BELCAMP SHD – SUSTAINABLE TRANSPORT STRATEGY

SYSTRA

BELCAMP SHD

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1. INTRODUCTION

1.1.1 SYSTRA Ltd. (SYSTRA) has been appointed by Gerard Gannon Properties (the Client) to provide transport input to proposals related to the Belcamp Strategic Housing Development (SHD) and development of a site-wide Sustainable Transport Strategy (STS). In order to develop the principles and suggested measures for the STS, SYSTRA has undertaken strategic transport modelling and analysis using information gathered from desktop research, previous studies and planning applications, and data extracted from the National Transport Authority's (NTA) Eastern Regional Model (ERM). The Sustainable Transport Strategy is intended to support and inform the Transport Assessment (TA) which will ultimately be prepared and submitted in support of an SHD application for the Belcamp Development Area. The TA, and all other work related to transport matters, is being undertaken by Waterman Moylan Consulting Engineers.

1.1.2 Belcamp is an 87 hectare development site (formerly Belcamp College) at Belcamp, Dublin 17. The site is bounded by the R139 to the south and extends into Fingal to the north, with access onto the Malahide Road. The zoned Belcamp lands have a potential development capacity of over 3,000 dwellings, in addition to associated mixed-uses.

1.1.3 The location of the Belcamp SHD site in relation to Greater Dublin is shown below in red in **Figure 1**. It is noted that the Site falls within the boundaries of Dublin City Council (DCC) and Fingal County Council.

Figure 1. General Location of Site

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1.1.4 It has been recognised from an early stage of the development that the successful delivery of the site requires a comprehensive approach toward transport which seeks to maximise opportunities to encourage sustainable mode choices, and reduce both use of and reliance on the private car. By using strategic modelling tools and techniques, it is possible to both understand the types of trips which residents will wish to make, and how their choices of mode will be influenced by the availability of public transport services, the quality and extent of pedestrian and cycle infrastructure, and conditions on both local road networks and those serving the greater Dublin area.

1.1.5 It should be noted that the assessments contained within this report have been carried out for the express purpose of developing the STS principles and measures; they are not intended to be representative of a "final" Belcamp SHD, although every effort has been made to ensure consistency with the proposals at the time of the corresponding modelling taking place.

1.1.6 Whilst some additional amendments to the scheme design (including the introduction of a bus gate to facilitate the N8 bus route, and improvements to cycle connectivity) have been undertaken which are not directly represented in the transport modelling work, these improvements will result in more sustainable transport infrastructure and should result in a further increase toward active and sustainable travel throughout the whole life of the development.

1.1.7 Following this introduction, the remainder of the document is structured as follows:

- Section 2 presents the results of the baseline transport information gathering exercise, including details of planned future transport upgrades;
- Section 3 sets out a series of trip generation exercises for the proposed development which have been used to refine the representation of the Belcamp SHD site within the subsequent ERM modelling;
- Section 4 details the assumptions which have been made with regards to the setup and use of the ERM (Bus Connects) models;
- Section 5 presents a summary of relevant results from the 2028 "Do Minimum" models which are used to represent a base position prior to development at the site, represented by the 2028 "With Development" and 2040 "With Development" models;
- Section 6 contains further analysis of outputs and data from the 2028 "With Development" and 2040 "With Development" models;
- Section 7 applies the findings from the previous exercises to define principles of the STS and a series of specific proposed measures to be integrated into the wider Belcamp Transport Strategy; and
- Section 8 presents a summary and conclusions of the study.

2. BASELINE AND ANTICIPATED FUTURE TRANSPORT INFORMATION

2.1 Overview

2.1.1 This section summarises the existing public transport infrastructure and facilities across the Belcamp SHD site and in the vicinity. Information is then summarised for expected future transport network improvements, including Bus Connects and the Metro proposals.

2.2 Existing Road Network

2.2.1 Certain parts of the existing road network play a central role in facilitating the provision of current on-street public transport services; these are outlined below to provide context to the existing public transport infrastructure and service patterns.

Northern Cross Extension (R139)

2.2.2 The Northern Cross Extension (R139) is an orbital route running on an east-west alignment along the southern edge of the Site and reflecting the current northern edge of the Dublin urban area. The route connects to the M1 and M50 via a grade separated roundabout junction approximately 2.5km to the west of the Site, as well as Clongriffin to the east.

2.2.3 The section of the Northern Cross Extension in the vicinity of the Site consists of a two-lane carriageway in both directions separated by white hatching markings. Footways are present on both sides of the carriageway. The road is subject to a 60kph speed limit.

2.2.4 The Northern Cross Extension connects to Malahide Road (R107) at a signalised junction to the south east of the Site.

Malahide Road (R107)

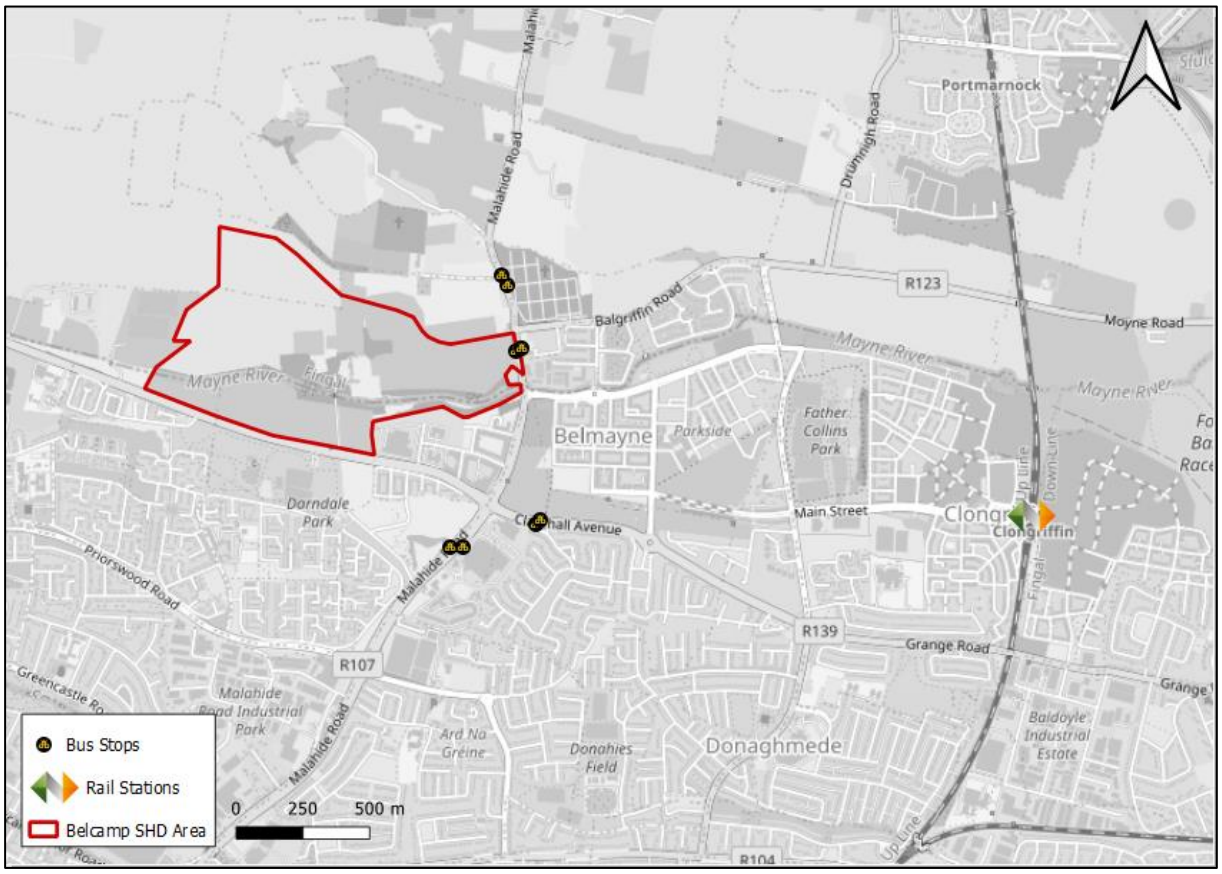
2.2.5 Malahide Road (R107) is a radial route running on a north-south alignment along the eastern edge of the Site. The route links the Site to the Clare Hall Shopping Centre and Central Dublin to the south and Malahide to the north.

2.2.6 The section of Malahide Road to the south of the signalised junction with the Northern Cross Extension consists of three lanes in both directions. One lane for each direction is dedicated as a bus lane with painted cycle lanes included. Footways are present on both sides of the carriageway. The road is subject to a 60kph speed limit.

2.3 Public Transport Services

2.3.1 A summary map of existing bus and rail infrastructure in the vicinity of the Site is presented in **Figure 2**. It is noted that the Belcamp Development Area includes Phase 1 which is currently under construction.

Figure 2. Local Bus and Rail Infrastructure



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Bus Services

2.3.2 Bus services are provided by Dublin Bus, with multiple stops located along Malahide Road and Clare Hall Avenue, to the north, east and south of the Malahide Road/Clare Hall Avenue signalised junction.

2.3.3 A summary of bus services calling at stops in the vicinity of the Site is shown in **Table 1**.

Table 1. Bus Routes currently operating in the vicinity of the Site

BUS ROUTE	DESTINATIONS SERVED
15	Clongriffin – Ballycullen Road
27	Clare Hall - Jobstown
27X	Clare Hall – UCD Belfield
42	Talbot Street - Portmarnock
43	Talbot Street – Swords Business Park

2.3.4 The service frequencies of the above routes are listed in **Table 2** below.

Table 2. Bus Service Frequencies

LOCATION	SERVICE	WEEKDAY MAX FREQUENCY PER HR	WEEKEND MAX FREQUENCY PER HR
Malahide Road / Balgriffin Cottages	42	3	3
	43	3	2
Malahide Road / Fingal Cemetery	42	3	3
	43	3	2
Clare Hall Avenue / Temple View Rise	15	8	4
	27	6	6
	27X	1	0
Clare Hall	42	3	3
	43	3	2

LOCATION	SERVICE	WEEKDAY MAX FREQUENCY PER HR	WEEKEND MAX FREQUENCY PER HR
	15	8	4
	27	6	6
	27X	1	0

2.3.5 Routes 42 and 43 provide up to six services an hour running north-south on Malahide Road at the eastern edge of the Site and onwards into central Dublin. Bus stops are located on Malahide Road, at Balgriffin Cottages and Fingal Cemetery.

2.3.6 Routes 15, 27 and 27X provide a further 15 services an hour routing to/from the east on Clare Hall Avenue and using Malahide Road to route to/from the south and Central Dublin. Bus stops are located on Clare Hall Avenue at Temple View Rise, approximately 800m east of the Site, and on Malahide Road at Clare Hall Shopping Centre, approximately 800m south east of the Site.

2.3.7 It is noted that, at the time of writing, it is expected that a new Bus Connects service will be commencing imminently along the Malahide Road, which will improve accessibility between the Belcamp area and Dublin City Centre. (This service, along with other committed future service increases, are reflected in the ERM modelling which is described later in this report). In addition, agreement in principle has been reached with the NTA which will allow Route N8 to pass through the centre of the site and dates for the implementation of the new "D" routes are also in the process of being fixed.

Rail Services

2.3.8 The nearest station to the Site is Clongriffin, located approximately 2.5km to the east of the Site. Clongriffin is located on the DART northern route, with a 20-minute journey time to Connolly Station in Central Dublin. Rail services are provided by Iarnród Éireann and connect Clongriffin to Malahide and Portmarnock to the north, as well as Bray Daly and Greystones to the south, via Central Dublin.

2.3.9 Dublin Bus Route 15 provides a direct connection between the Site and Clongriffin Station, with a maximum weekday frequency of eight services per hour.

2.3.10 The frequencies of rail services available from Clongriffin Station are listed in **Table 3** below.

Table 3. Rail Service Frequencies

STATION	DIRECTION	WEEKDAY MAX FREQUENCY PER HR	WEEKEND MAX FREQUENCY PER HR
Clongriffin	NB	3	3
	SB	4	3

2.3.11 Up to four southbound services per hour call at Clongriffin and provide a link to Central Dublin.

2.4 Future Transport Schemes

Bus Connects

2.4.1 Bus Connects is the National Transport Authority (NTA)'s programme to greatly improve bus services in Irish cities. It is a key part of the Government's policy to improve public transport and address climate change in Dublin and other cities across Ireland. Bus Connects Dublin includes the Network Redesign and the Core Bus Corridors.

2.4.2 The Site will be served by Corridor 1 which encompasses the Clongriffin – City Centre route. This route commences at Clongriffin Station and routes via a new east-west link currently under construction to a new junction with Malahide Road, located approximately 200m to the north of the signalised junction with Clare Hall Avenue. Bus services will then route south on Malahide Road towards the city centre.

2.4.3 Three core "spine" routes and one additional "local" route will serve the Site, listed in **Table 4** below. In addition, the NTA has agreed in principle to route the key orbital service N8 via the site, which connects Clongriffin with Clarehall / Belcamp, Dublin Airport and on to Blanchardstown.

Table 4. Bus Connects Future Services

BUS ROUTE	DESTINATIONS SERVED	MAX SERVICES PER HOUR
D1	Clongriffin – Crumlin	2
D2	Clongriffin South – Tallaght	6
D3	Clongriffin - Clondalkin	6
N8	Clongriffin – Clarehall – Belcamp – Dublin Airport - Blanchardstown	2
280 (Local)	Portrane – Swords – Clongriffin - DCU	3

2.4.4 Up to 19 services per hour in one direction will call either within or in close proximity to the Site when the Bus Connects scheme is fully implemented, currently anticipated to take place in 2028.

2.4.5 Access between Malahide Road and the new east-west link towards Clongriffin Station will be restricted to buses, taxis and cycles only in order to encourage sustainable means of travel.

2.4.6 As part of this scheme, the Malahide Road / Clare Hall Avenue signalised junction will be upgraded to provide bus priority measures and enhanced pedestrian and cycle infrastructure facilities.

DART+ Programme

2.4.7 The Dublin Area Rapid Transit system (DART) is an electrified railway network serving the Greater Dublin area and outlying towns. Clongriffin Station is part of the network on the northern route.

2.4.8 The DART+ Programme aims to modernise and improve existing rail services across Greater Dublin, providing a more frequent and reliable rail service, improving capacity on rail corridors serving Dublin.

2.4.9 As part of this scheme, new frequent electrified services between Drogheda and Dublin City Centre via Clongriffin are planned. Increases to service frequencies have not been confirmed at time of writing, however it is anticipated that significant additional capacity

for trips into and through the City Centre will be provided. New rolling stock will also be purchased.

2.4.10 The non-tunnelled elements of the DART+ Programme, including the northern route, are expected to be operational by 2028 with the full programme complete by 2043. New rolling stock is expected to come into service by late 2022.

MetroLink

2.4.11 MetroLink is a proposed high-capacity, high-frequency rail line running from Swords to Charlemont. The scheme will connect to Dublin Airport, as well as Irish Rail, DART, Dublin Bus and Luas services, link key destinations including Ballymun, the Mater Hospital, the Rotunda Hospital, Dublin City University and Trinity College Dublin and create a fully integrated public transport in the Greater Dublin Area.

2.4.12 The nearest stations to the Site would be Dardistown (although this station is proposed to come forward after the scheme is operational), Dublin Airport and Northwood.

2.4.13 The scheme would shorten travel times between the airport and city centre to 20 minutes, providing up to 40 trains per hour in each direction, equating to one service every 90 seconds on average.

2.4.14 Although initially forecast to be operational by 2027, the MetroLink scheme is currently assumed to open between 2028 and 2043.

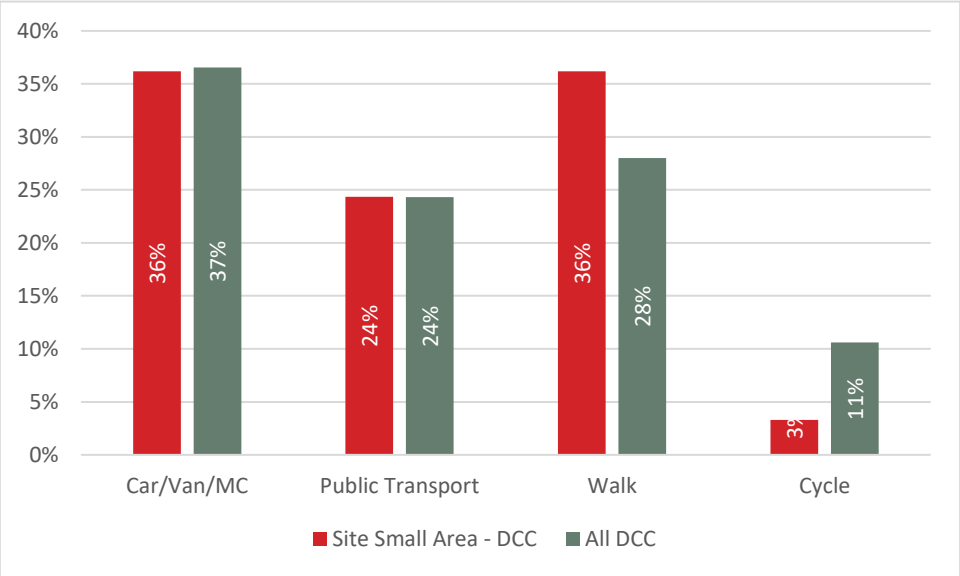
2.5 Mode Share Data: Existing Travel Patterns – Mode Splits

2.5.1 As part of the baseline exercises, information has been gathered on the travel behaviour of the existing population of the locality. This is considered necessary to predict the likely travel patterns of future residents at the Site and identify existing constraints which may impact upon the sustainability of future development.

2.5.2 Using the Small Area Population Statistics (SAPS) from the 2016 Census data, the commuting to work and education mode shares for DCC were analysed. It is noted that the Site partially falls within the boundary of FCC, however the corresponding Small Area covers predominantly rural land and it was therefore considered that the DCC Small Area would be more representative of the Site's future potential mode share.

2.5.3 **Figure 3** compares the commuting mode share for Small Area 268119010, covering the part of the Site falling within the DCC boundary, and for all Small Areas within DCC.

Figure 3. DCC and Local Commuting Mode Shares



2.5.4 It can be seen that the car (and other private motorised vehicle) and public transport commuting mode share are broadly similar for the Small Area and the wider DCC urban area.

2.5.5 It is noted that the public transport mode share is higher than expected for an outer suburban area, which can be explained by multiple bus routes serving the area and combining to provide a high frequency of services.

2.5.6 The cycling mode share for the local area is relatively low at 3% when compared to the DCC share of 11%. It is considered that one reason for this may be existing connectivity issues, which the proposed development will seek to address.

2.6 Car Ownership

2.6.1 Household car ownership data from the 2016 Census was analysed to determine potential levels of car use in the local area.

2.6.2 The number of households with access to one or more cars were broadly similar for the DCC Small Area encompassing the Site, at 62% and for all small areas within the DCC boundary, at 64%.

2.6.3 The observed levels of car ownership are consistent with known patterns of traffic within the greater Dublin area, and contribute to observed issues in many locations with existing congestion.

2.6.4 The next section of the report presents the results of a series of trip generation exercises carried out to support the ERM modelling.

3. TRIP GENERATION EXERCISES

3.1 Overview

3.1.1 The ERM models contain a number of "standard" trip rates to represent different types of development. Whilst this is appropriate for general representation of existing development or sites which have yet to be brought forward as part of the planning process, it is good practice to review these rates where more details of a proposed development are known. SYSTRA has therefore used information from the Belcamp SHD proposals to calculate site-specific trip rates for the purposes of the STS study; these have then been compared against the ERM trip rates to confirm that they remain suitable to represent the proposed development.

3.1.2 It should be noted that these trip rates are intended to represent the site for the purposes of the STS study only.

3.2 Existing Applications

3.2.1 To provide an initial comparison for potential trip rates, SYSTRA has taken note of all significant recent permissions in the vicinity, especially those associated with the South Fingal Transport Study Growth Areas. Two of these applications included a Transport Assessment and associated trip rates.

3.2.2 The Transport Assessment for South Portmarnock Phase 1C dates from October 2019 and was approved in January 2020. The document lists the person trip rates applied, with a blanket 65% mode share applied to calculate the number of vehicle trips, derived from the general TRICS mode share. The person and vehicle trip rates as well as the number of trips of each type generated by the residential element of this development are shown in **Table 5**.

Table 5. South Portmarnock Phase 1C TA Trip Rates

	AM PEAK			PM PEAK		
	ARRIVALS	DEPARTURES	TWO-WAY	ARRIVALS	DEPARTURES	TWO-WAY
Person Trip Rates	0.124	0.359	0.484	0.314	0.170	0.484
Vehicle Trip Rates	0.081	0.234	0.314	0.204	0.110	0.314

3.3 TRICS Analysis

3.3.1 SYSTRA has generated an initial set of trip rates using TRICS version 7.7.4 to conduct a comparison with those used for South Portmarnock Phase 1C, with the following criteria selected:

- Sites located within the Republic of Ireland;
- Sites categorised as Suburban or Edge of Town; and
- Maximum Parking ratio of 1.5 spaces per dwelling.

3.3.2 This selection criteria returned two sites, located within the urban areas of Dublin and Galway respectively. These trip rates are shown in **Table 6**.

Table 6. TRICS Trip Rates, Max Parking Ratio of 1.5

	AM PEAK			PM PEAK		
	ARRIVALS	DEPARTURES	TWO-WAY	ARRIVALS	DEPARTURES	TWO-WAY
Person Trip Rates	0.040	0.667	0.707	0.477	0.293	0.770
Vehicle Trip Rates	0.029	0.305	0.334	0.282	0.092	0.374

3.3.3 It can be seen that the TRICS trip rates are generally higher than those used for the South Portmarnock Phase 1C TA.

3.3.4 SYSTRA has subsequently conducted an additional TRICS analysis removing the maximum parking ratio. This selection criteria returned an additional two sites in south Dublin. These trip rates are shown in **Table 7**.

Table 7. TRICS Trip Rates, No Max Parking Ratio

	AM PEAK			PM PEAK		
	ARRIVALS	DEPARTURES	TWO-WAY	ARRIVALS	DEPARTURES	TWO-WAY
Person Trip Rates	0.091	0.606	0.697	0.415	0.241	0.656
Vehicle Trip Rates	0.033	0.261	0.294	0.245	0.083	0.328

3.3.5 It can be seen that the TRICS vehicle trip rates for sites with no maximum parking ratio are lower than those for sites with a maximum parking ratio of 1.5; it is considered that this is a result of the wider site pool available for the “unrestricted” parking test and the wider characteristics of the identified sites (see below). The unrestricted parking ratio trip rates are also noted to be closer to those used for the South Portmarnock Phase 1C TA.

This should not however be taken to mean that the provision of increased car parking provision has no effect on the number of car-based trips; rather, it provides evidence that higher car parking provision does not automatically result in proportionately higher numbers of car-based trips to and from a development.

3.4 Influence of Public Transport

3.4.1 It is noted that the additional two TRICS sites are located within walking distance to stations on the DART line serving the coastal suburbs of south Dublin. It is considered that this partially reflects the situation of the Belcamp SHD Site, being located in relatively close proximity to Clongriffin station which is connected to the centre of Dublin by DART services.

3.4.2 The proximity of public transport connections to the additional two TRICS sites somewhat explains the lower than anticipated vehicle trip rates for the sites with no maximum parking ratio (when compared to the sites with a restricted parking ratio) and suggests that proximity to public transport connections may have a greater influence overall on vehicle trip rates arising from sites of this type than the number of parking spaces provided.

3.4.3 Therefore. enhancing public transport connections to and from the Site through schemes such as Bus Connects route extensions, a dedicated link to Clongriffin station and the DART+ programme in addition to the provision of active transport links could consequently form the basis of the emerging Public Transport Strategy for the Belcamp SHD site and help to a build case for a reduced set of vehicle trip rates which would be manually adjusted from the TRICS data.

3.5 Anticipated Trip Generation (TRICS)

3.5.1 For reference, the number of person and vehicle trips anticipated to be generated for an indicative Phase 1 (1,000 dwellings) and the full build-out (3,700 dwellings) of the Belcamp SHD using the set of trip rates for sites with no maximum parking ratio (outlined in **Table 7**) are shown in **Table 8** below. Note that 1,000 occupied units was taken as an indicative figure to assess the impact of initial occupation, but Phase 1 of the proposed SHD actually includes 1,504 residential units. The full build-out figure was conservatively assumed to be as high as 3,700 dwellings, though in fact the subject SHD includes 2,527 residential units, while all other Phases (applied for under separate planning submissions) include a total of 408 dwellings, for a cumulative total of 2,935 dwellings on the fully built-out lands.

Table 8. Phase 1 and Full Build-Out Generated Trips – Using TRICS Trip Rates with no Maximum Parking Ratio

	AM PEAK			PM PEAK		
	ARRIVALS	DEPARTURES	TWO-WAY	ARRIVALS	DEPARTURES	TWO-WAY
Person Trips – Phase 1	91	606	697	415	241	656
Vehicle Trips – Phase 1	33	261	294	245	83	328
Person Trips – Full Build Out	337	2,242	2,579	1,536	892	2,427
Vehicle Trips – Full Build Out	122	966	1,088	907	307	1,214

3.5.2 It is noted that the modelling undertaken for the purposes of this report is intended to inform the design process; the figures within the final TA report may diverge slightly due to later amendments to the design, but the data and outputs are still considered to be suitable for use in connection with the work around phasing and build-out of the development.

3.5.3 These trip rates have been taken forward and used to inform the preparation of the custom ERM model runs; section 4 explains the modelling process and assumptions in further detail.

4. MODELLING INPUTS AND ASSUMPTIONS

4.1 Introduction

4.1.1 In seeking to develop a Sustainable Transport Strategy for the Belcamp SHD site, SYSTRA has made use of the existing ERM models as a basis for understanding and assessing expected future travel demands associated with the site.

4.1.2 The Belcamp site is located in close proximity to the Bus Connects network which is being developed and implemented to provide coverage of a significant part of the Dublin area. This work is well advanced and SYSTRA has therefore taken the existing 2028 ERM model which includes the elements of the Bus Connects system expected to be in place in that year as the starting point for the modelling exercises.

4.1.3 It is recognised that using these models means that it is necessary to assess the proposed development at an intermediate stage of its projected build-out; through discussion with the client and project team, we have assumed an indicative phase-in of 1,000 dwellings[1] by this date. As this assessment is intended to explore the feasibility of an STS and measures to be included within it, it is considered that this is an appropriate assumption to make and allows for the expected impacts of the development to be assessed against a "do minimum" position which is known to be an accurate representation of the network as it is expected to operate in 2028. It is also then possible to use the NTA's 2040 model, which includes the further transport improvements set out in Section 2, as an indicative test of the eventual full build-out of the site.

4.1.4 The models which SYSTRA have prepared for the analysis within this report are therefore as follows:

- 2028 "Do Minimum" – the 2028 ERM prepared to support and develop the Bus Connects scheme, with the relevant elements of those works present in the model, but excluding any development or new infrastructure at the site;
- 2028 "With Development" – a customised version of the 2028 "Do Minimum" model, which includes representation of 1000 new dwellings at the Belcamp site and is broadly considered to be representative of Phase 1 of the Belcamp SHD proposals, including an upgraded version of the existing access to the Malahide Road and a new access on to the R139; and
- 2040 "With Development" – the 2040 model which includes the full Bus Connects scheme, Dart+ and Metro schemes, the full East-West Link Road, and all main internal roads within the site coded as links.

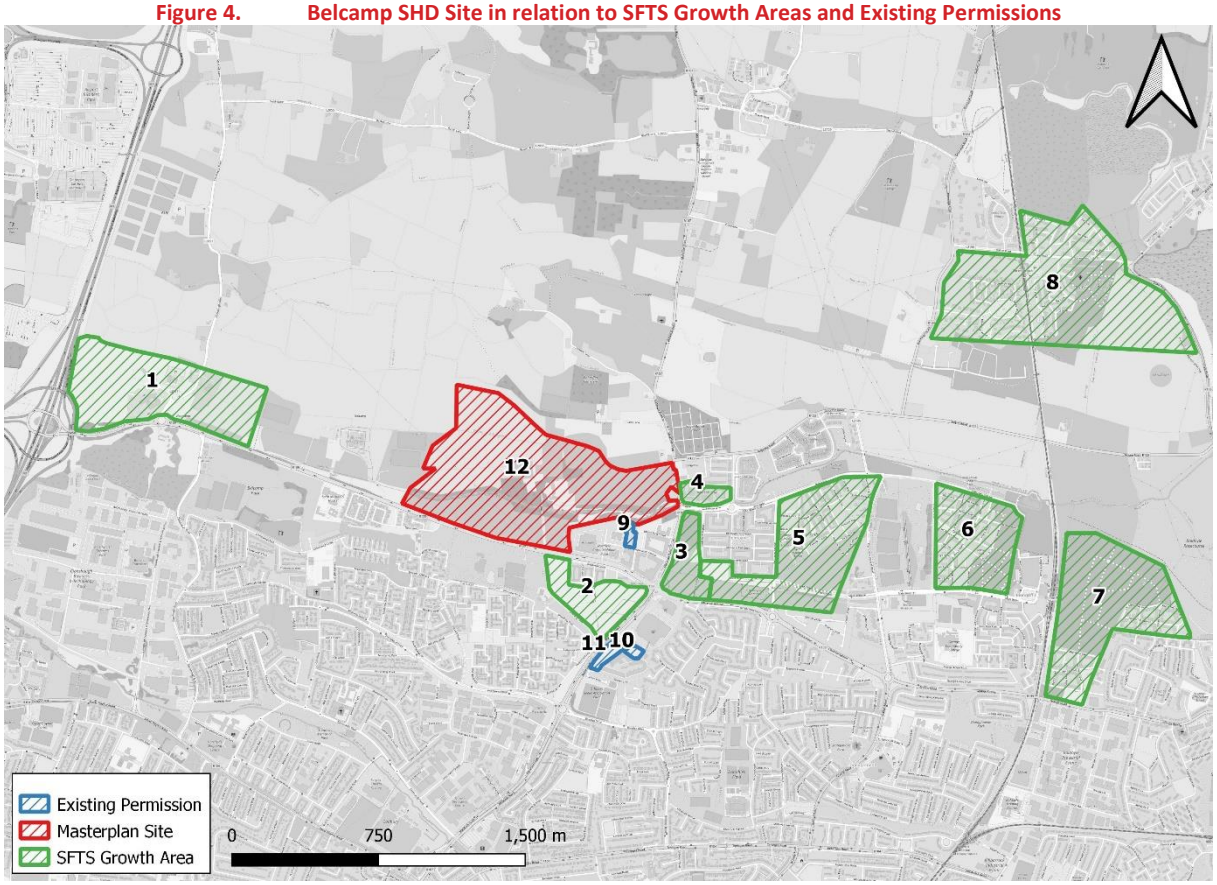
4.1.5 As part of the preparation for the modelling exercises, SYSTRA has reviewed a series of assumptions within the existing 2028 mode in relation to consented and planned development within the areas of Fingal and Dublin City which are relevant to the strategic modelling exercises. This information has been used in turn in order to inform the assumptions made regarding these developments during the modelling of the road and public transport networks around and within the Belcamp SHD Site.

[1] Out of the eventual maximum of 2,527 dwellings noted at time of undertaking the modelling.

4.2 Planning Data Analysis

4.2.1 SYSTRA has analysed the South Fingal Transport Study and taken note of all Growth Areas in the South Fingal/North Dublin Fringe area; where sites are expected to be built out over an extended period, a figure of 30% of the total anticipated number of dwellings has been assumed to be completed by 2028. In addition, local sites of significance with recent permissions in the vicinity of the Belcamp SHD site were taken into account, shown in **Figure 4** below.

Figure 4. Belcamp SHD Site in relation to SFTS Growth Areas and Existing Permissions



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4.2.2 Details of these sites and the corresponding assumed development to be delivered in the period to 2028 are summarised in **Table 9**.

Table 9. SFTS Growth Areas and Local Existing Permissions (to 2028)

SITE ID	NAME	CATEGORY	NO. DWELLINGS/ JOBS - 2028	NO. DWELLINGS/ JOBS - 2040
1	Clonshaugh	SFTS Growth Area	500 jobs	500 jobs
2	DCC Lands	SFTS Growth Area	255 dwellings	850 dwellings
3		SFTS Growth Area		
4	Balgriffin	SFTS Growth Area	75 dwellings	250 dwellings
5	Belmayne	SFTS Growth Area	360 dwellings	1,200 dwellings
6	Clongriffin	SFTS Growth Area	420 dwellings	1,400 dwellings
7	Baldoyle	SFTS Growth Area	405 dwellings	1,350 dwellings
8	South Portmarnock	SFTS Growth Area	435 dwellings	1,450 dwellings
9	Northern Cross	Existing permission	191 dwellings	191 dwellings
10	Clare Hall	Existing permission	123 dwellings	123 dwellings
11	Newtown, Malahide Road	Existing permission	331 dwellings	331 dwellings
12	Belcamp	SHD Site	1,000 dwellings	2,546 dwellings, 21 jobs, 400 pupils

4.2.3 The table above represents the expected development in the period to 2028. Beyond this (i.e. between 2028 and 2040), it is expected that the remainder of the Belcamp SHD site will be completed, providing an additional 1,546 dwellings, and that the remaining 70% of development at sites 2 to 8 will be delivered, amounting to 4,550 additional dwelling in that period.

4.2.4 It is noted that, in relation to site 1 (Clonshaugh), whilst the South Fingal Study included 8,500 jobs, subsequent to this study being completed there have been refusals in relation to the significant applications made for employment uses, and it is not currently considered that this number of jobs could be provided in this area for the foreseeable future, the number of jobs has been reduced to 500.

4.2.5 The figures make allowance for job creation associated with a number of recent permissions granted for hotel development and some other minor job growth.

4.2.6 It is noted that the Applicant has been in contact with the developer of the High Technology lands immediately to the west of the subject Belcamp Lands and it is understood that development of these lands is being actively considered; if this were to occur there would be additional provision of local employment opportunities which could further enhance the viability of proposed bus services to the area overall and reduce the need to travel by car by providing more local employment opportunities.

4.2.7 For further context, a preliminary analysis of recent planning applications within the SFTS Growth Areas is included in **Table 10** below. It is noted that at the time of writing, this list represents the level of development currently known to be permitted across the Growth Areas.

Table 10. SFTS Growth Area Recent Planning Application Details

SITE	DETAILS
Clonshaugh	• Recent permissions (2015 onwards) for several airport hotels • Refused application for 3x 5 storey office blocks in 2016/17 (F16A/0397) • Historic refusal for works associated with 120 acre Fingal Business and Manufacturing Park in 2001 (F97A/0788) • The area is identified as a High Technology Zone, aiming to provide for office, research and development and high technology/high technology manufacturing type employment, but no other relevant planning applications found
South Portmarnock	• F13A/0248 : 102 no. house dwellings. - approved 2014 – Potentially lapsed if not yet started. • SHD002/17: 150 no. units (52 no. duplex / apartments and 98 no. houses) – approved 26 Mar 2018. • F14A/0132: 700 no dwelling houses, 556 parking spaces, approved via appeal in 2015 • F20A/0222: 28 no. residential houses, 35 parking spaces, refused in 2020 • SHD/012/19: Portmarnock South Phase 1c. 153 no. units, 3 no. retail/café/restaurant units, 315 no. car parking spaces, approved Jan 2020. Phase 1a of the development (101 units) completed and fully occupied, phase 1b (150 houses) under construction.

SITE	DETAILS
	Total number of dwellings with consent within this area: 1032 (101 completed units excluded)
Balgriffin	Development area appears to have been built out recently. Relevant planning applications are: • F07A/0394/E1 original app (2007, extended in 2013) for 184 No. dwelling • F14A/0363 (2014): Block A1: 34 Apartments, A2: 31 apartments, A3: 13 apartments. • Block B: 33 units • Blocks D and E originally permitted under Reg. Ref. F07A/0394, extended by F07A/0394/E1 and previously amended by Reg. Refs. F14A/0190 and F14A/0363 on a 3.075 ha site - around 130 flats permitted. **Total number of dwellings with consent within this area: 207**
DCC Lands	• 3977/17: (2018) – 13 houses permitted • 2670/14 (2015) – 19 units permitted **Total number of dwellings with consent within this area: 32**
Belmayne	• 2941/14 (2014) - Parkside Development Lands, Former Balgriffin Park Lands - 166 units permitted. Construction commenced • 3791/18 (2019) 96 units permitted relating to above project permitted • 2296/16 (2016) 48 units permitted relating to above project permitted • 2679/16 (2016) 94 units relating to above project permitted • 3486/17 (2018) 89 units relating to above project permitted **Total number of dwellings with consent within this area: 493**
Clongriffin	• The development of Clongriffin commenced in 2002 and is expected to complete in 2025. Overall development to comprise 4220 dwelling units. By June 2019, 40% of residential units have been completed • 2852/20 (2021) – 129 bed nursing home permitted • 3894/19 (2020) - Lands at Clongriffin plots 3, 13 and 15. 420 units permitted **Total number of dwellings with consent within this area: 420**
Baldoyle	The two following applications are currently over five years old, with no apparent extension applications, so these are assumed either to have commenced and are under construction or the approvals have subsequently lapsed.

SITE	DETAILS
	• F03A/1162/E3 (2014) - Phase 2 of approved Baldoyle action plan community granted extension. 478 resi units. • F06A/0671 (2007) – Phase 3 of above. 482 units. **Total number of dwellings with consent within this area: 960**

4.2.8 The collated data from these exercises has been used to update the assumed population and employment forecasts within the 2028 and 2040 models.

4.3 Other Modelling Assumptions

4.3.1 In addition to confirming and updating the population and employment assumptions for the model zones, additional assumptions have been applied in relation to the representation of the Belcamp SHD site itself within the 2028 "With Development" and 2040 models, as follows:

- The site itself lies across two zones within the model. Using the Belcamp SHD proposals as a guide, dwellings have been assigned proportionately to these zones.
- In the 2028 "With Development" model, the site access points which are intended to be available at the completion of Phase 1 have been modelled, with connectors provided from the corresponding zones. These have been arranged so that trips originating in either zone can "choose" which access point to use; this has been done to represent the fact that the site will in reality operate in this manner.
- The length of the connections from the zones to the existing road network have been arranged to be broadly representative of a "centre point" of the Phase 1 area. This is intended to ensure that when the model is calculating and assigning trips by active modes that the distance to be travelled within the site is neither too long or too short (and thus not biased toward or against those modes relative to vehicular-based travel).
- The 2040 models have the full connecting road network from the Belcamp SHD proposals (including all access points) represented as road links.

4.3.2 A summary of these additional assumptions is shown below in **Table 11**. It is noted that, in addition, discussions with the NTA have led to an in-principle decision to bring route N8 through the site (as discussed in previous sections); this is not reflected in the modelling assumptions but would be expected to have further positive effects on public transport use.

Table 11. Summary of Modelling Assumptions

Scheme / Developments	2028 Do Min	2028 With Dev	2040 With Dev
Belcamp SHD	**0**	1,000	2,546
Bus Connects Corridors	✓	✓	✓
R107 Clarehall Relief Road	**X**	✓	✓
East-West Link Road	**X**	**X**	✓
New Bus Line from Airport to Clogriffin Station	**X**	**X**	✓

5. MODEL OUTPUTS AND FINDINGS

5.1 Overview

5.1.1 The 2028 "Do Minimum" model runs have been conducted to serve as a basis for comparison with the 2028 "With Development" and 2040 "With Development" models. To inform this process, a series of junctions within the vicinity of the site have been analysed in terms of their operational performance.

5.1.2 The analysis presented within this section of the report has been carried out in order to provide an understanding of how network congestion and delays would be likely to affect mode choice and journey times for residents of the proposed development, so that this can be reflected in the subsequent identification of sustainable transport measures for inclusion within the wider strategy.

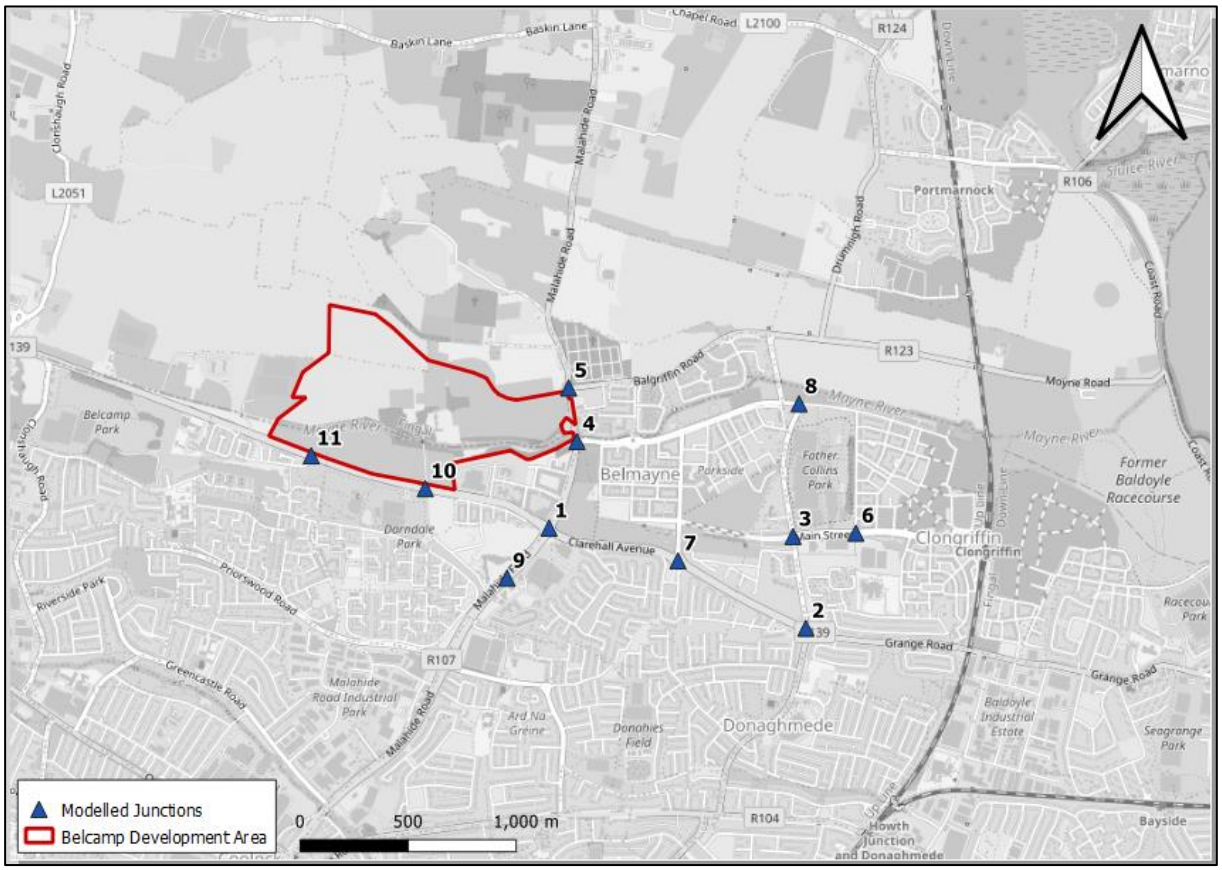
5.1.3 Eleven junctions were selected for the initial analysis, based on a brief desktop assessment of the local road network in the vicinity of the Belcamp SHD site. The junctions modelled are listed in **Table 12** and the locations are shown in **Figure 5** below. It should be noted that junctions 10 and 11 are included in the 2028 and 2040 "With Development" scenarios only.

Table 12. Modelled Junctions

ID	JUNCTION
1	Clarehall Avenue / Malahide Road
2	Clarehall Avenue / Hole in the Wall Road
3	Hole in the Wall Road / Main Street
4	Malahide Road / Belmayne
5	Malahide Road / Balgriffin Road
6	Main Street / Park Avenue
7	Clarehall Avenue / Belmayne Avenue Roundabout
8	Hole in the Wall Road / Belmayne / Marsfield Avenue

ID	JUNCTION
9	Malahide Road / Clarehall Access
10	Northern Cross Extension / Belcamp Lane / Southern Belcamp Access – East
11	Northern Cross Extension / Southern Belcamp Access – West

Figure 5. Modelled Junction Locations



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5.1.4 Outputs were obtained both the AM (08:00 to 09:00) and PM (17:00 – 18:00) peak periods, in order to determine when the surrounding road network is at its busiest.

5.1.5 For the purposes of this section, junction arms are labelled as per which direction facing. For example – an arm labelled as "North" faces north and contains southbound traffic to the junction.

5.1.6 As noted in Section 4, AM and PM models have been prepared to represent a 2028 future year with the addition of 1,000 dwellings at the Belcamp site. It is noted that subsequent

to this modelling being undertaken, the actual number of dwellings within Phase 1 was confirmed to be up to 872 dwellings. As such, whilst the actual number of trips associated with Phase 1 will be slightly lower than suggested by the model exercises, it is considered that the mode splits and trip origins and destinations remain a good representation of how the development would operate.

5.1.7 As noted in Section 4, AM and PM models have been prepared to represent a 2040 future year. This model includes the full Bus Connects, Dart+ and Metro schemes, the full East-West Link Road, and all main internal roads within the site coded as links.

5.2 Junction 1: Northern Cross Extension / Malahide Road

5.2.1 The Northern Cross Extension / Malahide Road junction is a major signalised junction in close proximity to the south east corner of the Belcamp SHD site. The junction is formed of the intersection of Northern Cross Extension (R139), which roughly bounds the northern edge of the Dublin urban area, and Malahide Road (R107), a key radial route linking the centre of Dublin with areas to the northeast.

5.2.2 The junction is signalised, with pedestrian crossings present on each arm. Segregated left turn lanes are provided on all arms.

2028 "Do Minimum" Outputs

5.2.3 Key outputs relating to this junction are shown in **Table 13** and **Table 14** below, for the 2028 "Do Minimum" AM and PM peak periods respectively.

Table 13. Northern Cross Extension / Malahide Road, 2028 "Do Minimum" AM Peak Model Outputs

ARM	MAX V/C	DELAY (S)
Malahide Road North	>1.00	5-10 mins
Northern Cross Extension East	>1.00	5-10 mins
Malahide Road South	>1.00	1-5 mins
Northern Cross Extension West	0.90 - 1.00	1-5 mins

Table 14. Northern Cross Extension / Malahide Road, 2028 "Do Minimum" PM Peak Model Outputs

ARM	MAX V/C	DELAY (S)
Malahide Road North	>1.00	5-10 mins
Northern Cross Extension East	>1.00	5-10 mins
Malahide Road South	>1.00	5-10 mins
Northern Cross Extension West	>1.00	1-5 mins

5.2.4 It can be seen that the junction operates over capacity in both peak periods, across nearly all arms.

5.2.5 The Northern Cross Extension East arm is the most congested arm in the AM peak period, recording a V/C ratio of 1.23 and a delay of over nine minutes. The opposite Northern Cross Extension East and the Malahide Road South arms are the most congested arms in the PM peak period, both recording a V/C ratio of 1.17 and a delays of over seven and eight minutes respectively.

2028 "With Development" Outputs

5.2.6 When compared with the 2028 "Do Minimum" outputs, a general increase in flow is observed across the junction during the AM peak period, most prominently on the west to north and north to south movements. A general decrease in flow is observed during the PM peak period, most prominently on the west to north, south to north and north to south movements. A prominent increase was observed on the south to west movement.

5.2.7 Key outputs relating to this junction are shown in **Table 15** and **Table 16** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 15. Northern Cross Extension / Malahide Road, 2028 "With Development" AM Peak Model Outputs

ARM	MAX V/C	DELAY (S)
Malahide Road North	>1.00	5-10 mins
Northern Cross Extension East	>1.00	>10 mins
Malahide Road South	>1.00	1-5 mins
Northern Cross Extension West	0.90 - 1.00	1-5 mins

Table 16. Northern Cross Extension / Malahide Road, 2028 "With Development" PM Peak Model Outputs

ARM	MAX V/C	DELAY (S)
Malahide Road North	>1.00	1-5 mins
Northern Cross Extension East	>1.00	5-10 mins
Malahide Road South	>1.00	1-5 mins
Northern Cross Extension West	>1.00	1-5 mins

5.2.8 It can be seen that the junction operates over capacity in both peak periods, across all arms.

5.2.9 The Northern Cross Extension East arm is the most congested arm in the AM peak period, recording a V/C ratio of 1.27 and a delay of over ten minutes. The same arm is the most congested arm in the PM peak period, recording a V/C ratio of 1.08 and a delay of over five minutes.

2040 "With Development" Outputs

5.2.10 When compared to the 2028 "With Development" scenario, a reduction in flow is recorded across all arms in both peak periods. The movements where this decrease is most notable are the Malahide Road South to Northern Cross Extension West and the Northern Cross Extension West to Malahide Road north arms. It is noted that the new Belcamp Lane link and the east-west link through the Belcamp SHD site provide an alternative to these movements which could attract trips away from this junction.

Key outputs relating to this junction are shown in **Table 17** and **Table 18** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 17. Northern Cross Extension / Malahide Road, 2040 "With Development" AM Peak Model Outputs

ARM	MAX V/C	DELAY (S)
Malahide Road North	>1.00	5-10 mins
Northern Cross Extension East	>1.00	5-10 mins
Malahide Road South	>1.00	1-5 mins
Northern Cross Extension West	0.90 - 1.00	1-5 mins

Table 18. Northern Cross Extension / Malahide Road, 2040 "With Development" PM Peak Model Outputs

ARM	MAX V/C	DELAY (S)
Malahide Road North	0.90 - 1.00	1-5 mins
Northern Cross Extension East	>1.00	5-10 mins
Malahide Road South	>1.00	1-5 mins
Northern Cross Extension West	0.90 - 1.00	1-5 mins

5.2.11 It can be seen that the junction operates over capacity on both Malahide Road arms and the Northern Cross Extension East arm during the AM peak period. The Northern Cross Extension East arm is the most congested arm in the AM peak period, recording a V/C ratio of 1.23 and a delay of over nine minutes.

5.2.12 The junction operates over capacity on both the Northern Cross Extension East and Malahide Road South arms during the PM peak period. The Northern Cross Extension East arm is the most congested arm in the PM peak period, recording a V/C ratio of 1.07 and a delay of over five minutes.

5.3 Junction 2: Northern Cross Extension / Hole in the Wall Road / Grange Road Roundabout

5.3.1 The Northern Cross Extension / Hole in the Wall Road / Grange Road Roundabout is an unsignalised roundabout junction, located approximately 1.2km east of the Northern Cross Extension / Malahide Road junction. The roundabout marks the intersection between Northern Cross Extension (R139), Hole in the Wall Road, which runs north and provides access to residential areas of Belmayne and Clongriffin, and Grange Road, which runs south and provides access to Donaghmede and the Donaghmede Shopping Centre.

5.3.2 The roundabout itself is unsignalised, however pedestrian crossings are provided downstream on both Northern Cross Extension arms and on the Hole in the Wall Road arm

5.3.3 Two lanes are coded on both Northern Cross Extension arms and the Hole in the Wall Road arm. One lane with an additional flare is coded on the Grange Road arm.

2028 "Do Minimum" Outputs

5.3.4 Key outputs relating to this junction are shown in **Table 19** and **Table 20** below, for the 2028 "Do Minimum" AM and PM peak periods respectively.

Table 19. Northern Cross Extension / Hole in the Wall Road / Grange Road, 2028 "Do Minimum" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road	0.90 - 1.00	< 30 secs
Northern Cross Extension East	<0.90	< 30 secs
Grange Road	>1.00	< 30 secs
Northern Cross Extension West	0.90 - 1.00	< 30 secs

Table 20. Northern Cross Extension / Hole in the Wall Road / Grange Road, 2028 "Do Minimum" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road	<0.90	< 30 secs
Northern Cross Extension East	<0.90	< 30 secs
Grange Road	>1.00	1-5 mins
Northern Cross Extension West	<0.90	< 30 secs

5.3.5 The junction is operating over capacity on the Grange Road arm during the AM peak period, showing a V/C ratio of 1.00, causing a delay of 16 seconds. All other arms operate within capacity during the AM peak period.

5.3.6 The junction is operating over capacity on the Grange Road arm during the PM peak period, showing a V/C ratio of 1.04 and a delay of over one minute. All other arms operate within capacity during the PM peak period.

2028 "With Development" Outputs

5.3.7 When compared to the 2028 "Do Minimum" outputs, a general increase in flow is observed during both peak periods, most prominently on the Hole in the Wall Road and Grange Road arms, with traffic routing to and from the new east-west running Main Street link.

5.3.8 Key outputs relating to this junction are shown in **Table 21** and **Table 22** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 21. Northern Cross Extension / Hole in the Wall Road / Grange Road, 2028 "With Development" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road	<0.90	<30 secs
Northern Cross Extension East	<0.90	<30 secs
Grange Road	>1.00	<30 secs
Northern Cross Extension West	0.90 - 1.00	<30 secs

Table 22. Northern Cross Extension / Hole in the Wall Road / Grange Road, 2028 "With Development" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road	<0.90	<30 secs
Northern Cross Extension East	<0.90	<30 secs
Grange Road	>1.00	1-5 mins
Northern Cross Extension West	<0.90	<30 secs

5.3.9 The junction is over capacity on the Grange Road arm within both peak periods, showing a V/C ratio of 1.00 and 1.04 in the AM and PM peak periods respectively.

5.3.10 The Hole in the Wall Road and Northern Cross Extension West arms are approaching capacity in the AM peak period, with V/C ratios of 0.87 and 0.96 respectively.

2040 "With Development" Outputs

5.3.11 When compared with the 2028 "With Development" outputs, a general increase in flow is observed during both peak periods.

5.3.12 Key outputs relating to this junction are shown in **Table 23** and **Table 24** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 23. Northern Cross Extension / Hole in the Wall Road / Grange Road, 2040 "With Development" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road	0.90 - 1.00	30-60 secs
Northern Cross Extension East	<0.90	<30 secs
Grange Road	0.90 - 1.00	<30 secs
Northern Cross Extension West	0.90 - 1.00	<30 secs

Table 24. Northern Cross Extension / Hole in the Wall Road / Grange Road, 2040 "With Development" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road	<0.90	<30 secs
Northern Cross Extension East	<0.90	<30 secs
Grange Road	>1.00	1-5 mins
Northern Cross Extension West	<0.90	<30 secs

5.3.13 The Hole in the Wall Road, Northern Cross Extension West and Grange Road arms are approaching capacity in the AM peak period, all recording V/C ratios of between 0.90 and 1.00.

5.3.14 The junction is over capacity on the Grange Road arm in the PM peak period, recording a V/C ratio of 1.06.

5.4 Junction 3: Hole in the Wall Road / Main Street

5.4.1 Hole in the Wall Road / Main Street is a signalised junction, located approximately one kilometre from the eastern boundary of the Belcamp SHD site. Main Street links this junction to Clongriffin Station to the east. The west arm will eventually link to Belmayne Avenue and Malahide Road but this link is not yet complete.

5.4.2 The junction is coded as two lanes with bus lane flares on both Main Street arms, one general traffic lane and one bus lane on the Hole in the Wall Road north arm and one lane with flare on the Hole in the Wall Road south arm.

2028 "Do Minimum Outputs"

5.4.3 Key outputs relating to this junction are shown in **Table 25** and **Table 26** below, for the 2028 "Do Minimum" AM and PM peak periods respectively.

Table 25. Hole in the Wall Road / Main Street, 2028 "Do Minimum" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road North	0.90 - 1.00	1-5 mins
Main Street East	>1.00	1-5 mins
Hole in the Wall Road South	>1.00	1-5 mins
Main Street West	<0.90	30-60 secs

Table 26. Hole in the Wall Road / Main Street, 2028 "Do Minimum" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road North	<0.90	1-5 mins
Main Street East	>1.00	1-5 mins
Hole in the Wall Road South	>1.00	5-10 mins
Main Street West	<0.90	1-5 mins

5.4.4 The junction is recorded as operating over capacity on the Main Street East and Hole in the Wall Road South arms in the AM peak period. The Hole in the Wall Road North arm is approaching capacity with a V/C ratio of 0.99 and a delay of over two minutes.

5.4.5 The junction is recorded as operating over capacity on the Main Street East and Hole in the Wall Road South arms in the PM peak period, with V/C ratios of 1.08 and 1.07, and delays of over two and five minutes respectively.

2028 "With Development Outputs"

5.4.6 When compared with the 2028 "Do Minimum" outputs, a general increase in flow is observed across the junction in the AM peak period, most prominently on the through movements on Hole in the Wall Road in both directions. This is less prominent in the PM peak period. A decrease in flow is observed on the Main Street West arm in both peak periods. Traffic appears to be using the east-west running Belmayne, Main Street and Balgriffin Cottages routes via Hole in the Wall Road to access the Northern Cross Extension

from Malahide Road (and vice-versa), without passing through the congested Northern Cross Extension / Malahide Road junction.

5.4.7 Key outputs relating to this junction are shown in **Table 27** and **Table 28** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 27. Hole in the Wall Road / Main Street, 2028 "With Development" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road North	<0.90	30-60 secs
Main Street East	<0.90	30-60 secs
Hole in the Wall Road South	<0.90	30-60 secs
Main Street West	<0.90	30-60 secs

Table 28. Hole in the Wall Road / Main Street, 2028 "With Development" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road North	<0.90	<30 secs
Main Street East	<0.90	30-60 secs
Hole in the Wall Road South	<0.90	30-60 secs
Main Street West	<0.90	30-60 secs

5.4.8 It can be seen that the junction operates within capacity during both peak periods.

2040 "With Development Outputs"

5.4.9 When compared with the 2028 "With Development" scenario, a general reduction in traffic flow is observed in the AM peak period, most notably on the Hole in the Wall Road south-north movement, somewhat offset by an increase in flow making the Hole in the Wall Road South to Main Street East movement. A modest increase in flow is observed during the PM peak period.

5.4.10 Key outputs relating to this junction are shown in **Table 29** and **Table 30** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 29. Hole in the Wall Road / Main Street, 2040 "With Development" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road North	<0.90	30-60 secs
Main Street East	<0.90	30-60 secs
Hole in the Wall Road South	<0.90	30-60 secs
Main Street West	<0.90	1-5 mins

Table 30. Hole in the Wall Road / Main Street, 2040 "With Development" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Hole in the Wall Road North	<0.90	<30 secs
Main Street East	<0.90	30-60 secs
Hole in the Wall Road South	<0.90	30-60 secs
Main Street West	<0.90	30-60 secs

5.4.11 It can be seen that the junction operates within capacity during both peak periods.

5.5 Junction 4: Malahide Road / Belmayne

5.5.1 The Malahide Road / Belmayne signalised junction is located adjacent to the eastern boundary of the Belcamp SHD site. Belmayne provides access through the Belmayne area, connecting with Hole in the Wall Road towards Clongriffin Station.

5.5.2 Both Malahide Road arms are coded as one lane plus flare for traffic turning into Belmayne. The Belmayne arm is coded as two general traffic lane and one bus lane.

2028 "Do Minimum" Outputs

5.5.3 Key outputs relating to this junction are shown in **Table 31** and **Table 32** below, for the 2028 "Do Minimum" AM and PM peak periods respectively.

Table 31. Malahide Road / Belmayne, 2028 "Do Minimum" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	<30 secs
Belmayne	<0.90	1-5 mins
Malahide Road South	<0.90	<30 secs

Table 32. Malahide Road / Belmayne, 2028 "Do Minimum" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	< 30 secs
Belmayne	<0.90	1-5 mins
Malahide Road South	<0.90	< 30 secs

5.5.4 It can be seen that the junction operates within capacity during both peak periods.

2028 "With Development" Outputs

5.5.5 When compared with the 2028 "Do Minimum" outputs, substantial decreases are observed for southbound flow accessing the junction from Malahide Road, in both peak periods. It is noted that increased flow is shown using Balgriffin Cottages further to the north as an east-west link as part of a pattern of traffic avoiding the congested Northern Cross Extension / Malahide Road junction.

5.5.6 Key outputs relating to this junction are shown in **Table 33** and **Table 34** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 33. Malahide Road / Belmayne, 2028 "With Development" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	<30 secs
Belmayne	<0.90	1-5 mins
Malahide Road South	<0.90	<30 secs

Table 34. Malahide Road / Belmayne, 2028 "With Development" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	<30 secs
Belmayne	<0.90	1-5 mins
Malahide Road South	<0.90	<30 secs

5.5.7 It can be seen that the junction operates within capacity during both peak periods.

2040 "With Development" Outputs

5.5.8 When compared with the 2028 "With Development" outputs, increases are observed on the Belmayne and West Access arms in both peak periods. A decrease in northbound flow is observed on the Malahide Road South arm in both peak periods. It is noted the Belmayne, among other east-west running routes, provides an alternative route to access Malahide Road to the Northern Cross Extension, which could explain the changing pattern of flow at this junction.

5.5.9 Key outputs relating to this junction are shown in **Table 35** and **Table 36** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 35. Malahide Road / Belmayne, 2040 "With Development" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	<30 secs
Belmayne	>1.00	5-10 mins
Malahide Road South	<0.90	<30 secs

Table 36. Malahide Road / Belmayne, 2040 "With Development" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	<30 secs
Belmayne	0.90 - 1.00	1-5 mins
Malahide Road South	<0.90	<30 secs

5.5.10 During the AM peak period, the Belmayne arm is over capacity, showing a V/C ratio of 1.09 and a delay of over six minutes. All other arms are operating within capacity.

5.5.11 The Belmayne arm is showing to be approaching capacity in the PM peak period, recording a V/C ratio of 0.95 and a delay of over three minutes. All other arms are operating within capacity.

5.6 Junction 5: Malahide Road / Balgriffin Cottages

5.6.1 The Malahide Road / Balgriffin Cottages junction is a signalised junction located adjacent to the northwest corner of the Belcamp SHD site. Balgriffin Cottages provides an east-west running link between Malahide Road and Portmarnock.

5.6.2 Both the Malahide Road south and Balgriffin Cottages arms are coded as one lane plus flare for the right turn movement. The Malahide Road north arm is coded as one lane only. A western arm providing access on the eastern edge of the Belcamp Development Area is added in the 2028 and 2040 "With Development" scenarios, consisting of one lane plus flare.

2028 "Do Minimum" Outputs

5.6.3 Key outputs relating to this junction are shown in **Table 37** and **Table 38** below, for the 2028 "Do Minimum" AM and PM peak periods respectively.

Table 37. Malahide Road / Balgriffin Cottages, 2028 "Do Minimum" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Balgriffin Cottages	>1.00	1-5 mins
Malahide Road South	<0.90	<30 secs

Table 38. Malahide Road / Balgriffin Cottages, 2028 "Do Minimum" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Balgriffin Cottages	>1.00	1-5 mins
Malahide Road South	<0.90	< 30 secs

5.6.4 The Balgriffin Cottages arm is over capacity in the AM peak period, showing a V/C ratio of 1.01 and a delay of over eighty seconds. The same arm is over capacity in the PM peak period, showing a V/C ratio of 1.01 and a delay of over seventy seconds. All other arms are reported to be within capacity.

2028 "With Development" Outputs

5.6.5 When compared with the 2028 "Do Minimum" outputs, a general decrease in flow is observed, particularly on the Malahide Road North and Balgriffin Cottages to Malahide Road south movements, with an increase on the north to west movements. This is

mirrored by an increase in flow on other parallel east-west routes in the vicinity, particularly Belmayne.

5.6.6 Key outputs relating to this junction are shown in **Table 39** and **Table 40** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 39. Malahide Road / Balgriffin Cottages, 2028 "With Development" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Balgriffin Cottages	>1.00	1-5 mins
Malahide Road South	<0.90	<30 secs
West Arm	<0.90	30-60 secs

Table 40. Malahide Road / Balgriffin Cottages, 2028 "With Development" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Balgriffin Cottages	0.90 - 1.00	30-60 secs
Malahide Road South	<0.90	<30 secs
West Arm	<0.90	30-60 secs

5.6.7 The Balgriffin Cottages arm is over capacity in the AM peak period, showing a V/C ratio of 1.02 and a delay of 2 minutes. The same arm is approaching capacity in the PM peak period, showing a V/C ratio of 0.92 and a delay of 50 seconds. All other arms are reported to be within capacity.

2040 "With Development" Outputs

5.6.8 When compared to the 2028 "With Development" outputs, a general increase in flow is observed during both peak periods. The Balgriffin Cottages arm records a decrease in flow during both peak periods, most notably to both Malahide Road arms.

5.6.9 Key outputs relating to this junction are shown in **Table 41** and **Table 42** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 41. Malahide Road / Balgriffin Cottages, 2040 "With Development" AM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Balgriffin Cottages	>1.00	5-10 mins
Malahide Road South	<0.90	<30 secs
West Arm	0.90 - 1.00	30-60 secs

Table 42. Malahide Road / Balgriffin Cottages, 2040 "With Development" PM Peak Model Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Balgriffin Cottages	>1.00	1-5 mins
Malahide Road South	<0.90	<30 secs
West Arm	<0.90	1-5 mins

5.6.10 The Balgriffin Cottages arm is over capacity in the AM peak period, showing a V/C ratio of 1.16 and a delay of over eight minutes. The same arm is at capacity in the PM peak period, showing a V/C ratio of 1.04 and a delay of four minutes.

5.6.11 The West arm is shown to be operating close to capacity in the AM peak period, recording a V/C ratio of 0.96 and a delay of almost one minute.

5.6.12 All other arms are reported to be within capacity.

5.7 Junction 6: Main Street / Park Avenue

5.7.1 Main Street / Park Avenue is an unsignalised priority junction located approximately 1.4km east of the Belcamp SHD site. Main Street will eventually provide an east-west link between Malahide Road and Clongriffin Station. Park Avenue provides access to Belmayne and Father Collins Park.

5.7.2 Both Main Street arms are coded as one general traffic lane and one bus lane, with the Main Street east arm including a right turn flare. The Park Avenue arm is coded as one lane.

2028 "Do Minimum" Outputs

5.7.3 Key outputs relating to this junction are shown in **Table 43** and **Table 44** below, for the 2028 "Do Minimum" AM and PM peak periods respectively.

Table 43. Main Street / Park Avenue, 2028 "Do Minimum" AM Peak Outputs

ARM	V/C	DELAY (S)
Main Street West	<0.90	< 30 secs
Park Avenue	<0.90	< 30 secs
Main Street East	<0.90	< 30 secs

Table 44. Main Street / Park Avenue, 2028 "Do Minimum" PM Peak Outputs

ARM	V/C	DELAY (S)
Main Street West	<0.90	< 30 secs
Park Avenue	<0.90	< 30 secs
Main Street East	<0.90	< 30 secs

5.7.4 It can be seen that the junction operates within capacity during both peak periods.

2028 "With Development" Outputs

5.7.5 When compared with the 2028 "Do Minimum" outputs, a general increase in flow is observed, particularly on Main Street East arm, in both peak periods.

5.7.6 Key outputs relating to this junction are shown in **Table 45** and **Table 46** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 45. Main Street / Park Avenue, 2028 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Main Street West	<0.90	<30 secs
Park Avenue	<0.90	<30 secs
Main Street East	<0.90	<30 secs

Table 46. Main Street / Park Avenue, 2028 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Main Street West	<0.90	<30 secs
Park Avenue	<0.90	<30 secs
Main Street East	<0.90	<30 secs

5.7.7 It can be seen that the junction operates within capacity during both peak periods.

2040 "With Development" Outputs

5.7.8 When compared with the 2028 "With Development" outputs, there is a general increase in flow across all arms during both peak periods.

5.7.9 Key outputs relating to this junction are shown in **Table 47** and **Table 48** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 47. Main Street / Park Avenue, 2040 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Main Street West	<0.90	<30 secs
Park Avenue	<0.90	<30 secs
Main Street East	<0.90	<30 secs

Table 48. Main Street / Park Avenue, 2040 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Main Street West	<0.90	<30 secs
Park Avenue	<0.90	<30 secs
Main Street East	<0.90	<30 secs

5.7.10 It can be seen that the junction operates within capacity during both peak periods.

5.8 Junction 7: Northern Cross Extension / Belmayne Avenue

5.8.1 The Northern Cross Extension / Belmayne Avenue junction is an unsignalised roundabout located approximately 600m east of the Northern Cross Extension / Malahide Road junction. Belmayne Avenue provides a north-south link between Northern Cross Extension and Belmayne. An unnamed road connects the roundabout with residential areas to the south.

2028 "Do Minimum Outputs"

5.8.2 Key outputs relating to this junction are shown in **Table 49** and **Table 50** below, for the 2028 "Do Minimum" AM and PM peak periods respectively.

Table 49. Northern Cross Extension / Belmayne Avenue 2028 "Do Minimum" AM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne Avenue	<0.90	< 30 secs
Northern Cross Extension East	<0.90	< 30 secs
Unnamed Road	<0.90	< 30 secs
Northern Cross Extension West	<0.90	< 30 secs

Table 50. Northern Cross Extension / Belmayne Avenue 2028 "Do Minimum" PM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne Avenue	<0.90	< 30 secs
Northern Cross Extension East	<0.90	< 30 secs
Unnamed Road	<0.90	< 30 secs
Northern Cross Extension West	<0.90	< 30 secs

5.8.3 It can be seen that the junction operates within capacity during both peak periods.

2028 "With Development" Outputs

5.8.4 When compared to the 2028 "Do Minimum" outputs, a decrease is observed on the Northern Cross Extension East arm, with traffic choosing to avoid the congested Northern Cross Extension / Malahide Road junction to the west.

5.8.5 Key outputs relating to this junction are shown in **Table 51** and **Table 52** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 51. Northern Cross Extension / Belmayne Avenue 2028 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne Avenue	<0.90	<30 secs
Northern Cross Extension East	<0.90	<30 secs
Unnamed Road	<0.90	<30 secs
Northern Cross Extension West	<0.90	<30 secs

Table 52. Northern Cross Extension / Belmayne Avenue 2028 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne Avenue	<0.90	<30 secs
Northern Cross Extension East	<0.90	<30 secs
Unnamed Road	<0.90	<30 secs
Northern Cross Extension West	<0.90	<30 secs

5.8.6 It can be seen that the junction operates within capacity during both peak periods.

2040 "With Development" Outputs

5.8.7 When compared with the 2028 "With Development" outputs, a relatively small decrease in traffic is observed on the Northern Cross Extension West arm, with traffic attracted to alternative routes to access Malahide Road due to congestion at the Northern Cross Extension / Malahide Road junction.

5.8.8 Key outputs relating to this junction are shown in **Table 53** and **Table 54** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 53. Northern Cross Extension / Belmayne Avenue 2040 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne Avenue	<0.90	<30 secs
Northern Cross Extension East	<0.90	<30 secs
Unnamed Road	<0.90	<30 secs
Northern Cross Extension West	<0.90	<30 secs

Table 54. Northern Cross Extension / Belmayne Avenue 2040 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne Avenue	<0.90	<30 secs
Northern Cross Extension East	<0.90	<30 secs
Unnamed Road	<0.90	<30 secs
Northern Cross Extension West	<0.90	<30 secs

5.8.9 It can be seen that the junction operates within capacity during both peak periods.

5.9 Junction 8: Hole in the Wall Road / Marrsfield Avenue / Belmayne

5.9.1 The Hole in the Wall Road / Marrsfield Avenue / Belmayne junction is an unsignalised priority junction located approximately one kilometres to the east of the Belcamp SHD site. Hole in the Wall Road connects this junction to Northern Cross Extension, Belmayne connects to Malahide Road and Marrsfield Road provides access to residential areas to the east. It is noted that a future additional arm will provide access to a new development immediately to the north of the junction.

5.9.2 The Hole in the Wall Road arm is coded as one general traffic lane and one bus lane. The remaining two arms are coded as one lane each.

2028 "Do Minimum" Outputs

5.9.3 Key outputs relating to this junction are shown in **Table 55** and **Table 56** below, for the 2028 "Do Minimum" AM and PM peak periods respectively.

Table 55. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2028 "Do Minimum" AM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne	<0.90	< 30 secs
Marrsfield Avenue	<0.90	< 30 secs
Hole in the Wall Road	<0.90	< 30 secs

Table 56. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2028 "Do Minimum" PM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne	<0.90	< 30 secs
Marrsfield Avenue	<0.90	< 30 secs
Hole in the Wall Road	<0.90	< 30 secs

5.9.4 It can be seen that the junction operates within capacity during both peak periods.

2028 "With Development" Outputs

5.9.5 When compared with the 2028 "Do Minimum" outputs, a general increase is observed during both peak periods, most prominently on the Hole in the Wall Road to Belmayne movement (and vice-versa) during the AM peak period.

5.9.6 Key outputs relating to this junction are shown in **Table 57** and **Table 58** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 57. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2028 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne	<0.90	<30 secs
Marrsfield Avenue	<0.90	<30 secs
Hole in the Wall Road	<0.90	<30 secs

Table 58. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2028 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne	<0.90	<30 secs
Marrsfield Avenue	<0.90	<30 secs
Hole in the Wall Road	<0.90	<30 secs

5.9.7 It can be seen that the junction operates within capacity during both peak periods.

2040 "With Development" Outputs

5.9.8 When compared with the 2028 "With Development" outputs, a general decrease in flow is recorded in the AM peak period, most notably on the Hole in the Wall Road to Belmayne movement. A general increase in flow is recorded in the PM peak period.

5.9.9 Key outputs relating to this junction are shown in **Table 59** and **Table 60** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 59. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2040 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne	<0.90	<30 secs
Marrsfield Avenue	<0.90	<30 secs
Hole in the Wall Road	<0.90	<30 secs

Table 60. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2040 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Belmayne	<0.90	<30 secs
Marrsfield Avenue	<0.90	<30 secs
Hole in the Wall Road	<0.90	<30 secs

5.9.10 It can be seen that the junction operates within capacity during both peak periods.

5.10 Junction 9: Malahide Road / Clarehall Access

5.10.1 The Malahide Road / Clarehall Access junction is a signalised junction located approximately 300m south of the Malahide Road / Northern Cross Extension junction. The junction provides access to the Clarehall Shopping Centre.

5.10.2 The Malahide Road North arm is coded as three lanes for general traffic and a left turn bus flare. The opposite Malahide Road South arm is coded as one bus lane, two general traffic lanes and a right turn flare, with the Clarehall Access arm is coded as two lanes.

2028 "Do Minimum" Outputs

5.10.3 Key outputs relating to this junction are shown in **Table 61** and **Table 62** below, for the 2028 "Do Minimum" AM and PM peak periods respectively.

Table 61. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2028 "Do Minimum" AM Peak Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Clarehall Access	<0.90	30-60 secs
Malahide Road South	<0.90	30-60 secs

Table 62. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2028 "Do Minimum" PM Peak Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Clarehall Access	<0.90	1-5 mins
Malahide Road South	<0.90	30-60 secs

5.10.4 It can be seen that the junction operates within capacity during both peak periods.

2028 "With Development" Outputs

5.10.5 When compared with the 2028 "Do Minimum" outputs, a substantial decrease in through southbound flow on Malahide Road is observed during the PM peak period.

5.10.6 Key outputs relating to this junction are shown in **Table 63** and **Table 64** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 63. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2028 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Clarehall Access	<0.90	1-5 mins
Malahide Road South	<0.90	30-60 secs

Table 64. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2028 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Clarehall Access	<0.90	1-5 mins
Malahide Road South	<0.90	30-60 secs

5.10.7 It can be seen that the junction operates within capacity during both peak periods.

2040 "With Development" Outputs

5.10.8 When compared to the 2028 "With Development" outputs, a decrease in flow was observed, most notably on the Malahide Road south to north movement.

5.10.9 Key outputs relating to this junction are shown in **Table 65** and **Table 66** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 65. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2040 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Clarehall Access	<0.90	1-5 mins
Malahide Road South	<0.90	30-60 secs

Table 66. Hole in the Wall Road / Marrsfield Avenue / Belmayne, 2040 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Malahide Road North	<0.90	30-60 secs
Clarehall Access	<0.90	1-5 mins
Malahide Road South	<0.90	30-60 secs

5.10.10 It can be seen that the junction operates within capacity during both peak periods.

5.11 Junction 10: Northern Cross Extension / Southern Belcamp Access – Eastern Junction

5.11.1 The Northern Cross Extension / Southern Belcamp Access – Eastern junction is a signalised junction located on the southern edge of the Belcamp Development Area. The junction forms a two-way access point to the Belcamp Development Area. Belcamp Lane provides a link to the south.

5.11.2 Both Northern Cross Extension arms are coded as two lanes with a right turn flare. The Belcamp Access and Belcamp Lane arms are coded as two lanes.

5.11.3 As this junction forms part of the Belcamp Development Area, it has been included in the 2028 and 2040 "With Development" scenarios only.

2028 "With Development" Outputs

5.11.4 Key outputs relating to this junction are shown in **Table 67** and **Table 68** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 67. Northern Cross Extension / Southern Access – Eastern Junction, 2028 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Belcamp Access	<0.90	1-5 mins
R139 East	<0.90	30-60 secs
Belcamp Lane	<0.90	30-60 secs
R139 West	<0.90	<30 secs

Table 68. Northern Cross Extension / Southern Access – Eastern Junction, 2028 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Belcamp Access	<0.90	30-60 secs
R139 East	<0.90	30-60 secs
Belcamp Lane	<0.90	1-5 mins
R139 West	<0.90	<30 secs

5.11.5 It can be seen that the junction operates within capacity during both peak periods.

2040 "With Development" Outputs

5.11.6 When compared to the 2028 "With Development" outputs, a general decrease in flow is observed during both peak periods. The Northern Cross Extension through movements in both directions show substantial decreases, in favour of increases to and from the Belcamp Access arm, making use of the alternative east-west link through the Belcamp Development Area.

5.11.7 Key outputs relating to this junction are shown in **Table 69** and **Table 70** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 69. Northern Cross Extension / Southern Access – Eastern Junction, 2040 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Belcamp Access	<0.90	30-60 secs
R139 East	<0.90	<30 secs
Belcamp Lane	<0.90	1-5 mins
R139 West	<0.90	<30 secs

Table 70. Northern Cross Extension / Southern Access – Eastern Junction, 2040 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Belcamp Access	<0.90	1-5 mins
R139 East	<0.90	<30 secs
Belcamp Lane	<0.90	1-5 mins
R139 West	<0.90	<30 secs

5.11.8 The Belcamp Lane arm is approaching capacity in the AM peak period with a V/C ratio of 0.89, resulting in a delay of one and a half minutes. All other arms are recorded as operating within capacity during the AM peak period.

5.11.9 During the PM peak period, the Belcamp Lane arm is approaching capacity with a V/C ratio of 0.90 and a delay of almost two minutes. All other arms are recorded as operating within capacity during the PM peak period.

5.12 Junction 11: Northern Cross Extension / Southern Belcamp Access – Western Junction

5.12.1 The Northern Cross Extension / Southern Belcamp Access – Western junction is a signalised junction located on the southern edge of the Belcamp Development Area. The junction forms a two-way access point to the Belcamp Development Area.

5.12.2 The Northern Cross Extension West arm is coded as two lanes. The Belcamp Access arm is coded as one lane with a left turn flare. The Northern Cross Extension East arm is coded as two lanes with a right turn flare. It is noted that although a southern arm provides access to the St Dominick's Park estate, this is not represented in the ERM.

5.12.3 As this junction forms part of the Belcamp Development Area, it has been included in the 2028 and 2040 "With Development" scenarios only.

2028 "With Development" Outputs

5.12.4 Key outputs relating to this junction are shown in **Table 71** and **Table 72** below, for the 2028 "With Development" AM and PM peak periods respectively.

Table 71. Northern Cross Extension / Southern Access – Western Junction, 2028 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Northern Cross Extension West	<0.90	<30 secs
Belcamp Access	<0.90	1-5 mins
Northern Cross Extension East	<0.90	<30 secs

Table 72. Northern Cross Extension / Southern Access – Western Junction, 2028 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Northern Cross Extension West	<0.90	<30 secs
Belcamp Access	<0.90	30-60 secs
Northern Cross Extension East	<0.90	<30 secs

5.12.5 It can be seen that the junction operates within capacity during both peak periods.

2040 "With Development" Outputs

5.12.6 When compared to the 2028 "With Development" outputs, a general decrease in flow is observed during both peak periods. The Northern Cross Extension through movements in both directions show substantial decreases, in favour of increases to and from the Belcamp Access arm, making use of the alternative east-west link through the Belcamp Development Area.

5.12.7 Key outputs relating to this junction are shown in **Table 73** and **Table 74** below, for the 2040 "With Development" AM and PM peak periods respectively.

Table 73. Northern Cross Extension / Southern Access – Western Junction, 2040 "With Development" AM Peak Outputs

ARM	V/C	DELAY (S)
Northern Cross Extension West	<0.90	<30 secs
Belcamp Access	>1.00	1-5 mins
Northern Cross Extension East	<0.90	<30 secs

Table 74. Northern Cross Extension / Southern Access – Western Junction, 2040 "With Development" PM Peak Outputs

ARM	V/C	DELAY (S)
Northern Cross Extension West	<0.90	<30 secs
Belcamp Access	<0.90	30-60 secs
Northern Cross Extension East	<0.90	<30 secs

5.12.8 The Belcamp Access arm is recorded as operating over capacity in the AM peak period with a V/C ratio of 1.02 and a delay of 86 seconds. Both Northern Cross Extension arms are operating within capacity during the AM peak period.

5.12.9 It can be seen that the all arms operate within capacity during the PM peak period.

5.13 Summary

5.13.1 The outputs from the 2028 "Do Minimum" model indicate that, with the Bus Connects scheme in place, there will be significant congestion at a number of junctions within the vicinity of the site, most significantly at the Malahide Road / Northern Cross Extension junction. These locations are understood to presently suffer from regular congestion at peak times, and from the junction data it can be seen that the introduction of Bus Connects will lead to some improvement for those routes used by buses, but in some cases this comes at the expense of general traffic capacity.

5.13.2 For the specific purposes of the STS, this data shows that travel by car to and from the site is likely to encounter delays, and that therefore it is not only necessary to determine how use of alternative modes can reduce demand and pressure on the existing road network, but also where those alternatives can offer a genuinely attractive option in terms of journey time and journey experience.

5.13.3 The next section of the report details the analysis of data from the 2028 "With Development" models in further detail.

6. 2028 & 2040 "WITH DEVELOPMENT" MODEL – GENERAL FINDINGS

6.1 Overview of Models

6.1.1 As noted in Section 4, AM and PM models have been prepared to represent a 2028 future year with the addition of 1,000 dwellings and a 2040 future year with the addition of 2,546 dwellings, 21 jobs and 400 school places, at the Belcamp SHD site. Preparing the models in this manner allows for specific analysis to be undertaken of the trip volumes, mode choices and timings which would broadly be expected to be observed at completion of the first phase of development.

6.1.2 It is noted that subsequent to this modelling being undertaken, the actual number of dwellings within Phase 1 was confirmed to be up to 872 dwellings. As such, whilst the actual number of trips associated with Phase 1 will be slightly lower than suggested by the model exercises, it is considered that the mode splits and trip origins and destinations remain a good representation of how the development would operate.

6.1.3 It is important to recognise that these models do not include any additional measures to influence mode choice; this has been done so that the specific types of journey which will be made wholly or largely by car in the absence of a comprehensive sustainable transport strategy can be identified. In turn, this provides the necessary evidence to allow targeting of specific measures for different sustainable modes to be devised and then built into the sustainable transport strategy itself.

6.1.4 It is anticipated that, in the absence of a defined sustainable transport strategy, the observed mode splits and geographical distribution of trips would remain relatively consistent for the development of the whole Belcamp SHD scheme (currently understood to comprise 2,546 dwellings). Certain trip types, such as those associated with primary education, would alter with the introduction of the planned new primary school within the Belcamp SHD; this is discussed further in Section 7 of this report.

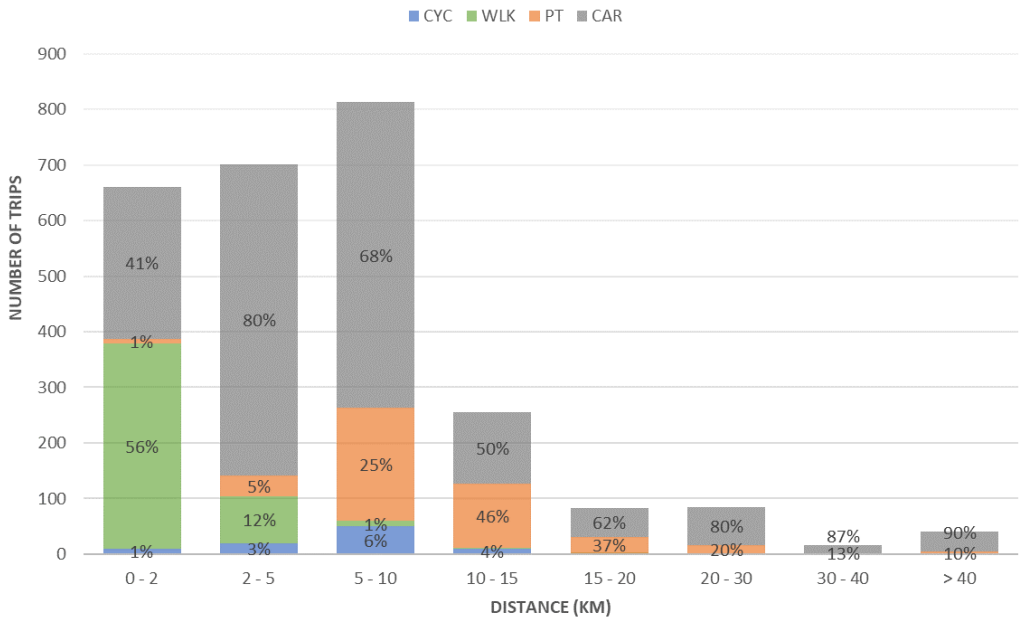
6.2 Development Trip Lengths and Mode Shares

AM Peak

6.2.1 **Figure 6** below shows how outbound trips by all modes in the AM peak hour are split by total distance travelled, for the 2028 "With Development" scenario.

6.2.2 It is noted here for reference that the analysis within this section of the report focuses on the "dominant" trips, which for the AM peak includes all trips made from the Belcamp SHD site to an external destination. The corresponding inbound trips (i.e. those made from outside locations to the site) are far fewer in number, but are largely consistent in terms of length and the proportions made by different modes.

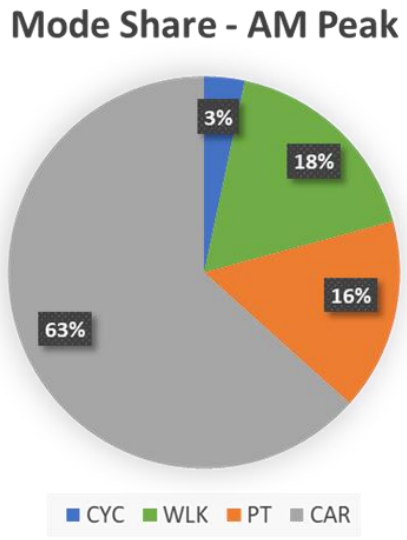
Figure 6. 2028 AM Peak Outbound Development Trips by Distance and Mode



6.2.3 The trip distance figures show that in 2028, there is a very high concentration of short trips made from the development; there is also a particularly high proportion of trips made by car which are less than 5km in length. The notably higher proportions of PT trips in the 5 to 15km bands are representative of travel into Dublin City Centre and its immediate surroundings.

6.2.4 By 2040, the proportion of car trips reduces for nearly all categories of trip length.

Figure 7. Overall Mode Shares – 2028 AM Peak Outbound Development Trips



6.2.5 Taken as a whole, the mode split for outbound trips shows that car travel is expected to account for 63% of all trips made in 2028 and 55% in 2040. However, as evidenced above, this does not correlate to large numbers of longer trips. This provides a starting point for further examination of trip-making patterns, as with certain exceptions it is generally

more difficult to provide attractive alternatives to car travel for longer trips (i.e. those more than 15km in length).

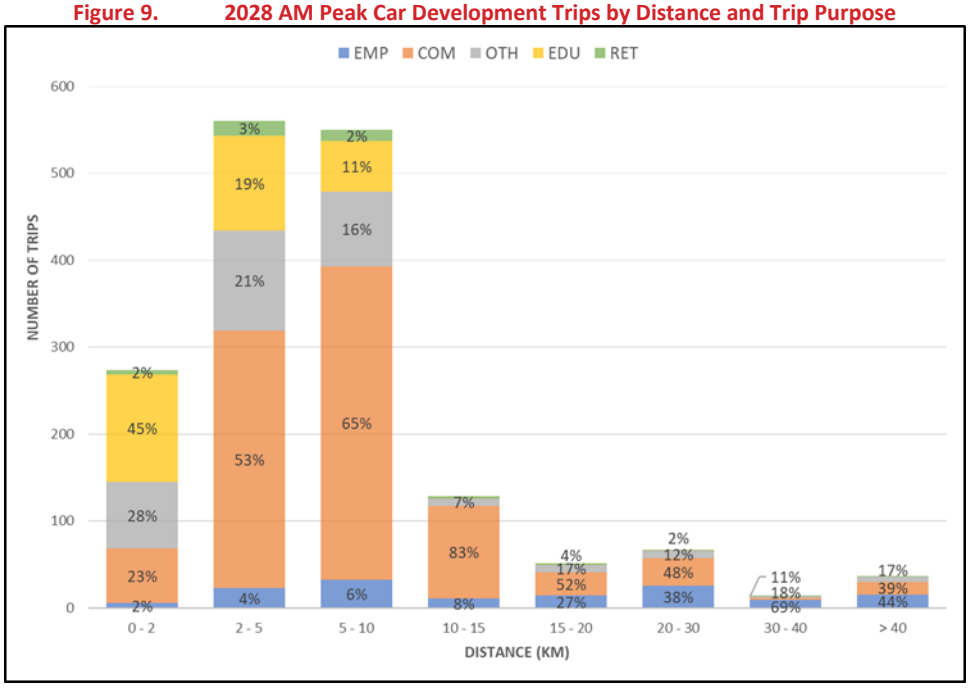
Figure 8. Breakdown of 2028 AM Peak Development Trips by Mode and Distance

DIST (km)		NUMBER OF TRIPS					
		CYC	WLK	PT	CAR	TOTAL	%
0	2	9	369	9	274	661	25%
2	5	19	84	38	560	702	26%
5	10	50	9	204	550	813	31%
10	15	10	0	116	128	255	10%
15	20	1	0	30	51	82	3%
20	30	0	0	17	67	84	3%
30	40	0	0	2	14	16	1%
> 40		0	0	4	36	40	2%
TOTAL		**89**	**463**	**420**	**1,680**	**2,652**	**100%**

6.2.6 The breakdown of trip numbers by distance and mode for 2028 is shown in more detail in **Figure 8**. It can be seen that almost two thirds of all car trips fall into the 2-5 km and 5-10km ranges in 2028, rising to almost three quarters in 2040, and there is also a significant number of car trips of less than 2km, which is well within a comfortable walking distance for all except the very young, very old, and those with mobility issues.

6.2.7 Further information on how these trip numbers are split by purpose is shown in **Figure 9** below.

Figure 9. 2028 AM Peak Car Development Trips by Distance and Trip Purpose



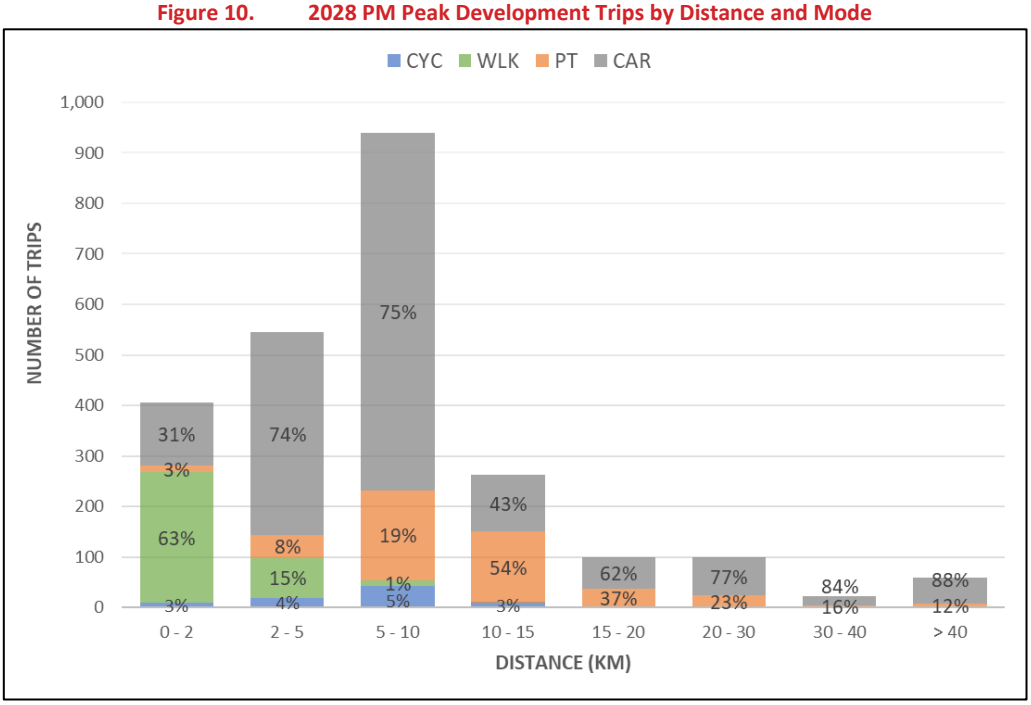
6.2.8 As would be expected, commuting activity accounts for a large proportion of trips in the 2028 AM peak, accounting for at least half of all car trips of between 2 and 30km in length. The influence of education trips in the 0 to 10km trip bands is also significant and is

examined further as part of the spatial mapping exercises presented later in this section of the report.

PM Peak

6.2.9 The PM peak data for inbound trips by distance and mode is shown in **Figure 10**. The biggest change in comparison with the AM peak data is the higher number of trips within the 5km to 10km category; this is considered to occur as a result of there being proportionately fewer education trips in this time period, with commuting activity becoming more dominant. As observed in the AM peak data, the prevalence of PT modes in the 5 to 10 and 10 to 15km categories corresponds largely with City Centre trips.

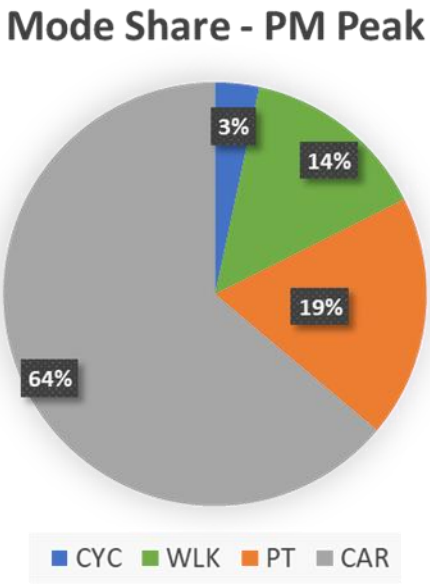
Figure 10. 2028 PM Peak Development Trips by Distance and Mode



6.2.10 The increased dominance of commuting travel is also reflected in the overall mode splits for all trip types. The percentage of PT trips in 2028 is slightly higher in the PM peak than the AM peak (19% vs. 16% respectively) whereas trips on foot are slightly lower (14% PM vs. 16% AM). This pattern is repeated in 2040 for PT trips (19% PM vs 18% AM) and for trips on foot (15% PM vs 23% AM).

6.2.11 The percentage of car and cycle trips is very consistent between the AM and PM peaks in 2028, whereas in 2040, the car mode share is higher in the PM peak, at 62%, compared with 55% on the AM peak.

Figure 11. Overall Mode Shares – PM Peak Development Trips



6.2.12 The breakdown of trips by mode and distance shows that the heavy prevalence of car trips in the 2 to 5km and 5 to 10km trip bands observed in the AM peak is also consistently seen in the PM peak data.

Figure 12. Breakdown of PM Peak trips by Mode and Distance

DIST (km)		NUMBER OF TRIPS					
		CYC	WLK	PT	CAR	TOTAL	%
0	2	10	257	13	125	406	17%
2	5	19	79	45	401	545	22%
5	10	43	10	179	706	939	39%
10	15	9	0	141	112	262	11%
15	20	0	0	37	62	99	4%
20	30	0	0	23	77	100	4%
30	40	0	0	3	18	22	1%
> 40		0	0	7	51	58	2%
TOTAL		**82**	**346**	**449**	**1,553**	**2,430**	**100%**

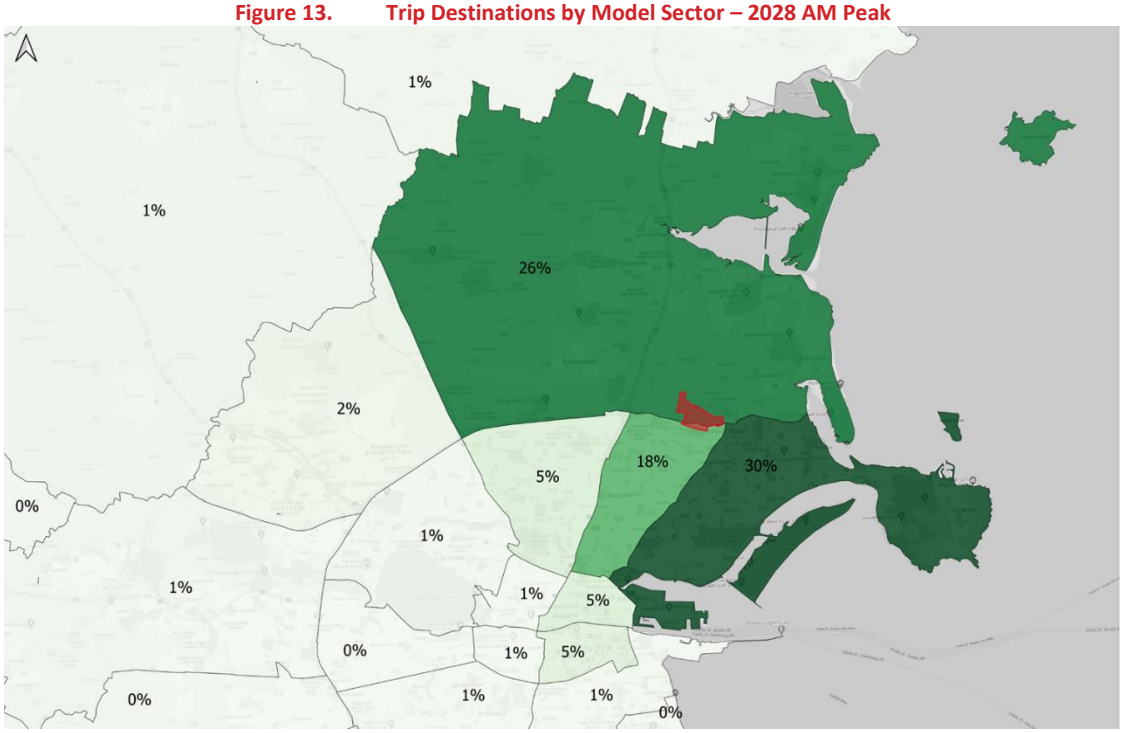
6.2.13 The feasibility of generating modal shift away from car-based trips within these bands has been explored through analysis of the spatial distribution of trips; this is examined in more detail below.

6.3 Spatial Analysis of Trips Generated by Phase 1 of the Proposed Development

6.3.1 Analysis of the trips arising as a result of Phase 1 of the proposed development has been undertaken using GIS mapping to show the number of trips travelling between the site and external zones within the model. **Figure 13** below shows a general aggregation of trips into model sectors for 2028; this shows clearly the concentration of trips eastwards from

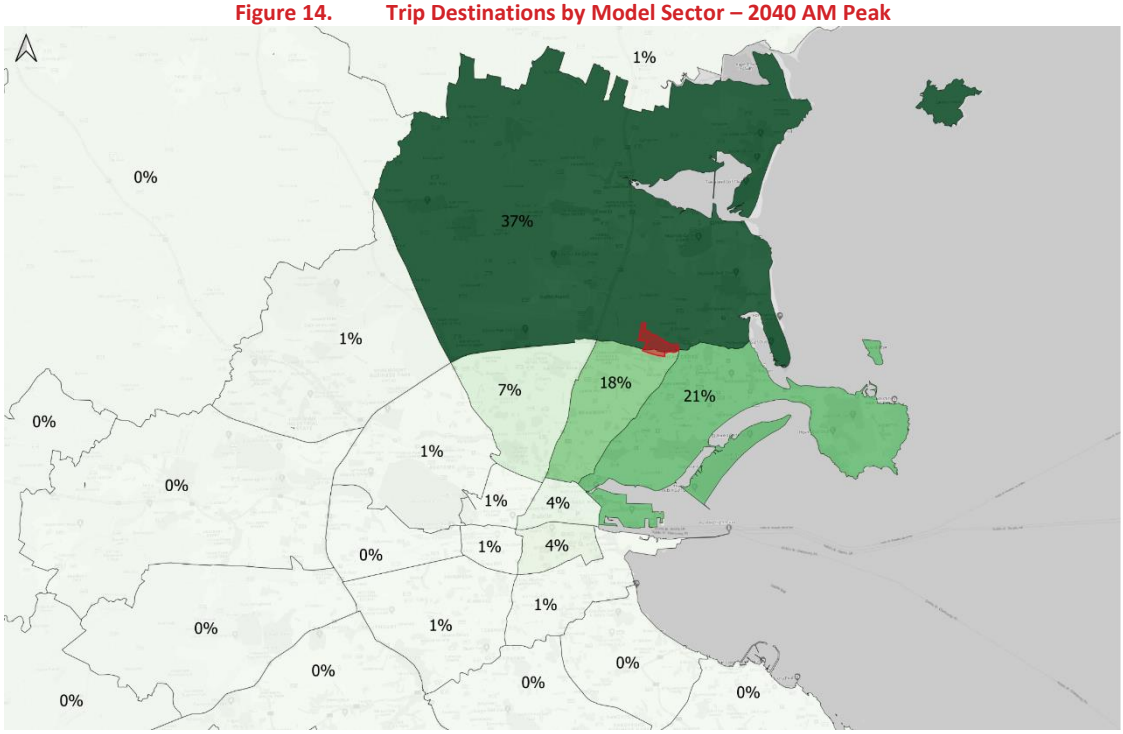
the site, the proportion of movement into the City Centre, and the relative lack of trips to the western and southern parts of Dublin City and the areas beyond.

Figure 13. Trip Destinations by Model Sector – 2028 AM Peak



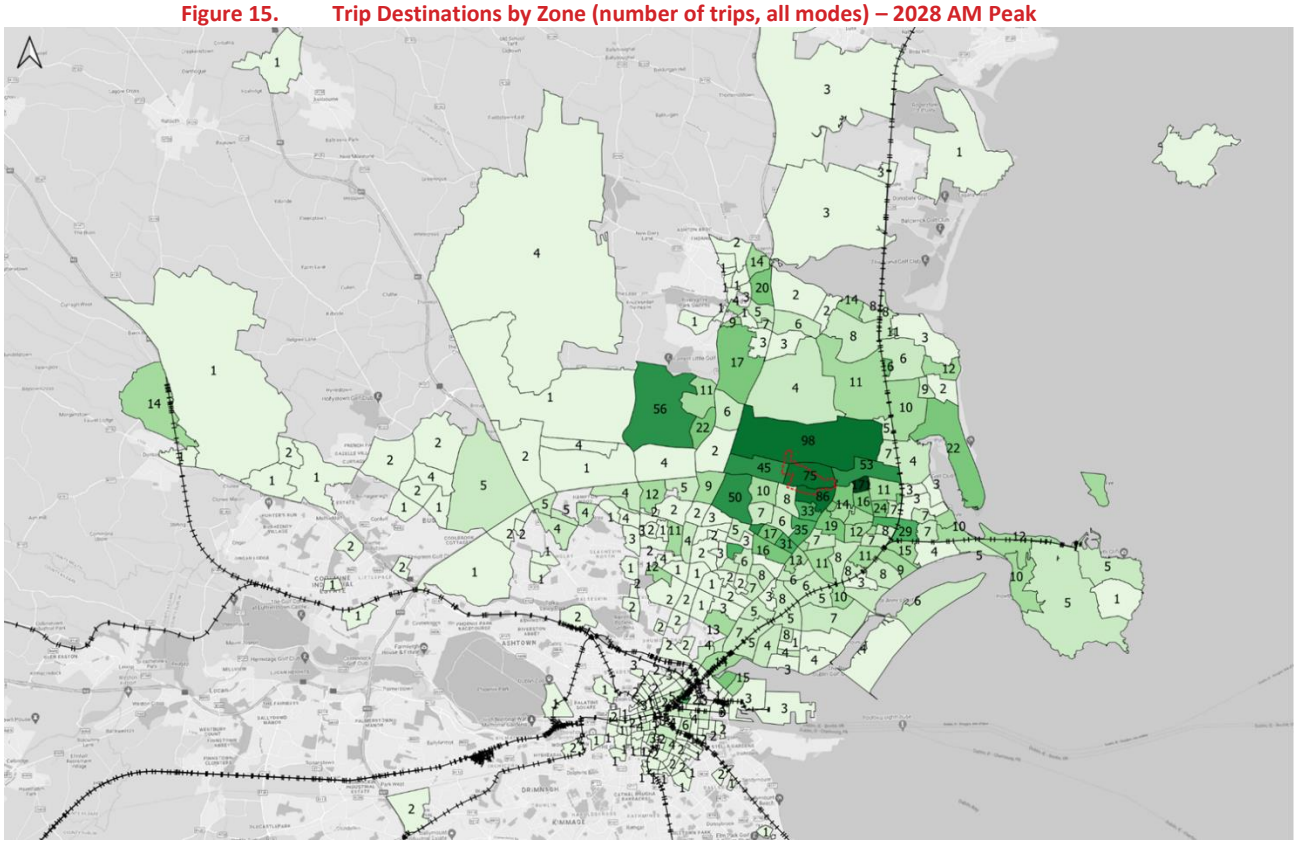
6.3.2 **Figure 14** below shows a general aggregation of trips into model sectors for 2040. The concentration of car trips can be seen to slightly shift to areas in closer proximity to the Belcamp SHD site, whilst still retaining a sizeable level to the areas directly to the south and east.

Figure 14. Trip Destinations by Model Sector – 2040 AM Peak



6.3.3 **Figure 15** shows the outbound trips in the AM peak by all modes using the model zone map; the number of trips to each zone is shown in its corresponding area.

Figure 15. Trip Destinations by Zone (number of trips, all modes) – 2028 AM Peak



6.3.4 From the mapped data for the 2028 AM peak, it can be seen that there are high concentrations of trips to the zones which cover the proposed development site, and which lie directly adjacent; there is also a very high number of trips (171) to a specific zone to the east of the site. This zone contains multiple schools and it is considered that a significant proportion of these trips are directly related to education. A similar pattern is observed in the 2040 AM peak.

6.3.5 The zone which contains Dublin Airport also stands out, with 56 trips; other zones to the south-west of the site and along the Malahide Road are considered to have concentrations of employment activity. The dense collection of small zones making up the city centre also accounts for a significant volume of trips.

6.3.6 It is possible to break this data down further by trip modes; the figures below show the outbound trip numbers specifically for walking and cycling, public transport, and car trips.

Figure 16. Trip Destinations by Zone (number of trips, walking and cycling) – 2028 AM Peak

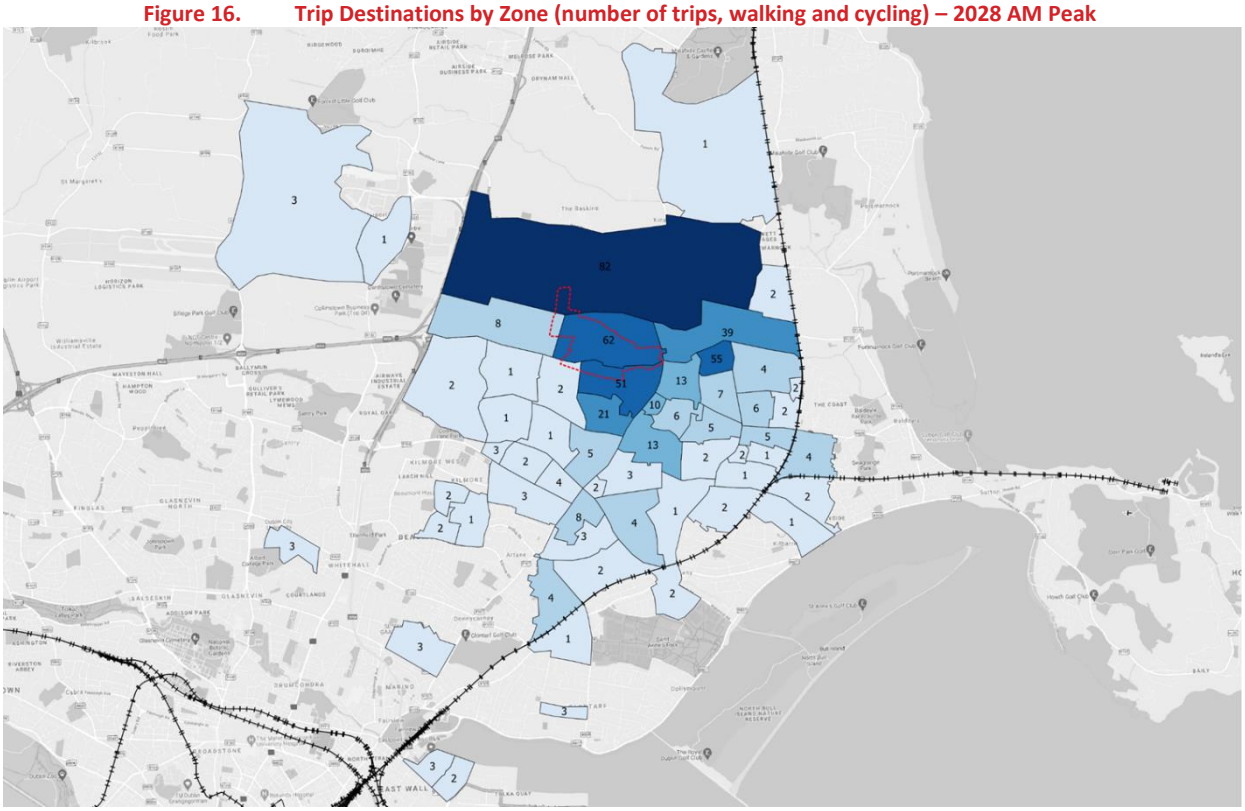


Figure 17. Trip Destinations by zone (number of trips, Public Transport) – 2028 AM Peak

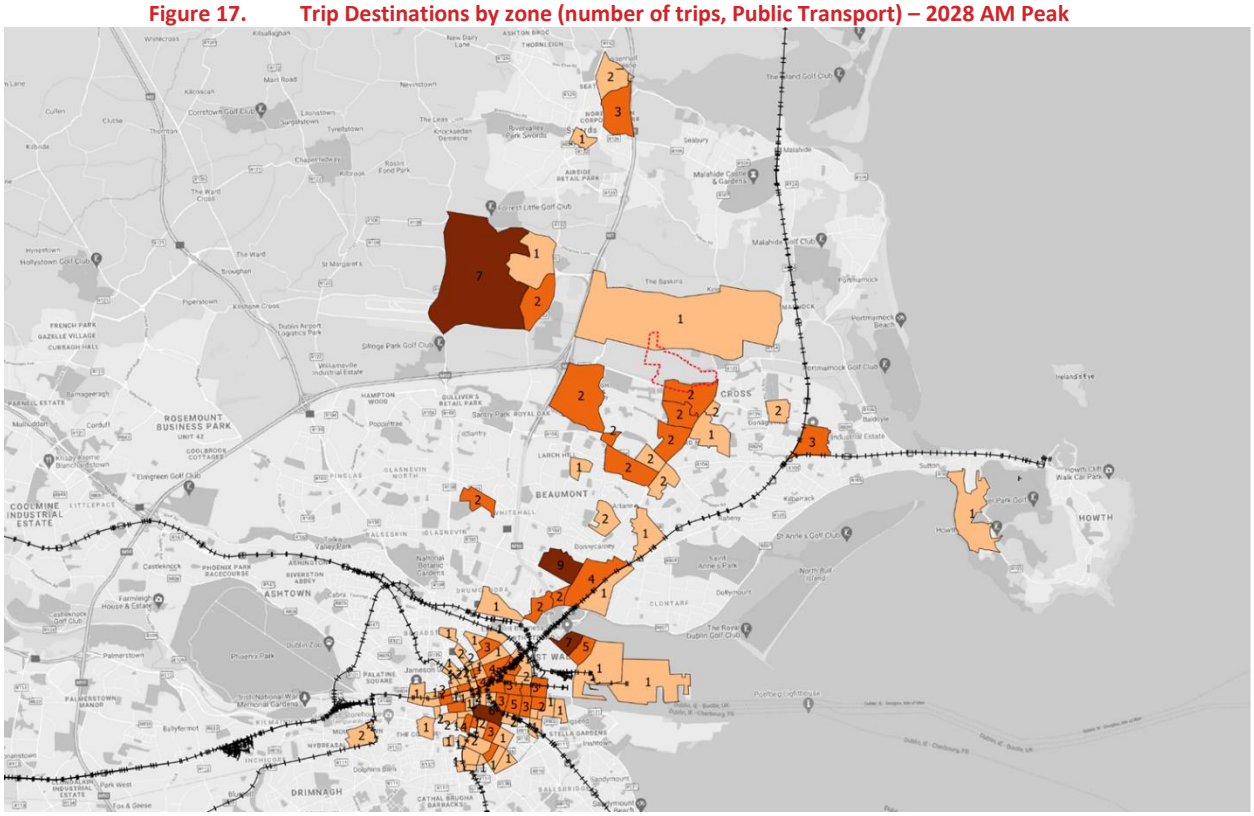
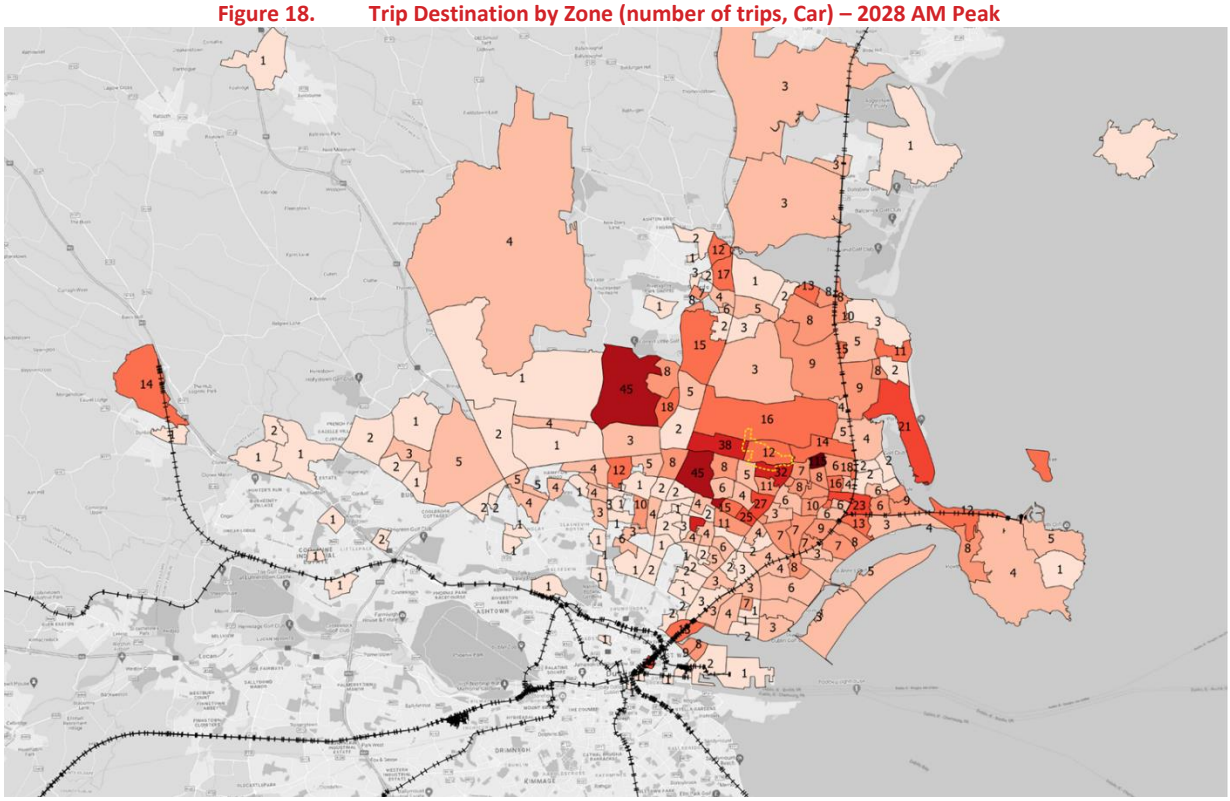


Figure 18. Trip Destination by Zone (number of trips, Car) – 2028 AM Peak



6.3.7 The walking and cycling map demonstrates that, as would be expected, trips by these modes are heavily concentrated around a small number of zones in proximity to the site. The zone previously identified in the "all modes" map to the east of the site records a large number of trips (55); however, if the same zone is examined in the car travel map, the corresponding figure is 115 trips. This indicates that, although this zone is clearly within walking and cycling distance, within the model a large number of car trips are still made to it. The sustainable transport strategy therefore has potential to encourage a shift toward higher walking and cycling activity to this area, which would in turn directly reduce the number of car trips being generated by the development in the 2028 AM peak. The corresponding difference in 2040 decreases, with 54 car trips and 46 walking and cycling trips.

6.3.8 The PT map demonstrates that, based on the planned public transport network, there will be a substantial movement of people between the site and the city centre, but that PT trips to other destinations will be more sparse. It is noted that when these figures are compared with those for walking, cycling, and car travel, it is clear that within the model very few trips to any part of the city centre area are assigned to modes other than PT. This is an important finding, as it indicates that there is little potential benefit in strengthening PT connections to the city centre, and that improvements should instead seek to focus on journeys where there is a significant level of demand, but little or no current direct PT service provision.

Figure 19. Trip Origins by Model Sector – 2028 PM Peak

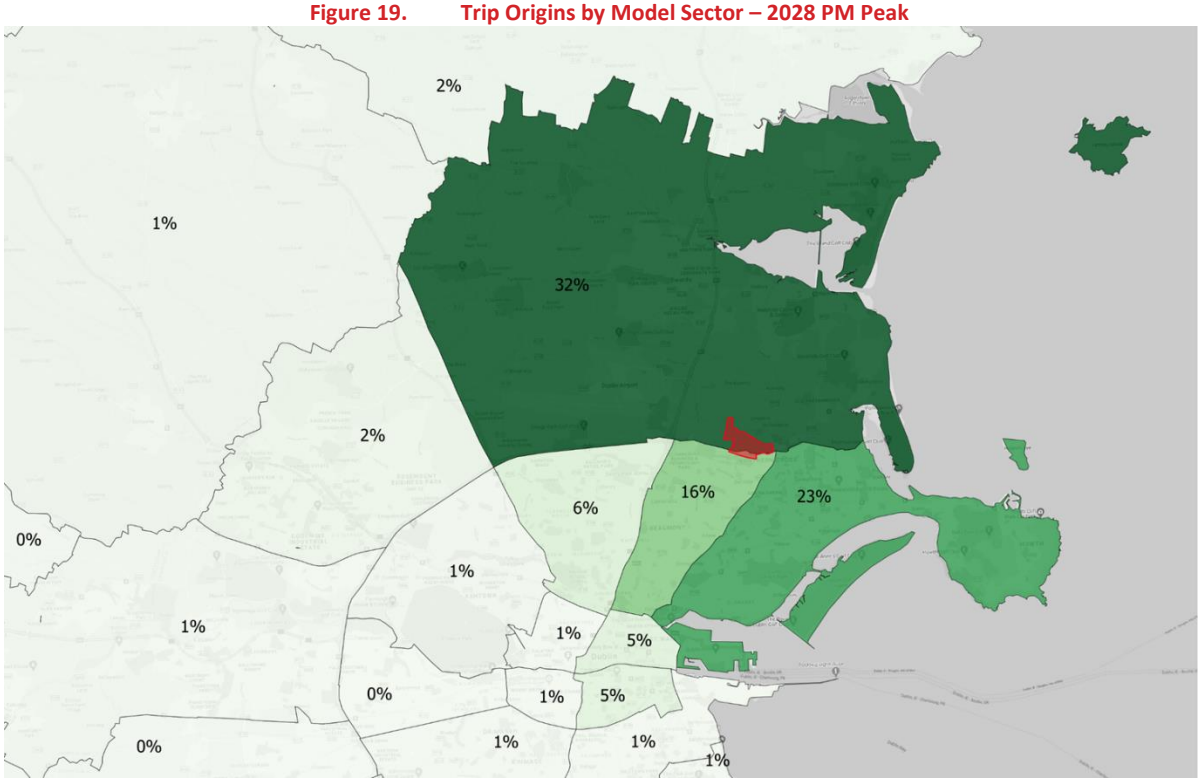
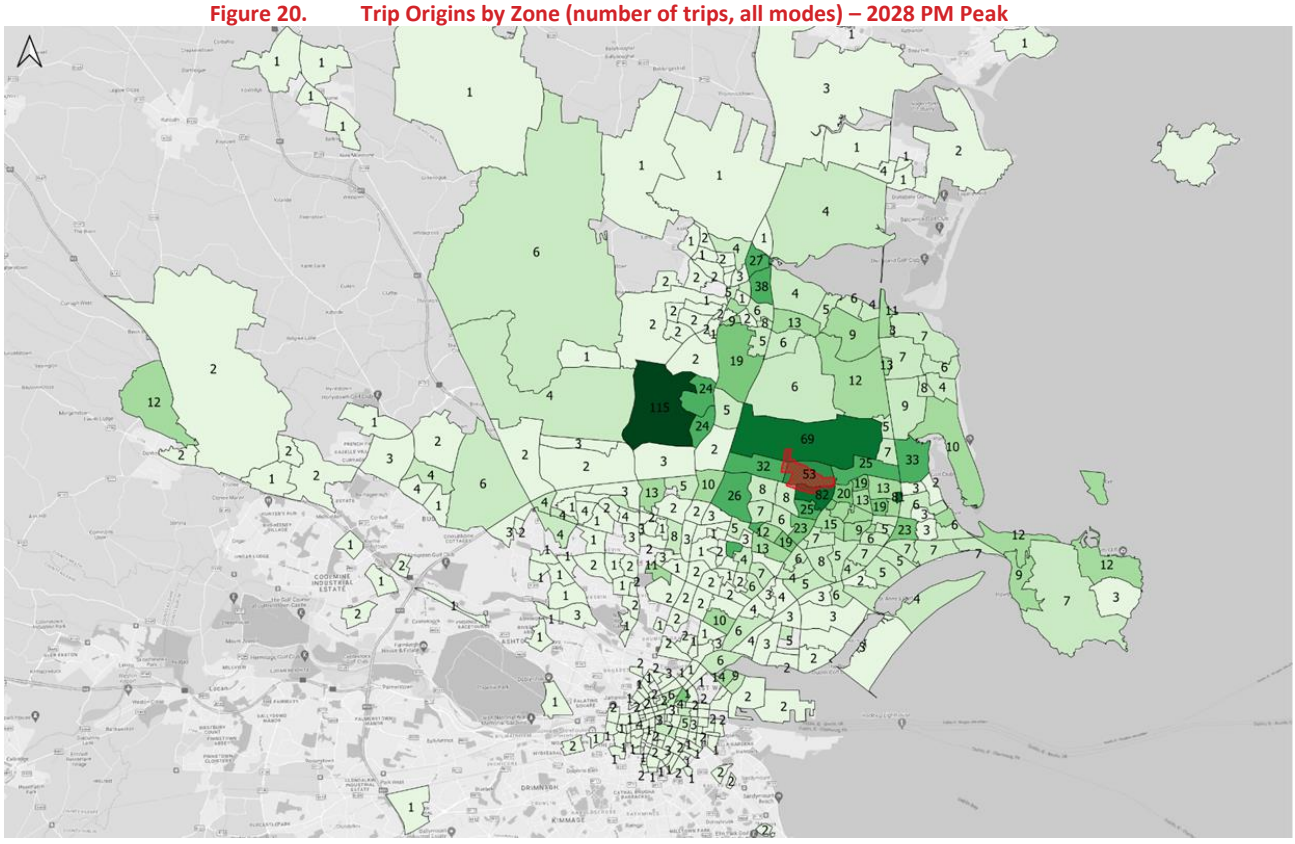


Figure 20. Trip Origins by Zone (number of trips, all modes) – 2028 PM Peak



6.3.9 The PM peak maps demonstrate a similar spatial profile to the AM peak maps; key differences are that the zone to the east previously observed to have very high numbers

of trips associated with it has far fewer (20) in the PM peak data. The importance of the airport as an employment destination is made very clear, with 115 trips from the airport to the site in 2028 and 251 in 2040; almost all of these (105 in 2028 and 203 in 2040) are made by car. There are also 81 trips made in 2028 from the zone directly serving Clongriffin Station to the site; once again, the great majority (76) are made by car. These patterns are considered to represent a combination of car-based pick-ups and "park and ride" behaviour.

Figure 21. Trip Origins by Zone (number of trips, Walking and Cycling) – 2028 PM Peak

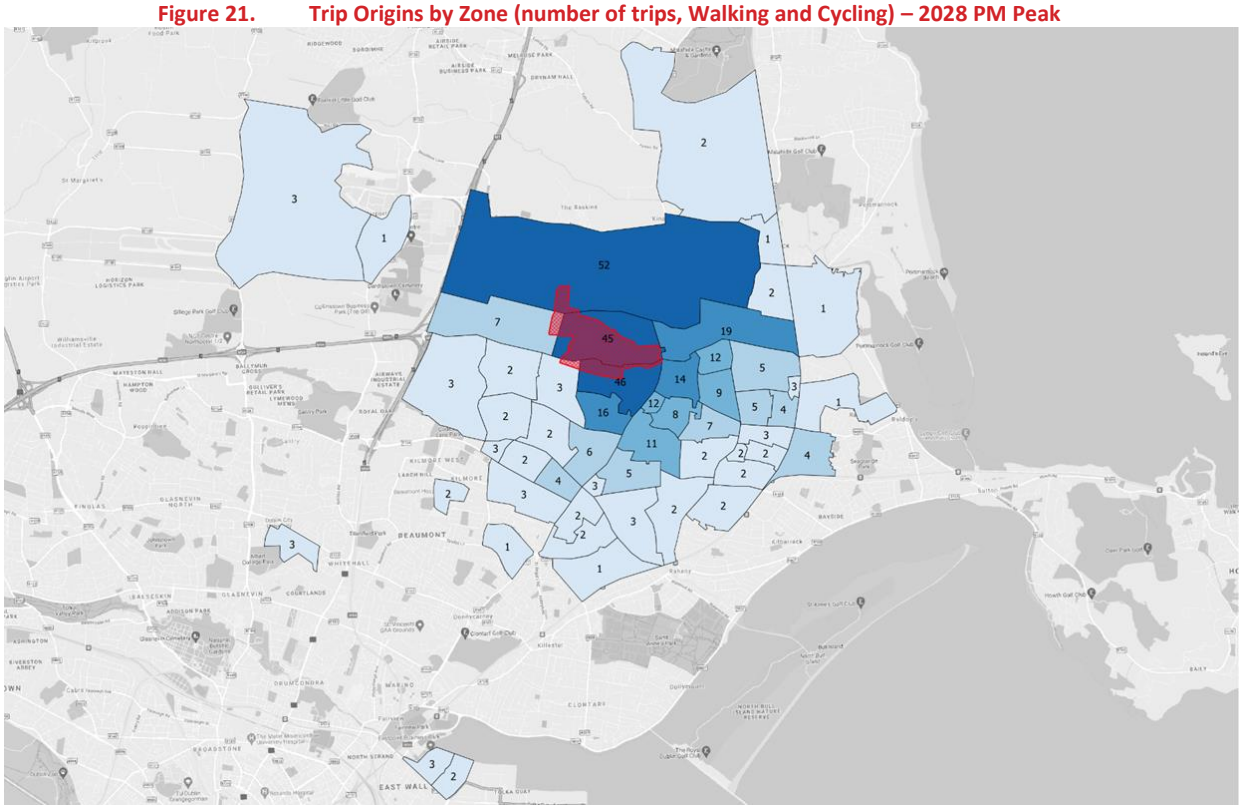


Figure 22. Trip Origins by Zone (number of trips, Public Transport) – 2028 PM Peak

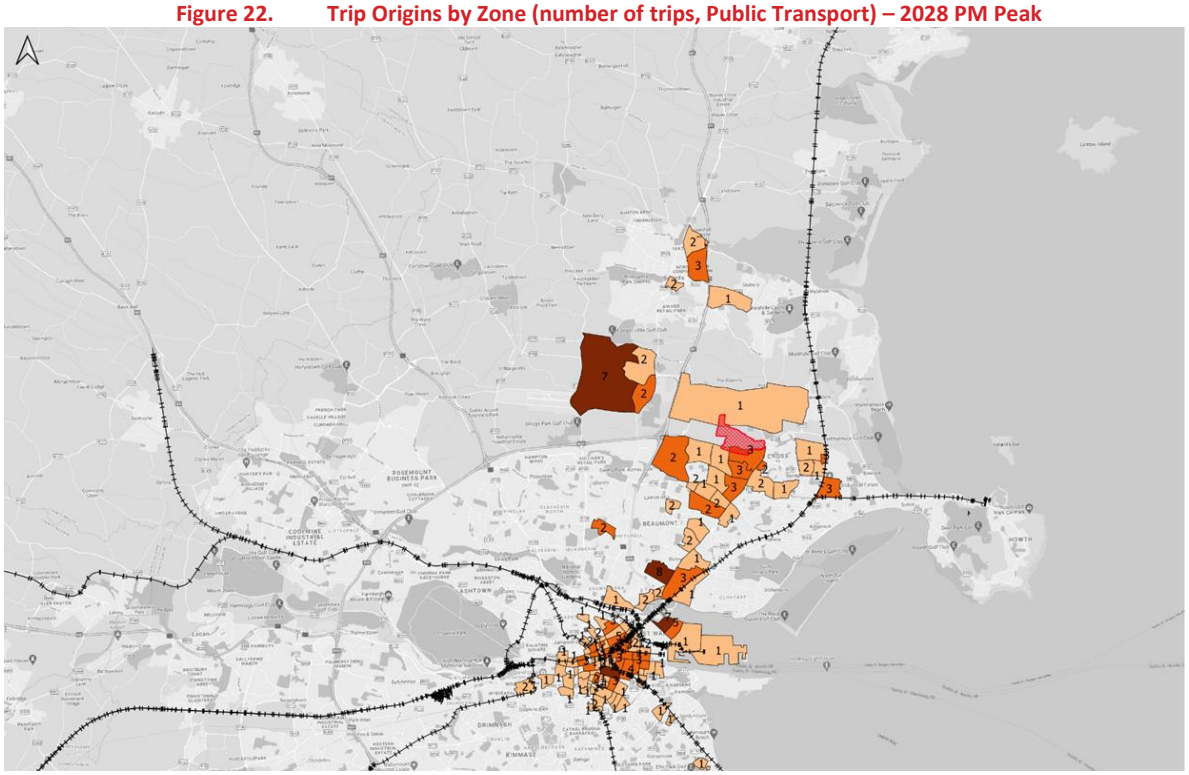
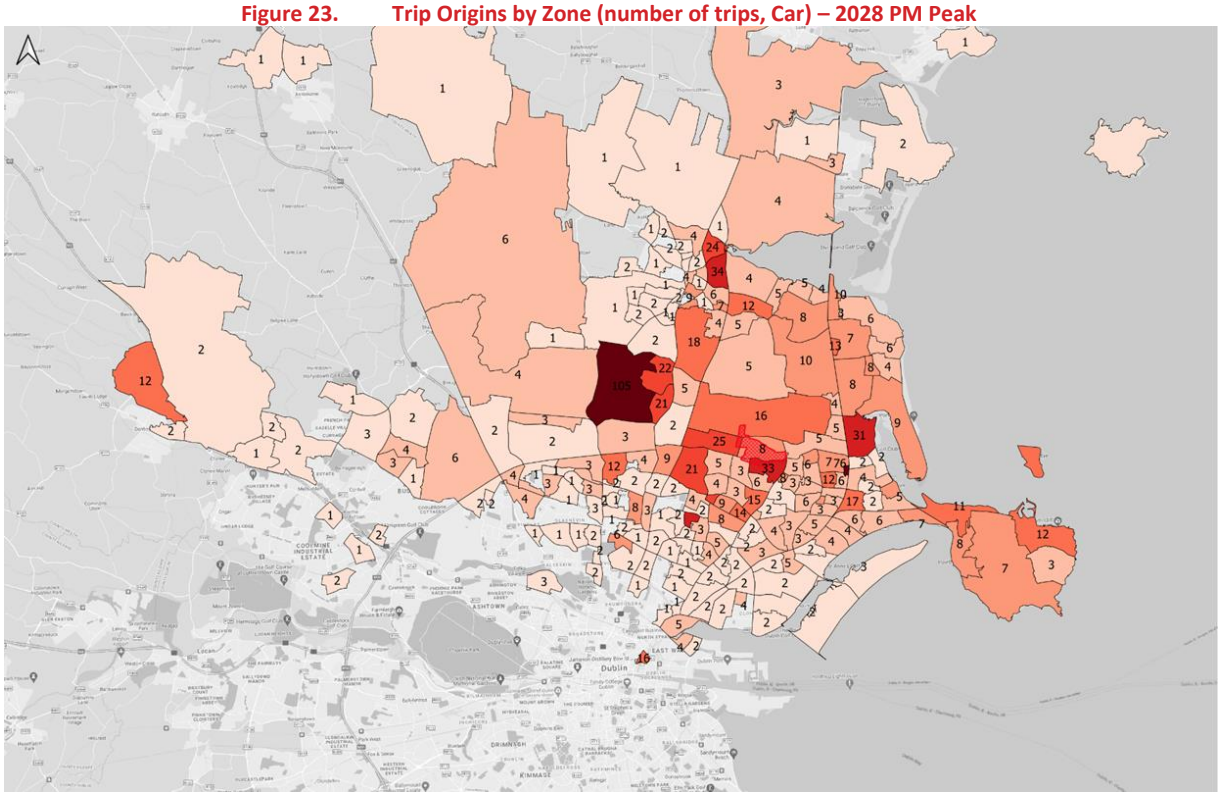


Figure 23. Trip Origins by Zone (number of trips, Car) – 2028 PM Peak



6.3.10 Overall, the analysis of the AM and PM peak data for trips made to and from the site has identified a number of discrete travel patterns and demands. As would be expected, there is a broad spread of trips from the site to surrounding areas; however, there are relatively few true long distance trips, and there are specific destinations where it is clear that there

is potential to achieve a shift away from the car-based travel which is observed in the absence of the kinds of measures which an STS can deliver.

6.3.11 The next section of this report therefore identifies the trip-making behaviours evidenced in the model which could be changed via sustainable transport measures, and provides recommendations as to how these measures could be developed and applied specifically to the Belcamp SHD.

7. SUSTAINABLE TRANSPORT STRATEGY COMPONENTS

7.1 The Case for a Bespoke Sustainable Transport Strategy

7.1.1 The model analysis has enabled SYSTRA to consider the specific challenges which will be presented by development of the Belcamp SHD site. Whilst the 2028 "With Development" modelling represents Phase 1 of the proposed development, it is considered that the same spatial distribution of travel demand would be observed for the full site buildout; the 2028 trip figures therefore represent approximately 40% of the travel demand which would be generated by the site as a whole.

7.1.2 The measures which are described within this section of the report are therefore designed to be applicable at various stages of the development. It is recognised in particular that there will be a need to take early action to support the initial development delivery in the period before Bus Connects comes into full operation, and it is intended that further work would be undertaken in this regard as part of the development of the full TA report; to this end, discussions have taken place with the NTA which have resulted in further amendments to the bus proposals as described previously in this report.

7.2 Proposed STS Measures

7.2.1 As noted previously, this section of the report provides a summary of the key findings which have arisen from SYSTRA's analysis of the trip mode, length and destination data extracted from the 2028 ERM, modified to include a representation of Phase 1 of the Belcamp SHD.

7.2.2 The specific purpose of this exercise has been to assess the distribution of trips by different modes in the AM and PM peak models (as described in the preceding section), with the aim of determining what types and volumes of trips predicted by the model to take place by car would potentially be feasible to target for modal shift to sustainable modes. In turn, this information has been used to propose measures which could be contained within a Sustainable Transport Strategy (STS) and delivered as part of the process of implementing the Proposed Development.

7.2.3 Significant findings and observations from the data are presented below; following this, **Table 75** sets out the identified issues and opportunities associated with the proposed development, and recommends measures or further examination of possible actions which could be incorporated into an STS.

- A large majority of trip associated with Phase 1 of the development are less than 15km and therefore in principle could be made by modes other than private car (with active modes being particularly relevant for trips of under 5km, and public transport being most attractive as an alternative for trips of up to 15km). This is expected to be consistent across all Phases.
- Education trips play a significant role in AM peak trip patterns. Whilst there are a substantial number of trips made by sustainable modes, a similar number are made by car.

- PM peak travel patterns are dominated by commuting, but show similar concentrations around particular zones to the AM peak excluding known education areas.
- A large majority of trips into the City Centre which will be made by residents of the proposed development are predicted by the models to be made by public transport with relatively few made by car.
- Furthermore as public transport capacity is improved so is the potential for those living in the development to choose employment and non-work activities at locations served by the routes. The corollary of this effect is a potential reduction in proportion of local residents who choose employment and other activities that require a car to get to.
- The "potential" of walking and cycling provision within the site could be supported through external improvements, particularly to the immediate networks to the east and south of the site; it is recognised that the delivery of these elements would rest with the local Highway Authority.
- The sustainable transport strategy should include a focus on making short trips easy and convenient for walking and cycling.
- Providing a direct and attractive link to Clongriffin Station has potential to reduce trips by car, as evidenced by the model origins and destination analysis
- Whilst recognising local congestion issues, outside of specific destinations it is unlikely that more general car use can be significantly discouraged without direct action to manage parking provision within the site.

7.2.4 **Table 75** below presents the proposed measures for inclusion within the STS.

Table 75. Sustainable Transport Strategy Issues and Proposed Measures

IDENTIFIED ISSUE / OPPORTUNITY	PROPOSED MEASURE OR ACTION	NOTES
High proportion of trips made are of relatively short length (i.e AM peak 82% 10km or less, PM peak 78% 10km or less)	Identification of key origins and destinations with concentrations of trips within these distances, and subsequent development of proposals for improvements to access by sustainable modes	Examination of any potentially complementary strategies or aspirations within relevant local transport plans
Relatively high proportion of very short trips (under 2km) are made by car (i.e. 41% of trips are made by car in the AM peak, and 30% in the PM peak)	As above, plus consideration of factors such as parking availability and role of facilities within the development area	
High proportion of short trips (2 to 5km) are made by car (i.e. 80% of trips are made by car in the AM peak, and 73% in the PM peak)	As above, plus consideration of factors such as parking availability	
Concentration of car trips in the AM peak corresponding to zone with primary school provision	Improvement to walking and cycling infrastructure on off-site parts of routes to identified zone to be supported (subject to implementation by LHA)	Earlier implementation of primary school development within the Belcamp SHD area (understood to also be recommended by Fingal CC with regard to Education comments)
Concentration of car trips in the AM and PM peaks associated with Airport (commuting)	Examination of potential PT improvements (either short term using existing road networks, or longer term using new east-west link road)	Examination of on-site parking provision
Concentration of car trips in the AM and PM peaks associated with hospital / healthcare (based on zone trip numbers)	Examination of improvements to access to Bus Connects corridor from the development site, and to off-site cycling infrastructure provision (where feasible)	Examination of on-site parking provision

Concentration of car trips in the AM and PM peaks associated with "park and ride / kiss and ride" activity at Clongriffin Station	Test introduction of dedicated bus service linking site directly with station; longer term potential to integrate with direct service to Airport	Examination of on-site parking provision

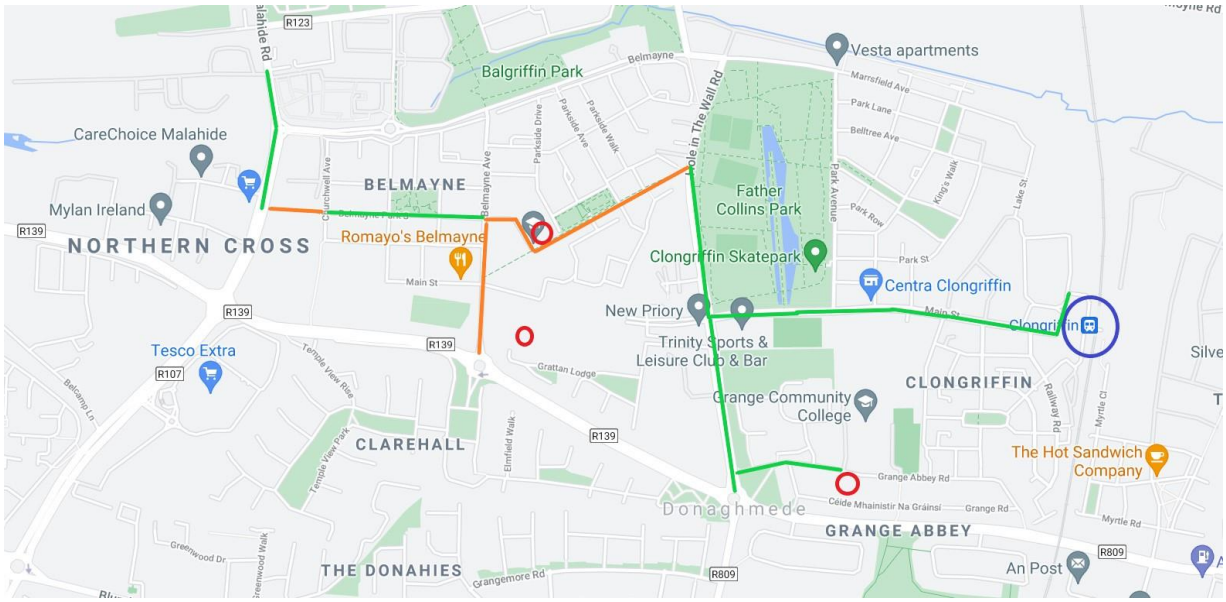
7.2.5 With regard to the specific measures proposed, the following additional points are noted:

Walking and Cycling Infrastructure

7.2.6 The 2028 models include the new Bus Connects links which will significantly improve connectivity between Malahide Road and Hole in the Wall Road; in addition to providing enhanced bus connectivity, these new routes will also enable much easier east-west movement on foot and by cycle. Whilst these routes are represented in the models, it should be noted that the ERM is principally a strategic model and is therefore not always able to fully represent subtle differences between journey choices at a very local level; as such, the full benefits (and attractiveness) of these routes for active modes do not always translate into a corresponding shift from private car use within the model results. In particular, models such as the ERM are not designed to directly reflect matters such as parking restrictions or demand at destination zones, which when combined with short journey distances mean that the "real life" choices of residents are more likely to tend toward sustainable mode choices.

7.2.7 This does not mean that further improvement to routes is not possible, and specifically with reference to any early development (i.e. prior to Bus Connects being implemented), analysis of the existing network has identified certain "links" where some short-term improvements would assist in establishing sustainable travel behaviour from an early stage of the development's implementation. These are shown visually in Figure 1 below; it is noted that the delivery of such improvements would be subject to suitable agreements being reached with the relevant Highway Authority, but that benefits from such improvements being funded by the development would accrue jointly both to residents of the proposed development and other local residents.

Figure 24. Existing (Pre-Bus Connects) Network – areas for walking and cycling upgrade consideration



Clongriffin Station

7.2.8 The 2028 "With Development" model has identified a number of car-based trips taking place in the AM and PM peaks between the site and Clongriffin Station. These trips are considered to represent a mixture of drop-offs and effectively "park and ride" activity.

7.2.9 The model data therefore supports the earlier proposal made by the Belcamp project team to introduce some form of "shuttle bus" to directly link the Belcamp site to Clongriffin Station. It is recognised that this will need some form of subsidy in the initial phase of development, and over the longer term there will be a need to co-ordinate or integrate this service with the wider bus network. Nonetheless, providing a quick and direct connection to the station would render car travel for this purpose less attractive. The speed of this service would naturally also improve as and when the Bus Connects new links from Malahide Road are implemented.

7.2.10 Over the longer term, there is potential for this route to be extended with the eventual completion of the East-West link road, and for a connection to be made to Dublin Airport. For the purposes of informing the current transport planning and analysis work being carried out by Watermans, a frequent (10 minute) service which links the Airport, the Site, and Clongriffin Station is being tested with the 2040 ERM. It is expected that this service will deliver benefits not just for the Site itself, but would also represent an attractive option for other residents within the Belmayne and Northern Cross areas, further reducing demand for car-based travel to the destinations served.

7.2.11 Subsequent to completion of the initial strategic modelling exercises, the applicant has undertaken discussions with the NTA and it is now proposed that Route N8 will serve the site directly, creating a direct connection between Clongriffin, Clarehall, the Belcamp development, Dublin Airport and eventually Blanchardstown. This route would address a significant number of the demands identified above and would be likely to produce an increased movement toward sustainable modes.

7.2.12 Given the progress made with regards to the Bus Connects proposals, it is considered that development funding could be directed towards a specific service to connect pupils with local schools. Further discussion and investigation of this would be required to determine anticipated demand in greater detail; however this service would offer a direct alternative to car and escort trips for school pupils and would have a positive effect on car-based trip generation, particularly in the AM peak period.

7.3 Integration with the Belcamp Transport Strategy

7.3.1 It is proposed that the STS should form a part of the wider Belcamp Transport Strategy. The integration of STS measures will be informed by the outcomes of the assessments contained within the full TA for the site, including any proposed off-site mitigation measures which may be identified via the TA technical assessments.

8. SUMMARY AND CONCLUSIONS

8.1.1 SYSTRA Ltd. (SYSTRA) has been appointed by Gerard Gannon Properties (the Client) to provide transport input to proposals related to the Belmayne and Belcamp Lane Belcamp SHD, and development of a site-wide Sustainable Transport Strategy (STS).

8.1.2 In order to develop the principles and suggested measures for the STS, SYSTRA has undertaken strategic transport modelling and analysis using information gathered from desktop research, previous studies and planning applications, and data extracted from the National Transport Authority's (NTA) Eastern Regional Model (ERM).

8.1.3 The Sustainable Transport Strategy is intended to support and inform the Transport Assessment (TA) which will ultimately be prepared and submitted in support of an application for the Belcamp SHD site.

8.1.4 The analysis carried out using customised versions of the strategic ERM models has shown the following:

- A large majority of trip associated with Phase 1 of the development are less than 15km and therefore in principle could be made by modes other than private car (with active modes being particularly relevant for trips of under 5km, and public transport being most attractive as an alternative for trips of up to 15km). This is expected to be consistent across all Phases.
- Education trips play a significant role in AM peak trip patterns. Whilst there are a substantial number of trips made by sustainable modes, a similar number are made by car; a new bus service designed specifically to connect the development with local schools could reduce the number of associated car-based trips.
- PM peak travel patterns are dominated by commuting, but show similar concentrations around particular zones to the AM peak excluding known education areas.
- A large majority of trips into the City Centre which will be made by residents of the proposed development are predicted by the models to be made by public transport with relatively few made by car.
- The "potential" of walking and cycling provision within the site could be supported through external improvements, particularly to the immediate networks to the east and south of the site.
- The wider Belcamp Transport Strategy should include a focus on making short trips easy and convenient for walking and cycling.
- Providing a direct and attractive link to Clongriffin Station has potential to reduce trips by car, as evidenced by the model origins and destination analysis; the proposed introduction of the N8 bus service to the site would address this requirement.

8.1.5 A series of measures has therefore been proposed which will seek to encourage and facilitate use of sustainable modes for trips where this is both feasible and where it is expected that there would be a material benefit to both the development and the transport networks, by directly reducing the number of trips to and from the proposed development made by car.

8.1.6 It is anticipated that by applying the suggested measures, the overall impact of the proposed development on the transport networks would be reduced; on the basis of the evidence gathered from the modelling exercises it is considered that there is a robust basis for the expected benefits of these measures to be taken into account when the residual impacts of the proposed development are assessed for the purposes of the site's TA report.

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