0			
A-C	509			509			

09:15 - 09:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	21	672	0.031	21	0.0	7.063	A

C-A	101			101			
C-B	80	568	0.140	80	0.2	7.823	A
A-B	0			0			
A-C	426			426			

2039, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Arm A Direction	Arm B Direction	Arm C Direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	Two-way	Two-way		1.44	A

Junction Network

Driving side	Lighting	Network delay (s)	Network LOS
Left	Normal/unknown	1.44	A

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D6	2039	PM	ONE HOUR	17:00	18:30	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A		✓	372	100.000
B		✓	126	100.000
C		✓	298	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	0	372
	B	0	0	126
	C	267	31	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	0	4
	B	0	0	5
	C	16	24	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
B-AC	0.21	7.05	0.3	A
C-A				
C-B	0.06	8.33	0.1	A
A-B				
A-C				

Main Results for each time segment

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	95	695	0.136	94	0.2	6.285	A
C-A	201			201			
C-B	23	587	0.040	23	0.1	7.914	A
A-B	0			0			
A-C	280			280			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	113	687	0.165	113	0.2	6.590	A
C-A	240			240			
C-B	28	580	0.048	28	0.1	8.087	A
A-B	0			0			
A-C	335			335			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	139	675	0.206	138	0.3	7.044	A
C-A	294			294			
C-B	34	570	0.060	34	0.1	8.330	A
A-B	0			0			
A-C	410			410			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	139	675	0.206	139	0.3	7.050	A
C-A	294			294			
C-B	34	570	0.060	34	0.1	8.331	A
A-B	0			0			
A-C	410			410			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	113	687	0.165	114	0.2	6.598	A
C-A	240			240			
C-B	28	580	0.048	28	0.1	8.090	A
A-B	0			0			
A-C	335			335			

18:15 - 18:30

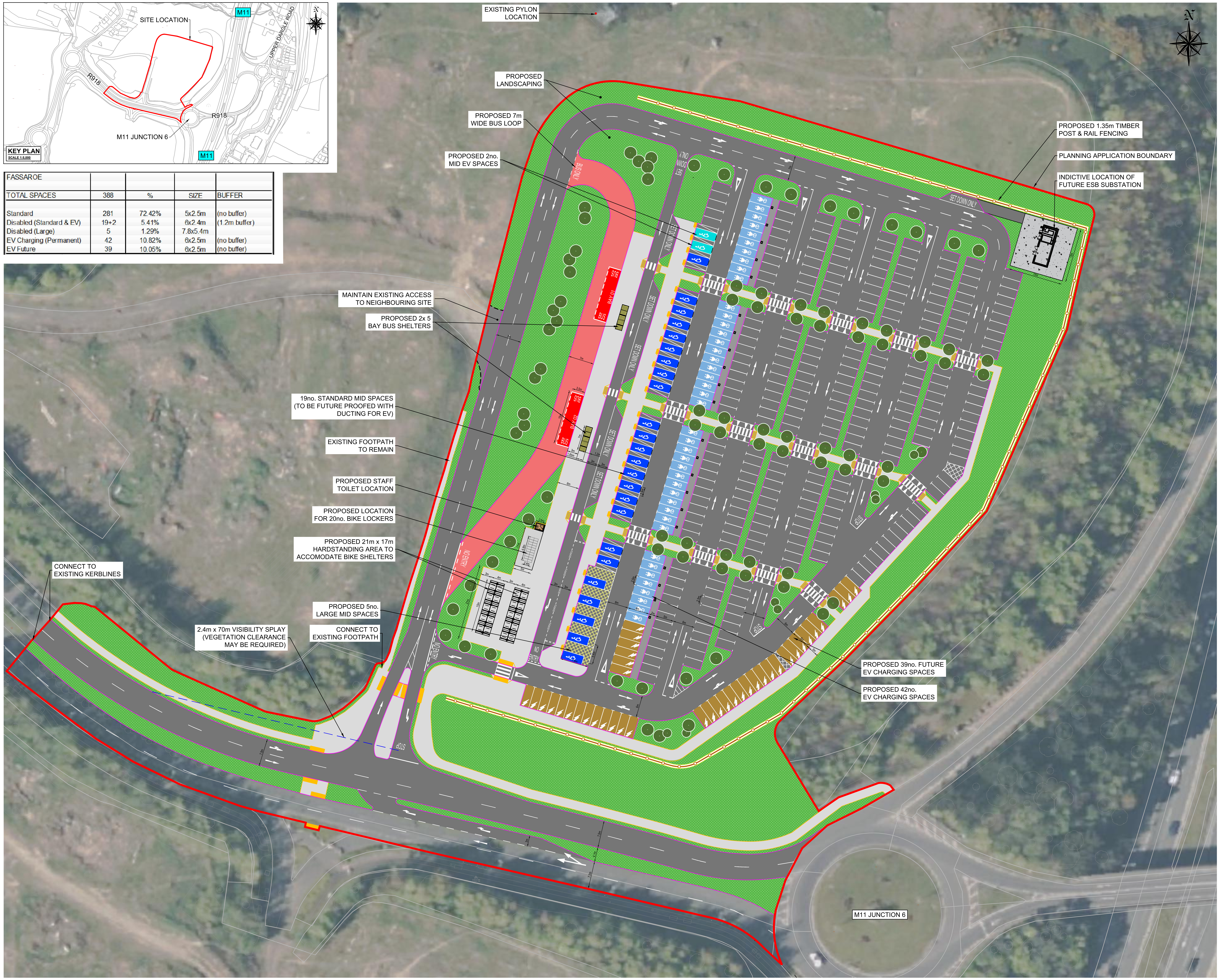
Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	95	695	0.136	95	0.2	6.300	A

C-A	201			201			
C-B	23	587	0.040	23	0.1	7.920	A
A-B	0			0			
A-C	280			280			

Appendix C: Masterplan for the Park and Ride Fassaroe Site

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A1



FASSAROE				
TOTAL SPACES	388	%	SIZE	BUFFER
Standard	281	72.42%	5x2.5m	(no buffer)
Disabled (Standard & EV)	19+2	5.41%	6x2.4m	(1.2m buffer)
Disabled (Large)	5	1.29%	7.8x5.4m	
EV Charging (Permanent)	42	10.82%	6x2.5m	(no buffer)
EV Future	39	10.05%	6x2.5m	(no buffer)

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Tionscadal Éireann
Project Ireland
2040

P+R

WICKLOW
CILL MHANTÁIN
ENDLESS OPPORTUNITIES
DEISEANNA SÍORAÍ

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Clifton Scannell Emerson Associates

LEGEND:

- PLANNING APPLICATION BOUNDARY
- PROPOSED CARRIAGEWAY EDGE
- PROPOSED KERB EDGING
- PROPOSED 1.35m TIMBER POST & RAIL FENCING
- PROPOSED ACCESS ROAD & CARPARK
- PROPOSED FOOTPATH
- PROPOSED HARDSTANDING AREA
- PROPOSED LANDSCAPING/PLANTING
- PROPOSED BUS LOOP
- PROPOSED BUS BAYS
- PROPOSED STANDARD MID SPACES (19no.)
- PROPOSED LARGE MID SPACES (5no.)
- PROPOSED EV MID SPACES (2no.)
- PROPOSED EV CHARGING SPACES (42no.)
- PROPOSED FUTURE EV CHARGING SPACES (39no.)
- PROPOSED TREES

Rev	Description	Drawn	Checked	Date
P04	ISSUED FOR PLANNING	SM	BD	27/07/23

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Client: WICKLOW COUNTY COUNCIL

Project: FASSAROE PARK AND RIDE FACILITY

Dwg. Title: GENERAL ARRANGEMENT LAYOUT PLAN

Drawn By: SM
Date: JULY 2023
Checked By: BD
Scale: 1:500 @ A1
CSEA Job No.: 20_008N

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
20_008N	CSE	GEN	XX	DR	C	2200

20_008N - CSE - GEN - XX - DR - C - 2200

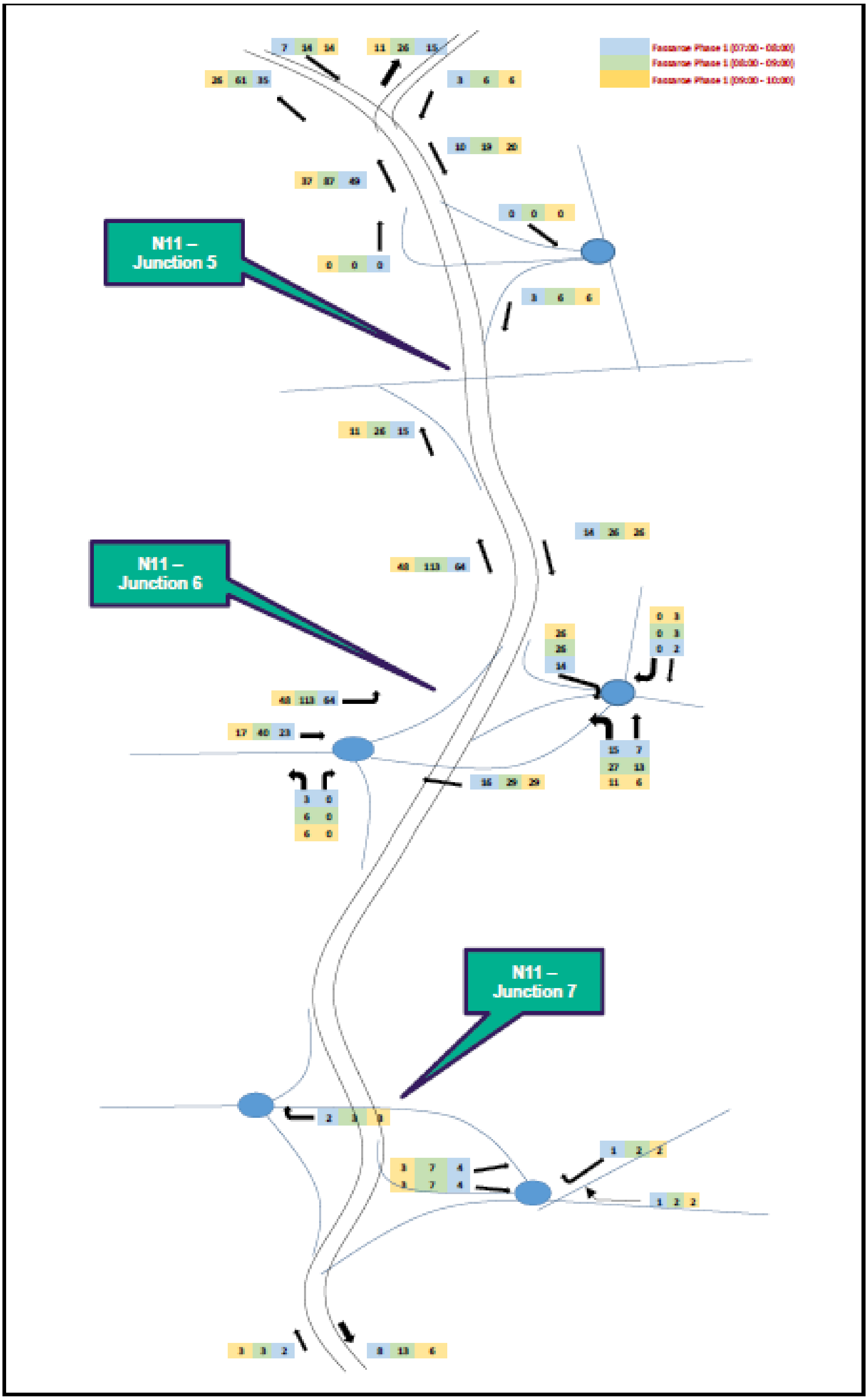
Status Code: S2
Suitability Description: PART VIII APPROVAL

Revision: P04
Project Status: FOR PLANNING

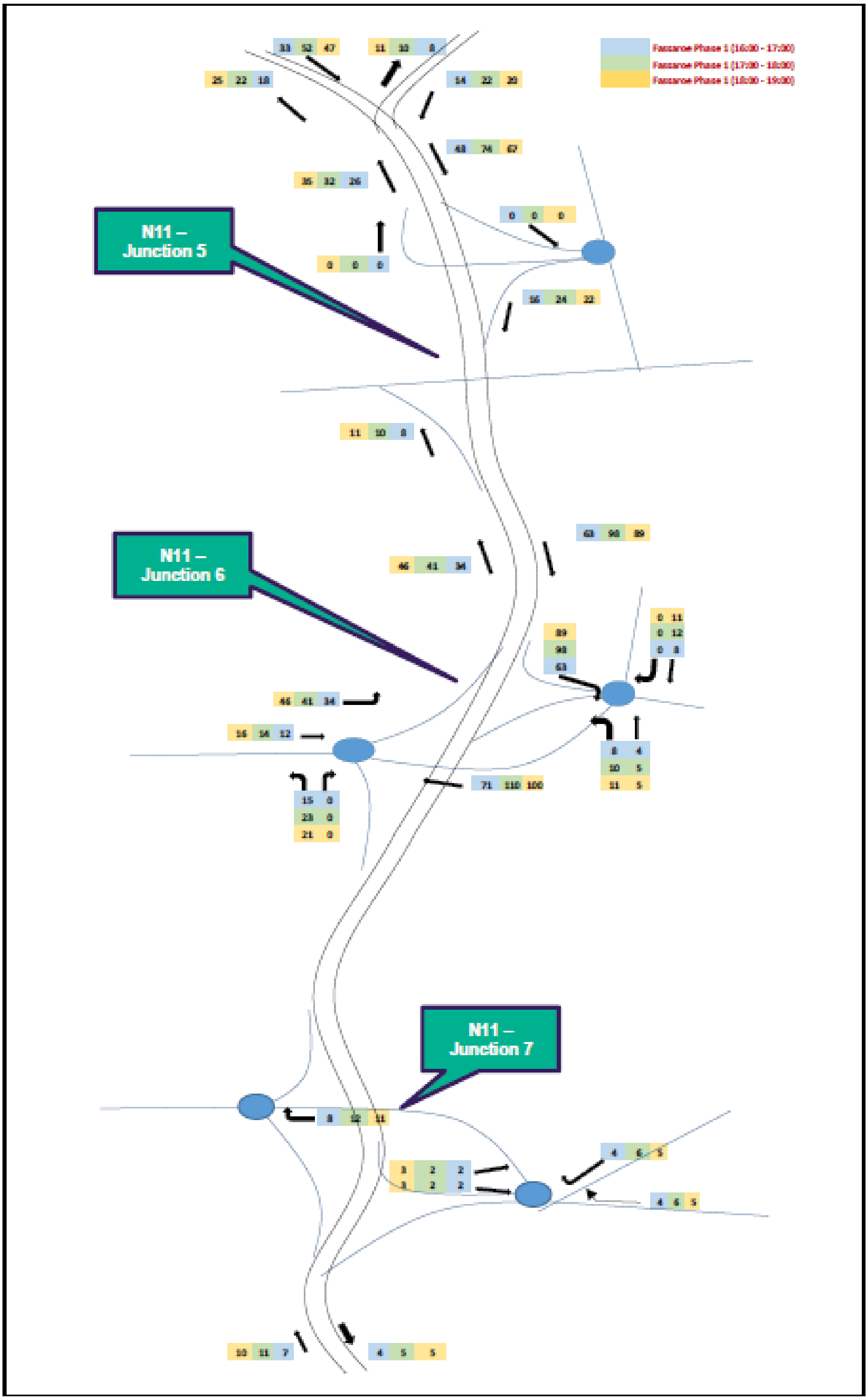
Appendix D: Committed Development Trip Generation

Reference: Chapter 12 Fassaroe Phase 1 SHD EIAR

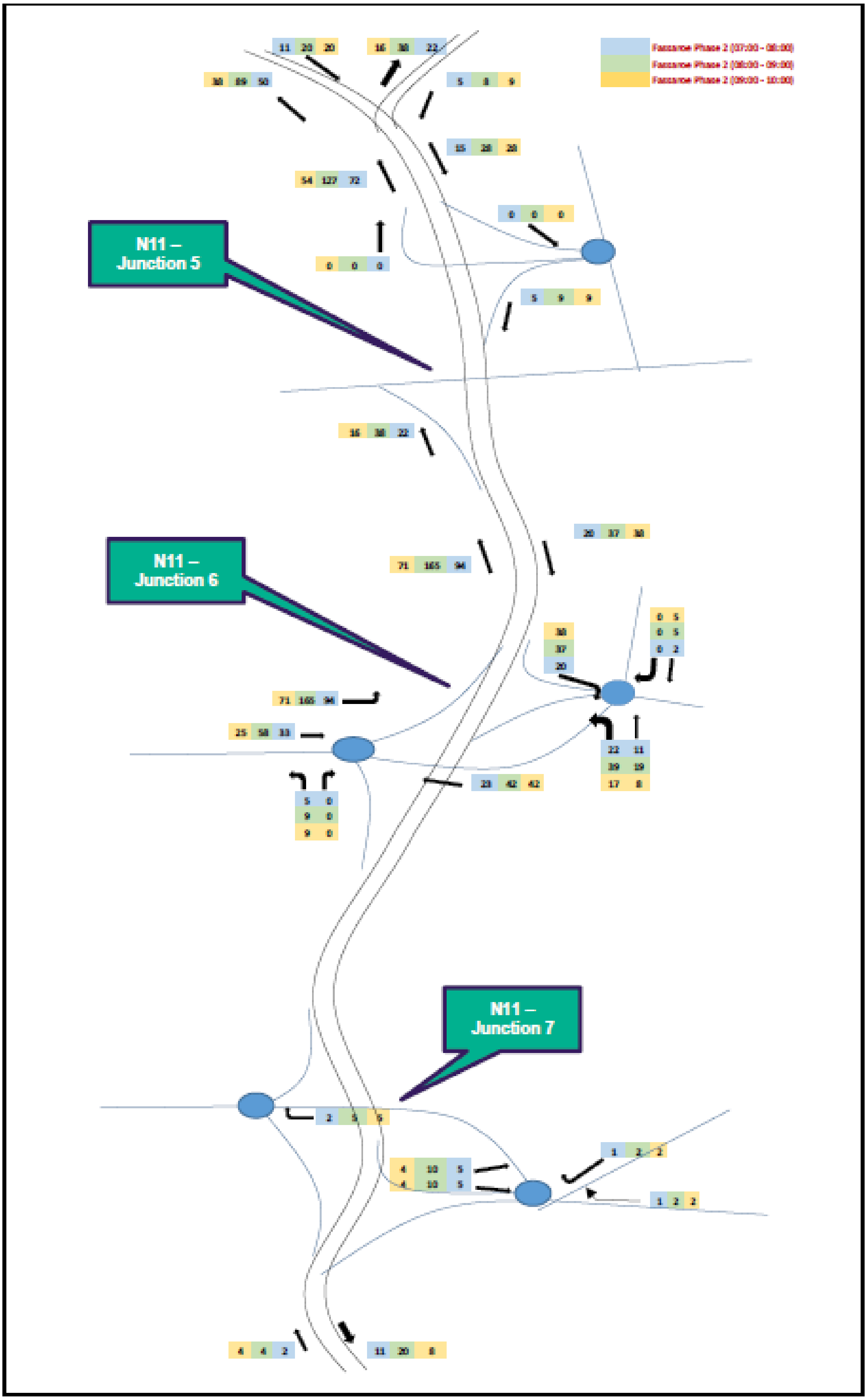
1. *Trip Distribution AM Peak- Fassaroe Development (650 units)*



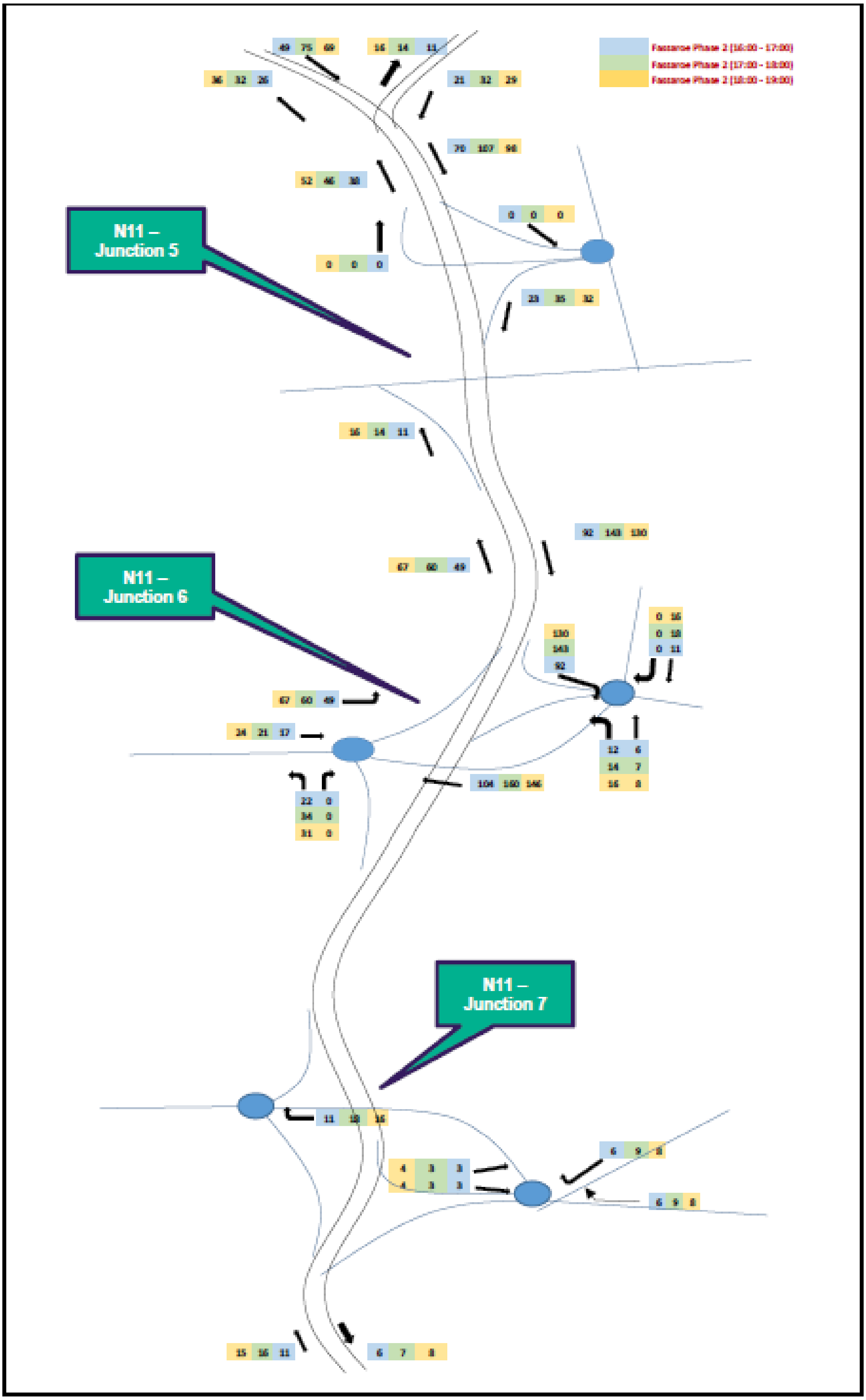
2. *Trip Distribution PM Peak- Fassaroe Development (650 units)*



3. *Trip Distribution AM Peak- Fassaroe Development (1200 units)*



4. *Trip Distribution PM Peak- Fassaroe Development (1200 units)*



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Appendix G

RESOURCE WASTE MANAGEMENT PLAN FOR A PROPOSED PARK & RIDE CARPARK AT THE FASSEROE SITE CO WICKLOW

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Report Prepared For

Wicklow County Council

Report Prepared By

Brian Maguire Environmental Consultant

Our Reference

BM/227501.0524WMR01

Date of Issue

8 August 2023

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Record of Approval

Details	Written by	Approved by
Signature	Brian maguire	
Name	Brian Maguire	Chonaill Bradley
Title	Environmental Consultant	Principal Environmental Consultant
Date	8 August 2023	8 August 2023

CONTENTS

Page

1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has prepared this Resource Waste Management Plan (RWMP) on behalf of Clifton Scannell Emerson Associates. The Proposed Development will consist of a 388 space Park and Ride facility, located at junction 6 on the M11, Bray, Co. Wicklow.

This plan will provide information necessary to ensure that the management of Construction & Demolition (C&D) waste at the site is undertaken in accordance with the current legal and industry standards including the *Waste Management Act 1996* as amended and associated Regulations [1], *Environmental Protection Agency Act 1992* as amended [2], *Litter Pollution Act 1997* as amended [3] and the *Eastern-Midlands Region Waste Management Plan 2015 – 2021* [4]. In particular, this plan aims to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible. It also seeks to provide guidance on the appropriate collection and transport of waste from the site to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil and/or water).

This RWMP includes information on the legal and policy framework for C&D waste management in Ireland, estimates of the type and quantity of waste to be generated by the Proposed Development and makes recommendations for management of different waste streams. The RWMP should be viewed as a live document and will be regularly revisited throughout a project's lifecycle so that opportunities to maximise waste reduction / efficiencies are exploited throughout, and that data is collected on an ongoing basis so that it is as accurate as possible

2.0 RESOURCE & WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Irish Government issued a policy statement in September 1998*, Changing Our Ways* [5], which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. The target for C&D waste in this report was to recycle at least 50% of C&D waste within a five year period (by 2003), with a progressive increase to at least 85% over fifteen years (i.e. 2013).

In response to the *Changing Our Ways* report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report entitled '*Recycling of Construction and Demolition Waste'* [6] concerning the development and implementation of a voluntary construction industry programme to meet the Government's objectives for the recovery of C&D waste.

In September 2020, the Irish Government published a policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan, *'A Waste Action Plan for a Circular Economy'* [7] (WAPCE), replaces the previous national waste management plan, *"A Resource Opportunity"* (2012), and was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to an altered economical model, where climate and environmental challenges are turned into opportunities.

The WAPCE sets the direction for waste planning and management in Ireland up to 2025. This reorientates policy from a focus on managing waste to a much greater focus on creating circular patterns of production and consumption. Other policy statements of a number of public bodies already acknowledge the circular economy as a national policy priority.

The policy document contains over 200 measures across various waste areas including circular economy, municipal waste, consumer protection and citizen engagement, plastics and packaging, construction and demolition, textiles, green public procurement and waste enforcement.

One of the first actions to be taken was the development of the Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less' (2021) [8] to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity and was issued in December 2021. It is anticipated that the Strategy will be updated in full every 18 months to 2 years.

The Circular Economy and Miscellaneous Provisions Act 2022 [9] was signed into law in July 2022. The Act underpins Ireland's shift from a "take-make-waste" linear model to a more sustainable pattern of production and consumption, that retains the value of resources in our economy for as long as possible and that will to significantly reduce our greenhouse gas emissions. The Act defines Circular Economy for the first time in Irish law, incentivises the use of recycled and reusable alternatives to wasteful, single-use disposable packaging, introduces a mandatory segregation and incentivised charging regime for commercial waste, streamlines the national processes for End-of-Waste and By-Products decisions, tackling the delays which can be encountered by industry, and supporting the availability of recycled secondary raw materials in the Irish market, and tackles illegal fly-tipping and littering.

The Environmental Protection Agency (EPA) of Ireland issued '*Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects' in November 2021* [10]*.* These guidelines replace the previous 2006 guidelines issued by The National Construction and Demolition Waste Council (NCDWC) and the Department of the Environment, Heritage and Local Government (DoEHLG) in 2006 [11]. The guidelines provide a practical approach which is informed by best practice in the prevention and management of C&D wastes and resources from design to construction of a project, including consideration of the deconstruction of a project. These guidelines have been followed in the preparation of this document and include the following elements:

- Predicted C&D wastes and procedures to prevent, minimise, recycle and reuse wastes;
- Design teams roles and approach;
- Relevant EU, national and local waste policy, legislation and guidelines;
- Waste disposal/recycling of C&D wastes at the site;
- Provision of training for Resource Waste Manager (RM) and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan; and
- Details of consultation with relevant bodies i.e. waste recycling companies, Local Authority, etc.

Section 3 of the Guidelines identifies thresholds above which there is a requirement for the preparation of a RWMP for developments. The new guidance classifies developments on a two-tiered system. Developments which do not exceed any of the following thresholds may be classed as Tier 1 development:

- New residential development of less than 10 dwellings.
- Retrofit of 20 dwellings or less.
- New commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 1,250m^2.
- Retrofit of commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 2,000m^2; and
- Demolition projects generating in total less than 100m^3 in volume of C&D waste.

A development which exceeds one or more of these thresholds is classed as a Tier-2 project. This development is a Tier 1 development as it does not exceed any of the above thresholds.

Other guidelines followed in the preparation of this report include *'Construction and Demolition Waste Management – a handbook for Contractors and Site Managers'* [12], published by FÁS and the Construction Industry Federation in 2002 and the previous guildines, 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects' (2006).

These guidance documents are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

2.2 Regional Level

The proposed development is located in the Local Authority area of Wicklow County Council (WCC).

The *EMR Waste Management Plan 2015 – 2021* is the regional waste management plan for the DCC area published in May 2015. A new *National Waste Management Plan for a Circular Economy* is expected to be published in 2023 and will supersede the three current regional waste management plans in Ireland.

The current regional plan sets out the following strategic targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015.*

The *Wicklow County Development Plan 2022 – 2028* [13] sets out a number of policies and objectives for Wicklow County in line with National, Regional and County Objectives. The goals around waste aim to are to contribute to the three pillars of 'sustainable healthy communities', 'climate action' and 'economic opportunity'. The Solid Waste Management Objective are:

CPO 15.1 *To require all developments likely to give rise to significant quantities of waste, either by virtue of the scale of the development or the nature of the development (e.g. one that involves demolition) to submit a construction management plan, which will outline, amongst other things, the plan to minimise waste generation and the plan to protect the environment with the safe and efficient disposal of waste from the site.*

CPO 15.2 *To require all new developments, whether residential, community, agricultural or commercial to make provision for storage and recycling facilities (in accordance with the standards set out in Development & Design Standards of this plan).*

CPO 15.3 *To facilitate the development of existing and new waste prevention and recovery facilities and in particular, to facilitate the development of 'green waste' recovery sites.*

CPO 15.4 *To facilitate the development of waste-to-energy facilities, particularly the use of landfill gas and biological waste.*

CPO 15.5 *To have regard to the Council's duty under the 1996 Waste Management Act (as amended), to provide and operate, or arrange for the provision and operation of, such facilities as may be necessary to promote reuse or for the recovery and disposal of household waste arising within its functional area.*

CPO 15.6 *To facilitate the development of sites, services and facilities necessary to achieve implementation of the objectives of the Regional Waste Management Plan.*

2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 (No. 10 of 1996) as amended.
- Environmental Protection Act 1992 (No. 7 of 1992) as amended.
- Litter Pollution Act 1997 (No. 12 of 1997) as amended.
- Planning and Development Act 2000 (No. 30 of 2000) as amended [14].
- Circular Economy and Miscellaneous Provisions Act 2022.

One of the guiding principles of European waste legislation, which has in turn been incorporated into the *Waste Management Act 1996 - 2001* and subsequent Irish legislation, is the principle of *"Duty of Care"*. This implies that the waste producer is responsible for waste from the time it is generated through until its legal recycling, recovery or disposal (including its method of disposal). As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final destination, waste contractors will be employed to physically transport waste to the final destination. Following on from this is the concept of *"Polluter Pays"* whereby the waste producer is liable to be prosecuted for pollution incidents, which may arise from the incorrect management of waste produced, including the actions of any contractors engaged (e.g. for transportation and disposal/recovery/recycling of waste).

It is therefore imperative that the developer ensures that the waste contractors engaged by construction contractors are legally compliant with respect to waste transportation, recycling, recovery and disposal. This includes the requirement that a contractor handle, transport and recycle/recover/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments* or a waste or IE licence granted by the EPA. The COR/permit/licence held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

3.0 DESIGN APPROACH

The client and the design team have integrated the *'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects'* guidelines into the design workshops, to help review processes, identify and evaluate resource reduction measures and investigate the impact on cost, time, quality, buildability, second life and management post construction. Further details on these design principals can be found within the aforementioned guidance document.

The design team have undertaken the design process in line with the international best practice principles to firstly prevent wastes, reuse where possible and thereafter sustainably reduce and recover materials. The below sections have been the focal point of the design process and material selections and will continued to be analysed and investigated throughout the design process and when selecting material.

The approaches presented are based on international principles of optimising resources and reducing waste on construction projects through:

- Prevention;
- Reuse;
- Recycling;
- Green Procurement Principles;
- Off-Site Construction;
- Materials Optimisation; and
- Flexibility and Deconstruction.

3.1 Designing For Prevention, Reuse and Recycling

Undertaken at the outset and during project feasibility and evaluation the Client and Design Team considered:

- Establishing the potential for any reusable site assets (buildings, structures, equipment, materials, soils, etc.);
- Assessing any existing buildings on the site that can be refurbished either in part or wholly to meet the Client requirements; and
- Enabling the optimum recovery of assets on site.

3.2 Designing for Green Procurement

Waste prevention and minimisation pre-procurement have been discussed and will be further discussed in this section. The Design Team will discuss proposed design solutions, encourage innovation in tenders and incentivise competitions to recognise sustainable approaches. They will also discuss options for packaging reduction with the main Contractor and subcontractors/suppliers using measures such as 'Just-in-Time' delivery and use ordering procedures that avoid excessive waste. The Green procurement extends from the planning stage into the detailed design and tender stage and will be an ongoing part of the long-term design and selection process for this development.

3.3 Designing for Off-Site Construction

Use of off-site manufacturing has been shown to reduce residual wastes by up to 90% (volumetric building versus traditional). The decision to use offsite construction is typically cost led but there are significant benefits for resource management. Some further considerations for procurement which are being investigated as part of the planning stage design process are listed as follows:

- Modular buildings as these can displace the use of concrete and the resource losses associated with concrete blocks such as broken blocks, mortars, etc.;
    - Modular buildings are typically pre-fitted with fixed plasterboard and installed insulation, eliminating these residual streams from site.
- Use of pre-cast structural concrete panels which can reduce the residual volumes of concrete blocks, mortars, plasters, etc.;
- The use of prefabricated composite panels for walls and roofing to reduce residual volumes of insulation and plasterboards;
- Using pre-cast hollow-core flooring instead of in-situ ready mix flooring or timber flooring to reduce the residual volumes of concrete/formwork and wood/packaging, respectively; and
- Designing for the preferential use of offsite modular units.

3.4 Designing for Materials Optimisation During Construction

To ensure manufacturers and construction companies adopt lean production models, including maximising the reuse of materials onsite as outlined in section 3.1, structures will be designed with the intent of designing out waste. This helps to reduce the environmental impacts associated with transportation of materials and from waste management activities. This includes investigating the use of standardised sizes for certain materials to help reduce the amount of offcuts produced on site, focusing on promotion and development of off-site manufacture.

3.5 Designing for Flexibility and Deconstruction

Design flexibility has and will be investigated throughout the design process to ensure that where possible products (including buildings) only contain materials that can be recycled and are designed to be easily disassembled. Material efficiency is being considered for the duration and end of life of a building project to produce; flexible, adaptable spaces that enable a resource-efficient, low-waste future change of use; durability of materials and how they can be recovered effectively when maintenance and refurbishment are undertaken and during disassembly/deconstruction.

4.0 DESCRIPTION OF THE PROJECT

4.1 Location, Size and Scale of the Development

"The proposed development comprises a car park with 388 parking spaces, including 26 designated for mobility-impaired users, 42 for electric vehicles and 39 additional spaces futured proofed for electric vehicles.

The proposal involves provision of hardstanding areas for bike shelters and lockers, active travel connections, fencing, kerbs, drainage, road markings, public lighting, CCTV, ticketing machines, and a new ESB substation and switch room.

The scheme also features area with two bus bays, two passenger shelters, and a dedicated bus turning circle within the site. A new access junction is proposed at Fassaroe Lane, incorporating a new right-turning pocket lane for accessing the facility. The existing bus bay on the northern (eastbound) carriageway of Fassaroe Lane is proposed for removal."

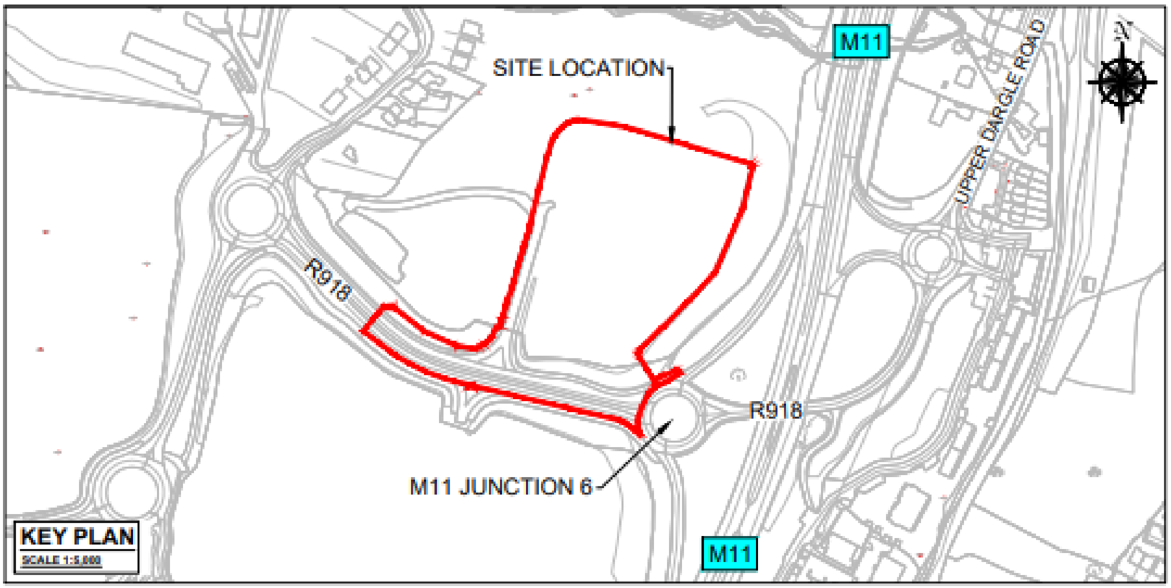

Figure 1 Site location Map of proposed Park and ride facility (source: CSEA 20-008N-CSE-GEN-XX-DR-C-2200)

4.2 Details of the Non-Hazardous Wastes to be produced

There will be soil, stones, clay, gravel and made ground excavated to facilitate construction of new foundations, underground services, and the installation of the proposed foundations. The development engineers Clifton Scannell Emerson Associates have estimated that 12,764m^3 of material will need to be excavated to do so. It is currently envisaged that 7,111m^3 will be able to be retained and reused onsite for landscaping and fill, the remaining material, will need to be removed offsite due to the limited opportunities for reuse on site. This will be taken for appropriate offsite reuse, recovery, recycling and / or disposal.

During the construction phase there may be a surplus of building materials, such as timber off-cuts, broken concrete blocks, cladding, plastics, metals and tiles generated. There may also be excess concrete during construction which will need to be disposed of. Plastic and cardboard waste from packaging and supply of materials will also be generated. The contractor will be required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

Waste will also be generated from construction workers e.g. organic / food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided on site during the construction phase. Waste printer / toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices.

4.3 Potential Hazardous Wastes to be produced

4.3.1 Contaminated Soil

Ground investigations was undertaken by Clifton Scannell Emerson Associates in February 2023. Environmental testing was completed by ALS Environmental Ltd. Suite I testing was carried out on six samples. Leachate results were compared with the published waste acceptance limits of BS EN 12457-2 to determine whether the material on the site could be accepted as 'inert material' by an Irish landfill.

The Waste Classification report created using HazWasteOnline™ software by Site Investigations Ltd found that the material tested can be classified as non-hazardous material. Leachate disposal suite results indicate that the soils tested would generally be able to be treated as Inert Waste.

Six samples were tested but it cannot be discounted that any localised contamination may have been missed. In the event that any potentially contaminated material is encountered, it will need to be segregated from clean / inert material, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled 'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous' [14] using the HazWasteOnline™ application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC [15], which establishes the criteria for the acceptance of waste at landfills.

In the event that Asbestos Containing Materials (ACMs) are found within the excavated material, the removal will only be carried out by a suitably permitted waste contractor, in accordance with S.I. No. 386 of 2006 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010. All asbestos will be taken to a suitably licensed or permitted facility.

In the event that hazardous soil, or historically deposited waste is encountered during the construction phase, the contractor will notify WCC and provide a Hazardous / Contaminated Soil Management Plan, to include estimated tonnages, description of location, any relevant mitigation, destination for disposal / treatment, in addition to information on the authorised waste collector(s).

4.3.2 Fuel/Oils

As fuels and oils are classed as hazardous materials, any on-site storage of fuel/oil, all storage tanks and all draw-off points will be bunded (or stored in double-skinned tanks) and located in a dedicated, secure area of the site. Provided that these requirements are adhered to and site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil wastage at the site.

4.3.3 Invasive Plant Species

A baseline review of biodiversity at the site was carried out by the project ecologists Doherty Environmental. No Japanese Knotweed was detected; however Giant Hogweed was found on the site during the ecological survey of the site. An invasive species management plan will need to be produced and submitted to WCC outlining a management plan to deal with the Giant Hogweed and any other invasive plant species that may be discovered during the construction phase.

4.3.4 Other known Hazardous Substances

Paints, glues, adhesives and other known hazardous substances will be stored in designated areas. They will generally be present in small volumes only and associated waste volumes generated will be kept to a minimum. Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor.

In addition, WEEE (containing hazardous components), printer toner/cartridges, batteries (Lead, Ni-Cd or Mercury) and/or light bulbs and other mercury containing waste may be generated from during C&D activities or temporary site offices. These wastes (if encountered) will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor.

5.0 ROLES AND RESPONSIBILITIES

The *Best Practice Guidelines on the Preparation of Resource Waste Management Plans for Construction and Demolition Projects* promotes that a RM will be appointed. The RM may be performed by number of different individuals over the life-cycle of the Project, however it is intended to be a reliable person chosen from within the Planning/Design/Contracting Team, who is technically competent and appropriately trained, who takes the responsibility to ensure that the objectives and measures within the Project RWMP are complied with. The RM is assigned the requisite authority to meet the objective and obligations of the RWMP. The role will include the important activities of conducting waste checks/audits and adopting construction methodology that is designed to facilitate maximum reuse and/or recycling of waste.

5.1 Role of the Client

The Client and the body establishing the aims and the performance targets for the project.

- The Client has commissioned the preparation and submission of a preliminary RWMP as part of the design and planning submission;
- The Client is to commission the preparation and submission of an updated RWMP as part of the construction tendering process;
- The Client will ensure that the RWMP is agreed on and submitted to the local authority prior to commencement of works on site;
- The Client is to request the end-of-project RWMP from the Contractor.

5.2 Role of the Client Advisory Team

The Client Advisory Team or Design Team is responsible for:

- Drafting and maintaining the RWMP through the design, planning and procurement phases of the project;
- Appointing a Resource Manager (RM) to track and document the design process, inform the Design Team and prepare the RWMP.
- Including details and estimated quantities of all projected waste streams with the support of environmental consultants/scientists. This will also include data on waste types (e.g. waste characterisation data, contaminated land assessments, site investigation information) and prevention mechanisms (such as by-products) to illustrate the positive circular economy principles applied by the Design Team;
- Handing over of the RWMP to the selected Contractor upon commencement of construction of the development, in a similar fashion to how the safety file is handed over to the Contractor;
- Working with the Contractor as required to meet the performance targets for the project.

5.3 Future Role of the Contractor

The construction Contractors have not yet been decided upon for this RWMP. However, once select they will have major roles to fulfil. They will be responsible for:

- Preparing, implementing and reviewing the RWMP during the construction phase (including the management of all suppliers and sub-contractors) as per the requirements of these guidelines;
- Identifying a designated and suitably qualified RM who will be responsible for implementing the RWMP;
- Identifying all hauliers to be engaged to transport each of the resources / wastes off-site;
- Implementing waste management policies whereby waste materials generated on site are to be segregated as far as practicable;
- Identifying all destinations for resources taken off-site. As above, any resource that is legally classified as a 'waste' must only be transported to an authorised waste facility;
- End-of-waste and by-product notifications addressed with the EPA where required;
- Clarification of any other statutory waste management obligations, which could include on-site processing;
- Full records of all resources (both wastes and other resources) will be maintained for the duration of the project; and
- Preparing a RWMP Implementation Review Report at project handover.

6.0 KEY MATERIALS & QUANTITIES

6.1 Project Resource Targets

Project specific resource and waste management targets for the site have not yet been set and this information will be updated for these targets once these targets have been confirmed by the client. However, it is expected for projects of this nature that a minimum of 70% of waste is fully re-used, recycled or recovered where possible. Target setting will inform the setting of project-specific benchmarks to track target progress. Typical Key Performance Indicators (KPIs) that may be used to set targets include (as per guidelines):

- Weight (tonnes) or Volume (m^3) of waste generated per construction value;
- Weight (tonnes) or Volume (m^3) of waste generated per construction floor area (m^2);
- Fraction of resource reused on site;
- Fraction of resource notified as by-product;
- Fraction of waste segregated at source before being sent off-site for recycling/recovery; and
- Fraction of waste recovered, fraction of waste recycled, or fraction of waste disposed.

6.2 Main C&D Waste Categories

The main non-hazardous and hazardous waste streams that could be generated by the construction activities at a typical site are shown in Table 6.1. The List of Waste (LoW) code (as effected from 1 June 2015) (also referred to as the European Waste Code or EWC) for each waste stream is also shown.

Table 6.1 Typical waste types generated and LoW codes (*individual waste types may contain hazardous substances)

Waste Material	**LoW/EWC Code**
Concrete, bricks, tiles, ceramics	17 01 01-03 & 07
Wood, glass and plastic	17 02 01-03
Bituminous mixtures, coal tar and tarred products	17 03 01*, 02 & 03*
Metals (including their alloys) and cable	17 04 01-11
Soil and stones	17 05 03* & 04
Paper and cardboard	20 01 01
Mixed C&D waste	17 09 04
Green waste	20 02 01
Electrical and electronic components	20 01 35 & 36
Batteries and accumulators	20 01 33 & 34
Liquid fuels	13 07 01-10
Chemicals (solvents, pesticides, paints, adhesives, detergents etc.)	20 01 13, 19, 27-30
Organic (food) waste	20 01 08
Mixed Municipal Waste	20 03 01

7.0 WASTE MANAGEMENT

There will be some waste materials generated from modifications required to the existing internal access road and surface water, foul and process wastewater drainage systems.

Table 7.1 shows the breakdown of C&D waste types produced on a typical site based on data from the EPA *National Waste Reports, the GMIT* [16] and other research reports.

Table 7.1 Waste materials generated on a typical Irish construction site

Waste Types	%
Mixed C&D	33
Timber	28
Metals	8
Concrete	6
Other	15
Total	**100**

Table 7.2 shows the predicted construction waste generation for the Proposed Development based on the information available to date along with the targets for management of the waste streams. The predicted waste amounts are based on an average largescale development waste generation rate per m^2, using the waste breakdown rates shown in Table 7.1.

Table 7.2 Estimated off-site reuse, recycle and disposal rates for construction waste

Waste Type	Tonnes	Reuse	Recycle/Recovery	Disposal

		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	51.2	10	5.1	80	41	10	5.1
Timber	17.4	40	7	55	9.6	5	0.9
Metals	12.4	5	0.6	90	11.2	5	0.6
Concrete	9.3	30	2.8	2.8	6.1	5	0.5
Other	46.6	20	9.3	60	27.9	20	9.3
Total	**136.9**		**24.8**		**95.7**		**16.4**

In addition to the information in Table 7.2, it is estimated that c. 12,764 m^3 of soil, stone, gravel, clay & made ground will be excavated to facilitate construction of new foundations, installation of service and associated ancillary services. It is estimated that 5,653m^3 of material is to be removed and disposed of offsite by a permitted waste management company for recovery and/or disposal at a suitably permitted/ licensed facility.

7.1 Proposed Resource and Waste Management Options

Waste materials generated will be segregated on site, where it is practical. Where the on-site segregation of certain waste types is not practical, off-site segregation will be carried out. There will be skips and receptacles provided to facilitate segregation at source where feasible. All waste receptacles leaving site will be covered or enclosed. The appointed waste contractor will collect and transfer the wastes as receptacles are filled. There are numerous waste contractors in the WCC Region that provide this service.

All waste arisings will be handled by an approved waste contractor holding a current waste collection permit. All waste arising's requiring disposal off-site will be reused, recycled, recovered or disposed of at a facility holding the appropriate registration, permit or licence, as required.

Written records will be maintained by the contractor(s) detailing the waste arising throughout the construction phase, the classification of each waste type, waste collection permits for all waste contactors who collect waste from the site and COR/permit or licence for the receiving waste facility for all waste removed off site for appropriate reuse, recycling, recovery and/or disposal.

Dedicated bunded storage containers will be provided for hazardous wastes which may arise such as batteries, paints, oils, chemicals etc, if required.

The management of the main waste streams is outlined as follows:

<u>Soil, Stone, Gravel, Clay & Made Ground</u>

The waste hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling / recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal. The excavations are required to facilitate construction works so the preferred option (prevention and minimisation) cannot be accommodated for the excavation phase.

It is anticipated that all excavated topsoil (4,477m^3) and 2633 m^3 of subsoil will be reused on site. It is anticipated that 5,654 m^3 of subsoil material will need to be removed offsite for appropriate reuse, recovery and/or disposal.

If material is removed off-site it could be reused as a by-product (and not as a waste). If this is done, it will be done in accordance with Regulation 27 (By-products), as amended, of S.I. No. 323/2020 - European Union (Waste Directive) Regulations 2011-

2020, (Previously Article 27 of the European Communities (Waste Directive)), which requires that certain conditions are met and that by-product notifications are made to the EPA via their online notification form. Excavated material should not be removed from site until approval from the EPA has been received. The potential to reuse material as a by-product will be confirmed during the course of the excavation works, with the objective of eliminating any unnecessary disposal of material.

The next option (beneficial reuse) may be appropriate for the excavated material. Clean inert material may be used as fill material in other construction projects or engineering fill for waste licensed sites. Beneficial reuse of surplus excavation material as engineering fill may be subject to further testing to determine if materials meet the specific engineering standards for their proposed end use.

Any nearby sites requiring clean fill/capping material will be contacted to investigate reuse opportunities for clean and inert material. If any of the material is to be reused on another site as a by-product (and not as a waste), this will be done in accordance with Regulation 27. Similarly, if any soils/stones are imported onto the site from another construction site as a by-product, this will also be done in accordance with Regulation 27. Regulation 27 will be investigated to see if the material can be imported onto this site for beneficial reuse instead of using virgin materials.

If the material is deemed to be a waste, then removal and reuse / recovery / disposal of the material will be carried out in accordance with the *Waste Management Act 1996* as amended, the *Waste Management (Collection Permit) Regulations 2007* as amended and the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended. Once all available beneficial reuse options have been exhausted, the options of recycling and recovery at waste permitted and licensed sites will be considered.

In the unlikely event that contaminated material is encountered and subsequently classified as hazardous, this material will be stored separately to any non-hazardous material. It will require off-site treatment at a suitable facility or disposal abroad via Trans frontier Shipment of Wastes (TFS).

<u>Bedrock</u>
While it is not envisaged that bedrock will be encountered, if bedrock is encountered, it is anticipated that it will not be crushed on site. Any excavated rock is expected to be removed off- site for appropriate reuse, recovery and / or disposal.

<u>Silt & Sludge</u>
Silt and petrochemical interception will be carried out on runoff and pumped water from site works, where required. Sludge and silt will then be collected by a suitably licensed contractor and removed offsite.

<u>Concrete Blocks, Bricks, Tiles & Ceramics</u>
The majority of concrete generated as part of the construction works are expected to be clean, inert material and will be recycled, where possible.

<u>Hard Plastic</u>
As hard plastic is a highly recyclable material, much of the plastic generated will be primarily from material off-cuts. All recyclable plastic will be segregated and recycled, where possible.

<u>Timber</u>
Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc., will be disposed of in a separate skip and recycled off-site.

<u>Metal</u>

Metals will be segregated where practical and stored in skips. Metal is highly recyclable and there are numerous companies that will accept these materials.

Waste Electrical and Electronic Equipment (WEEE)
Any WEEE will be stored in dedicated covered cages/receptacles/pallets pending collection for recycling.

Other Recyclables
Where any other recyclable wastes such as cardboard and soft plastic are generated, these will be segregated at source into dedicated skips and removed off-site.

Non-Recyclable Waste
C&D waste which is not suitable for reuse or recovery, such as polystyrene, some plastics and some cardboards, will be placed in separate skips or other receptacles. Prior to removal from site, the non-recyclable waste skip/receptacle will be examined by a member of the waste team (see Section 9.0) to determine if recyclable materials have been placed in there by mistake. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly and recyclable waste will be removed and placed into the appropriate receptacle.

Other Hazardous Wastes
On-site storage of any hazardous wastes produced (i.e. contaminated soil if encountered and/or waste fuels) will be kept to a minimum, with removal off-site organised on a regular basis. Storage of all hazardous wastes on-site will be undertaken so as to minimise exposure to on-site personnel and the public and to also minimise potential for environmental impacts. Hazardous wastes will be recovered, wherever possible, and failing this, disposed of appropriately.

7.2 Tracking and Documentation Procedures for Off-Site Waste

All waste will be documented prior to leaving the site. Waste will be weighed by the contractor, either by weighing mechanism on the truck or at the receiving facility. These waste records will be maintained on site by the nominated project RM (see Section 9.0).

All movement of waste and the use of waste contractors will be undertaken in accordance with the *Waste Management Acts 1996 - 2011*, *Waste Management (Collection Permit) Regulations 2007* as amended and *Waste Management (Facility Permit & Registration) Regulations 2007* and amended. This includes the requirement for all waste contractors to have a waste collection permit issued by the NWCPO. The nominated project waste manager (see Section 9.0) will maintain a copy of all waste collection permits on-site.

If the waste is being transported to another site, a copy of the Local Authority waste COR/permit or EPA Waste/IE Licence for that site will be provided to the nominated project waste manager (see Section 9.0). If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) notification document will be obtained from DCC (as the relevant authority on behalf of all local authorities in Ireland) and kept on-site along with details of the final destination (COR, permits, licences etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

All information will be entered in a waste management recording system to be maintained on site.

8.0 ESTIMATED COST OF WASTE MANAGEMENT

An outline of the costs associated with different aspects of waste management is provided below.

The total cost of C&D waste management will be measured and will take into account handling costs, storage costs, transportation costs, revenue from rebates and disposal costs.

8.1 Reuse

By reusing materials on site, there will be a reduction in the transport and recycle/recovery/disposal costs associated with the requirement for a waste contractor to take the material off-site.

Clean and inert soils, gravel, stones etc. which cannot be reused on site may be used as access roads or capping material for landfill sites etc. This material is often taken free of charge or a reduced fee for such purposes, reducing final waste disposal costs.

8.2 Recycling

Salvageable metals will earn a rebate which can be offset against the costs of collection and transportation of the skips.

Clean uncontaminated cardboard and certain hard plastics can also be recycled. Waste contractors will charge considerably less to take segregated wastes, such as recyclable waste, from a site than mixed waste.

Timber can be recycled as chipboard. Again, waste contractors will charge considerably less to take segregated wastes such as timber from a site than mixed waste.

8.3 Disposal

Landfill charges are currently at around €130 - €150 per tonne which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015*. In addition to disposal costs, waste contractors will also charge a collection fee for skips.

Collection of segregated C&D waste usually costs less than municipal waste. Specific C&D waste contractors take the waste off-site to a licensed or permitted facility and, where possible, remove salvageable items from the waste stream before disposing of the remainder to landfill. Clean soil, rubble, etc. is also used as fill/capping material, wherever possible.

9.0 TRAINING PROVISIONS

A member of the construction team will be appointed as the RM to ensure commitment, operational efficiency and accountability in relation to waste management during the C&D phases of the development.

9.1 Resource Waste Manager Training and Responsibilities

The nominated RM will be given responsibility and authority to select a waste team if required, i.e. members of the site crew that will aid them in the organisation, operation and recording of the waste management system implemented on site.

The RM will have overall responsibility to oversee, record and provide feedback to the client on everyday waste management at the site. Authority will be given to the Waste

Manager to delegate responsibility to sub-contractors, where necessary, and to coordinate with suppliers, service providers and sub-contractors to prioritise waste prevention and material salvage.

The RM will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on site. The RM will also be trained in the best methods for segregation and storage of recyclable materials, have information on the materials that can be reused on site and be knowledgeable in how to implement this RWMP.

9.2 Site Crew Training

Training of site crew in relation to waste is the responsibility of the Waste Manager and, as such, a waste training program will be organised. A basic awareness course will be held for all site crew to outline the RWMP and to detail the segregation of waste materials at source. This may be incorporated with other site training needs such as general site induction, health and safety awareness and manual handling.

This basic course will describe the materials to be segregated, the storage methods and the location of the Waste Storage Area (WSA). A sub-section on hazardous wastes will be incorporated into the training program and the particular dangers of each hazardous waste will be explained.

10.0 TRACKING AND TRACING / RECORD KEEPING

Records will be kept for all waste material which leaves the site, either for reuse on another site, recycling or disposal. A recording system will be put in place to record the waste arisings on Site.

A waste tracking log will be used to track each waste movement from the site. On exit from the site, the waste collection vehicle driver will stop at the site office and sign out as a visitor and provide the security personnel or RM with a waste docket (or Waste Transfer Form (WTF) for hazardous waste) for the waste load collected. At this time, the security personnel will complete and sign the Waste Tracking Register with the following information:

- Date
- Time
- Waste Contractor
- Company waste contractor appointed by, e.g. Contractor or subcontractor name
- Collection Permit No.
- Vehicle Reg.
- Driver Name
- Docket No.
- Waste Type
- LoW
- Weight/Quantity

The waste vehicle will be checked by security personal or the RM to ensure it has the waste collection permit no. displayed and a copy of the waste collection permit in the vehicle before they are allowed to remove the waste from the site.

The waste transfer dockets will be transferred to the RM on a weekly basis and can be placed in the Waste Tracking Log file. This information will be forwarded onto the WCC Waste Regulation Unit when requested.

Each subcontractor that has engaged their own waste contractor will be required to maintain a similar waste tracking log with the waste dockets / WTF maintained on file and available for inspection on site by the main contractor as required. These subcontractor logs will be merged with the main waste log.

Waste receipts from the receiving waste facility will also be obtained by the site contractor(s) and retained. A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be maintained on site at all times and will be periodically checked by the RM. Subcontractors who have engaged their own waste contractors, will provide the main contractor with a copy of the waste collection permits and COR / permit / licence for the receiving waste facilities and maintain a copy on file, available for inspection on site as required.

11.0 OUTLINE WASTE AUDIT PROCEDURE

11.1 Responsibility for Waste Audit

The appointed RM will be responsible for conducting a waste audit at the site during the C&D phase of the proposed Project. Contact details for the nominated RM will be provided to the WCC Waste Regulation Unit after the main contractor is appointed and prior to any material being removed from site.

11.2 Review of Records and Identification of Corrective Actions

A review of all waste management costs and the records for the waste generated and transported off-site should be undertaken mid-way through the construction phase of the proposed Project.

If waste movements are not accounted for, the reasons for this will be established in order to see if and why the record keeping system has not been maintained. The waste records will be compared with the established recovery / reuse / recycling targets for the site. Each material type will be examined, in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved.

Upon completion of the C&D phase, a final report will be prepared, summarising the outcomes of waste management processes adopted and the total recycling / reuse / recovery figures for the development.

12.0 CONSULTATION WITH RELEVANT BODIES

12.1 Local Authority

Once the construction contractor has been appointed and they have appointed waste contractors, and prior to removal of any C&D waste materials off-site, details of the proposed destination of each waste stream will be provided to the WCC Waste Regulation Unit.

WCC will also be consulted, as required, throughout the excavation and construction phases in order to ensure that all available waste reduction, reuse and recycling opportunities are identified and utilised and that compliant waste management practices are carried out.

12.2 Recycling / Salvage Companies

The appointed waste contractor for the main waste streams managed by the construction contractors will be audited in order to ensure that relevant and up-to-date waste collection permits and facility registrations / permits / licences are held. In addition, information will be obtained regarding the feasibility of recycling each material, the costs of recycling / reclamation, the means by which the wastes will be collected and transported off-site, and the recycling / reclamation process each material will undergo off-site.

13.0 REFERENCES

1. Waste Management Act 1996 (No. 10 of 1996) as amended.
2. Environmental Protection Agency Act 1992 as amended.
3. Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended
4. Eastern-Midlands Region Waste Management Plan 2015 – 2021 (2015).
5. Department of Environment and Local Government (DoELG) *Waste Management – Changing Our Ways, A Policy Statement* (1998).
6. Forum for the Construction Industry – *Recycling of Construction and Demolition Waste.*
7. Department of Communications, Climate Action and Environment (DCCAE), *Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025* (Sept 2020).
8. DCCAE, *Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less*' (2021)
9. Circular Economy and Miscellaneous Provisions Act 2022.
10. Environmental Protection Agency (EPA) *'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021)*
11. Department of Environment, Heritage and Local Government, *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects* (2006).
12. FÁS and the Construction Industry Federation (CIF), *Construction and Demolition Waste Management – a handbook for Contractors and* site *Managers* (2002).
13. Wicklow County Council (WCC), *Wicklow County Development Plan 2022 – 2028*
14. Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended
15. Council Decision 2003/33/EC, establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.
16. EPA, *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* (2015)
17. Environmental Protection Agency (EPA), *National Waste Database Reports 1998 – 2020*.
18. EPA and Galway-Mayo Institute of Technology (GMIT), *EPA Research Report 146 – A Review of Design and Construction Waste Management Practices in Selected Case Studies – Lessons Learned* (2015).

Appendix H

CourtneyDeery
ARCHAEOLOGY & CULTURAL HERITAGE

Archaeological Impact Assessment Report

Fassaroe Park & Ride,

Fassaroe, Co. Wicklow

For

AWN Consulting

Dr Francesca Cadeddu

Lisa Courtney

1st August 2023

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EXECUTIVE SUMMARY

This report describes the results of an archaeological impact assessment of the proposed Park and Ride site at Fassaroe, Bray, in County Wicklow. This report has been prepared by Courtney Deery Heritage Consultancy Ltd on behalf of Awn Consulting Ltd.

There are no recorded or national monuments within the proposed development boundary. St Valery's Cross (also known as Fassaroe Cross or St Valerie's), a National Monument (NM No. 337; RMP WI007-026001-002), is located c. 200m to the southwest of the development. Previously, as part of wider predevelopment works, a programme of archaeological testing took place around the cross (Licence No. 02E0084, Bulletin Ref. No. 2002:1967), no features of archaeological interest or potential were uncovered. Unlicenced archaeological monitoring has taken place across the proposed development site as part of advance works for a previously approved scheme. No features of an archaeological nature were revealed as a result of this process.

As the site has been previously archaeologically assessed and nothing of an archaeological nature or interest was detected it is anticipated that no further archaeological works are required.

With respect to the significance of the immediate and wider historic landscape, in regard to the findings of this assessment, it is acknowledged that from a cultural heritage perspective this development will have no direct physical impact on any existing national or recorded monument. In addition, due to the archaeological monitoring of previous topsoil stripping activities, no further archaeological mitigation is required.

All recommendations are subject to approval from the National Monuments Section (NMS) of the Department of Housing, Local Government and Heritage (DHLGH) and the local planning authority who may make additional recommendations.

1. INTRODUCTION

1.1. General

This report describes the results of an archaeological impact assessment of the proposed Park and Ride site at Fassaroe, Bray, in County Wicklow. This report has been prepared by Courtney Deery Heritage Consultancy Ltd on behalf of Awn Consulting Ltd.

The objective of the report is to assess the impact of the proposed development on the receiving cultural, architectural, and archaeological heritage environments and to propose ameliorative measures to safeguard any monuments, features, finds of antiquity or features of architectural or cultural heritage merit.

1.2. Study Area

The proposed Park and Ride location is situated in the lands surrounding Junction 6 on the M11, in the townland of Fassaroe, on the west side of the town of Bray, in the civil parish of Kilmacanoge, in the Barony of Rathdown, County Wicklow (Figure 1).

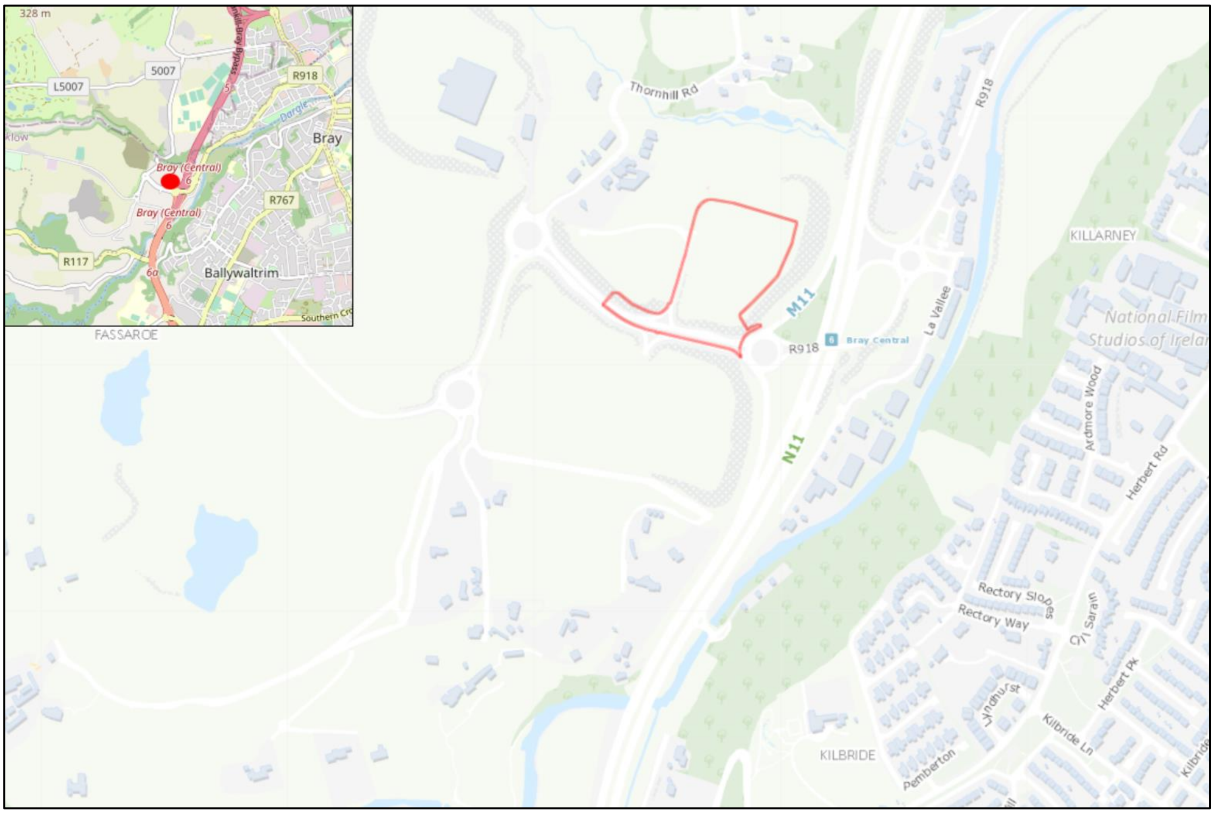

Figure 1 Site Location and Development Boundary

1.3. Description of proposed development

The proposed development comprises a car park with 391 parking spaces, including 25 designated for mobility-impaired users, 40 for electric vehicles and 40 additional spaces futured proofed for electric vehicles.

The proposal involves provision of hardstanding areas for bike shelters and lockers, active travel connections, fencing, kerbs, drainage, road markings, public lighting, CCTV, ticketing machines, and a new ESB substation and switch room.

The scheme also features area with two bus bays, two passenger shelters, and a dedicated bus turning circle within the site. A new access junction is proposed at Fassaroe Lane, incorporating a new right-turning pocket lane for accessing the facility. The existing bus bay on the northern (eastbound) carriageway of Fassaroe Lane is proposed for removal.

1.4. Methodology

The archaeological assessment of the proposed development site was based on a desk study, based on an examination of published and unpublished documentary and cartographic material, which was supported by a field inspection. A review of the following information took place in order to inform the report:

- National Monuments in State care, as listed by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage (DHLGH);
- Sites with Preservation Orders;
- Sites listed in the Register of Historic Monuments;
- Record of Monuments and Places (RMP) and the Sites and Monuments Record (SMR) from the Archaeological Survey of Ireland; The statutory RMP records known upstanding archaeological monuments, their original location (in cases of destroyed monuments) and the position of possible sites identified as cropmarks on vertical aerial photographs. Archaeological sites identified since 1994 have been added to the non-statutory SMR database of the Archaeological Survey of Ireland (National Monuments Service, DHLGH), which is available online at www.archaeology.ie and includes both RMP and SMR sites. Archaeological sites identified since 1994 are placed on the SMR and are scheduled for inclusion on the next revision of the RMP (Appendix 2);
- Record of Protected Structures (RPS) in the Wicklow County Development Plan (2022-2028) and Dún Laoghaire-Rathdown County Development Plan (2022-2028);
- National Inventory of Architectural Heritage (NIAH) Building Survey (NIAH ratings are international, national, regional, local and record, and those of regional and above are recommended for inclusion in the RPS);
- National Inventory of Architectural Heritage (NIAH) Garden Survey (paper survey only);
- A review of artefactual material held in the National Museum of Ireland;
- Cartographical Sources, OSi Historic Mapping Archive, including early editions of the Ordnance Survey including historical mapping (such as Down Survey 1656 Map);
- The Irish archaeological excavations catalogue i.e., Excavations bulletin and Excavations Database (Appendix 1);
- Place names; Townland names and toponomy (loganim.ie);
- National Folklore Collection (Duchas.ie);
- National Monuments Act (as amended, Appendix 3)
- Wicklow County Development Plan (2022-2028) (Appendix 4);
- Dún Laoghaire-Rathdown County Development Plan 2022-2028 (Appendix 5);

- A review and interpretation of aerial imagery (OSI Aerial Imagery 1995, 2000, 2005, Aerial Premium 2013-2018, Digital Globe 2011-2013, Google Earth 2001–2022, Bing 2022) to be used in combination with historic mapping to map potential cultural heritage assets.

A bibliography of sources used is provided in the References section.

2. ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

The proposed development site is located c. 270m to the west of the Dargle river in relatively low-lying ground along the eastern fringes of the Wicklow Mountains and c. 100m south of the boundary between County Dublin and County Wicklow. The archaeological record for the landscape around Fassaroe and the proposed development site demonstrates that this area has been occupied since at least the Mesolithic period (7000-5000 BC), with the nearby Dargle river possibly forming a focus for prehistoric activity. The presence of several 'Kil' or *Cill* placenames in the surrounding area demonstrates the ecclesiastical character of the area in the early medieval period, to which probably pertains Fassaroe Cross (WI007-026002), located on Fassaroe Lane c. 210m west of the proposed development site. A later medieval occupancy is testified by Fassaroe Castle (WI007-027), c. 470m south of the proposed development site.

2.1. Prehistoric period (c. 7000 – AD 500)

The location of the proposed development site, adjacent to the Dargle and Cookstown Rivers, close to the Irish Sea and located on light soils within reach of uplands, would have been attractive in prehistory, offering access to a variety of resources and opportunities for communication. The earliest recorded archaeological feature was found along the Dargle river in the townland of Killarney (RMP WI004-006; Licence No. 95E0004), c. 400m northeast of the proposed development site. It comprised of a structure of 17 oak timbers, one of which was radiocarbon dated to 4661-4360 BC. This Late Mesolithic structure was thought to have been a landing place for logboats.

The Bronze Age is characterised by an introduction of metal and metalwork technology and by a change in burial rites. Replacing the megalithic monuments, Bronze Age burials occurred in simple pits and cists (pits lined with stone flags) and was sometimes accompanied by pottery vessels (known as food vessels) or other small grave goods or contained within large pottery urns. These cists may be placed in tumuli, cairns and barrows or set within 'natural' monuments such as sand ridges or laid in so-called flat cemeteries with no above ground evidence at all.

A cist burial covered with a large granite boulder was discovered in Fassaroe in 1935 (RMP WI003-035). Stones below the boulder formed a roughly circular cist. Pottery was found in association with the cist. The cremated bone rested on a rather cracked and corroded schist flag, which formed a pavement to the cist, located c. 0.9m beneath the surface of the field. The cist was c. 0.60m in diameter and appeared to have been formed by setting six or seven slabs in a circular plan form, putting in the paving stone and wedging the whole cist firmly in position with small slabs. The capstone rested on top of large stones laid lengthwise on upright slabs. All the stones were granite, bar two forming the cist, which were a siliceous limestone. The bones were examined in the NMI and identified as the cremated remains of one adult male. The burial was accompanied by two flint chips (NMI Ref. No. 1935:800-1).

Another burial (WI007-024; NMI Ref. No. 1943:316-20) was discovered in Fassaroe in the 1940s, c. 1km southwest of the proposed development site. The extended inhumation was found in a layer of disturbed glacial till, within which were a few flint flakes and a fragment of a plough, indicating modern disturbance. The pit was a long ovoid, oriented east to west and 0.43–0.96m deep. A semi-circular flint knife with secondary chipping was found in the section face. The flint suggests an Early Bronze Age date for the burial, although the extended position and orientation of the skeleton suggests a later date—the flint and burial may not be directly associated.

A mound in Kilcroney, c. 730m south of the proposed development site, may be of prehistoric date (WI007-060). It was historically known as *Poll an Choradh*, meaning 'the hole or grave of the weir or champion', which could hint at its use as a burial mound. Adjacent archaeological investigations at the footbridge did not reveal any features (Licence No.: 05E0590; RMP files).

Other prehistoric features are recorded in Ballyman, County Dublin, including a ring-ditch which is likely to be of Bronze Age date (DU026-065) and a *fulacht fiadh* and what the excavator termed a 'squatting area' (DU028-002008; Licence no.: E000182), c. 990m and c. 1.1 km north-northwest respectively of the proposed development site. These recorded sites represent further evidence of a settled Bronze Age community in this landscape.

One of the few Roman sites known in Ireland was discovered at what is now Esplanade Terrace in Bray town (c. 2.6km east of the proposed development site) where, in 1835, several extended burials were found in a sandbank (WI004-004). Coins found with the skeletons included those of the emperors Hadrian (AD 177–138) and Trajan (AD 97–117). The skeletons were orientated east–west with a stone at each head (Davies 1998; Bradley and King 1989).

2.2. Early Medieval period (c. AD 500 – AD 1200)

The early medieval period saw the development of a mixed-farming economy managed by kings, nobles and free farmers. Where ringforts were the major secular component of early Christian settlement, ecclesiastical centres became the focus of the new religion that was readily adopted in the 5th and 6th centuries. The majority of ecclesiastical settlements had one or more concentric curvilinear enclosures, with the church placed at the centre, in the inner sanctum (frequently preserved in the surviving graveyard boundary), with more secular activities (domestic, commercial, and industrial) reserved for the outer enclosures. The enclosing wall or bank would have been similar to that found at the coeval secular sites, such as ringforts, but for ecclesiastical sites this enclosing feature was significant in defining the sacred character of the area of the church. They usually had a network of radiating roads, with the principal approach road (often from the east) terminating in a triangular marketplace. Features commonly found to be associated with early ecclesiastical sites include holy wells (usually outside of the main settlement), bullaun stones, high crosses, cross-inscribed stones and round towers.

Fassaroe Cross (Nat. Mon. No. 337; RMP WI007-026002), known as St Valerie's (also spelt Vallery's and Valery's) is located on Fassaroe Lane, c. 200m southwest of the proposed development site. The granite cross has a circular head and chamfered edges. Depicted on the western face is a figure of Christ with his head inclined to the right. On the eastern face are two lozenge shapes, probably stylised representations of human heads. Another is located on the lower south circular edge of the crosshead, while a fourth is on the northeast side of the base. Similar crosses with these features are found in the neighbouring area in Killegar, Rathmichael, Kilturk and Blackrock, all classified as Fassaroe-type crosses, a group of distinctive granite crosses likely to have been the work of the same stone mason who worked in Rathdown in the middle of the 12th century. The same date seems confirmed by the Romanesque type heads suggest that the cross at Fassaroe is likely to date to the second half of the twelfth century, as they are similar to the pointed mitre of the figure on the cross of Dysart, Co. Clare (Ó hÉailidhe 1958). The form and style of this cross type appears to have developed in Cornwall, where there are over two hundred examples, the majority of which have a pair of similar crosses on the two faces. Chamfering appears on many crosses and is regarded as a sign of later medieval work.

An octagonal limestone font (WI007-026001), a possible cross fragment (WI007-026003) and a quern stone were found in association with the cross and recorded by O'Curry (1837, in O'Flanagan 1927) but were subsequently removed to a farmhouse beside Fassaroe Castle. Inspection of the adjoining farmhouses in 1998 failed to locate any of these features. There is, however, a simple granite basin at the castle. O'Curry was also informed that a circular crosshead had been removed and that human bones had been dug up on the southern side. Before O'Curry's visit in 1837, the remains of a building, believed to be a church, could be traced in an adjoining field to the cross. Adjacent archaeological investigations, conducted to assess a proper minimum buffer zone for the cross, revealed no evidence of any archaeological features associated with St Valery's Cross, hence a twofold interpretation: the cross has been moved from its original location; the cross is a tearmann cross, marking the boundary of consecrated lands and may be peripheral to ecclesiastical remains (Tobin 2002, Licence No. 02E0084).

The proliferation of 'Kil' or *Cill* placenames west of Bray demonstrates the ecclesiastical character of the area in the early medieval period. The placename element, meaning 'church', is found in the neighbouring townlands of Killarney, Kilbride, and Kilcroney, suggesting that early church foundations were made in these areas.

There are two early Christian foundations in Kilbride (WI007-029001, WI008-001001) and one in Kilcroney (WI007-030), c. 800m east, and c. 1.2km south respectively of the proposed development site. The church at Kilcroney is a national monument (Nat. Mon. No. 417, RMP WI007-030) with features typical of very early churches, including projecting antae and a lintelled doorway.

Ballyman Church (DU0028-002002), situated just across the border in Dublin, c. 1.3km northwest of the proposed development site, has produced two Rathdown cross slabs. One was incorporated into the church as a lintel in the south window but subsequently removed to the National Museum of Ireland for safekeeping; the broken fragment of another remains in situ. The church was dedicated to St Sillan in the early medieval period and was attached in pre-Norman times to Glendalough. In the early 14th century, the church was listed among the possessions of the Knights Templars at their dissolution (O'Brien 1986). Excavation in the environs of early medieval church revealed three distinct phases of activity. The earliest recorded find was a terminal of a zoomorphic penannular brooch with millifiore setting, dated to around the 7th century AD (Licence No.: E000182).

2.3. Medieval period (c. AD 1200 – AD 1600)

In 1173, following the arrival of the Anglo-Normans, the manor of Bray, together with other lands in Wicklow and Dublin, was granted to Walter de Ridelesford by Strongbow for services rendered during the invasionswee. It is thought that Strongbow intended a much larger tract of land for de Ridelesford, but the vagueness of the charter meant that the final area confirmed by King John was much smaller.

De Ridelesford's castle was probably located on the high bluff on the south side of the river, near the now deconsecrated St Paul's Church on Herbert Road. The site was chosen to protect the ford across the Dargle river where Bray Bridge is now located. In 1213, Walter de Ridelesford II was granted a weekly market at the manor of Bray (Sweetman and Handcock 1875-86). The first reference to burgages occurred c.1225 when a burgage 'opposite my castle, beyond the river' was granted to St Mary's Abbey of Dublin by de Ridelesford (Gilbert 1884–86). Subsequently, another burgage was granted to the monks of St Mary's extending towards the sea. The manor would remain in the hands of the de Ridelesfords until 1280 when it was resigned to the Crown by Christina de Marisco, granddaughter of Walter de Ridelesford, who exchanged it for lands in England (Sweetman and Hadcock 1875–86, ii, no. 1798). Subsequently, the manor appears to have been divided between the Butler family and the Crown.

The borough continued to function in the 14th century, albeit precariously. During the Gaelic resurgence, the main threat to Bray's stability came from the south and southwest in the form of the O'Tooles and the O'Byrnes who had been expelled from the County Kildare area by the Anglo-Normans. Bray was a prime target for raids into English territory, with the main O'Toole stronghold at Powerscourt, only a few kilometres away. Sir Hugh Lawless, who had been granted the manor of Bray in 1316, returned it to the Crown in 1320, complaining that his profit during five years of tenancy had amounted to two salmon. Since 1315, when the Scots had come to Ireland under Edward Bruce, he said, the Irish of the Leinster Mountains had gone to war against the king and had 'hostilely invaded, burned and altogether destroyed' not only his lands at Bray but 'all other lands and tenements of divers faithful of the King in those parts' (Gilbert 1870). Other tenants at Bray were also allowed a reduction in rents because 'divers wars of the Irish' made their tenements 'untilled and uncultivated' (Gilbert 1870). In 1402, the O'Byrnes were defeated by the mayor of Dublin at a site that became known as 'Bloody Bank' (later 'Sunny Bank') on the north side of the Dargle.

Attacks from the Gaelic Irish continued however, and it is due to this that Fassaroe Castle (WI007-027) was constructed west of Bray, a short distance south of the site option (c. 473m). Only two walls of the granite castle built in 1535 by William Brabazon, the treasurer of Ireland, survive. Thomas Cromwell mentioned the castle when writing to Henry VIII's minister about the troubles with the O'Byrnes and O'Tooles: 'Master Tresorer Brabazon is engaged in defending the country and is building the castles of Powere's Court and the Fassagh-Rowe.'.

2.4. Post-Medieval period (c. AD 1600 – AD 1800)

In the latter part of the 17th century, Bray underwent a number of changes that altered the character and fortunes of the town. In 1660, a stone bridge was built over the river as the successor to an earlier and much less reliable one. The ford had become dangerous to cross, with flash floods and high tides imperilling travellers. Secondly, in 1666, the manor and lands of Great Bray were formally partitioned between the second Earl of Meath and the earl of Tyrconnell. The settlement of conflicting claims began a period of expansion for Bray as each landlord granted leases for parcels of land around the town. The Earl of Meath was granted the castle, the mill, the rabbit warren, one house on the west side of the main road and around half a dozen on the east side. Tyrconnell received seven dwellings and gardens adjacent to the churchyard on the west side of the main road.

The third change experienced by 17th century Bray was the building of a military barracks immediately west of St Paul's churchyard in 1692. The presence of a military barracks throughout the 18th century was to provide a stimulus for trade and social life as well as an official guarantee of protection in times of unrest.

Bray in the mid-18th century was still a market town of modest proportions. During the last decades of the century, however, two geographical factors came into play, which transformed the town. The first was, ironically, that same factor which had stifled its development as a borough in the Middle Ages—its proximity to the Wicklow mountains. The other factor was its proximity to the seashore. Both of these combined to make Bray a highly attractive destination for the growing number of fashionable tourists in Ireland.

Fassaroe is located on the landward side of Bray and would not have been a tourist destination, but the transformation of the town in the 18th and 19th century would also lead to the construction of named country residences in the surrounding townlands, including Fassaroe. Griffith's Valuation records that the lands where the proposed development site is located was held in the 1830s by the Honorable Judge Crampton, Solicitor-General for Ireland, with his residence at St. Valery to the south (Wicklow RPS 03-34).

2.5. Cartographic Sources

2.5.1. Down Survey map (1654-58)

The Down Survey of 1656-58 was, undertaken in order to measure the land forfeited from the Catholic population to be redistributed amongst merchant adventurers and loyal English soldiers. The map of County Wicklow depicts the Dargle River, labelled 'Bray Water', with Bray shown at the mouth of the river. More details are shown on the map of the Half Barony of Rathdown: Fassaroe is named on the north and west side of the bend in the river. The southwest corner of the townland, adjacent to the Dargle River, is subdivided with woodland depicted in that area, but no features are shown in the vicinity of the proposed development (Figure 2).

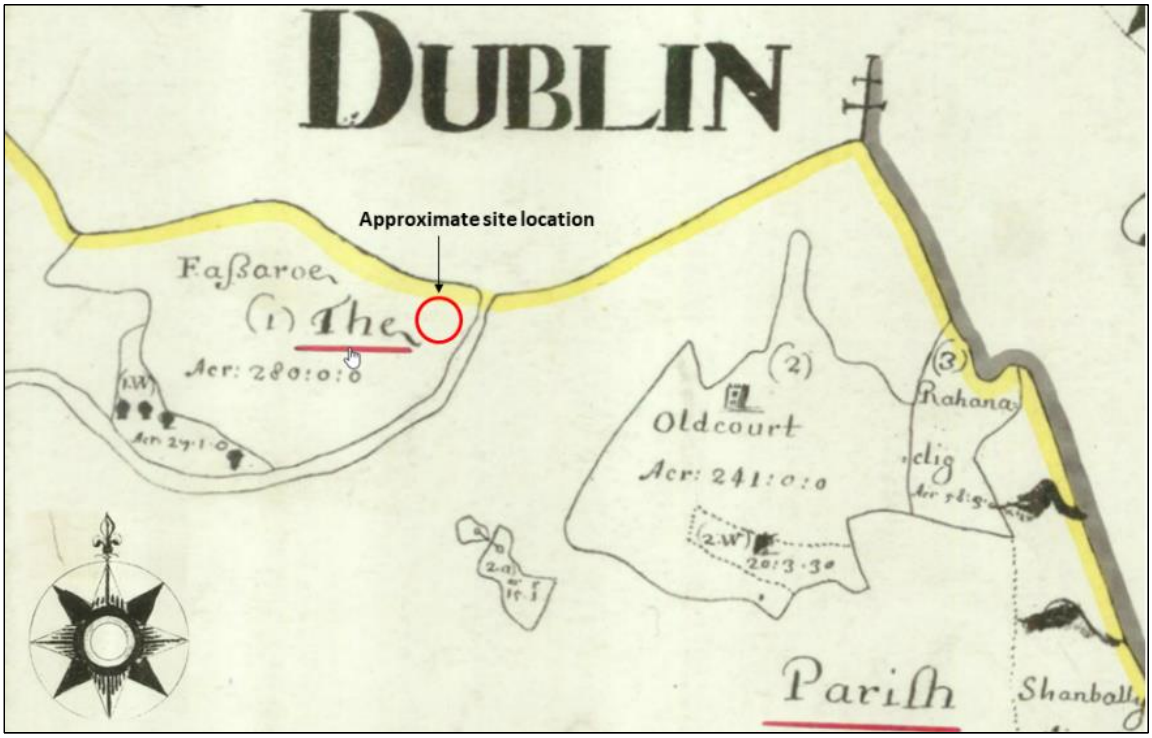

Figure 2 Detail of the Down Survey Map of the Half Barony of Rathdown with approximate site location (in red)

2.5.2. John Rocque's map: An actual survey of the County of Dublin (1760)

Rocque's map of the County of Dublin was published in 1760, and though it is sparse on detail beyond the borders of Dublin, it does depict Bray, Powerscourt, the River Dargle or 'Bray Water', and the Cookstown River. The area between the Dargle and Cookstown Rivers and the Dublin border where Fassaroe is located is shown as featureless with the exception of a dashed line showing the continuation of the Upper Dargle Road from County Dublin into Wicklow (Figure 3).

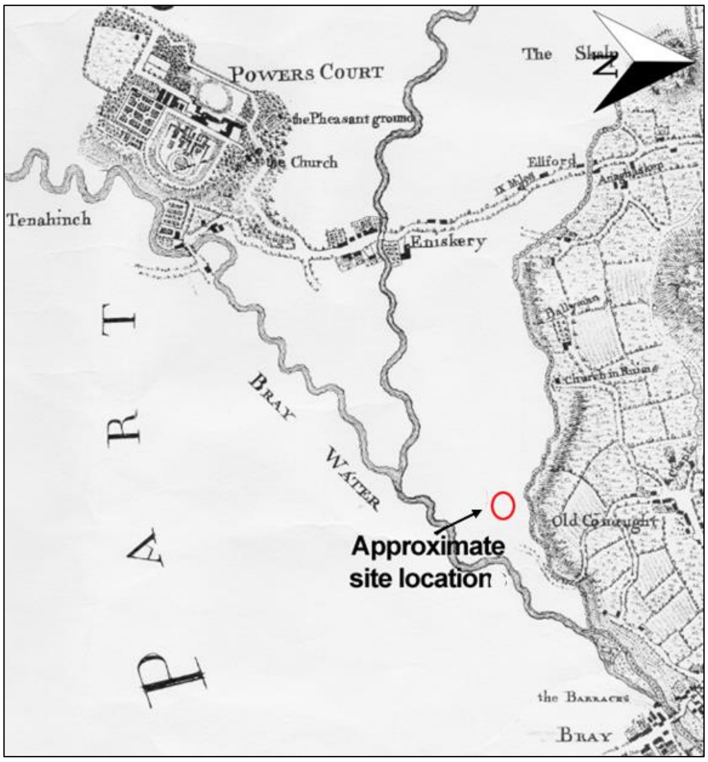

Figure 3 Detail of Roque's Map 'An Actual Survey of the County of Dublin' (1760) with approximate site location (in red)

2.5.3. Hall's map of the County of Wicklow (1822)

From George Newenham Wright's '*A guide to the county of Wicklow: illustrated by engravings, with a large map of the county, from actual survey'* comes this map that depicts the Upper Dargle Road to the east of Fassaroe Lane / Thornhill Road to the west. The area of the proposed development is shown as featureless (Figure 4).

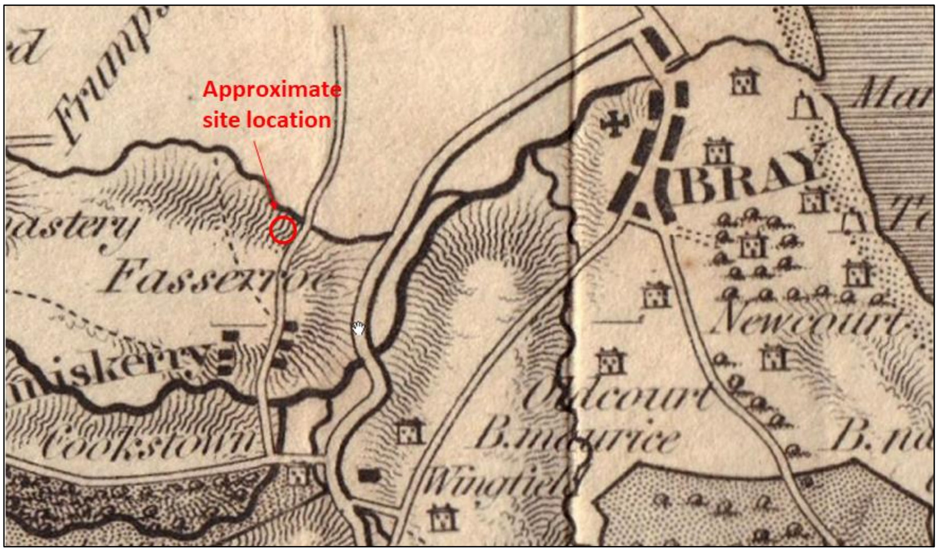

Figure 4 Detail of Hall's Map from Wright's guide to County Wicklow (1822) with approximate site location (in red)

2.5.4. Ordnance Survey maps (19th – 20th century)

The Ordnance Survey first edition six-inch map (1843) produced maps on a national scale, recording natural features, topographical conditions, built structures and archaeological features. They represent the earliest accurate and detailed cartographic source for the study area. The map shows that the proposed development site is located within agricultural fields, with field boundaries being the only features of note within the proposed site. The Dargle River and the original Upper Dargle Road are shown to the east, and Fassaroe Lane/ Thornhill Road are depicted on the west. St. Vallery's Cross (Nat. Mon. No. 337; RMP WI007-026002) is shown along the Fassaroe Lane as 'Cross'. The county boundary is depicted a short distance to the north (Figure 5).

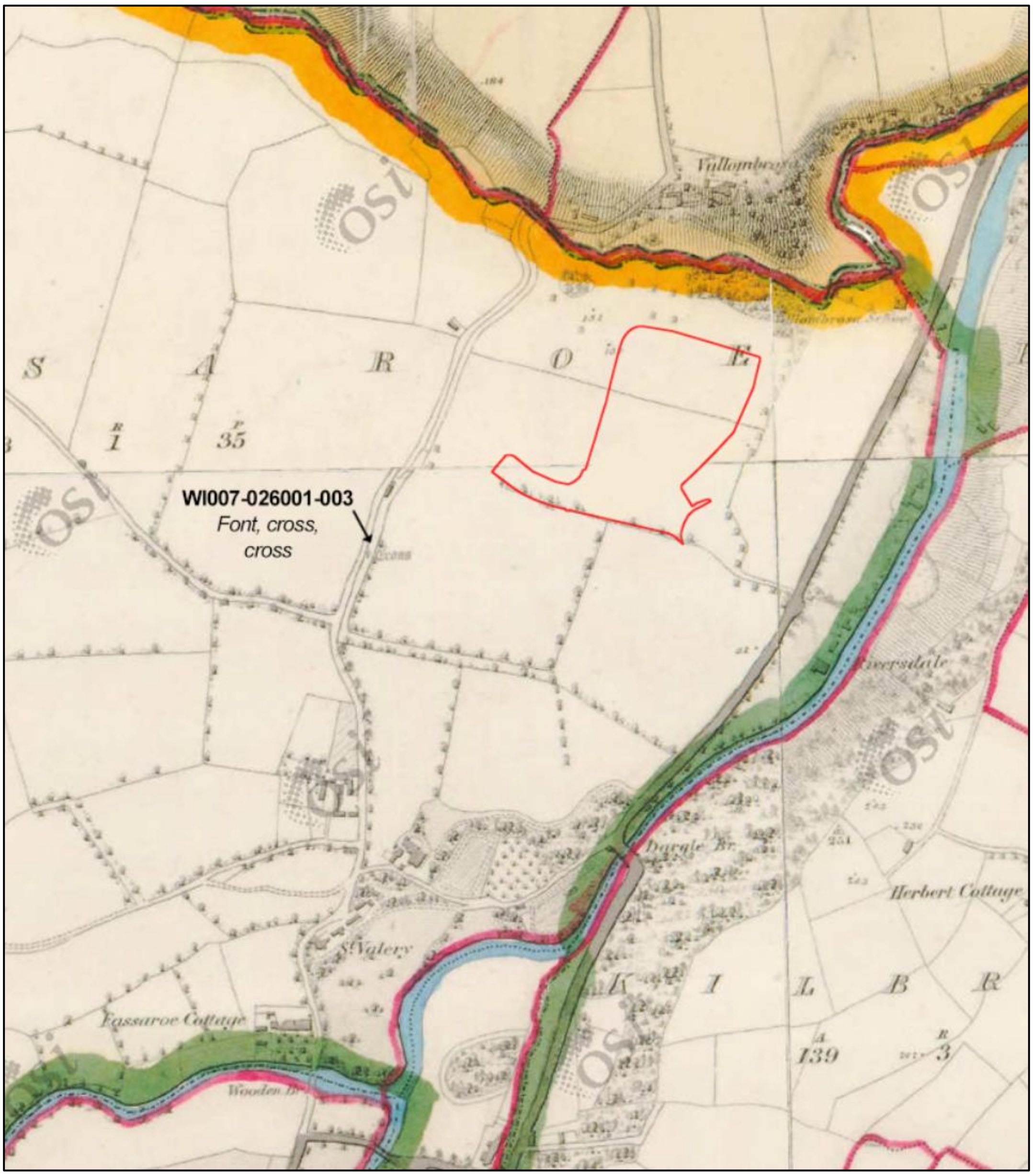

Figure 5 Detail of First Edition six-inch OS map (1843) with approximate site location (in red)

The 25-inch map (1906) similarly shows the proposed development site within agricultural fields, but with the addition of the Dublin Corporation Watermain which crosses over the site of the present Fassaroe Avenue (Figure 6). No additional detail is shown in the revised Ordnance Survey six-inch map of 1937.

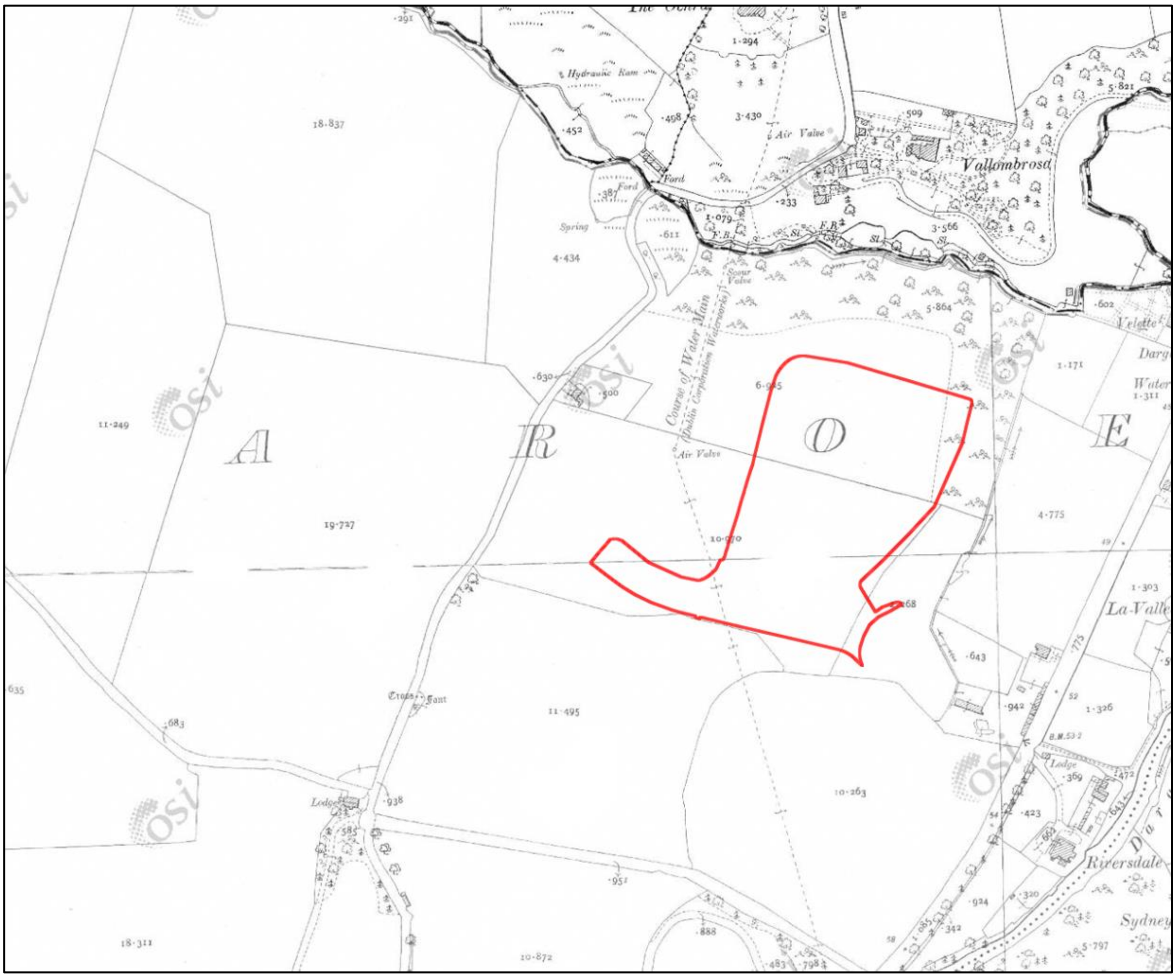

Figure 6 Detail of 25-inch OS map (1906) with approximate site location (in red)

2.6. Aerial Photography

Aerial photography (OSi imagery) shows the proposed development area as an agricultural field in 1999 with the N11 to the east and the Fassaroe junction to the south and east. (Figure 7). As far back as 2005, Google Earth aerial imagery shows the proposed Park and Ride site under development, with the area subject to topsoil stripping and access roads being built from the south and west, providing access to the central interior of the field. This southern access road now forms the southern boundary of the Park and Ride site (Figure 8). The 2012 aerial image (Digital Globe) shows the site disturbed from previous developments and the expansion of the road network to the south and west of the site wit additional roundabouts now facilitating traffic.

Figure 7 Detail of OSI Ortho Aerial Imagery (1999) with approx. site location (in red)

Figure 8 Detail of OSI Aerial Imagery (2005) with approx. site location (in red)

Figure 9 Digital Globe Aerial Imagery (2012) with approx. site location (in red)

2.7. Previous archaeological investigations

Unlicensed archaeological monitoring took place across the proposed Park and Ride site and a larger area of land as part of an approved warehouse and office development scheme by Wicklow County Council (Ref 02/6564) and An Bord Pleanála (Ref. No. PL 27.201368) for Cosgrave Property Development Ltd. The programme of monitoring was carried out at the site, on a phased basis from 5th December 2003 to 15th May 2004 (Figure 12) by Byrne, Mullins & Associates (Byrne 2004).

All topsoil stripping/ general ground reduction associated with the development was monitored. The topsoil which was up to 370mm in depth, consisted of a mid-brown silty clay with moderate pebbles and cobbles dispersed throughout. This lay upon a relatively compact orange /brown clay for much of the site. However, in the northeast area of the site (which is partly within the Park and Ride site) a grey marl was uncovered below the topsoil. According to the monitoring archaeologist, the layers under the topsoil material represent 'natural' subsoils. A total of thirty-five flint pebbles were recovered, none of which showed any indications of being 'worked' or used by humans as tools.

A number of clay pipe stems (14) and bowls (11), as well as 30 sherds of pottery/ceramics (china), were recovered, all of which are of 19th and 20th century date. All the retrieved material was recovered from, and dispersed randomly throughout the topsoil.

The presence of the flint pebbles suggests the presence of moronic flint in the area. There is nothing in the character of this material to suggest that it was deliberately introduced by human action.

No features, structures or deposits of archaeological interest or potential were uncovered during the course of the monitoring programme (Byrne 2004).

The extent of the previously archaeologically monitored area as part of the above scheme is shown in Figure 10 and Figure 11 (shown as a black outline). For reference, the extent of the proposed Park and Ride area shown within this area (shown in red).

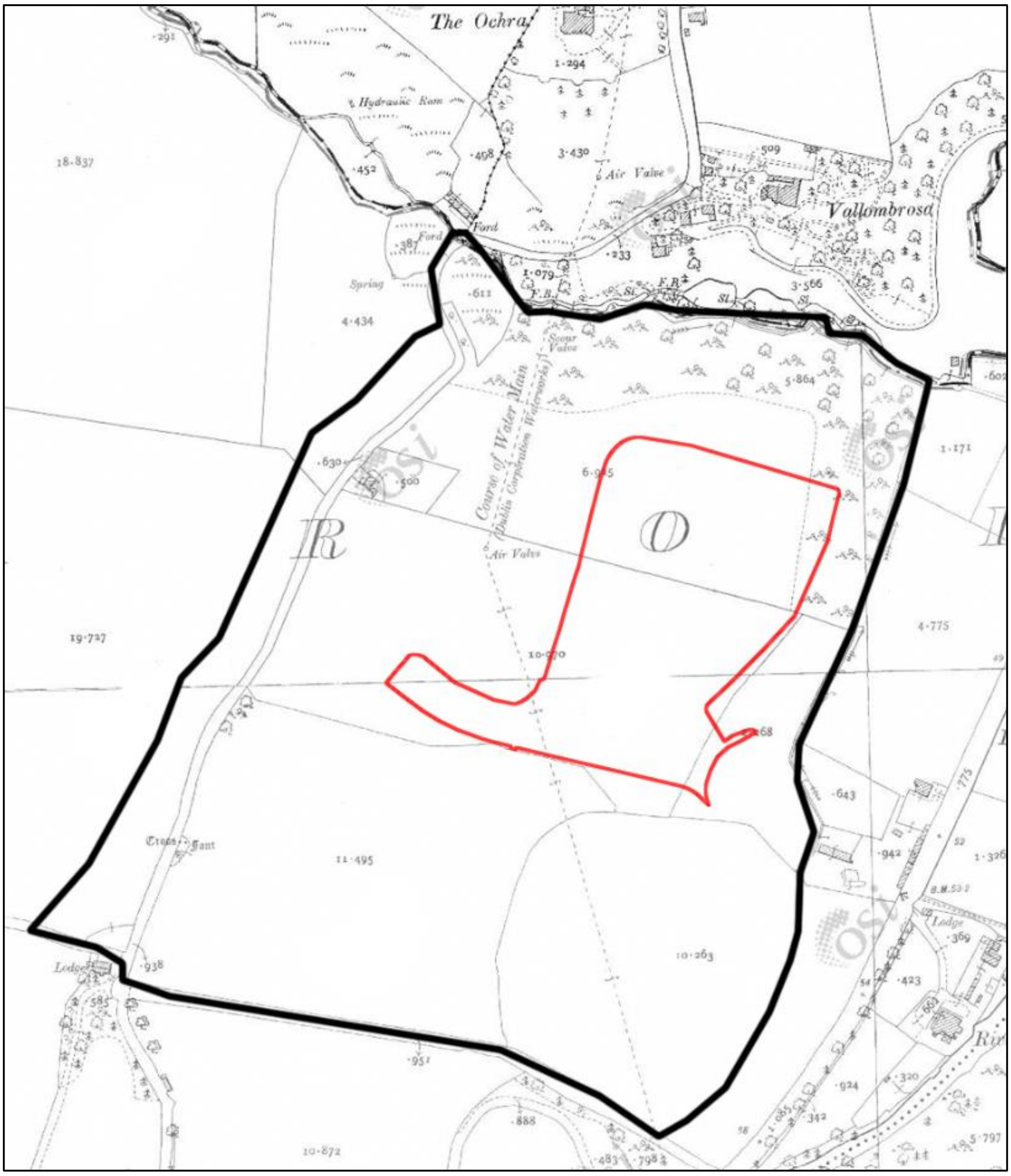

Figure 10 Archaeologically monitored area for approved scheme (Ref. No. PL 27.201368)

Figure 11 Archaeologically monitored area for approved scheme (Ref. No. PL 27.201368)

There have been previous archaeological investigations in the surrounding area (Figure 12). Archaeological investigations in the townland of Fassaroe (Licence nos. 02E0084, 16E0052, 17E0097) have not revealed any archaeological features.

In the townland of Killarney, archaeological investigations along the Dargle river, c. 400m northeast of the proposed development site, revealed a wooden structure which dated to 4660-4360BC, being a Late Mesolithic date (Licence no.: 95E0004, Bulletin Ref. No. 1995:289; RMP WI004-006). It was thought to have been a landing place for logboats.

The neighbouring townland of Ballyman, County Dublin has revealed a cluster of archaeological features, several of which have been recorded in the RMP. Several seasons of research excavation in the vicinity of Glen Munire church (DU028-002002), c. 1.1km northwest of the proposed development site, have revealed a *fulacht fia* (DU028-002008), a scatter of lithic and bone finds, an early medieval corn-drying kiln (DU028-002007), a medieval occupation layer dating to the 13th

/ 14th century, and post-medieval drainage features. Features from across the site included a cobbled layer and furnace-bottoms (Licence No. N/A, Bulletin Ref. No. 1986:21). A pit containing two urn burials was also discovered in Ballyman, c. 1.4km to the northwest of the proposed development site, and later recorded as a monument (Excavation no.: E1056; SMR DU026-113). The cremated remains dated to the Middle Bronze Age, with the remains of a young, probably male adult, contained in a cordoned urn, and the remains of an infant and adult of unknown sex and age contained in an undecorated urn.

A more detailed description of the archaeological investigations carried out within 1km of the proposed development is presented in Appendix 1.

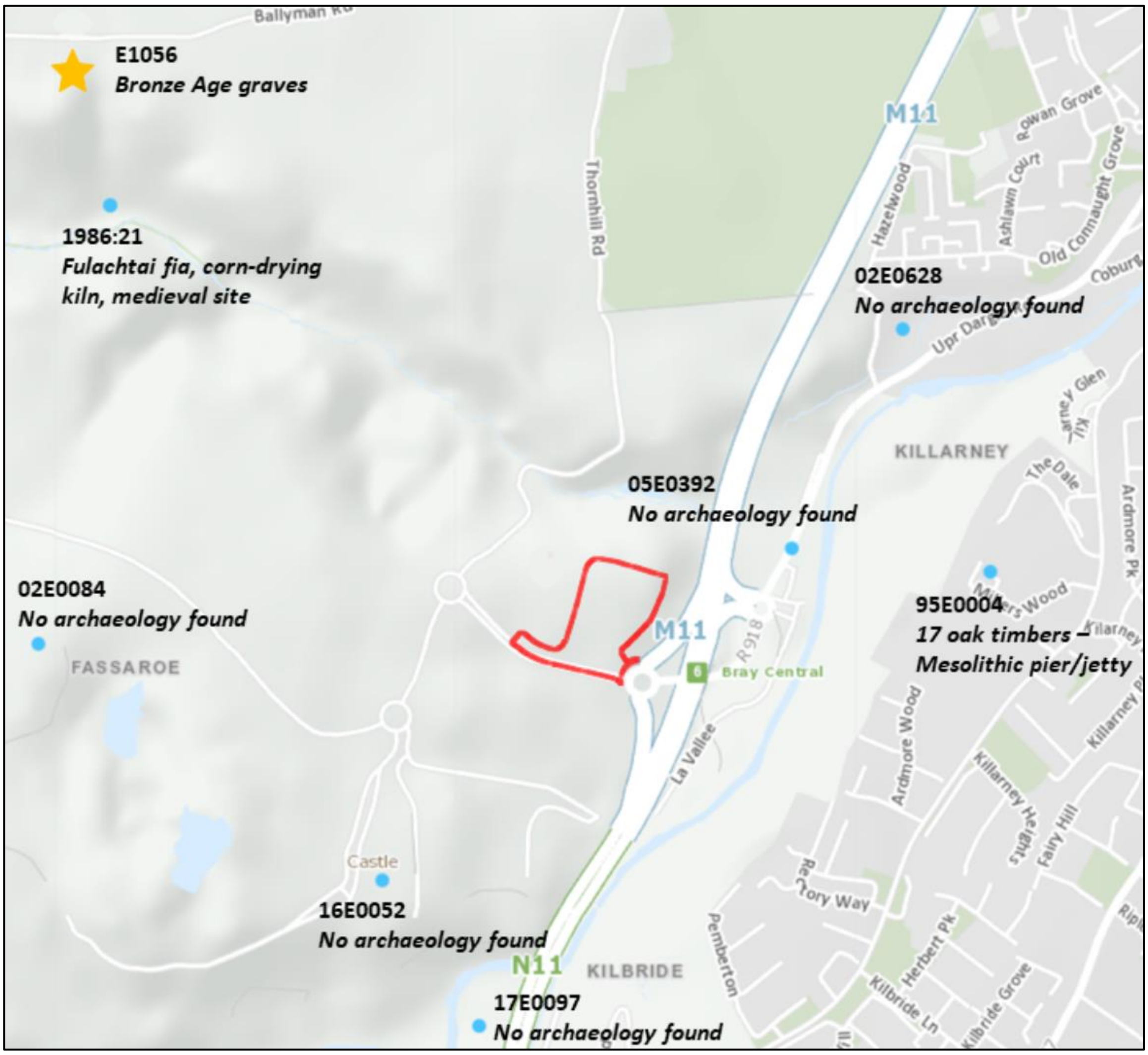

Figure 12 Previous archaeological investigations in the vicinity of the proposed development site

2.8. Topographical Files of the National Museum of Ireland

The topographical files record the discovery of a cist covered with a large granite boulder in Fassaroe in 1935. The cremated bone was accompanied by flint chips (NMI ref. 1935:800-1).

Within 1km of the proposed development site, the topographical files record the pit burial at Ballyman (NMI ref.: 1979:83-86; Excavation no.: E001056; DU026-113), c. 1.3km north-west from the proposed development site, and the decorated graveslab from Ballyman (NMI ref.: 1940:106;

DU028-002005), located c. 1.1 km to the north-west. A number of long cists and early slabs are recorded in the townland of Kilcroney (no reference number), as well as a broken bronze pin (NMI ref.: 1940:111-117) c. 1.1km south of the proposed development site.

Very little locational information is given for most of the finds in the Bray area in the topographical files, with many simply provenanced to 'Bray'. They range in date from the Neolithic to the medieval period and complement the monument evidence, suggesting a long period of archaeological activity in the environs of Bray.

The earliest finds include a barbed and tanged flint arrowhead (NMI Reg. No. 1899:1) found in Bray in 1898. These arrowheads are dated to the Early Bronze Age and occasionally turn up in burials suggesting they were prized personal possessions. A decorated bronze flanged axe (record only) which may be a transitional form between the later Early Bronze Age Derryniggin type axe and the Middle Bronze Age flanged axe is described as having been found 'near Bray'.

Later finds include an undatable beaten bronze basin (record only) made from a single sheet of bronze which was found in the bank of the Dargle river between Bray and Enniskerry.

A bronze ecclesiastical bell (record only) is recorded as having been found in Bray and is now in the Hunt Museum in Limerick. There is also an iron bell (NMI Reg. No. 1929:1336) from Oldconnaught found in a pile of stones, possibly the remains of a destroyed church.

A small stone vessel (NMI Reg. No. 1935:795) described as boat-shaped but which may be a naturally weathered stone was found in a garden near Bray. The description suggests that it might otherwise be a quern or rubbing stone. A stone mortar (NMI Reg. No. 1932:6581) decorated with three incised mortars was found in Little Bray, Co. Wicklow.

3. ARCHAEOLOGICAL HERITAGE

3.1. National Monuments in State care

There are no National Monuments in State care within the proposed development site and two in the surrounding area: the cross in Fassaroe (WI007-026001-002, NM No. 337), located c. 200m to the southwest, and the ecclesiastical site at Kilcroney (WI007-030, NM No. 417), situated c. 1.2km south of the proposed development site.

3.2. Recorded Archaeological Sites (RMP/SMR sites)

There are no recorded archaeological monuments within the proposed development site and 31 recorded monuments within 1km (Figure 13). The proposed development site is located centrally between five discrete early medieval ecclesiastical sites at Fassaroe (WI007-026001-003), c. 200m southwest of the proposed development site, Kilbride (WI008-001001-004), located c. 890m to the southeast, Ballyman (DU028-002001-011), c. 1.1km northwest, and Kilcroney (Nat. Mon. No. 417; RMP WI007-030 – in map inset), c. 1.2km south of the proposed development site. This remarkable density of early medieval ecclesiastical sites suggests that the area was of some importance in the early medieval period, and it is likely that the surrounding area would have been farmed to provide for these sites. A corn-drying kiln in Ballyman (DU028-002007) dating to the 5th century and located c. 1.1km to the northwest of the proposed development site, demonstrates that arable crops were grown in the period approaching the foundation of these sites.

It is likely that the area was of importance prior to the founding of these Christian sites, and four recorded prehistoric monuments may demonstrate the sort of ritual and settlement activity which was practiced in the area. They comprise a pier / jetty (WI004-006) located c. 580m to the northeast of the proposed development site, a mound (WI007-060), c. 715m to the south, a ring-ditch (DU026-065), c. 1km north of the proposed development site, a burial (WI007-024), situated c. 1km to the west, and a *fulacht fia* (DU028-002008), c. 1.1km to the northwest.

The medieval period is represented by a 16th century tower house in Fassaroe which was built by William Brabazon, Treasurer of Ireland (WI007-027), located c. 475m to the south of the proposed development site.

The recorded monuments are discussed also in Section 2 and described in Appendix 2.

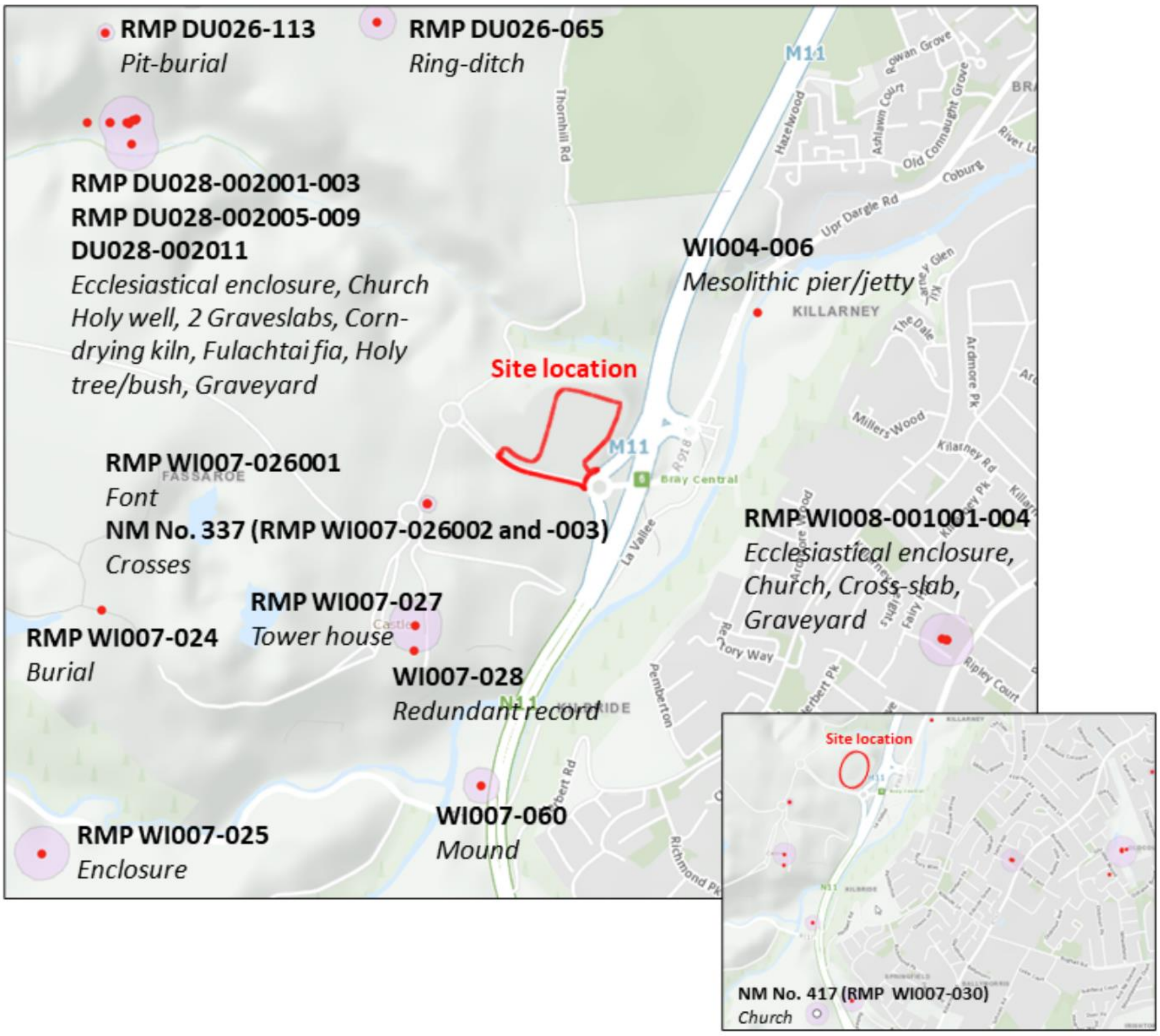

Figure 13 RMP / SMR sites within 1km of proposed development site (in red)

4. ARCHITECTURAL HERITAGE

4.1. Designated Sites

There are no architectural features within the proposed development site and eight designated architectural heritage features within 500m (Figure 14). Two of these structures are protected structures under the Dun Laoghaire Rathdown and the Wicklow County Development Plans (Vallombrosa and St. Valery Dargle Valley; RPS Dlr 1886, RPS Wicklow Co. Co. 03-34). Seven are registered in the National Inventory of Architectural Heritage (NIAH). The designated features comprise of 19th and early 20th century dwellings and a 20th century gate lodge, demonstrating the emergence of country residences for the middle and upper classes in this period.

In Wicklow, to the south of the proposed Park and Ride site, Fassaroe Cottage (site id 4286) and St Valery (site id 4281) are included in the NIAH Garden Survey as is Thorn Hill (site id 2568) in Old Connaught, Co Dublin to the north of the site. This survey, records historic gardens and designed landscapes which are principally demesnes but also include garden cemeteries and urban parks.

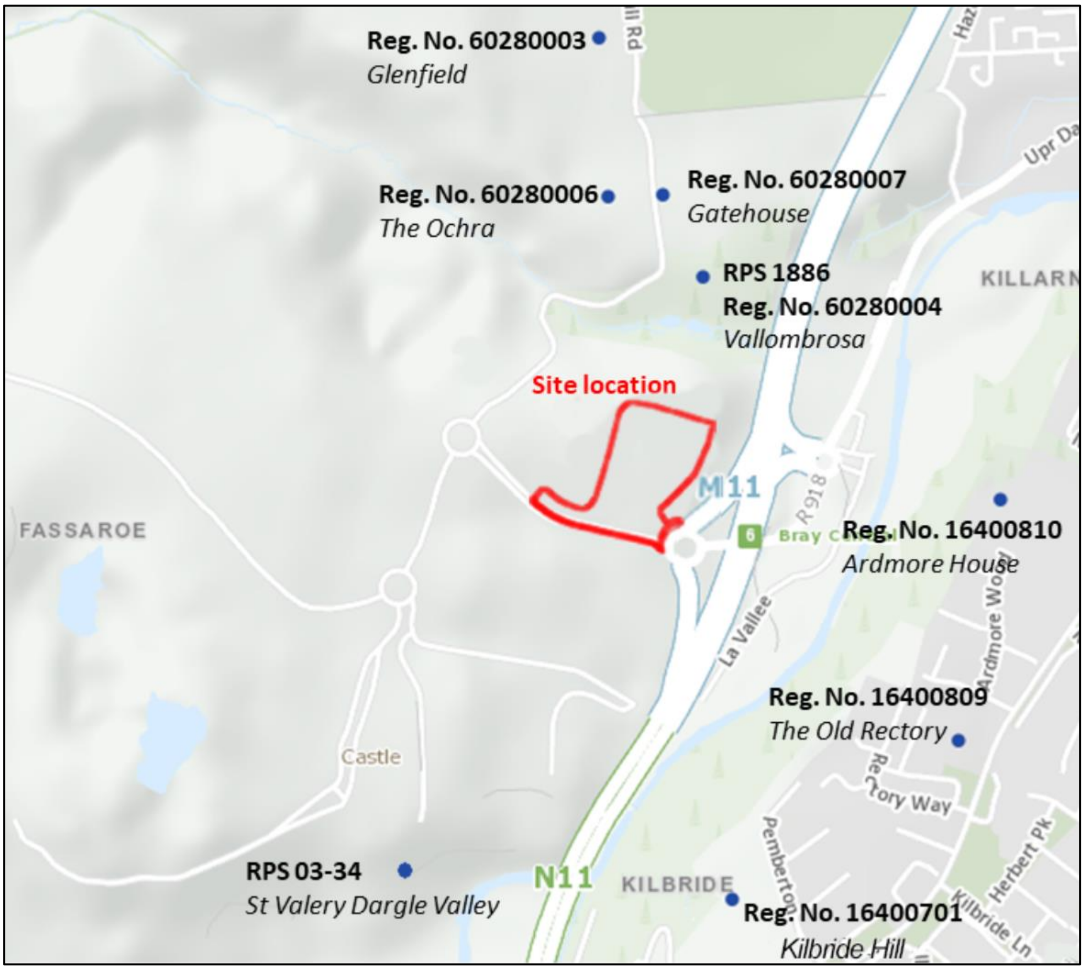

Figure 14 NIAH sites within 500m of proposed development site (in red)

5. CULTURAL HERITAGE

5.1. Townland and Placename evidence

The name of Fassaroe is derived from *An Fásach Rua*, meaning the 'red wilderness'. The origin of such a name is unclear, as the land is quite fertile. Surrounding townland names such as Killarney, Kilbride and Kilcroney include the *Cill* (Church) element in their names, suggesting a number of early churches were built in this area, and the proliferation of early ecclesiastical sites is confirmed in the archaeological record.

5.2. Townland boundaries

There are no townland boundaries within the proposed development site. The county boundary between Dublin and Wicklow counties is located c. 110m to the north of the proposed development site.

5.3. Folklore

In the Schools' Collection by the Irish Folklore Commission (1937-39), and available at www.duchas.ie, it is possible to find mention of the Fassaroe Cross (WI007-026002), c. 200m southwest of the proposed development site. The text refers to a stone cross, standing to the right side of Dargle Road, '*about five-foot, five ins. in height, with a rough figure of Our Lord carved on it*'. The source also records, just behind the cross, the presence of a '*stone holy water-font mounted on a small stone pillar about a foot in height, and around it is an iron railing and there is also a notice asking the public to protect it*', probably referring to the font recorded also in O'Flanagan (1927).

6. FIELD INSPECTION

The proposed site was inspected by two archaeologists on 25th August 2022, on a dry bright day, accessed via a tarmacadam road from Fassaroe Avenue, with an adjacent site compound located to the west. The site is currently in use as a storage area for this compound. An east-west oriented path divides the site in two, and a small angle tower is located in the north-west corner of the site (Plate 1).

Plate 1 Proposed development site facing northeast

The area has been subject previously to topsoil stripping, as noted in aerial photography, and it was evident that further stripping has been undertaken recently on the north and east (Plate 2).

Plate 2 Stripped area on the north with rough vegetation visible to south, facing south

The ground comprises of bare earth and chipped stone to the north, with rough vegetation to the south. The southern portion has not been re-stripped, and piles of spoil and building waste survive here (Plate 3).

Plate 3 Chipped stone surface and angle tower in the northwest area of proposed development site, facing northwest

The area is east sloping, with the east side significantly lower than the compound to the west, with earthmoving works possibly having contributed to this differential. The site is contained by embankments of spoil, with thick vegetation also on the north, east and south sides.

The Irish Sea is visible to the north-east through a gap in the topography and vegetation, and the Sugar Loaf is visible to the south. Tall vegetation and local topography obscures visibility in all other directions.

7. SUMMARY AND CONCLUSIONS

As demonstrated by aerial image the Park and Ride site has been previously disturbed and has been subjected to previous archaeological monitoring (Bryne 2004). No finds or features of an archaeological significance were revealed.

A national monument, Fassaroe Cross (St Valery's Cross) (NM No. 337; RMP WI007-026001-002), is located 200m to the south-west of the proposed development, the nature of these works will have no direct, physical impact on this cross.

This cultural heritage assessment did not identify any archaeological (recorded monument) or architectural heritage site (recorded within the NIAH or the RPS) within the proposed development site.

In the vicinity of the proposed development, there are two protected structures recorded in the Dun Laoghaire Rathdown and the Wicklow County Development Plans: Vallombrosa (RPS Dlr Co. Co. 1886), located c. 400m north, and St. Valery Dargle Valley (RPS Wicklow Co. Co. 03-34), located c. 570m south of the proposed development site. The development will have no direct impact on either of these structures or their grounds which are maintained within woodland boundaries.

Given the above, it is anticipated that no further archaeological or cultural heritage mitigation is required in order for the development to proceed.

All recommendations are subject to approval from the National Monuments Section (NMS) of the Department of Housing, Local Government and Heritage (DHLGH) and the local planning authority who may make additional recommendations.

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APPENDIX 1 SUMMARY OF ARCHAEOLOGICAL INVESTIGATIONS

Table 1 Previous archaeological investigations within 1km of the proposed development site

Licence No.	Bull. Ref.	Address	Results of investigations
E000182	1977-79:0036; 1980-84:0094; 1985:22; 1986:21	Ballyman, Co. Du	The site is located approximately 76 metres SW. of the Early Christian/medieval church of Glen Munire (Ballyman) on the Dublin/Wicklow county border. Investigation of a river meander (originally suspected of being the site of a possible Fulacht Fiadh (now recorded as DU028-002008)) was undertaken in August 1979. Excavation revealed the stony layer of a probable post-glacial river meander, sealed underneath a shallow layer of peat-like material, which has been identified as an old Al horizon; this was partly sealed by a layer of hill-wash. The site appears to be a squatting area; finds include a small number of artifacts of flint and stone, waste flint and small cores, also some fragments of burnt and split bone and animal teeth. Recovered mainly from upper levels were several pieces of slag, and a small number of pottery sherds, probably associated with the known Early Christian/medieval church site nearby. Subsequent seasons of excavation revealed three phases as follows: Phase 1: Post-Roman and Early Christian: Corn-drying kiln (now recorded as DU028-002007) containing remains of 6-row hulled barley (M. Monk), and hazel charcoal which produced a C14 date in the 5th century A.D. (UB 2663). Elsewhere on site a terminal of a zoomorphic penannular brooch with millifiore setting (c. 7th century) was recovered. Phase 2: Medieval: Cobbled layer containing evidence of iron smelting and iron working activity for which a 13th/ 14th-century dating is indicated by both the finds and C14 dating (UB2662). Phase 3: Post-medieval: When phase 2 activity had ceased the site became waterlogged and covered by a layer of fen peat. Early 19th-century activity is indicated by the insertion of massive stone 'coffin' drains and later French drains, in order to drain the site. The final season comprised of investigations surrounding an upright stone anvil, while the remainder of the site was cleared to boulder clay. Some pieces of worked flint were recovered from the base of the phase 2 cobbled layer, together with slag, furnace bottoms, charcoal, broken animal bone, and flint fragments/pebbles.
E001056		Ballyman, Co. Dublin	In September 1979 a pit containing two inverted urns, each covering a cremation, was discovered at Ballyman, Co. Dublin. The pit was exposed when an avenue to a new house was being cut, but the urns were not discovered in the section until five years later, when they were noticed by two officials from An Foras Talúntais. The site was reported to the NMI by Leo Swan, who had collected some of the cremated bone and urn sherds. A rescue excavation was carried out on 19 September 1979 by Mary Cahill. The human remains from the site were analysed by Barra Ó Donnabháin. A combined charcoal sample from both burials was dated first, producing a date of 3370±50 BP. Cremated bone samples from both burials were subsequently radiocarbon-dated. Cremated bone from the cordoned urn yielded a date of 3350±30 BP, which calibrates to 1736–1531 BC at 95% probability. Bone from the undecorated urn was dated to 3320±30 BP, which calibrates to 1684–1523 BC at 95% probability. Brindley (2007, 146) places the decorated vessel within the cordoned urn series. The cordoned urn contained a younger adult who was probably a male. The undecorated urn contained an infant and an adult of unknown age and sex. Now recorded as DU026-113.
95E0004	1995:289	Killarney, Co. Wicklow	In early January 1995 the IAWU carried out a brief investigation of a recently exposed wooden structure on the banks of the River Dargle at Bray, Co. Wicklow, at the request of the OPW. The structure was identified by the Urban District Council as extensive mechanical excavation was carried out to widen the river. The original

Licence No.	Bull. Ref.	Address	Results of investigations
			bank was approx. 4.5m high and this was removed to just above water-level and taken back 25m. All of the material removed was glacial gravel reworked by the river. Seventeen oak timbers were exposed 5m from the current river edge at a height of 0.7m above the water-level. The mechanical excavations continued around the site after timbers were identified so that it survived on a slight rise. All the timbers visible at the start of the excavation had been dislodged from the gravel and were loose. However, a single stratified timber was uncovered during the excavation. Most of the timbers were lying in a north-east/south-west orientation perpendicular to the river bank. There were a small number of pieces set at right angles to this. The timbers ranged in width from 0.1m to 0.6m and the max. length was 3.2m. The surfaces of the timbers were abraded and no toolmarks were identified at the site. In cross-section nearly all of the timbers appear to have been split and this is the strongest evidence that the site was not formed by natural deposition. An unutilised flint flake was recovered from a disturbed context. Dendrochronological analysis failed to produce a date; however, it did indicate that the stratified timber was probably from the same tree as some of the disturbed timbers. A radiocarbon date of 4661-4360 BC was returned for one of the timbers. Now recorded as WI004-006.
98E0445	1998:125	Carrickmines-Bray Gas Pipeline	A number of sites were identified and excavated during the construction of a Bord Gáis Éireann pipeline in September-November 1998. The proposed route of the pipeline ran roughly north-south from Carrickmines to Bray. The townlands that the pipeline passed through included Ballyman in County Dublin, and Fassaroe, Kilbride, Kilcroney, Wingfield and Ballywaltrin in County Wicklow. Nothing of archaeological interest was recorded within 1km of the site options. (Carrickmines Great / Laughanstown / Tiknick / Rathmichael / Shankill / Ballyman, Cos. Dublin & Wicklow.)
02E0084	2002:1967	Fassaroe, Co. Wicklow	Testing was carried out on the site of a proposed warehouse and ancillary offices in the townland of Fassaroe, Co. Wicklow, in order to establish a suitable buffer zone around the recorded monument of St Valery's Cross (WI007-026002). This testing revealed no evidence of any archaeological features associated with St Valery's Cross. Therefore, it seems that two interpretations are possible in respect of the cross. Firstly, the cross has been moved from its original location, as suggested by Anne Plumptre in the early 19th century. This view is not contradicted by the test results. The other possibility is that it is a tearmann cross. If this is the case, it marks the boundary of consecrated lands and may be peripheral to any physical ecclesiastical remains.
02E0628	2002:1961	Diamond Valley, Bray, Co. Wicklow	Archaeological testing at a proposed apartment development. Testing failed to reveal either subsurface features or portable finds. From the middle of the site to the eastern side of the proposed development-ground had been heavily disturbed in recent times, with modern pits containing red brick, roof tile, glass, plastic and car parts revealed.
02E1864	2002:0460	Ballyman, Co. Dublin	Testing was undertaken in the townland of Ballyman, Co. Dublin, before a proposed diversion of 110kv ESB overhead lines required to facilitate the proposed construction of a new golf-course for Dún Laoghaire Golf Club. The area of testing was confined to the south of the Ballyman Road, in the vicinity of a possible castle (SMR 26:63), a pit burial (SMR 26:113), possible standing stones (SMR 28:1) and ecclesiastical remains (SMR 28:2). The proposed locations of two pairs of poles and a pylon were subjected to the programme of testing. No features or finds of archaeological interest were uncovered.
05E0057	2005:386	Ballyman, Co. Dublin	Monitoring was carried out at the site of erection of angle masts 40E and 40W for the Carrickmines–Fassaroe 110kV line diversion. The site was located on the south-facing slope of the River Dargle valley c. 100m from SMR 28:1, a standing stone, and 28:2, a complex of archaeological sites including a church and graveyard. The angle mast 40W required the

Licence No.	Bull. Ref.	Address	Results of investigations
			installation of four box trenches 3.35m by 3.35m and 2.6m deep. The angle mast 40E required the installation of a linear trench 2m wide and 1.6m deep. No archaeological features or deposits were identified.
05E0392	2005:530	Shanganagh / Cork Little / Aske / Cork Great / Little Bray / Bray Commons, Cos. Dublin & Wicklow	Monitoring of geotechnical investigations in advance of the Shanganagh Bray main drainage scheme included the townlands of Little Bray and Bray Commons. No features of archaeological significance were discovered.
05E0950	-	Enniskerry Footbridge, Kilbride and Fassaroe	No archaeological features were encountered.
07E0169	2008:1312	Enniskerry / Killegar / Fassaroe / Parknasillogе / Knocksink / Kilgarran, Co. Wicklow	Monitoring was carried out at Enniskerry, Co. Wicklow, along the route of the proposed Enniskerry water supply scheme. A continuous archaeological presence was kept throughout all topsoil-stripping within greenfield areas within the southern section of Pipeline A in the townland of Fassaroe. Nothing of archaeological significance was uncovered during monitoring works.
12R0053	2012:640	Bray Little / Ravenswell / Bray Commons / Killarney / Bray, Co. Wicklow	Wade survey and a magnetometry survey by hand-held metal detection were carried out at the site out along a 4km stretch of the River Dargle at Bray, Co. Wicklow, in advance of a flood defence scheme. No archaeologically significant material was encountered.
16E0052	2016:442	Fassaroe, Bray, Co. Wicklow	Archaeological testing revealed a number of modern features comprising a stone-filled drain, two pits and a shallow curvilinear feature filled with loose clay. No archaeological features or deposits were identified.
17E0027	2018:178	Ballyman & Old Connaught, Co. Dublin	Monitoring of site investigations associated with the proposed development of the Ballyman Reservoir and associated pipelines within the townlands of Ballyman and Old Connaught, County Dublin, comprised of 15 slit trenches in greenfield or within areas of archaeological potential due to the proximity of recorded monuments. No features or artefacts of archaeological significance were identified during the course of monitoring.
17E0097	2017:172	Fassaroe, Co. Wicklow	Archaeological testing in advance of development. The proposed development area is located, for the most part, within the townland of Fassaroe, although the south-west corner of the site is located within the townland of Cookstown. This section of the site in occupied by mature trees. Today the main part of the proposed development area is bordered to the east by the M11 and to the west by the Cookstown and Dargle Rivers. The R117 borders the site to the south. A mound (WI007-060) is within the south-east corner of the proposed development area, this will be preserved in situ. Nine test trenches were excavated across the site (546 linear metres). These revealed that the site has been subject to extensive disturbance, having previously been stripped. According to the landowner the site was used as a compound during the construction of the M11 to the immediate east. Despite the obvious archaeological potential of the area, being bordered by water courses, nothing of significance was identified during the course of the works and it is likely that any archaeological remains that were located here have since been removed.
21E0406	2021:070	Castlefield, Fassaroe, Bray, Co. Wicklow	This site of the proposed development is located at Castlefield, Fassaroe Lane, Fassaroe, Bray, Co. Wicklow. The site is adjacent to and to the east of a cul de sac just off Fassaroe Lane, in the south-east part of Fassaroe townland in Castlefield, Bray, Co. Wicklow. The site consists of a rectangular plot that was previously a part of a large site, with a dwelling located to the east.

Licence No.	Bull. Ref.	Address	Results of investigations
			The north-east extent of the site is located within the Zone of Archaeological Potential associated with Castle – tower house WI007-027—-. The site is a part of a plot that was previously subjected to archaeological test trenching. This was carried out under licence 16E0052. Four test trenches were excavated with Trenches 1 and 2 within the north and north-eastern portion of the current site, within the footprint of the existing driveway. A number of modern features were recorded in the trenches, including a shallow curvilinear feature in Trench 1 and a modern pit in Trench 2. No deposits or features of archaeological significance were exposed. Subsequent archaeological monitoring similarly did not reveal any deposits or features of archaeological significance.

APPENDIX 2 SUMMARY OF RECORDED MONUMENTS

Table 2 Recorded monuments (RMP/SMR) within 1km of the proposed development site

RMP / SMR no.	Class	Townland	ITM E	ITM N	Description
DU026-065	Ring-ditch	BALLYMAN	724134	718853	The ring-ditch is located in an area of tillage that falls south to the Bray River with views of the coastline and the Sugarloaf Mountain. The ring-ditch (diameter c. 15m) is visible as a cropmark on an aerial photograph taken in 1970 (CUCAP, BDP 23). It is not visible at ground level.
DU028-001	Redundant record	BALLYMAN	723492	718629	Redundant record which was formerly recorded as standing stones (Dúchas The Heritage Service 1998).
DU028-002001	Ecclesiastical enclosure	BALLYMAN	723601	718638	Situated at the bottom of a valley on a south facing slope overlooking the north bank of the County Brook. Ecclesiastical enclosure (40m N-S x 72m SW-NE) associated with a church (DU028-002002-) two graveslabs (DU028-002006-, DU028-002005-) and a holy well (DU028-002003-). The church is noted as being enclosed until the turn of the century when it was referred to as a cashel (Anon 1900, 187).
DU028-002002	Church	BALLYMAN	723579	718629	Situated at the bottom of a valley on a south facing slope overlooking the north bank of the County Brook. Remains of a small rectangular building associated with an ecclesiastical enclosure (DU028-002001-). It is of late 12th or early 13th century date. The east gable and portion of the south wall is still standing. The north wall survives to foundation level. Built of roughly coursed granite masonry. It has a round-headed east window under a segmental arch. There is a splayed ope at the west end of the south wall. The aumbry in the east gable has a graveslab as a lintel (see DU028-002006-).This is the church of Glen Munire, formerly an Early Christian foundation dedicated to St. Sillan and attached to Glendalough (O'Brien 1988, 520). The church in the early 14th century is listed among the possessions of the Knights Templars at their dissolution (O'Brien 1985, 20-21). It was enclosed until 1850. Excavations in an area within *c.*80m of the church have revealed evidence for occupation from the 7th century through the medieval and post-medieval periods.
DU028-002003	Ritual site - holy well	BALLYMAN	723543	718630	Situated on the south facing slope of a valley. The well, or spring, rises at the foot of a bank on the north side of the County Brook. it was still venerated in the 1950's (Ó Danachair 1958, 84; Anon, 1900, 187). The OS Letters (1837) call it a blessed well (Herity 2001, 33).
DU028-002005	Graveslab	BALLYMAN	723584	718629	One of two early graveslabs (see also DU028-002006-) this slab formed a lintel to the church window: it was moved to the National Museum of Ireland in 1940 (Reg. no. 1940:106; see DU018-146----). The slab (L 1.32m, Wth 0.48m) is carved with two groups of concentric circles with centre cup marks, a centre band and

RMP / SMR no.	Class	Townland	ITM E	ITM N	Description
					herringbone pattern. (Ó hÉailidhe 1973, 57, no. B14; Swords 2009, 84).
DU028-002006	Graveslab	BALLYMAN	723584	718627	An aumbry in the south end of east gable of the church (DU028-026002-) is partly formed by a graveslab fragment (L 0.38m, Wth 0.28m). The slab bears a central band and herringbone pattern (Ó hÉailidhe 1957, 78, 83).
DU028-002007	Kiln - corn-drying	BALLYMAN	723594	718635	A corn-drying kiln discovered during excavation (E000182). The kiln containing remains of barley and hazel charcoal which produced a C14 date in the 5th century (O'Brien 1986, 20-21).
DU028-002008	Fulacht fia	BALLYMAN	723599	718635	A fulacht fiadh discovered during excavations (E000182) undertaken east (80m) of the church at Ballyman (O'Brien 1987-88, 71).
DU028-002009	Ritual site - holy tree/bush	BALLYMAN	723543	718630	Situated at the bottom of a valley on a south facing slope overlooking the north bank of the County Brook. A holy tree associated with the ecclesiastical remains of a small rectangular building associated with an ecclesiastical enclosure (DU028-002001-) (Anon 1900, 187, 193).
DU028-002011	Graveyard	BALLYMAN	723590	718583	A burial ground noted in OS Letters as a cillín in the 1830's (O'Flanagan (ed. (1927, 65).
WI004-006	Pier/Jetty	KILLARNEY	724975	718209	Seventeen oak timbers (L 0.5m - 3.4m; Wth 0.12m-0.6m; T 0.08m-0.22m) located on a gravel surface were uncovered here in 1995 as part of works associated with widening the river (Excavation Licence 95E0004). The timbers were in two groups, 2.2m apart. Most of the timbers in the larger group (14) lay parallel to one another, and two of those in the smaller group appeared to be parallel. A radiocarbon date of 4661-4360 BC was returned for one of the timbers. The identification of these timbers as an archaeological structure is not certain and the excavator (McDermott 1995, 5) suggested that 'the most likely purpose for a structure at Killarney was as a landing place for log boats'. (McDermott 1995, 1-5).
WI007-024	Burial	FASSAROE	723524	717550	Situated on a gentle east-facing slope. Extended inhumation of an adult female (aged c. 35 years) in a unlined grave found during quarrying. The skeleton was aligned E-W with the head to the west. Part of a flint scraper and a flint blade came from a high level in the grave fill (NMI 1943-00316-7). The site has been removed through quarrying. (Keenan et al. 1944)
WI007-025	Enclosure	COOKSTOWN	723392	717012	Situated on level ground overlooking the steep side of the Cookstown River valley immediately to the north. Circular enclosure (diam. c. 20m), visible as a cropmark on aerial photographs (GSIAP, O 173-4). Not visible at ground level.
WI007-026001	Font	FASSAROE	724245	717785	Octagonal limestone font described in the OS Letters (O'Flanagan 1928, 22) immediately to the east of the cross (WI007-026002-). No longer at this location.

RMP / SMR no.	Class	Townland	ITM E	ITM N	Description
WI007-026002	Cross	FASSAROE	724245	717785	National Monument in state guardianship No. 337. Situated on a gentle east-facing slope with a steeper slope immediately to the east. A granite cross (H 1.42m; T 0.16m) known as St Vallery's Cross with a circular head and chamfered edges. The west face has a depiction of Christ, represented as naked, with head inclined to the right. In the centre of the east face are two apparently bearded human heads in relief one possibly wearing a mitre. There are two other much worn heads, one on the lower south edge of the cross-head and one on the northeast side of the base (Ó hÉailidhe 1958, 101). There is no trace of the octagonal limestone font described in the OS Letters (O'Flanagan 1928, 22) but a simple circular basin occurs in a small granite block immediately south of Fassaroe Castle (WI007-027----) from where the font is reputed to have been removed. Possibly the remains of an ecclesiastical site. Archaeological test excavations carried out in 2002 adjacent to this cross failed to reveal anything of archaeological significance (Tobin 2004, 534)
WI007-026003	Cross	FASSAROE	724245	717785	The OS Letters (O' Flanagan 1928, 27) describe a second cross alongside WI007-026002- as follows: 'There is a piece of a stone, 2 feet six inches long, nine inches wide and five thick lying at the foot of the cross, having one end shaped for the purpose of filling a round hole or mortice, ... This was another cross, but the arms or circle was broken off and probably for the purpose of what is called a cap stone under a rick or stack of corn.' The present location of this cross is unknown.
WI007-027	Castle - tower house	FASSAROE	724218	717516	Situated on a south-east-facing slope overlooking the Dargle valley. Built by William Brabazon, the Treasurer of Ireland, in 1535 (Fitzgerald, 1909-11, 129), only two walls (the west and south) of this granite-built tower house survive, although traces of the foundations of the other two can be identified. A substantial part of the barrel vault extends from the south wall over the first floor. Embrasures and aumbries survive at the ground- and first-floor levels in both walls. The barrel vault and the soffits of the embrasures retain traces of wicker centring. The doorway and stairwell were on either the east or north side and no trace of them survives.
WI007-028	Redundant record	FASSAROE	724214	717460	Listed in the SMR (1986) as 'enclosure' based on an aerial photograph (GSIAP O 173/174 (1973)). On inspection in 1989 there was nothing of archaeological significance found. It was concluded that evidence on the aerial photograph was not sufficient to warrant accepting this as an archaeological monument and it was not included in the 1995 RMP.

RMP / SMR no.	Class	Townland	ITM E	ITM N	Description
WI007-029001	Burial ground	KILBRIDE (Rathdown By.)	724564	716762	Situated on a natural rise at the base of a stream valley. A small square enclosure (dims. 5.8m x 6m) defined by a wall of uncoursed stone with an entrance (Wth c. 1.2m) at the east. It produced an early medieval cross-inscribed graveslab (possibly covering a long cist) (designated WI007-029002-), a fragment of another (designated WI007-029003-) and two simple granite crosses one with a small inscribed Latin cross (now in the NMI) (designated WI007-029004- and WI007-029005-). Not visible at ground level. (Kilbride-Jones 1939, 173-6)
WI007-029002	Graveslab	KILBRIDE (Rathdown By.)	724564	716762	An early medieval cross-inscribed graveslab (possibly covering a long cist).
WI007-029003	Graveslab	KILBRIDE (Rathdown By.)	724564	716762	Fragment of an early medieval cross-inscribed graveslab.
WI007-029004	Cross	KILBRIDE (Rathdown By.)	724564	716762	One of two simple granite crosses one with a small inscribed Latin cross (now in the NMI) (designated WI007-029004- and WI007-029005-).
WI007-029005	Cross	KILBRIDE (Rathdown By.)	724564	716762	One of two simple granite crosses one with a small inscribed Latin cross (now in the NMI) (designated WI007-029004- and WI007-029005-).
WI007-030	Church	KILCRONEY	724385	716694	National Monument in state guardianship No. 417. Situated on a low rise above a steep east-facing slope. A simple rectangular church (dims. 12.15m x 7.8m) with well-built walls of sandstone, granite and shale blocks of various sizes, substantially restored (H1.5-4.5m). The east gable has antae but the west end of the church appears to have been extended and the antae removed. The south wall has a flat lintelled doorway, and there is a small round-arched window towards the east end.
WI007-060	Mound	KILCRONEY	724363	717162	The Ordnance Survey Letters (1838/40) noted 'the North East part of Kilcroney townland terminates in a point between two streams; on this point is a hillock of considerable size, which the people call a moate; but they tell you that it was anciently called Poll and choradh, i.e. the hole of the weir, or the hole or grave of the champion.' (O' Flanagan 1928, 21). An oval enclosed area (dims. c. 90m E-W; c. 70m N-S) covered in trees and bounded by a stream on the east, is indicated in the northeast part of Kilcroney townland on the 1st ed. OS 6-inch map (1838). In its present form it appears as an oval mound (dims. c. 50m N-S x c. 30m E-W; H c. 5m) with possible traces of a fosse along its north side and cut by the N11 on its east side. Referred to as the 'Rath field' and the 'Fairy fort' (Conboy 2007, 2-3). No archaeological features were encountered when constructing the foot bridge immediately to the south (ibid).
WI008-001001	Ecclesiastical enclosure	KILBRIDE (Rathdown By.)	725391	717485	Situated on a gentle SW facing slope. The modern housing estate which now occupies most of the site is believed locally to be built on

RMP / SMR no.	Class	Townland	ITM E	ITM N	Description
					the site of a church and graveyard. Not visible at ground level. The 1907 OS 6-inch map shows an approximately semicircular curve in the field boundary which may represent the line of an enclosure and the adjacent field is named 'Glebe' on the 1838 edition. A cross-slab (H 1.22m), said to be situated in the graveyard (O'Flanagan 1928, 28), stands to the east of the estate between it and the road. It has an irregular cross in relief on the upper part of one face flanked under the arms by two raised bosses.
WI008-001002	Church	KILBRIDE (Rathdown By.)	725391	717485	Situated on a gentle SW-facing slope. The modern housing estate which now occupies most of the site is believed locally to be built on the site of a church and graveyard. Not visible at ground level.
WI008-001003	Cross-slab	KILBRIDE (Rathdown By.)	725382	717488	A cross-slab (H 1.22m), said to be situated in the graveyard (O'Flanagan 1928, 28), stands to the E of the estate between it and the road. It has an irregular cross in relief on the upper part of one face flanked under the arms by two raised bosses.
WI008-001004	Graveyard	KILBRIDE (Rathdown By.)	725391	717485	Situated on a gentle SW-facing slope. The modern housing estate which now occupies most of the site is believed locally to be built on the site of a church and graveyard. Not visible at ground level.

APPENDIX 3 RELEVANT LEGISLATION

National Monuments Legislation (1930-2004)

The National Monument Act, 1930 (as amended) provides the formal legal mechanism to protect monuments in Ireland. Protection of a monument is provided via:

Record of Monuments and Places (RMP);

National Monument in the ownership or guardianship of the Minister for Arts, Heritage, Regional, Rural & Gaeltacht Affairs or a Local Authority;

National Monument subject to a Preservation Order (or temporary Preservation Order);

Register of Historic Monuments (RHM).

The definition of a monument is specified as:

any artificial or partly artificial building, structure or erection or group of such buildings, structures or erections;

any artificial cave, stone or natural product, whether forming part of the ground, that has been artificially carved, sculptured or worked upon or which (where it does not form part of the place where it is) appears to have been purposely put or arranged in position;

any, or any part of any, prehistoric or ancient tomb, grave or burial deposit, or (ii) ritual, industrial or habitation site; and

any place comprising the remains or traces of any such building, structure or erection, any cave, stone or natural product or any such tomb, grave, burial deposit or ritual, industrial or habitation site.

Under Section 14 of the Principal Act (1930):

It shall be unlawful...

to demolish or remove wholly or in part or to disfigure, deface, alter, or in any manner injure or interfere with any such national monument without or otherwise than in accordance with the consent hereinafter mentioned (a licence issued by the Office of Public Works National Monuments Branch),

or

to excavate, dig, plough or otherwise disturb the ground within, around, or in the proximity to any such national monument without or otherwise than in accordance...

Under Amendment to Section 23 of the Principal Act (1930):

A person who finds an archaeological object shall, within four days after the finding, make a report of it to a member of the Garda Síochána...or the Director of the National Museum...

The latter is of relevance to any finds made during a watching brief.

In the 1994 Amendment of Section 12 of the Principal Act (1930), all the sites and 'places' recorded by the Sites and Monuments Record of the Office of Public Works are provided with a new status in law. This new status provides a level of protection to the listed sites that is equivalent to that accorded to 'registered' sites [Section 8(1), National Monuments Amendment Act 1954] as follows:

The Commissioners shall establish and maintain a record of monuments and places where they believe there are monuments and the record shall be comprised of a list of monuments and such places and a map or maps showing each monument and such place in respect of each county in the State.

The Commissioners shall cause to be exhibited in a prescribed manner in each county the list and map or maps of the county drawn up and publish in a prescribed manner information about when and where the lists and maps may be consulted.

In addition, when the owner or occupier (not being the Commissioners) of a monument or place which has been recorded, or any person proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such monument or place, he shall give notice in writing of his proposal to carry out the work to the Commissioners and shall not, except in the case of urgent necessity and with the consent of the Commissioners, commence the work for a period of two months after having given the notice.

The National Monuments Amendment Act enacted in 2004 provides clarification in relation to the division of responsibilities between the Minister of Environment, Heritage and Local Government, Finance and Arts, Sports and Tourism together with the Commissioners of Public Works. The Minister of Environment, Heritage and Local Government will issue directions relating to archaeological works and will be advised by the National Monuments Section and the National Museum of Ireland. The Act gives discretion to the Minister of Environment, Heritage and Local Government to grant consent or issue directions in relation to road developments (Section 49 and 51) approved by An Bord Pleanála and/or in relation to the discovery of National Monuments.

14A. (1) The consent of the Minister under section 14 of this Act and any further consent or licence under any other provision of the National Monuments Acts 1930 to 2004 shall not be required where the works involved are connected with an approved road development.

14A. (2) Any works of an archaeological nature that are carried out in respect of an approved road development shall be carried out in accordance with the directions of the Minister, which directions shall be issued following consultation by the minister with the Director of the National Museum of Ireland.

Subsection 14A (4) Where a national monument has been discovered to which subsection (3) of this section relates, then the road authority carrying out the road development shall report the discovery to the Minister subject to subsection (7) of this section, and pending any directions by the Minister under paragraph (d) of this subsection, no works which would interfere with the monument shall be carried out, except works urgently required to secure its preservation carried out in accordance with such measures as may be specified by the Minister.

The Minister will consult with the Director of the National Museum of Ireland for a period not longer than 14 days before issuing further directions in relation to the national monument.

The Minister will not be restricted to archaeological considerations alone, but will also consider the wider public interest.

Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999

This Act provides for the establishment of a national inventory of architectural heritage and historic monuments.

Section 1 of the act defines “architectural heritage” as:

(a) all structures and buildings together with their settings and attendant grounds, fixtures and fittings,

(b) groups of such structures and buildings, and,

(c) sites

which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

Section 2 of the Act states that the Minister (for Arts, Heritage, Gaeltacht and the Islands) shall establish the NIAH, determining its form and content, defining the categories of architectural heritage, and specifying to which category each entry belongs. The information contained within the inventory will be made available to planning authorities, having regard to the security and privacy of both property and persons involved.

Section 3 of the Act states that the Minister may appoint officers, who may in turn request access to premises listed in the inventory from the occupiers of these buildings. The officer is required to inform the occupier of the building why entry is necessary, and in the event of a refusal, can apply for a warrant to enter the premises.

Section 4 of the Act states that obstruction of an officer or a refusal to comply with requirements of entry will result in the owner or occupier being guilty of an offence.

Section 5 of the Act states that sanitary authorities who carry out works on a monument covered by this Act will as far as possible preserve the monument with the proviso that its condition is not a danger to any person or property, and that the sanitation authority will inform the Minister that the works have been carried out.

The provisions in the Act are in addition to and not a substitution for provisions of the National Monument Act (1930–94), and the protection of monuments in the National Monuments Act is extended to the monuments covered by the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act (1999).

APPENDIX 4 COUNTY WICKLOW COUNTY DEVELOPMENT PLAN (2022-2028) – ARCHAEOLOGY AND ARCHITECTURAL HERITAGE OBJECTIVES

Archaeology Objectives

CPO 8.1 To secure the preservation of all archaeological monuments included in the Record of Monuments and Places as established under Section 12 of the National Monuments (Amendment) Act, 1994, and of sites, features and objects of archaeological interest generally. In the development management process, there will be a presumption of favour of preservation in-situ or, as a minimum, preservation by record. In securing such preservation the planning authority will have regard to the advice and recommendations of the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht.

CPO 8.2 No development in the vicinity of a feature included in the Record of Monuments & Places (RMP) or any other site of archaeological interest will be permitted which seriously detracts from the setting of the feature or which is seriously injurious to its cultural or educational value.

CPO 8.3 Any development that may, due to its size, location or nature, have implications for archaeological heritage (including both sites and areas of archaeological potential / significance as identified in Schedules 08.01 & 08.02 and Maps 8.01 & 8.02 of this plan) shall be subject to an archaeological assessment.

CPO 8.4 To require archaeological assessment for all developments with the potential to impact on the archaeological heritage of riverine, intertidal or sub tidal environments.

CPO 8.5 To facilitate public access to National Monuments in State or Local Authority care, as identified in Schedule 08.02 and Map 8.02 of this plan.

CPO 8.6 To protect the integrity of Baltinglass Hills archaeological landscape including identified monuments and their wider setting by resisting development that may adversely impact upon the significance and understanding of this important landscape.

CPO 8.7 To support the inscription of Glendalough to Ireland's tentative UNESCO World Heritage Site list and promote a conservation led approach to facilitating visitor access and enjoyment of this internationally significant landscape.

CPO 8.8 To protect and promote the characteristics of historic towns in County Wicklow identified as zones of archaeological potential in the Record of Monuments and Places (RMP), ensuring that cognisance is given in relevant development proposals to retaining existing street layout, historic building lines and traditional plot widths where these derive from medieval or earlier origins.

CPO 8.9 To protect and promote the conservation of historic burial grounds (those that are generally no longer in use but which may contain sites and features on the Record of Monuments and Places (RMP) and/or RPS) and support greater public access to these where possible.

Architectural Heritage Objectives

CPO 8.10 To protect, conserve and manage the built heritage of Wicklow and to encourage sensitive and sustainable development to ensure its preservation for future generations.

CPO 8.11 To support the work of the National Inventory of Architectural Heritage (NIAH) in collecting data relating to the architectural heritage, including the historic gardens and designed landscapes, of the County, and in the making of this information widely accessible to the public, and property owners.

CPO 8.12 To have regard to 'Architectural Heritage Protection: Guidelines for Planning Authorities' (Department of Arts, Heritage and the Gaeltacht, 2011) in the assessment of proposals affecting architectural heritage.

Record of Protected Structures Objectives

CPO 8.13 To ensure the protection of all structures, items and features contained in the Record of Protected Structures.

CPO 8.14 To positively consider proposals to alter or change the use of protected structures so as to render them viable for modern use, subject to architectural heritage assessment and to demonstration by a suitably qualified Conservation Architect / or other relevant expertise that the structure, character, appearance and setting will not be adversely affected and suitable design, materials and construction methods will be utilised.

CPO 8.15 All development works on or at the sites of protected structures, including any site works necessary, shall be carried out using best heritage practice for the protection and preservation of those aspects or features of the structures / site that render it worthy of protection.

CPO 8.16 To support the re-introduction of traditional features on protected structures where there is evidence that such features (e.g. window styles, finishes etc) previously existed.

CPO 8.17 To strongly resist the demolition of protected structures or features of special interest unless it can be demonstrated that exceptional circumstances exist. All such cases will be subject to full heritage impact assessment and mitigation.

Other Structures & Vernacular Architecture Objectives

CPO 8.18 To seek (through the development management process) the retention, conservation, appropriate repair and reuse of vernacular buildings and features such as traditional dwellings and outbuildings, historic shopfronts, thatched roofs and historic features such as stonewalls and milestones. The demolition of vernacular buildings will be discouraged.

CPO 8.19 Development proposals affecting vernacular buildings and structures will be required to submit a detailed, true measured survey, photographic records and written analysis as part of the planning application process.

CPO 8.20 Where an item or a structure (or any feature of a structure) is considered to be of heritage merit (where not identified in the RPS3), the Planning Authority reserves the right to refuse permission to remove or alter that structure / item, in the interests of the protection of the County's architectural heritage.

Architectural Conservation Area Objectives

CPO 8.21 Within Architectural Conservation Areas, all those buildings, spaces, archaeological sites, trees, street furniture, views and other aspects of the environment which form an essential part of their character, as set out in their character appraisals, shall be considered for protection. The repair and refurbishment of existing buildings within the ACA will be favoured over demolition/new build in so far as practicable.

CPO 8.22 The design of any development in Architectural Conservation Areas, including any changes of use of an existing building, should preserve and / or enhance the character and appearance of the Architectural Conservation Area as a whole. Schemes for the conservation and enhancement of the character and appearance of Architectural Conservation Areas will be promoted. In consideration of applications for new buildings, alterations and extensions affecting Architectural Conservation Areas, the following principles will apply:

- Proposals will only be considered where they positively enhance the character of the ACA.
- The siting of new buildings should, where appropriate retain the existing street building line.
- The mass of the new building should be in scale and harmony with the adjoining buildings, and the area as a whole, and the proportions of its parts should relate to each other, and to the adjoining buildings.
- Architectural details on buildings of high architectural value should be retained wherever possible. Original features, which are important to a building's character such as window type, materials, detailing, chimneys, entrances and boundary walls, both within and outside the architectural conservation area should be retained where possible.
- A high standard of shopfront design relating sympathetically to the character of the building and the surrounding area will be required.
- The materials used should be appropriate to the character of the area. Planning applications in ACAs should be in the form of detailed proposals, incorporating full elevational treatment and colours and materials to be used.
- Where modern architecture is proposed within an ACA, the application should provide details (drawings and/or written detail) on how the proposal contributes to, or does not detract from the attributes of the ACA. CPO 8.23 To consider the designation of further ACAs for towns and villages in County Wicklow, when preparing future local plans, and as deemed appropriate.

CPO 8.24 To establish, where it is considered appropriate, "Areas of Special Planning Control", if it is considered that all or part of an Architectural Conservation Area is of special importance to the civic life or the architectural, historical, cultural or social character of a town or village in which it is situated. 3 The National Inventory of Architectural Heritage can sometimes be utilised as a source of information with regard to the architectural value of any such items or structures.

Historical and Cultural Heritage Objectives

CPO 8.25 To protect and facilitate the conservation of structures, sites and objects which are part of the County's distinct local historical and cultural heritage, whether or not such structures, sites and objects are included on the RPS.

CPO 8.26 To facilitate access to and appreciation of areas of historical and cultural heritage, through the development of appropriate trails and heritage interpretation, in association with local stakeholders and site landowners, having regard to the public safety issues associated with such sites.

CPO 8.27 To facilitate future community initiatives to increase access to and appreciation of railway heritage, through preserving the routes of former lines free from development.

CPO 8.28 Any road or bridge improvement works along the Military Road shall be designed and constructed with due regard to the history and notable features of the road (in particular its original support structures, route and alignment), insofar as is possible and reasonable given the existing transport function of the road.

APPENDIX 5 DUN LAOGHAIRE RATHDOWN POLICIES IN THE COUNTY DEVELOPMENT PLAN IN RELATION TO CULTURAL HERITAGE (2022-2028)

Archaeological Heritage

Policy Objective HER1: Protection of Archaeological Heritage

It is a Policy Objective to protect archaeological sites, National Monuments (and their settings), which have been identified in the Record of Monuments and Places and, where feasible, appropriate and applicable to promote access to and signposting of such sites and monuments.

Policy Objective HER2: Protection of Archaeological Material in Situ

It is a Policy Objective to seek the preservation in situ (or where this is not possible or appropriate, as a minimum, preservation by record) of all archaeological monuments included in the Record of Monuments and Places, and of previously unknown sites, features and objects of archaeological interest that become revealed through development activity. In respect of decision making on development proposals affecting sites listed in the Record of Monuments and Places, the Council will have regard to the advice and/ or recommendations of the Department of Culture, Heritage and the Gaeltacht (DCHG).

Policy Objective HER3: Protection of Historic Towns
It is a Policy Objective to promote and protect the Historic Town of Dalkey as identified by the Department of Culture, Heritage and the Gaeltacht (DCHG) (consistent with RPO 9.27 of the RSES).

Policy Objective HER4: Carrickmines Castle Site

It is a Policy Objective to support the implementation of the (Archaeological) Conservation Plan for the Carrickmines Castle Site.

Policy Objective HER5: Historic Burial Grounds

It is a Policy Objective to protect historical and/or closed burial grounds within the County and encourage their maintenance in accordance with good conservation practice and to promote access to such sites where possible.

Policy Objective HER6: Underwater Archaeology

It is a Policy Objective for all developments, which have potential to impact on riverine, intertidal and sub-tidal environments to require an archaeological assessment prior to works being carried out.

Architectural Heritage

Policy Objective HER7: Record of Protected Structures

It is a Policy Objective to include those structures that are considered in the opinion of the Planning Authority to be of special architectural, historical, archaeological, artistic, cultural, scientific, technical or social interest in the Record of Protected Structures.

Policy Objective HER8: Work to Protected Structures
It is a Policy Objective to:

i. Protect structures included on the RPS from any works that would negatively impact their special character and appearance.

ii. Ensure that any development proposals to Protected Structures, their curtilage and setting shall have regard to the 'Architectural Heritage Protection Guidelines for Planning Authorities' published by the Department of the Arts, Heritage and the Gaeltacht.

iii. Ensure that all works are carried out under supervision of a qualified professional with specialised conservation expertise.

iv. Ensure that any development, modification, alteration, or extension affecting a Protected Structure and/or its setting is sensitively sited and designed, and is appropriate in terms of the proposed scale, mass, height, density, layout, and materials.

v. Ensure that the form and structural integrity of the Protected Structure is retained in any redevelopment and that the relationship between the Protected Structure and any complex of adjoining buildings, designed landscape features, or views and vistas from within the grounds of the structure are respected.

vi. Respect the special interest of the interior, including its plan form, hierarchy of spaces, architectural detail, fixtures and fittings and materials.

vii. Ensure that new and adapted uses are compatible with the character and special interest of the Protected Structure.

viii. Protect the curtilage of protected structures and to refuse planning permission for inappropriate development within the curtilage and attendant grounds that would adversely impact on the special character of the Protected Structure.

ix. Protect and retain important elements of built heritage including historic gardens, stone walls, entrance gates and piers and any other associated curtilage features.

x. Ensure historic landscapes and gardens associated with Protected Structures are protected from inappropriate development (consistent with NPO 17 of the NPF and RPO 9.30 of the RSES).

Policy Objective HER9: Protected Structures Applications and Documentation

It is a Policy Objective to require all planning applications relating to Protected Structures to contain the appropriate level of documentation in accordance with Article 23 (2) of the Planning Regulations and Chapter 6 and Appendix B of the 'Architectural Heritage Protection Guidelines for Planning Authorities', or any variation thereof.

Policy Objective HER10: Protected Structures and Building Regulations

It is a Policy Objective to protect the character and special interest of Protected Structures when considering or carrying out interventions to comply with the requirements of the Building Regulations - with particular reference to Part B and Part M.

Policy Objective HER11: Energy Efficiency of Protected Structures

It is a Policy Objective to have regard to the Department of Environment, Heritage and Local Government's publication on 'Energy Efficiency in Traditional Buildings' (2010) and the Irish Standard IS EN 16883:2017 'Conservation of Cultural Heritage - Guidelines for Improving the Energy Performance of Historic Buildings' (2017) and any future advisory documents in assessing proposed works on Protected Structures.

Policy Objective HER12: National Inventory of Architectural Heritage (NIAH)

It is a Policy Objective to review and update the RPS on foot of any Ministerial recommendations. The 'Ministerial Recommendations', made under Section 53 of the Planning Acts, will be taken into account when the Planning Authority is considering proposals for development that would affect the historic or architectural interest of these structures.

Policy Objective HER13: Architectural Conservation Areas

It is a Policy Objective to:

i. Protect the character and special interest of an area which has been designated as an Architectural Conservation Area (ACA).

ii. Ensure that all development proposals within an ACA be appropriate to the character of the area having regard to the Character Appraisals for each area.

iii. Ensure that any new development or alteration of a building within an ACA or immediately adjoining an ACA is appropriate in terms of the proposed design, including scale, height, mass, density, building lines and materials.

iv. Seek a high quality, sensitive design for any new development(s) that are complementary and/or sympathetic to their context and scale whilst simultaneously encouraging contemporary design which is in harmony with the area. Direction can also be taken from using traditional forms that are then expressed in a contemporary manner rather than a replica of a historic building style.

v. Ensure street furniture is kept to a minimum, is of good design and any redundant street furniture removed.

vi. Seek the retention of all features that contribute to the character of an ACA including boundary walls, railings, soft landscaping, traditional paving and street furniture.

Policy Objective HER14: Demolition within an ACA

It is a Policy Objective to prohibit the demolition of a structure(s) that positively contributes to the character of the ACA.

Policy Objective HER15: Shopfronts within an ACA
It is a Policy Objective to:

i. Ensure that all original and traditional shopfronts which contribute positively to the appearance and character of a streetscape within an ACA are retained and restored.

ii. Ensure that new shopfronts are well-designed, through the sympathetic use of scale, proportion and materials.

Policy Objective HER16: Public Realm and Public Utility works within an ACA
It is a Policy Objective to:

i. Retain or sensitively reintegrate any surviving items of historic street furniture and finishes such as granite kerbing and paving that contribute to the character of an ACA.

ii. Ensure that works to the public realm - such as the provision of traffic control measures, street furniture, materials and finishes - have regard to the distinctive character of the area.

iii. Encourage the undergrounding of overhead services and the removal of redundant wiring/cables within an ACA.

Policy Objective HER17: Candidate Architectural Conservation Areas
It is a Policy Objective to assess candidate Architectural Conservation Areas to determine if they meet the requirements and criteria for re-designation as Architectural Conservation Areas.

Policy Objective HER18: Development within a Candidate Architectural Conservation Area

It is a Policy Objective that development proposals within a candidate Architectural Conservation Area will be assessed having regard to the impact on the character of the area in which it is to be placed.

Policy Objective HER19: Protection of Buildings in Council Ownership
It is a Policy Objective to:

i. Continue to demonstrate best practice with regard to Protected Structures, Recorded Monuments and other elements of architectural heritage in the ownership and care of the Council.

ii. Ensure any works are undertaken having regard to the Department of Culture, Heritage and the Gaeltacht ‘Advice Series’ publications on how best to carry out repairs and maintain historic buildings and ensure the use of specialist practitioners in the field of conservation.

Policy Objective HER20: Buildings of Vernacular and Heritage Interest
It is a Policy Objective to:

i. Retain, where appropriate, and encourage the rehabilitation and suitable reuse of existing older buildings/structures/features which make a positive contribution to the character and appearance of the area and streetscape in preference to their demolition and redevelopment and to preserve surviving shop and pub fronts of special historical or architectural interest including signage and associated features.

ii. Encourage the retention and/or reinstatement of original fabric of our historic building stock such as windows, doors, roof coverings, shopfronts, pub fronts and other significant features. iii. Ensure that appropriate materials be used to carry out any repairs to the historic fabric.

Policy Objective HER21: Nineteenth and Twentieth Century Buildings, Estates and Features
It is a Policy Objective to:

i. Encourage the appropriate development of exemplar nineteenth and twentieth century buildings, and estates to ensure their character is not compromised.

ii. Encourage the retention and reinstatement of features that contribute to the character of exemplar nineteenth and twentieth century buildings, and estates such as roofscapes, boundary treatments and other features considered worthy of retention.

iii. Ensure the design of developments on lands located immediately adjacent to such groupings of buildings addresses the visual impact on any established setting.

Policy Objective HER22: Protection of Historic Street Furniture and Public Realm
It is a Policy Objective to:

i. Preserve the retention of historic items of street furniture where these contribute to the character of the area, including items of a vernacular or local significance.

ii. Promote high standards for design, materials and workmanship in public realm improvements within areas of historic character.

Policy Objective HER23: Industrial Heritage
It is a Policy Objective to:

i. Have regard to those items identified in the Industrial Heritage Survey when assessing any development proposals.

ii. Identify further sites of industrial heritage significance with a view to assessing them for inclusion in the Record of Protected Structures.

Policy Objective HER24: Protection of Coastline Heritage
It is a Policy Objective to:

i. Encourage and promote the retention of features of the County's coastal heritage where these contribute to the character of the area.

ii. Have regard to those items identified in the Coastal Architecture Heritage Survey when assessing any development proposals.

Policy Objective HER25: Heritage Plan

It is a Policy Objective to support the preparation and implementation of the third DLR County Heritage Plan 2021 – 2025.

Policy Objective HER26: Historic Demesnes and Gardens

It is a Policy Objective that historic demesnes and gardens should be identified and protected to reflect and acknowledge their significance as part of our National Heritage. The following houses and gardens are listed: Cabinteely House, Marlay House, Fernhill and Old Conna.

Policy Objective HER27: Civic Memorials

It is a Policy Objective that the Council will, at appropriate times and having due regard to resources and suitable subject matter, erect civic memorials in accordance with Part 1 of the Council's Memorials Policy adopted in 2011 in order to raise awareness of the County's history and heritage.

Policy Objective HER28: The Metals

It is a Policy Objective to manage and enhance The Metals from the Peoples Park to Dalkey giving due regard to its historic importance while continuing to facilitate and encourage its use as a walking and cycling route between Dún Laoghaire and Dalkey.

Appendix I

LVIA

LANDSCAPE AND VISUAL IMPACT ASSESSMENT

macroworks

Fassaroe Park
& Ride Facility

Co. Wicklow

LVIA Screening
Report

Registered
Landscape
Architect

March 2023

1 LANDSCAPE AND VISUAL SCREENING REPORT

1.1 INTRODUCTION

This Landscape and Visual Impact Assessment (LVIA) screening report has been prepared in respect of a planning application for a Park and Ride Facility in Fassaroe in County Wicklow. The LVIA screening report describes the landscape context of the proposed development and assesses the potential landscape and visual impacts of the scheme on the receiving environment.

Landscape Impact Assessment (LIA) relates to assessing effects of a development on the landscape as a resource in its own right and is concerned with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

Visual Impact Assessment (VIA) relates to assessing effects of a development on specific views and on the general visual amenity experienced by people. This deals with how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements. Visual impacts may occur from; Visual Obstruction (blocking of a view, be it full, partial or intermittent) or; Visual Intrusion (interruption of a view without blocking).

1.1.1 Statement of Authority

This Landscape and Visual Impact Assessment report was prepared by Macro Works Ltd; a landscape consultancy firm specialising in LVIA along with associated visibility mapping and photomontage graphics. Relevant experience includes LVIA work for a vast range of infrastructural, industrial and commercial projects since 1999.

1.1.2 Description of the Proposed Development

The proposed Park & Ride facility will consist of the following:

- A new car parking area capable of accommodating a total of 388 car parking spaces, including 26 no. mobility impaired parking spaces and 42 no. e-car charging spaces.
- New bus standing area with dedicated turning circle, 2 new bus bays and 2 passenger shelters.
- New set-down areas and taxi ranks with dedicated access.
- Hardstanding area for bike shelter and lockers.

1.2 LANDSCAPE AND VISUAL POLICY CONTEXT AND DESIGNATIONS

1.2.1 Wicklow County Development Plan (CDP) 2022-2028 – Landscape

A landscape character assessment is incorporated the current Wicklow County Development Plan, which divides the county into 6 no. landscape character units and a further 15 geographically specific landscape character areas. The proposed development at Fassaroe is contained in the landscape character unit ‘Urban Area’. In terms of landscape classification ‘Urban Areas’ *“have already been deemed suitable for development (of the type allowed by the settlement strategy and the development* *standards of this plan) and the impacts on the wider landscape of such development has already been deemed acceptable. Therefore it will not be necessary for developments in urban areas to have regard to the surrounding landscape classification or to carry out landscape or visual impact assessment."*

It is also worth noting that the proposed development is situated along the western extend of this urban area, which transitions to the 'Glencree/Glencullen – Area of Natural Beauty' to the southwest of the site and the 'Corridor Area East' to the south of the site.

Landscape sensitivity is addressed at a much finer scale than that of landscape units and Landscape Character Areas and is based more on specific landscape features, topography and land cover. The proposed development site is located in an area of contrasting sensitivity, with the northern portion of the site classified with a '*Low to Medium Sensitivity',* whilst the southern half of the site appears to be located in a '*Medium-High*' sensitivity classification*.* In the wider surrounds of the site, the landscape to the east is generally classified with a 'Low' sensitivity as it is principally characterised by highly urban land uses such as large-scale residential development, whereas to the south and west where the landscape transitions towards the 'Glencree/Glencullen Area of Natural Beauty', the sensitivity classifications range from 'Medium' to 'High' sensitivity.

Views and prospects in County Wicklow are set out in Tables 17.11 and 17.12 and on Maps 17.10 and 17.11 of the current Wicklow CDP. There are no views or prospects of special amenity value within the immediate vicinity of the site. The nearest designated views are located over 1.8km southwest of the site, whilst the nearest designated prospects are situated 2.5km southwest of the site. As a result of the heavily contained nature of the site and the distance from any scenic designations, it is not considered that the proposed development will result in significant visual impacts at surround scenic designations.

Natural Heritage 7 Biodiversity objectives outlined in section 17.4 of the current county development plan, some of which are relevant to the proposed development and have been considered as part of this screening report.

1.2.2 Bray Local Area Plan 2018

As per the current Bray Local Area Plan, the proposed development is located within the land use zoning E1 – Employments, which has a principal objective "*to provide for the development of enterprise and employment*". The LAP states that "*Uses generally appropriate for employment zoned land include general and light industry, office uses, enterprise units, appropriate warehousing, petrol filling stations (as deemed appropriate),* ***public transport depots****, open space, community facilities, utility installations and ancillary developments for employment and industry uses in accordance with the CDP.*

Thus, it is considered that the proposed Park and Ride facility is an appropriate land uses in within this land use zoning.

1.2.3 Dun Laoghaire Rathdown County Development Plan (CDP) 2022-2028 – Landscape Assessment

Although the proposed development is located within County Wicklow, the Dublin (Dun Laoghaire Rathdown district) county bounds is located a short distance north of the site, and therefore it is important to include relevant landscape designations.

Appendix 8 of the Dún Laoghaire-Rathdown County Development Plan ('DLRCDP') identifies that there are 14 Landscape Character Areas ('LCA') within the administrative area of Dún Laoghaire-Rathdown. The nearest and most relevant LCA in relation to the proposed development is LCA – 11 Ballyman, which is described as having a *"distinctively rural feel with an open landscape and agricultural fields generally larger than in the rest of the agricultural part of the County."*

1.3 EXISTING ENVIRONMENT

1.3.1 Landscape Baseline

The landscape baseline represents the existing landscape context and is the scenario against which any changes to the landscape brought about by the Development will be assessed. It is worth noting, however, that many of the landscape elements identified in the landscape baseline also relate to visual receptors i.e., places and transport routes from which viewers can potentially see the proposed development.

The proposed development is located immediately west of the M11/N11 in the townland of Fassaroe and sits at an elevation of c.31-37m AOD. The proposed development is situated in a small land parcel heavily enclosed by a belt of mature vegetation. The land holding forms part of Area Action Plan 1: Fassaroe, which is the location of a potentially major development on the outskirts of Bray. In terms of land uses, the proposed development is situated at the western periphery of the settlement of Bray, with much of the landscape to the east of the site heavily influenced by urban land uses such as large-scale residential development, major route corridors and commercial and retail developments. West of the M11/N11 and to the north, west and south of the site, the landscape begins to transition to a rural hinterland landscape and is principally dominated by pastoral farmland, areas of mature vegetation and dispersed rural settlements. The River Dargle is the principal watercourse in relation to the site and flows in a general northeast direction through the surrounding landscape just over c.250m east of the site at its nearest point. A small stream in a densely wooded valley also passes immediately north of the site.

Bray is the most notable settlement in relation to the proposed development, the outskirts of which are located immediately east of the site. A small cluster of residential development is also situated at Old Fassaroe immediately west of the site, whilst a cluster of detached residential dwellings is also located to the south of the site along Berrfield Lane and Fassaroe Avenue. As noted previously, the most notable major route in relation to the proposed development is the N11, which is situated immediately east of the site and acts as the principal area of transition between the more urban areas of Bray and the rural hinterland landscape further to the west. The R918 regional road is situated immediately south of the site, which merges with Fassaroe Avenue, providing the main access to the proposed development site.

The immediate landscape context is not highly synonymous with recreational amenity as it is heavily influenced by the N11/M11 major route corridor. Nonetheless, the wider landscape encompasses local walking trails, local sports pitches and golf clubs. The surrounding landscape also encompasses a dense web of crisscrossing local roads. The most notable aspect of amenity in the wider landscape principally relates to the coastline, which is situated over 2.5km east of the site, whilst the more elevated inland foothills of the Wicklow Mountains further inland to the west also encompass a notable sense of recreational amenity.

1.4 IMPACT POTENTIAL

1.4.1 PHYSICAL LANDSCAPE AND LANDSCAPE CHARACTER EFFECTS

The most notable physical impacts related to the proposed development are associated with regrading the site to facilitate the proposed park and ride facility, which will involve areas of cut and fill. Whilst every effort has been made to reduce the need for large areas of cut and fill, there will be some areas of soil stripping to accommodate the proposed access tracks, parking bays and footpaths. There will be physical disturbance of soil/subsoil to accommodate the foundations of the proposed structures, such as the proposed bus shelters, bicycle shelters, changing points and lighting poles. Overall, the physical impacts of the proposed development will be relatively modest as it is located in a brownfield site with an existing access from Fassaroe Avenue.

There will be construction stage landscape impacts relating to the excavation of materials, temporary storage of such materials and other building materials, and the occasional movement of construction machinery. However, such construction stage impacts will be temporary in duration and will cease once the facility is complete. Furthermore, the movement of HGVs along the surrounding road network is not uncommon, as an existing waste management facility is located immediately west of the proposed development. There will be some minor vegetation removal at the existing site entrance to achieve the proposed sightlines. Nonetheless, this will principally involve the removal of low ground cover and small shrub plantings. All vegetation removed will be replaced with low-growing shrubs and perennial plantings of native stock.

In terms of impacts on the character of the receiving landscape, this is strongly diluted by the heavily contained nature of the site, which will only potentially ever be visible from the access along Fassaroe Avenue to the south of the site. There will also be an increase in road traffic along the surrounding road network, however, this will not be out of character within this landscape context that is heavily influenced by an existing major route corridor. Even if briefly viewed from the immediate surrounding landscape, the proposed development represents the intensification of major route infrastructure, which is the primary influence on the landscape in the immediate surrounds of the site. Furthermore, the proposed development achieves the land use zoning of the site and will not appear out of place in this hinterland context. Overall, the proposed development is considered relatively modest in terms of its scale and nature, is discretely located and is a characteristic addition to the landscape in the immediate surrounds of the site.

1.4.2 VISUAL AMENITY EFFECTS

With regard to the potential visual impact of the proposed development, this is heavily diminished by the heavily contained nature of the site, which will be considerably screened by a belt of mature vegetation that occurs in the immediate site's surroundings. This will also be further enhanced by a comprehensive landscape strategy, which includes further areas of hedgerow planting and understorey planting along the perimeter of the site. Appendix B includes a booklet of outline montages, which encompasses three viewpoints from some of the nearest receptors to the site representing various viewing distances, angles and receptor types.

Viewpoint One represents receptors to the east of the site, which includes the N11/M11 corridor, the small business park and surrounding residential receptors. The will be no potential for views of the proposed development here due to the high degree of dense mature vegetation that occurs along the western verge of the major route corridor, combined with other areas of mature vegetation located within the surrounding local landscape context.

Viewpoint Two represents one of the only potential views afforded of the proposed development. Nonetheless, this view represents a brief and fleeting view afforded from a small section of Fassaroe Avenue (L1521 local road). There is potential to afford a brief view of the proposed development from adjacent to the site access; however, even from this near distance, the proposed development will be heavily screened by a combination of the terrain and surrounding vegetation in this uphill view. Furthermore, it is worth noting that no residential receptors are located along this road. Thus, the fleeting views only have the potential to be afforded by passing road users. Even if briefly viewed from here, the proposed development will have little consequence on the visual amenity of this local landscape context, which is heavily influenced by the existing M11/N11 major route corridor.

Viewpoint Three is located at the nearest residential cluster to the proposed development, along a steeply sloping section of the L5521 local road to the west of the site. Whilst some brief views of the more distant landscape have the potential to be afforded from some of the rear upper-floor windows of the dwellings to the east of the local road, there is limited potential to afford clear views of the proposed development site. Furthermore, once the proposed landscaping within and around the site's perimeter has fully established, this will further limit the potential for visibility of the proposed development. At most, there will potentially be brief views from the rear windows of the 1st floors of these dwellings of lighting poles and some of the taller built structures within the proposed development site.

Overall, the proposed development is located in a heavily contained site and will barely be visible from its surrounding immediate landscape context. Even if briefly viewed from the nearest local roads, the proposed development will have little notable influence on the visual amenity of the surrounding landscape due to the scale and nature of the development in this robust context that is heavily influenced by existing major route corridors.

1.5 CONCLUSION

The proposed park and ride facility is considered an appropriately site development that will only have a very modest physical impact on the receiving landscape. Impacts on the local landscape character will also be diminished by the heavily contained nature of the site, which is currently influenced by an array of anthropogenic land uses such as existing major route infrastructure, residential development and a waste management facility. In terms of visual impacts, there will be limited potential to get any clear views of the site due to the surrounding mature vegetation that encloses the site, combined with the additional proposed landscaping measures. Thus, it is considered that in this robust and heavily modified landscape context, the significance of landscape and visual impacts will be no greater than Slight, and in the majority of cases, the significance of visual impact is likely to be Imperceptible.

APPENDIX A – LVIA ASSESSMENT METHODOLOGY

1.5.1 Assessment Methodology

Production of this LVIA screening report involved:

- A desktop study to establish an appropriate study area, relevant landscape and visual designations in the Wicklow and Dun County Development Plan as well as other sensitive visual receptors. This stage culminates in the selection of a set of potential viewpoints from which to study the effects of the proposal;
- Fieldwork to establish the landscape character of the receiving environment and to confirm and refine the set of viewpoints to be used for the visual assessment stage;
- Assessment of the significance of the landscape impact of the development as a function of landscape sensitivity weighed against the magnitude of the landscape impact; and
- Assessment of the significance of the visual impact of the development as a function of visual receptor sensitivity weighed against the magnitude of the visual impact. This aspect of the assessment is supported by photomontages prepared in respect of the selected viewpoints.
- Incorporation of mitigation measures to reduce potential impacts and estimation of residual impacts once mitigation has become established.

1.5.1.1 Landscape Impact Assessment Criteria

When assessing the potential impacts on the landscape resulting from a proposed development, the following criteria are considered:

- Landscape character, value and sensitivity;
- Magnitude of likely impacts; and
- Significance of landscape effects

The sensitivity of the landscape to change is the degree to which a particular landscape receptor (Landscape Character Area (LCA) or feature) can accommodate changes or new elements without unacceptable detrimental effects to its essential characteristics. Landscape Value and Sensitivity is classified using the following criteria set out in **Table 0.1.**

Table 0.1 Landscape Value and Sensitivity

Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an international or national level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level (Area of Outstanding Natural Beauty), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes, which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use.

Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically, this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include, enhancement, repair and restoration.
Negligible	Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the proposed development. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the Site boundary that may have an effect on the landscape character of the area. **Table 0.2** refers.

Table 0.2 Magnitude of Landscape Impacts

Magnitude of Impact	Description
Very High	Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an extensive change of the landscape in terms of character, value and quality.
High	Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to a considerable change of the landscape in terms of character, value and quality.
Medium	Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to noticeable changes in landscape character, and quality.
Low	Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements that would lead to discernible changes in landscape character, and quality.
Negligible	Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable leading to no material change to landscape character, and quality.

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the following matrix set out in **Table 0.3**.

Table 0.3 Impact Significance Matrix

	Sensitivity of Receptor				
Scale/Magnitude	*Very High*	*High*	*Medium*	*Low*	*Negligible*
Very High	Profound	Profound-substantial	Substantial	Moderate	Slight
High	Profound-substantial	Substantial	Substantial-moderate	Moderate-slight	Slight-imperceptible
Medium	Substantial	Substantial-moderate	Moderate	Slight	Imperceptible
Low	Moderate	Moderate-slight	Slight	Slight-imperceptible	Imperceptible
Negligible	Slight	Slight-imperceptible	Imperceptible	Imperceptible	Imperceptible

Note: The significance matrix provides an indicative framework from which the significance of impact is derived. The significance judgement is ultimately determined by the assessor using professional judgement. Due to nuances within the constituent sensitivity and magnitude judgements, this may be up to one category higher or lower than indicated by the matrix. Judgements indicated in orange are considered to be 'significant impacts' in EIA terms.

1.5.1.2 Visual Impact Assessment Criteria

As with the landscape impact, the visual impact of the proposed development will be assessed as a function of sensitivity versus magnitude. In this instance, the sensitivity of the visual receptor, weighed against the magnitude of the visual effect.

1.5.1.3 Sensitivity of Visual Receptors

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity they are engaged in and whether this heightens their awareness of the surrounding landscape. A list of the factors considered by the assessor in estimating the level of sensitivity for a particular visual receptor is outlined below and used in Error! Reference source not found. below to establish visual receptor sensitivity at each VRP:

1.5.1.3.1 Susceptibility of Receptors

In accordance with the Institute of Environmental Management and Assessment ("IEMA") Guidelines for Landscape and Visual Assessment (3rd edition 2013) visual receptors most susceptible to changes in views and visual amenity are:

- *"Residents at home;*
- *People, whether residents or visitors, who are engaged in outdoor recreation, including use of public rights of way, whose attention or interest is likely to be focussed on the landscape and on particular views;*
- *Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience;*

- *Communities where views contribute to the landscape setting enjoyed by residents in the area; and*
- *Travellers on road, rail or other transport routes where such travel involves recognised scenic routes and awareness of views is likely to be heightened*".

Visual receptors that are less susceptible to changes in views and visual amenity include;

- "*People engaged in outdoor sport or recreation, which does not involve or depend upon appreciation of views of the landscape; and*
- *People at their place of work whose attention may be focussed on their work or activity, not their surroundings and where the setting is not important to the quality of working life*".

1.5.1.3.2 Values Associated with Views

1. **Recognised scenic value of the view** (County Development Plan designations, guidebooks, touring maps, postcards etc). These represent a consensus in terms of which scenic views and routes within an area are strongly valued by the population because in the case of County Developments Plans, for example, a public consultation process is required;
2. **Views from within highly sensitive landscape areas**. Again, highly sensitive landscape designations are usually part of a county's Landscape Character Assessment, which is then incorporated within the County Development Plan and is therefore subject to the public consultation process. Viewers within such areas are likely to be highly attuned to the landscape around them;
3. **Primary views from dwellings**. A proposed development might be seen from anywhere within a particular residential property with varying degrees of sensitivity. Therefore, this category is reserved for those instances in which the design of dwellings or housing estates, has been influenced by the desire to take in a particular view. This might involve the use of a slope or the specific orientation of a house and/or its internal social rooms and exterior spaces;
4. **Intensity of use, popularity**. This relates to the number of viewers likely to experience a view on a regular basis and whether this is significant at county or regional scale;
5. **Connection with the landscape**. This considers whether or not receptors are likely to be highly attuned to views of the landscape i.e. commuters hurriedly driving on busy national route versus hill walkers directly engaged with the landscape enjoying changing sequential views over it;

6. **Provision of elevated panoramic views**. This relates to the extent of the view on offer and the tendency for receptors to become more attuned to the surrounding landscape at locations that afford broad vistas;
7. **Sense of remoteness and/or tranquillity.** Receptors taking in a remote and tranquil scene, which is likely to be fairly static, are likely to be more receptive to changes in the view than those taking in the view of a busy street scene, for example;
8. **Degree of perceived naturalness**. Where a view is valued for the sense of naturalness of the surrounding landscape it is likely to be highly sensitive to visual intrusion by distinctly manmade features;
9. **Presence of striking or noteworthy features.** A view might be strongly valued because it contains a distinctive and memorable landscape feature such as a promontory headland, lough or castle;
10. **Historical, cultural and / or spiritual significance.** Such attributes may be evident or sensed by receptors at certain viewing locations, which may attract visitors for the purposes of contemplation or reflection heightening the sense of their surroundings;
11. **Rarity or uniqueness of the view**. This might include the noteworthy representativeness of a certain landscape type and considers whether the receptor could take in similar views anywhere in the broader region or the country;
12. **Integrity of the landscape character**. This looks at the condition and intactness of the landscape in view and whether the landscape pattern is a regular one of few strongly related components or an irregular one containing a variety of disparate components;
13. **Sense of place**. This considers whether there is special sense of wholeness and harmony at the viewing location; and
14. **Sense of awe**. This considers whether the view inspires an overwhelming sense of scale or the power of nature.

Those locations which are deemed to satisfy many of the above criteria are likely to be of higher sensitivity. No relative importance is inferred by the order of listing in the Error! Reference source not found.. Overall sensitivity may be a result of a number of these factors or, alternatively, a strong association with one or two in particular.

1.5.1.4 Visual Impact Magnitude

The magnitude of visual effects is determined on the basis of two factors; the visual presence (relative visual dominance) of the proposal and its effect on visual amenity.

Visual presence is a somewhat quantitative measure relating to how noticeable or visually dominant the proposal is within a particular view. This is based on a number of aspects, aside from scale in relation to distance. Some of these aspects include the extent and complexity of the view, as well as the degree of existing contextual movement experienced. The backdrop against which the development is presented and its relationship with other focal points or prominent features within the view is also considered. Visual presence is essentially a measure of the relative visual dominance of the proposal within the available vista and is often, though not always, expressed as one of the following terms:

- Minimal;
- Sub-dominant;
- Co-dominant;
- Dominant;
- Highly dominant.

The magnitude of visual impacts is classified in **Table 0.4**.

Table 0.4 Magnitude of Visual Impact

Criteria	Description
Very High	The proposal obstructs or intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. An extensive degree of visual change will occur within the scene completely altering its character, composition and associated visual amenity
High	The proposal obstructs or intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual change will occur within the scene substantially altering its character, composition and associated visual amenity
Medium	The proposal represents a moderate intrusion into the available vista and is a readily noticeable element. A noticeable degree of visual change will occur within the scene perceptibly altering its character, composition and associated visual amenity
Low	The proposal intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene
Negligible	The proposal would be barely discernible within the available vista and/or it would not influence the visual amenity of the scene

1.5.1.5 Visual Impact Significance

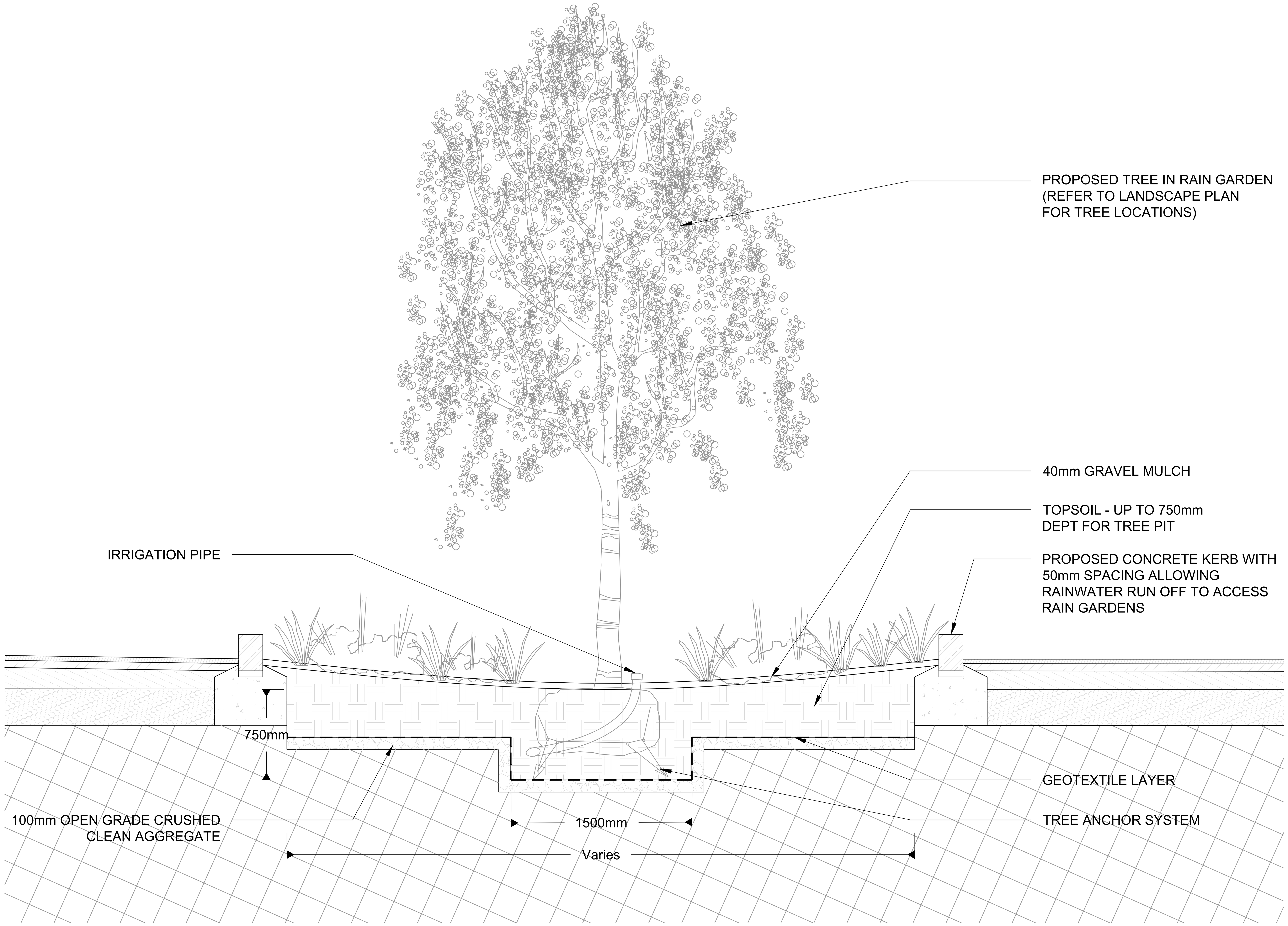
As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the same significance matrix and applies the same EPA definitions of significance as used earlier in respect of landscape impacts (**Table 0.3** refers).

1.5.1.6 Quality and Timescale of Effects

In addition to assessing the significance of landscape effects and visual effects, EPA Guidance for EIAs requires that the quality of the effects is also determined. This could be negative/adverse, neutral, or positive/beneficial. In the case of new energy / infrastructure developments within rural and semi-rural settings, the landscape and visual change brought about by an increased scale and intensity of built form is seldom considered to be positive / beneficial.

Landscape and Visual effects are also categorised according to their duration:

- Temporary – Lasting for one year or less;
- Short Term – Lasting one to seven years;
- Medium Term – Lasting seven to fifteen years;
- Long Term – Lasting fifteen years to sixty years; and
- Permanent – Lasting over sixty years.



TREE PIT IN RAIN GARDEN @ 1:20

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A1

Tionscadal Éireann
Project Ireland
2040

P+R

WICKLOW
CILL MHANTÁIN
ENDLESS OPPORTUNITIES
DEISEANNA SÍORAÍ

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Clifton Scannell Emerson Associates

macroworks

Registered Landscape Architect

Rev	Description	Drawn	Checked	Date
P02	ISSUED FOR PLANNING	SM	RB	10/08/23

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Client: WICKLOW COUNTY COUNCIL

Project: FASSAROE PARK AND RIDE FACILITY

Dwg. Title: PROPOSED LANDSCAPING DETAILS

Drawn By: CD
Date: JULY 2023
Checked By: RB
Scale: AS INDICATED @ A1
CSEA Job No.: 20_008N

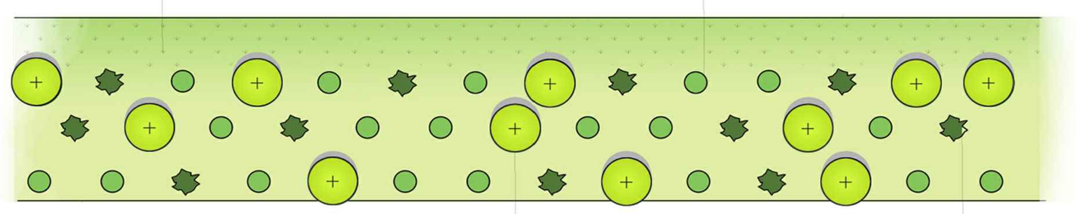
Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
20_008N	CSE	GEN	XX	DR	C	3801

20_008N - CSE - GEN - XX - DR - C - 3801

Status Code: S2
Suitability Description: PART VIII APPROVAL

Revision: P02
Project Status: FOR PLANNING

PROPOSED NATIVE HEDGEROW:



Typical section of proposed hedgerow (at implementation)

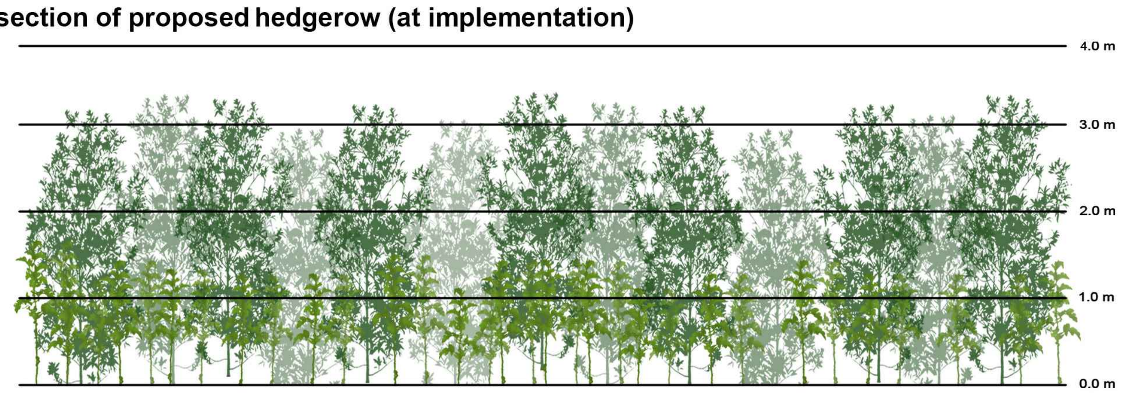


Figure LMP1 - Typical section of proposed mitigation screen planting of advanced nursery stock.

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A1

Tionscadal Éireann
Project Ireland 2040

P+R

WICKLOW CILL MHANTÁIN
ENDLESS OPPORTUNITIES
DEISEANNA SÍORAÍ

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Clifton Scannell Emerson Associates

macroworks

Registered Landscape Architect

LEGEND:

- EXISTING BOUNDARY VEGETATION RETAINED
- WOODLAND EDGE PLANTING MIX
- PROPOSED TREES
- PROPOSED NATIVE HEDGEROW
- PROPOSED RAIN GARDENS BETWEEN PARKING BAYS AND ADJACENT TO ROAD CARRIAGEWAYS
- PROPOSED POLLINATOR FRIENDLY ORNAMENTAL SHRUB AND PERENNIAL PLANTING MIX
- POLLINATOR FRIENDLY WILDFLOWER MEADOW
- SPECIES RICH GRASS MIX
- SITE BOUNDARY

Rev	Description	Drawn	Checked	Date
P02	ISSUED FOR PLANNING	CD	RB	10/08/23

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Client: WICKLOW COUNTY COUNCIL

Project: FASSAROE PARK AND RIDE FACILITY

Dwg. Title: PROPOSED LANDSCAPING PLAN

Drawn By: CD
Date: JULY 2023
Checked By: RB
Scale: 1:500 @ A1
CSEA Job No.: 20_008N

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
20_008N	CSE	GEN	XX	DR	C	3800

Status Code: S2
Suitability Description: PART VIII APPROVAL

Revision: P02
Project Status: FOR PLANNING

PROPOSED PLANTING:

PROPOSED TREES:

10	**AGrh**	*Amelanchier x grandiflora 'Robin Hill'*	*16-18 cm gr.*
10	**AG**	*Alnus glutinosa*	*16-18 cm gr.*
23	**BP**	*Betula pendula*	*16-18 cm gr.*
26	**CMs**	*Crataegus monogyna 'stricta'*	*16-18 cm gr.*
20	**SA**	*Sorbus acuparia*	*16-18 cm gr.*

POLLINATOR FRIENDLY PLANTING MIX (816 sqm):

Planted in drifts of 5, 7 or 9 plants at 5 plants per m2

Aster 'Asran'
Calamagrostis 'Karl Forester'
Geranium 'Cambridge'
Hebe wiri cloud
Ilex sp.
Lavandula sp.
Nepeta 'Walkers Low'
Rosmarinus officanale
Rudbeckia 'Goldstrum'
Sedum 'Autumn Joy'
Stachys 'Byzantia'
Stipa arundinacea
Trachelospermum Jasminoides
Viburnum tinus

RAIN GARDEN PLANTING MIX (1835 sqm) :

Planted in drifts of 5, 7 or 9 plants at 3 plants per m2

Allium spp.
Aster spp.
Bergenia spp.
Carex pendula
Cornus sanguinea
Dryopteris felix-mas
Helleborus foetidus
Iris pseudocorus
Miscanthis sinensis
Panicum virgatum
Rudbeckia spp.
Viburnum opulus

WOODLAND EDGE PLANTING (608 sqm) :

Prunus Padus	*90-120cm*
Corylus avellana	*90-120cm*
Ilex aquifolium	*90-120cm*
Prunus spinosa	*40-60cm*
Rosa-canina	*40-60cm*
Euonymus europaeus	*40-60cm*

NATIVE HEDGEROW (53 lin meters) :

Crateagus monogyna	*90-120cm*
Prunus spinosa	*90-120cm*
Ilex aquifolium	*90-120cm*
Viburnum opulus	*60-90cm*
Corylus avellana	*60-90cm*
Rosa canina	*60-90cm*
Euonymus europaeus	*60-90cm*

POLLINATOR FRIENDLY WILDFLOWER SEEDING (1151 sqm):

Birdsfoot Trefoil, Black Meddick, Cowslip, Devil's Bit Scabious, Meadow Buttercup, Field Scabious, Hemp Agrimony, Kidney Vetch, Lady's Bedstraw, Lady's Ann lace, Lesser Knapweed, Meadowsweet, Mullein, Ox-eye Daisy, Purple Loosestrife, Ragged Robin, Red Campion, Red Clover, Ribwort Plantain, Rough Hawksbit, Sorrel, St Johnswort, Wild Angelica, Wild Carrot, Yarrow. Yellow Agrimony, Yellow Rattle, Teasel and more. Also includes 35% annuals: Corn Marigold, Corn Poppy, Corncockle, Cornflower, Scented Mayweed,

DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A1

Tionscadal Éireann
Project Ireland
2040

P+R

WICKLOW
CILL MHANTÁIN
ENDLESS OPPORTUNITIES
DEISEANNA SÍORAÍ

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Clifton Scannell Emerson Associates

macroworks

Registered Landscape Architect

Rev	Description	Drawn	Checked	Date
P01	ISSUED FOR PLANNING	CD	RB	10/08/23

Clifton Scannell Emerson Associates

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Client: WICKLOW COUNTY COUNCIL

Project: FASSAROE PARK AND RIDE FACILITY

Dwg. Title: PROPOSED PLANTING PLAN

Drawn By: CD
Date: JULY 2023
Checked By: RB
Scale: 1:500 @ A1
CSEA Job No.: 20_008N

Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
20_008N	CSE	GEN	XX	DR	C	3802

Status Code: S2
Suitability Description: PART VIII APPROVAL

Revision: P01
Project Status: FOR PLANNING