St. Edmundsbury Hospital, Lucan, Co. Dublin

Traffic and Transport Assessment

20 April 2026

Formerly JB Barry Partners who became part of Egis in 2023

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1 INTRODUCTION

1.1 Background

EGIS was commissioned by the Saint Patrick's University Hospital to prepare a Traffic & Transport Assessment (TTA) for a proposed St. Edmundsbury Hospital, Lucan, Co. Dublin.

The proposed development will consist of the following:

Site clearance, including the removal of all existing structures (except protected structures such as St. Edmundsbury House) on Site;
The development of adult main hospital, adolescent unit, St. Edmundsbury House (historic building), individual therapy rooms (historic barn) and facilities building; and car and bicycle parking;
Proposed improvement works at Chapel Hill / Lucan Road Junction; and
The provision of public and communal open spaces, public realm, boundary treatments, landscaping and lighting; refuse storage, associated drainage, attenuation and services; and all associated site development works.

The proposed development Site is located to the north of Lucan Road as shown in **Figure 1.1** below.

FIGURE 1.1 - LOCATION OF THE PROPOSED DEVELOPMENT
(SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

1.2 Consultation and Scoping Study

Following analysis of the surrounding area, a conservative approach has been adopted and it has been agreed with the Applicant that the TTA would examine the impact of the proposed development on the following seven junctions surrounding the development:

Junction 1 - Western Access Road to St. Edmundsbury Hospital / Lucan Road;
Junction 2 - Eastern Access Road to St. Edmundsbury Hospital / Lucan Road / Esker Lane;
Junction 3 - R136 / Lucan Road;
Junction 4 - Lucan Road / Access to Hermitage Golf Club;
Junction 5 - R136 / N4 Slip Road (eastbound);
Junction 6 - R136 / N4 Slip Road (westbound); and
Junction 7 - Chapel Hill / Lucan Road.

These junctions were selected as they are considered the junctions most likely to be affected by traffic associated with the proposed development. As a result, these seven junctions will form the study area for the TTA. The locations of the seven junctions are illustrated in **Figure 1.2** below.

FIGURE 1.2 – LOCATION OF THE PROPOSED DEVELOPMENT AND CONCERNED JUNCTIONS
(SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

1.3 Objectives

This report provides an assessment of the potential traffic impacts associated with the proposed development. In this regard, the assessment aims to:

- Identify the existing environment in terms of traffic and transportation;
- Quantify the likely vehicle traffic flows to and from the development onto the surrounding road network;
- Identify and quantify the likely traffic impacts on the surrounding road network resulting from the development;
- Identify any potential impacts on vulnerable road users in the study area; and
- Identify suitable measures to mitigate traffic and transportation impacts, if any, associated directly with the development.

The assessment is based on the findings of site visits, traffic observations, on-site traffic counts, architectural plans, and discussions with the Design Team.

1.4 Methodology

The methodology adopted for this report is summarised as follows:

- Reference was made to site layout drawings issued by the design team and the proposed plans for the Site;
- An inspection of the local road network was undertaken during peak traffic periods;
- Proposed access arrangements for the development onto the surrounding road network were considered;

The traffic survey locations and survey times, which was undertaken on 22nd February 2023, adjacent to the proposed development at Lucan were selected so as to best reflect the likely traffic generation from the subject development, particularly at proposed site access/egress points;
The net trip generation for the proposed development was estimated by using the TRICS database;
Existing traffic volumes on the surrounding road network were analysed;
An exercise was carried out to quantify the expected development net trip generation (By using the TRICS database) as a proportion of existing traffic flows on the surrounding road network to determine if a detailed traffic impact assessment is required for all of the junctions included within the scoping study;
The improvement scheme was proposed to relieve traffic congestion and enhance the safety of vulnerable road users at Junction 7;
The modal shift for car was estimated;
Utilising the TRICS database, the junctions considered to be most likely to be impacted upon by traffic movements associated with the proposed development was assessed in terms of capacity and road safety;
Another two traffic count surveys at St. Patrick's University Hospital at Dublin 8 and at Junction 1 of Lucan were also undertaken on 2nd May 2024 and 21st May 2024 respectively to facilitate the estimation of net trip generation for the proposed development;
Utilising the aforementioned traffic count surveys, the junctions considered to be most likely to be impacted upon by traffic movements associated with the proposed development was assessed;
The analysis results based on different methods (i.e. by using the TRICS database, traffic count survey at St. Patrick's University Hospital and traffic count surveys at Lucan) were compared in term of net trip generation, net trip generation as a percentage of existing traffic and traffic impact;
Car parking utilization was also used to estimate the net trip generation for the proposed development; and
Utilising the car parking utilization, the junctions considered to be most likely to be impacted upon by traffic movements associated with the proposed development was assessed.

In preparing this assessment, reference has been made to the following documents:

TII Traffic and Transport Assessment Guidelines (2014);
TII PE-PAG-02017 - Project Appraisal Guidelines for National Roads Unit 5.3 - Travel Demand Projections (issued in October 2021);
Design Manual for Urban Roads and Streets (DMURS);
NTA Greater Dublin Area Transport Strategy 2022-2042;
Greater Dublin Area Cycle Network Plan;
South Dublin County Development Plan 2022-2028; and
Cycle Design Manual (issued in September 2023).

2 RECEIVING ENVIRONMENT

2.1 Site Location

The proposed development Site is located to the north of Lucan Road, Co. Dublin as shown in **Figure 1.2**. At present, two existing vehicular accesses are located at Junction 1 and Junction 2 on the Lucan Road to provide access to the proposed development. Refer to planning documentation and submitted plans for a more detailed description of the proposed development and the positioning of the building relative to the site boundary and access road/link.

2.2 Local Road Network

The local road network in the vicinity of the subject Site is illustrated graphically in **Figure 1.2**. **Figure 2.1** to **Figure 2.6** following illustrate the existing road network adjacent to the proposed development.

FIGURE 2.1 – JUNCTION 1 (WESTERN ACCESS ROAD TO ST. EDMUNDSBURY HOSPITAL/ LUCAN ROAD)
(*SOURCE: GOOGLE MAPS*)

FIGURE 2.2 – JUNCTION 2 (EASTERN ACCESS ROAD TO ST. EDMUNDSBURY HOSTPIAL/ LUCAN ROAD/ ESKER LANE)
(*SOURCE: GOOGLE MAPS*)

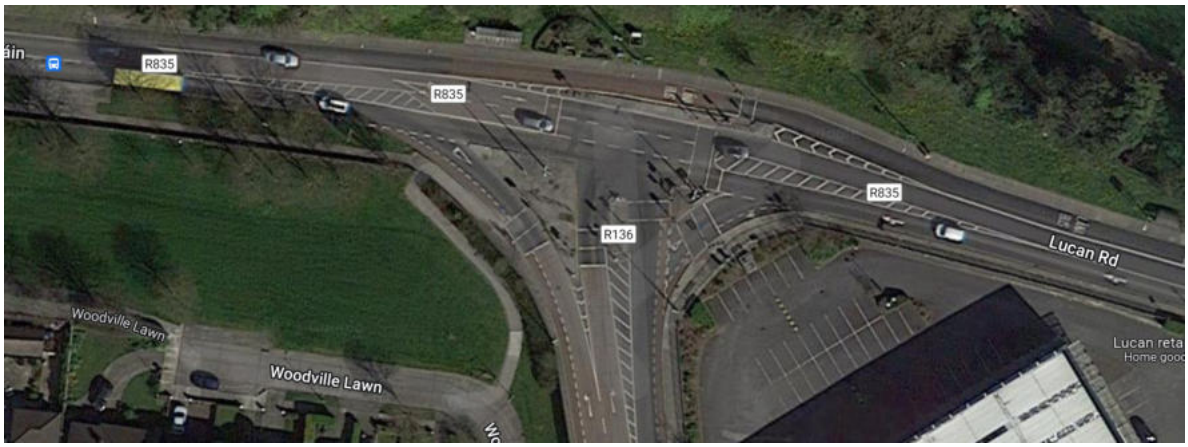

FIGURE 2.3 – JUNCTION 3 (R136/ LUCAN ROAD)
(*SOURCE: GOOGLE MAPS*)

FIGURE 2.4 – JUNCTION 7 (CHAPEL HILL/ LUCAN ROAD)
(*SOURCE: GOOGLE MAPS*)

FIGURE 2.5 – JUNCTION 5 (R136/ N4 SLIP ROAD – EASTBOUND)
(*SOURCE: GOOGLE MAPS*)

FIGURE 2.6 – JUNCTION 6 (R136/ N4 SLIP ROAD – WESTBOUND)
(*SOURCE: GOOGLE MAPS*)

2.2.1 Lucan Road

The subject Site is located to the north of Lucan Road, which connects to the R136 and the Chapel Hill. Lucan Road runs in east/west direction past the Site. Lucan Road between Junction 7 and Junction 1 is a bi-directional two-lane road with some turning inbound flares at junctions as shown in **Figure 2.1** above. The road pavement width of this road section is approximately 8.2 metres. Majority of Lucan Road between Junction 1 to Junction 4 is a bi-directional three-lane road (two lane for eastbound - including one bus lane, and one lane for westbound) with road pavement width of approximately 9 metres as shown in **Figure 2.2** above. A pedestrian footpath runs along both side of Lucan Road, but no cycle track/lane exists along Lucan Road. The speed limit of Lucan Road in the vicinity of the Site is 50kph.

2.2.2 R136

R136 is located to the east of the proposed development and it provides access to local residents travelling to/from the N4 via the Lucan Road and the R136 as shown in **Figure 1.2**. R136 is a bi-directional four-lane road with a road pavement width of approximately 12 metres as shown in **Figure 2.5** and **Figure 2.6** above. A pedestrian footpath is present along one side of R136. Cycle lane is presented along both side of R136 between Junction 3 and Junction 5 as shown in **Figure 2.5** but no cycle track/lane exists along R136 between Junction 5 and Junction 6 as shown in **Figure 2.6**.

2.3 Existing Public Transport

2.3.1 Bus Services

The proposed development is situated to benefit from a good quality existing bus services provided by two bus operators (i.e. Dublin Bus and Airport Hopper). The closest bus stop is just located outside the proposed development on Lucan Road westbound as shown in **Figure 2.7**. Another bus stop is located on Lucan Road eastbound with approximately 120 metres (approximately 1.5-minute walk) from the proposed development as shown in **Figure 2.7**. Also, the C3 bus route provides a link to Leixlip Louisa Bridge Station, which is located approximately 6 kilometres (approximately 30-minute cycle) from the proposed development. In addition, the L54 bus route provides a link to Red Cow LUAS (red line), which is located approximately 11 kilometres (approximately 55-minute cycle) from the proposed development. At the time of writing, the bus services serving the proposed development are detailed in **Table 2.1**.

FIGURE 2.7 – BUS STOP LOCATIONS
(SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

TABLE 2.1 – BUS ROUTES SERVING THE AREA

Route No.	Route Direction	Frequency of Services*			Bus Stop No.
		Mon – Fri	Sat	Sun	
C3	Maynooth, Straffan Road – Ringsend Road	38 services (04:36 – 22:36)	36 services (04:35 – 22:35)	34 services (04:36 – 22:36)	Stop 2233 at Lucan Road
	Ringsend Road – Maynooth, Straffan Road	37 services (05:34 – 23:35)	36 services (05:20 – 23:35)	34 services (05:36 – 23:36)	Stop 2218 at Lucan Road
C4	Maynooth Station – Ringsend	41 services (04:55 – 23:03)	39 services (05:05 – 23:02)	34 services (05:04 – 23:04)	Stop 2233 at Lucan Road
	Ringsend – Maynooth Station	42 services (05:09 – 23:06)	40 services (05:09 – 23:06)	36 services (05:07 – 23:07)	Stop 2218 at Lucan Road
C5	Maynooth, Straffan Road – Ringsend Road	5 services (23:36 – 03:36)	5 services (23:35 – 03:35)	5 services (23:36 – 03:36)	Stop 2233 at Lucan Road
	Ringsend – Maynooth Station	5 services (00:35 – 04:35)	5 services (00:35 – 04:35)	5 services (00:36 – 04:36)	Stop 2218 at Lucan Road
C6	Maynooth Station – Ringsend Road	5 services (00:02 – 04:02)	5 services (00:01 – 04:01)	5 services (00:03 – 04:03)	Stop 2233 at Lucan Road
	Ringsend Road – Maynooth Station	5 services (00:05 – 04:05)	5 services (00:05 – 04:05)	5 services (00:06 – 04:06)	Stop 2218 at Lucan Road
L52	Blanchardstown SC – Adamstown Station	18 services (06:15 – 23:25)	18 services (06:15 – 23:15)	16 services (08:15 – 23:20)	Stop 2223 at Main Street Lucan
	Adamstown Station – Blanchardstown SC	18 services (06:25 – 23:25)	18 services (06:20 – 23:25)	16 services (08:20 – 23:25)	Stop 2229 at Main Street Lucan
L54	River Forest – Red Cow LUAS	35 services (06:07 – 23:37)	32 services (06:07 – 23:37)	29 services (08:07 – 23:37)	Stop 2233 at Lucan Road
	Red Cow LUAS – River Forest	36 services (05:52 – 23:37)	32 services (06:07 – 23:37)	29 services (08:07 – 23:37)	Stop 2218 at Lucan Road
X30	Dodsboro – Belfield UCD	4 services (06:45 – 08:10)	-	-	Stop 2233 at Lucan Road
	Belfield UCD – Dodsboro	2 services (16:50 – 17:25)	-	-	Stop 2218 at Lucan Road
X31	River Forest – Earlsfort Terrace	3 services (07:20 – 07:55)	-	-	Stop 2233 at Lucan Road
	Earlsfort Terrace – River Forest	3 services (16:50 – 17:50)	-	-	Stop 2218 at Lucan Road
X32	Hewlett Packard – Earlsfort Terrace	2 services (07:05 – 07:45)	-	-	Stop 2233 at Lucan Road
	Earlsfort Terrace – Hewlett Packard	2 services (17:05 – 17:35)			Stop 2218 at Lucan Road

*Note: * The Dublin Bus timetable and Airport Hopper timetable can be referred to https://www.dublinbus.ie/Your-Journey1/Timetables/ and https://bustimes.org/operators/airport-hopper respectively.*

2.3.2 Train Services

The train stations in adjacent to the proposed development are Adamstown, Clondalkin Fonthill, Clonsilla, Leixlip Confey and Leixlip Louisa Bridge Stations as shown in **Figure 2.8**. The train stations with the feeder bus to the proposed development are illustrated in **Table 2.2**.

FIGURE 2.8 – LOCATION OF TRAIN STATIONS IN ADJACENT TO THE PROPOSED DEEVELOPMENT
(SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

TABLE 2.2 – ROUTE FROM THE PROPOSED DEVELOPMENT TO TRAIN STATION

Train Station	Distance from the Proposed Development	Route from the Proposed Development to Train Station	
		Feeder Bus Route	Total Walking Distance
Adamstown	Approx. 4.6km	L52 (to Adamstown Station)	Approx. 900m
Clondalkin Fonthill	Approx. 5.3km	L54 (to Red Cow LUAS)	Approx. 120m
Clonsilla	Approx. 5.3km	L52 (to Blanchardstown SC)	Approx. 1100m
Leixlip Confey	Approx. 5.6km	L54 (to River Forest)	Approx. 300m
Leixlip Louisa Bridge	Approx. 6.1km	C3 (to Maynooth)	Approx. 100m

At the time of writing, the frequency of train services provided at Adamstown, Clondalkin Fonthill, Clonsilla, Leixlip Confey and Leixlip Louisa Bridge Station are shown in **Table 2.3**. Exact times can be found in the Irish Rail website.

TABLE 2.3 – TRAIN SERVICE (*WWW.IRISHRAIL.IE*)

Train Direction	Train Serviced*	Frequency of Services**		
		Mon – Fri	Sat	Sun
Adamstown	Grand Canal Dock / Dublin Heuston - Portlaoise	48 services (06:32 – 23:22)	18 services (07:23 – 23:10)	7 services (09:05 – 20:20)
	Portlaoise – Grand Canal Dock / Dublin Heuston	46 services (05:33 – 22:30)	18 services (05:33 – 22:30)	8 services (07:40 – 20:30)
	Dublin Heuston – Waterford	1 service (20:15)	1 service (20:15)	-
	Waterford – Dublin Heuston	2 services (06:30 – 21:37)	1 service (21:37)	-
Clondalkin Fonthill	Grand Canal Dock / Dublin Heuston - Portlaoise	48 services (06:32 – 23:22)	18 services (07:25 – 23:10)	7 services (09:05 – 20:20)
	Portlaoise – Grand Canal Dock / Dublin Heuston	46 services (05:33 – 22:30)	19 services (05:33 – 22:30)	8 services (07:40 – 20:30)
	Dublin Heuston – Waterford	1 service (20:39)	1 service (20:39)	-
	Waterford – Dublin Heuston	1 service (07:30)	1 service (07:30)	-
	Dublin Heuston – Cork	19 service (06:51 – 0:11)	17 service (06:51 – 23:00)	13 services (06:51 – 23:00)
	Cork – Dublin Heuston	19 service (06:25 – 23:00)	18 service (06:25 – 23:00)	13 service (06:25 – 23:00)
Clonsilla	Dublin – M3 Parkway and, Longford	50 services (05:25 – 23:20)	32 services (05:58 – 23:27)	24 services (08:45 – 23:27)
	Longford and M3 Parkway – Dublin	64 services (05:57 – 23:10)	48 services (06:50 – 23:10)	39 services (08:07 – 23:10)
Leixlip Confey	Dublin – M3 Parkway and, Longford	37 services (05:25 – 23:20)	32 services (05:58 – 23:27)	24 services (08:45 – 23:27)
	Longford and M3 Parkway –Dublin	39 services (05:57 – 23:10)	31 services (06:50 – 23:10)	24 services (08:07 – 23:10)
Leixlip Louisa Bridge Station	Dublin Connolly – Sligo	3 services (17:10 – 20:50)	-	-
	Sligo - Dublin Connolly	2 services (07:00 – 07:35)	-	-
	Dublin – M3 Parkway and, Longford	38 services (05:25 – 23:20)	33 services (05:58 – 23:27)	25 services (08:45 – 23:27)
	Longford and M3 Parkway – Dublin	39 services (05:57 – 23:10)	31 services (06:50 – 23:10)	24 services (08:07 – 23:10)

*Note: * The rail fares and tickets details can be referred to https://www.irishrail.ie/en-ie/rail-fares-and-tickets/fares-info/dart-and-short-hop-zone.*

*** The train timetable can be referred to https://www.irishrail.ie/en-ie/travel-information/find-a-station.*

2.3.3 LUAS

The Red Line LUAS stop of Red Cow is located approximately 11 kilometres (approximately 55-minute cycle) to the southeast of the Site. Also, the L54 bus route provides a link between the proposed development and Red Cow LUAS stop. At the time of writing, the Red Line LUAS service is detailed in **Table 2.4** following.

TABLE 2.4 – OPERATING HOURS OF LUAS SERVICE (*WWW.LUAS.IE*)

LUAS	LUAS Serviced*	Timetable**			Closest Stop with Feeder Bus to the Proposed Development
		Mon – Fri	Sat	Sun	
Red Line	Eastbound from Tallaght	05:30 – 00:00	06:42 – 00:15	07:12 – 22:51	Red Cow
	Westbound from the Point	05:30 – 00:30	06:30 – 00:30	07:00 – 23:30	Red Cow
	Westbound from Connolly	07:10 – 19:31	09:14 – 18:39	15:12 – 19:03	Red Cow

*Note: * The LUAS fares and tickets details can be referred to https://luas.ie/ticket-types.html.*
*** The LUAS timetable can be referred to https://luas.ie/operating-hours.html.*

2.3.4 Taxi Services

Taxi is also a common form of transport in Ireland. Currently, passengers can order / book taxi services in advance via online / phone / apps (i.e. Free Now, Lynk, Taxy, etc.). By using these software, the passengers can order their nearest taxi so as to reduce the waiting time.

2.3.5 Car Clubs and Car Sharing

Car clubs or car sharing (i.e. "Yuko" and "GoCar") is a model of car rental where people rent cars for short periods of time, often by the hour. It differs from traditional car rental in that as noted above rental periods are shorter, the owners of the cars are sometimes private individuals themselves, and the carsharing facilitator is generally distinct from the car owners. Carsharing is part of a larger trend of shared mobility. Benefits include cost saving, convenience (no responsibility for insurance, tax, fuel, maintenance), less traffic congestion and less parking pressure. At the time of writing, two GoCars (GoBases) are available at the Lucan Road near Brookvale (refer to **Figure 2.9**) which is approximately 850 metres walking distance (approximately 10-minute walk) from the proposed development.

FIGURE 2.9 – LOCATION OF GOCAR
(SOURCE: https://www.gocar.ie/locations, ANNOTATION BY EGIS)

2.4 Emerging Transport Developments

2.4.1 BusConnects

The BusConnects Dublin Programme comprises a series of integrated initiatives, including the delivery of 12 Core Bus Corridor schemes, together with the phased implementation of the Dublin Network Redesign Project, enhanced bus stops and shelters, simplified fares, next generation ticketing and transition to a zero-emission fleet. As part of this programme, a number of improved and redesigned bus services have been introduced in the vicinity of the proposed development.

Of particular relevance to the subject site is Phase 2 of the Dublin Network Redesign, which was implemented on 28 November 2021 and introduced the C-Spine routes (C1, C2, C3 and C4), together with Route 52, a number of peak-only routes including X25, X26, X27, X28, X30, X31 and X32, and a number of local routes including L51, L52, L53, L54, L58 and L59. Two night-time routes, C5 and C6, were also introduced as part of this phase.

These services improve public transport accessibility in the wider area of the proposed development, including along Lucan Road to the south of the site. In particular, the C3 and C4 routes form part of the C-Spine, providing enhanced connectivity between the outer western suburbs and Dublin City Centre, while the L54 local route improves access to surrounding residential areas and onward connections to the Red Cow Luas stop. The X30, X31 and X32 peak-time routes further enhance commuter accessibility during peak periods.

Figure 2.10 and **Figure 2.11**, taken from the latest BusConnects proposals, illustrate the bus network in the vicinity of the proposed development.

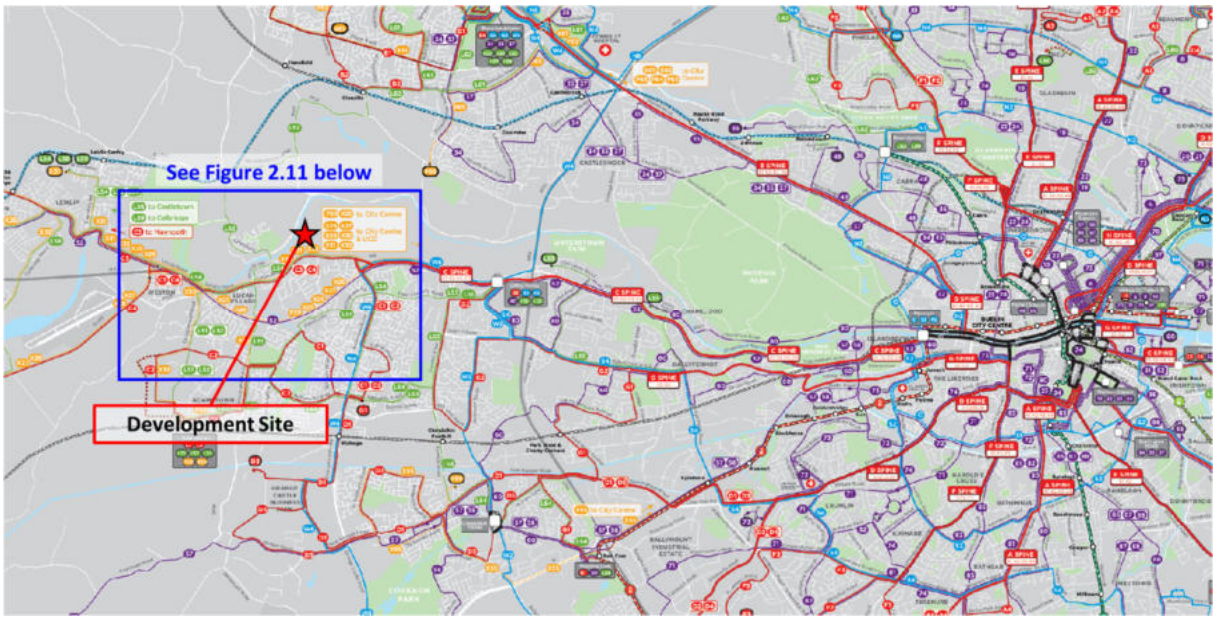

FIGURE 2.10 – BUSCONNECTS 'BIG PICTURE MAP' SHOWING SITE LOCATION
(SOURCE: www.busconnects.ie, ANNOTATION BY EGIS)

FIGURE 2.11 – PROPOSED BUSCONNECTS ROUTES IN THE VICINITY OF THE PROPOSED DEVELOPMENT (*SOURCE: www.busconnects.ie, ANNOTATION BY EGIS)*

2.4.2 LUAS Lucan Line

According to the GDA Transport Strategy 2022-2042, it is proposed to introduce a Luas Lucan, which will run from Lucan to the city centre via Liffey Valley Town Centre and Ballyfermot. New line will be built from Lucan (Newcastle Road) to Blackhorse, where it links to the Luas Red Line. The preliminary alignment of Luas Lucan is presented in **Figure 2.12**.

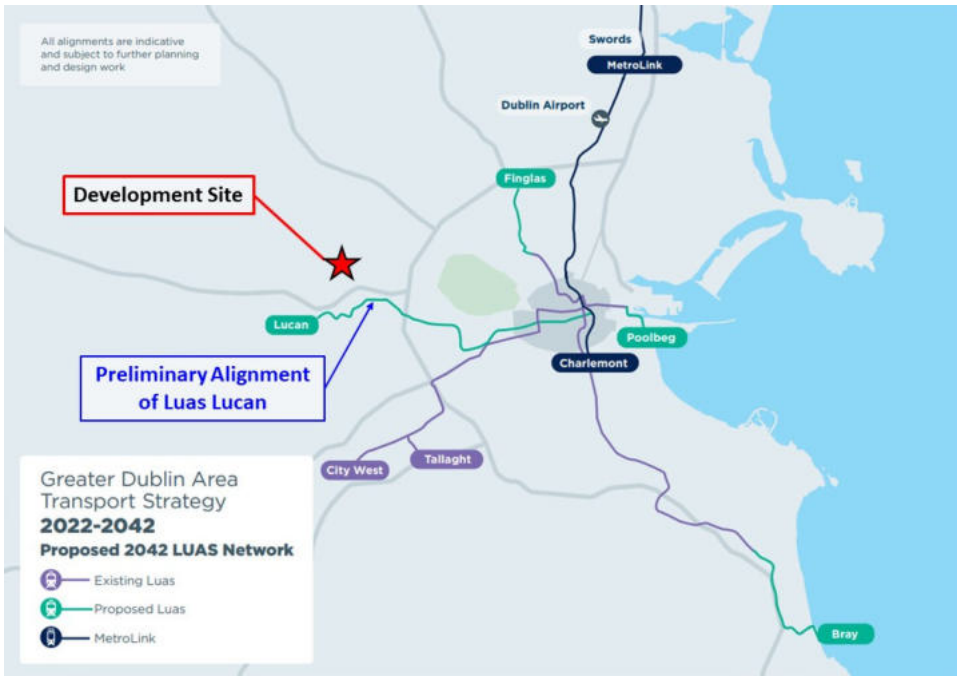

FIGURE 2.12 – PRELIMINARY ALIGNMENT OF LUAS LUCAN

(SOURCE: GDA TRANSPORT STRATEGY 2022-2042, ANNOTATION BY EGIS)

2.5 Cycling and Pedestrian Facilities

The Site is connected to the surround public footpath network via the footpath on Lucan Road. The nearest cycle track to the west of proposed development is on Laraghcon as shown in **Figure 2.15**. Cyclists are expected to share the carriageway with motorists for 850 metres along the Lucan Road, Chapel Hill and Lucan Bridge in order to access this cycle track as shown in **Figure 2.13**. In addition, the nearest cycle track to the east of proposed development is on R136 as shown in **Figure 2.15**. Cyclists are expected to share the carriageway with motorists for 700 metres along the Lucan Road in order to access this cycle track as shown in **Figure 2.14**.

FIGURE 2.13 – CYCLE TRACK ACCESS ON LARAGHCON
(SOURCE: GOOGLE MAPS)

FIGURE 2.14 – CYCLE TRACK ACCESS ON R1136
(SOURCE: GOOGLE MAPS)

In 2013, the NTA published the Greater Dublin Area (GDA) Cycle Network Plan, which examined existing cycle facilities within the GDA and identified a number of cycle networks consisting of the Urban Network, Inter-Urban Network and Green Route Network for each of the seven Local Authorities within the GDA. The existing nearby exiting cycle facilities are shown in **Figure 2.15**.

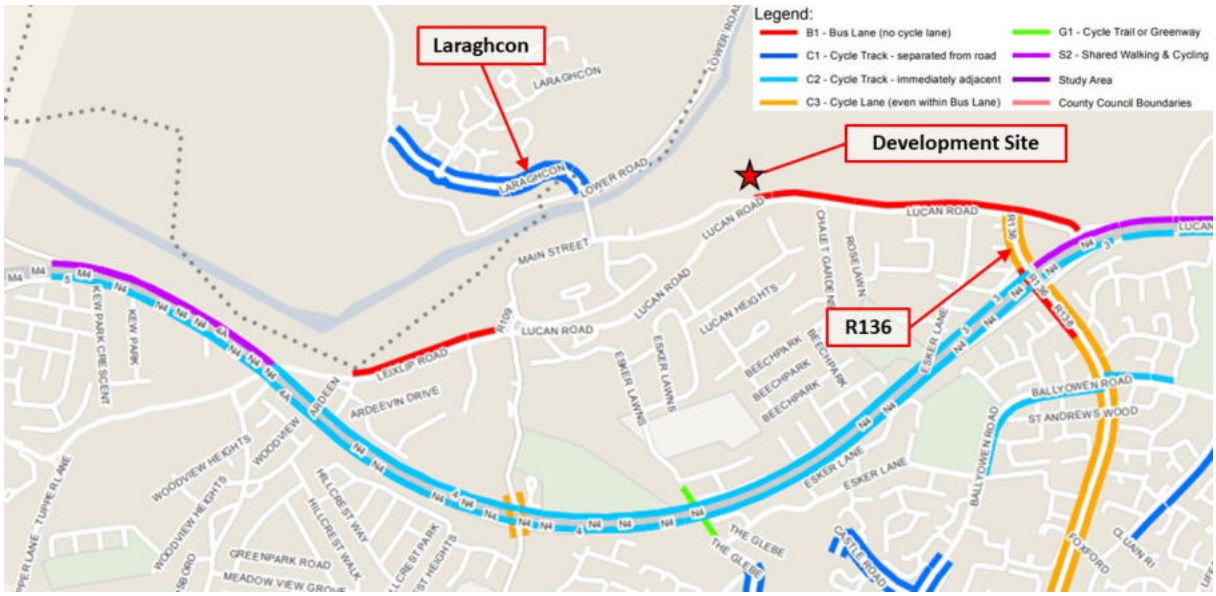

FIGURE 2.15 – EXISTING CYCLE FACILITIES (GREATER DUBLIN AREA CYCLE NETWORK PLAN)
(SOURCE: GREATER DUBLIN AREA CYCLE NETWORK PLAN, ANNOTATION BY EGIS)

The 2022 Greater Dublin Area Cycle Network Plan examines the proposed cycle network in the Dublin North West. The proposed cycle networks include a secondary cycling along the Lucan Road and Chapel Hill, which will allow easy and safe access to/from the proposed development as shown in **Figure 2.16**.

FIGURE 2.16 – PROPOSED CYCLE NETWORK
(SOURCE: 2022 GDA CYCLE NETWORK – DUBLIN NORTH WEST, ANNOTATION BY EGIS)

3 BASE YEAR 2023 – TRAFFIC VOLUMES & CAPACITY

3.1 Traffic Survey

To determine current traffic behaviour in the vicinity of the subject Site, a vehicle turning movement survey was carried out at the seven junctions identified in the scoping study (See **Figure 1.2**). These junctions are:

Junction 1 - Western Access Road to St. Edmundsbury Hospital / Lucan Road;
Junction 2 - Eastern Access Road to St. Edmundsbury Hospital / Lucan Road / Esker Lane;
Junction 3 - R136 / Lucan Road;
Junction 4 - Lucan Road / Access to Hermitage Golf Club;
Junction 5 - R136 / N4 Slip Road (eastbound);
Junction 6 - R136 / N4 Slip Road (westbound); and
Junction 7 - Chapel Hill / Lucan Road.

A vehicle turning movement survey was undertaken on Wednesday, 22nd February 2023. The count was carried out over the 12-hour period from 07:00 hours to 19:00 hours and included both the morning and evening peak periods. The date was chosen while schools were open to ensure the maximum volume of traffic was included. The count was designed to identify the critical peak hour periods of traffic flow through the adjacent junctions. Data was collected in 15-minute intervals and the following count classifications were employed.

Cars;
Taxi;
Light Goods Vehicles (LGV);
Motorcycles (M/C);
Oversize Goods Vehicles 1 (OGV1);
Oversize Goods Vehicles 2 (OGV2);
Public Service Vehicles (PSV); and
Pedal Cycles (P/C).

The morning and evening peak hours for Junction 1 to Junction 7 were identified as shown in **Table 3.1** below:

TABLE 3.1 – MORNING AND EVENING PEAK HOURS IN 2023 BASELINE YEAR

Junction	AM Peak Hour	PM Peak Hour
Junction 1 - Western Access Road to St. Edmundsbury Hospital / Lucan Road	09:00 - 10:00	14:00 - 15:00
Junction 2 - Eastern Access Road to St. Edmundsbury Hospital / Lucan Road / Esker Lane	08:00 - 09:00	14:00 - 15:00
Junction 3 - R136 / Lucan Road	08:00 - 09:00	15:00 - 16:00
Junction 4 - Lucan Road / Access to Hermitage Golf Club	07:00 - 08:00	15:00 - 16:00
Junction 5 - R136 / N4 Slip Road (eastbound)	08:00 - 09:00	14:00 - 15:00
Junction 6 - R136 / N4 Slip Road (westbound)	08:00 - 09:00	17:00 - 18:00
Junction 7 - Chapel Hill / Lucan Road	09:00 - 10:00	14:00 - 15:00

A full transcription of the turning movement survey is included in **Appendix 1** herein.

In order to carry out a robust traffic analysis of the surrounding road network, the traffic modelling exercise following herein will be based on traffic flows recorded for both the weekday morning and evening peak hours.

4 PROPOSED ACCCESS ARRANGEMENT FOR PROPOSED DEVELOPMENT

4.1 Access Arrangement and Internal Layout

At present, two existing vehicular accesses on the Lucan Road provide an access to the existing St. Edmundsbury Hospital via two internal roads, which are connected to each other, as shown in **Figure 4.1**. The Western Vehicular Access and Eastern Vehicular Access are located at Junction 1 and Junction 2 respectively. The proposed development will be mainly served by the existing Western Vehicular Access, which will connect to Lucan Road directly at Junction 1 as shown in **Figure 4.2**. Also, the proposed development will connect to the existing Eastern Vehicular Access at Junction 2 via the internal roads, which will be only allowed for emergency vehicles or medium / heavy goods vehicles use, as shown in **Figure 4.1**.

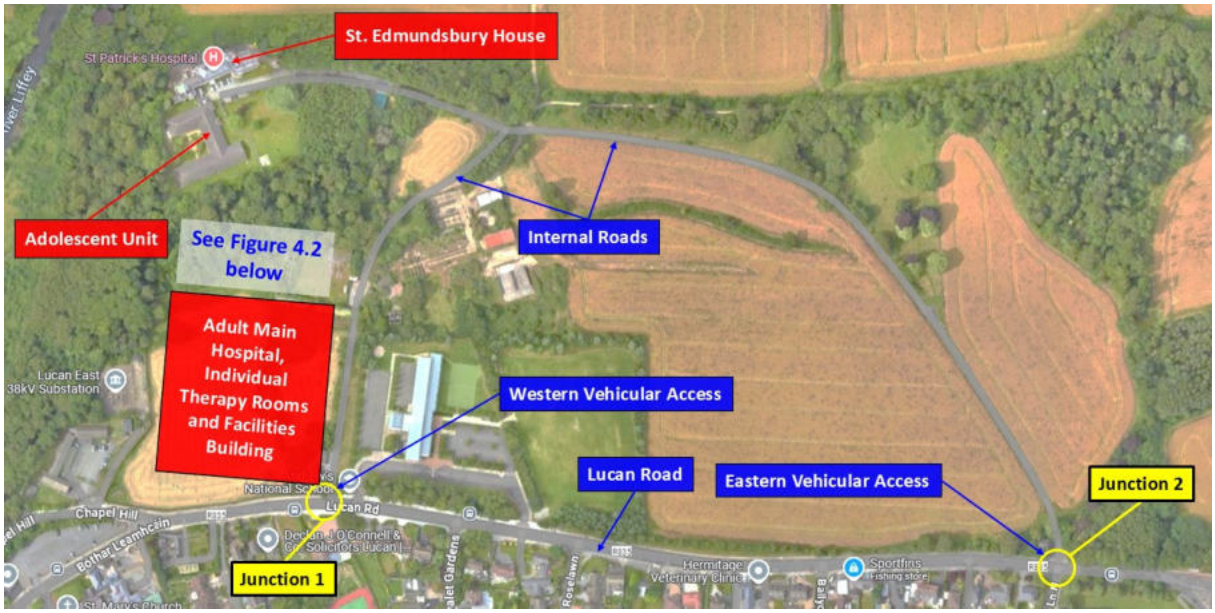

FIGURE 4.1 – ROAD NETWORK ADJACENT TO THE PROPOSED DEVELOPMENT

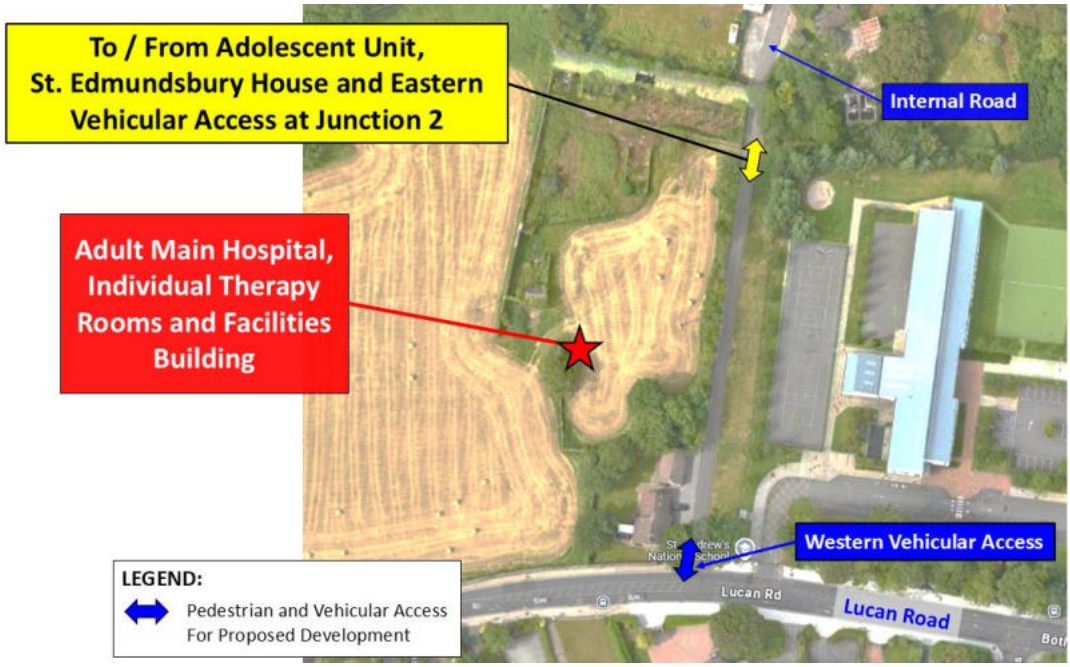

FIGURE 4.2 – PROPOSED WESTERN VEHICULAR ACCCESS TO THE PROPOSED DEVELOPMENT

Referring to the **Figure 4.2** above, a main pedestrian access to the proposed development will be located at the Western Vehicular Access at Junction 1. Also, another pedestrian access will connect to the Eastern Vehicular Access at Junction 2 via the internal roads as shown in **Figure 4.1**. However, section of this pedestrian access does not have a footpath and pedestrians are expected to share the carriageway with motorists for 600m along the internal road.

The Lucan Road has a 50kph speed limit. Sightlines in excess of 49 metres are provided in accordance with the Design Manual for Urban Roads and Streets for 50kph speed limit road at the Western Vehicular Access and Eastern Vehicular Access located at Junction 1 and Junction 2 respectively.

As shown in **Figure 2.16**, one of the proposed secondary routes is along the Lucan Road, which is outside the proposed development. Thus, it is considered that the site location will be well serviced by the cycle facilities.

The internal Site junctions have all been designed with corner radii of 4.5m or less to improve pedestrian and cyclist safety at junctions by lowering the speed at which vehicles can turn corners. To give priority to pedestrian and cyclist, appropriate measures (i.e. road markings, signages, ramp, courtesy crossing, etc.) will be considered in later detailed design stage to ensure safety of road users.

Pedestrian movements are fully catered for within the proposed development. A network of internal footpaths, dropped kerbs, tactile paving and walkways will link all parts of the development.

4.2 Proposed Public Road Improvement

To minimize a traffic disruption of west bound traffic on Lucan Road, road marking at the Western Vehicular Access will be modified in order to provide a right turning pocket to the proposed development as shown in **Figure 4.3**.

As shown in **Figure 2.16**, one of the proposed secondary routes is along the Lucan Road, which is outside the proposed development. Thus, it is considered that the site location will be well serviced by the cycle facilities.

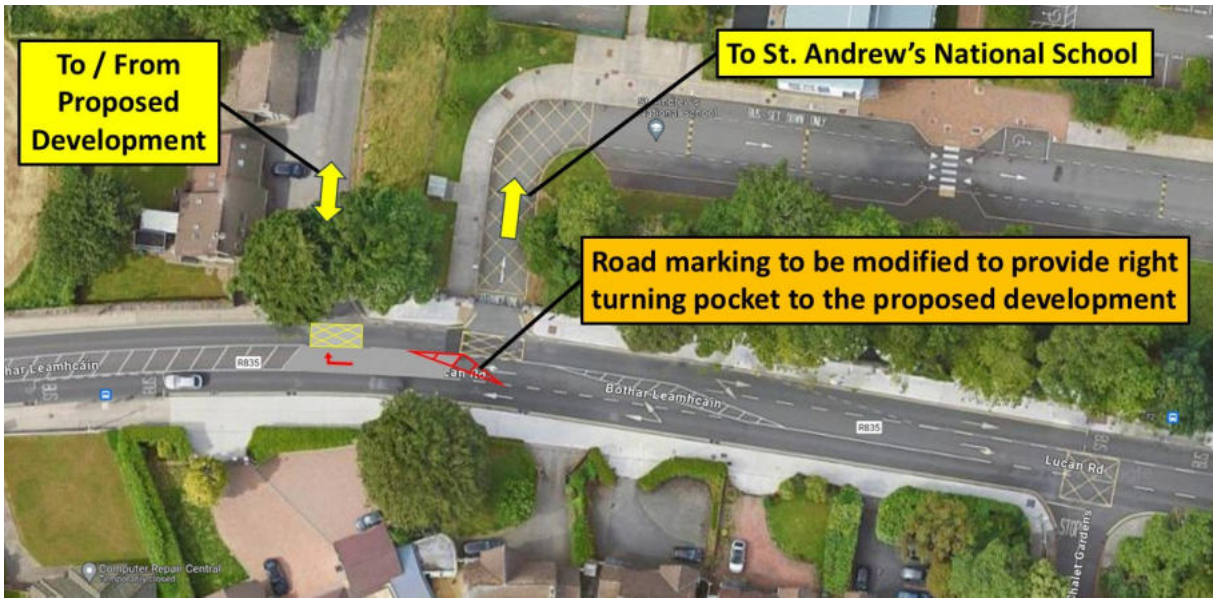

FIGURE 4.3 – PROVISION OF RIGHT TURNING POCKET AT WESTERN VEHICULAR ACCESS
(SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

In order to relieve the traffic congestion, it is proposed to upgrade the existing Chapel Hill / Lucan Road (Junction 7) to signalised junction with signalised parallel crossings as shown in **Figure 4.4**. As enhancement of safety of vulnerable road users is always a top priority in design, therefore, the active traffic facilities will be provided for the proposed improvement scheme in accordance with the Cycle Design Manual. The design has

been discussed and agreed in principle with South Dublin County Council. The proposed improvement scheme includes the following key features to enhance the safety of vulnerable road users:

Provision of one-way cycle track for both sides of the roads;
Removal of triangle island at the junction;
Provision of signalised parallel crossings (i.e. dedicated and separated crossing facilities for pedestrians and cyclists) at Lucan Road East arm, Lucan Road West arm and Chapel Hill arm; and
The existing bus stop at Lucan Road East arm will be relocated westward (approximately 80m) in order to minimize any traffic obstruction for vehicles travelling from Lucan Road East arm to Chapel Hill arm due to pick-up/drop-off activity by buses.

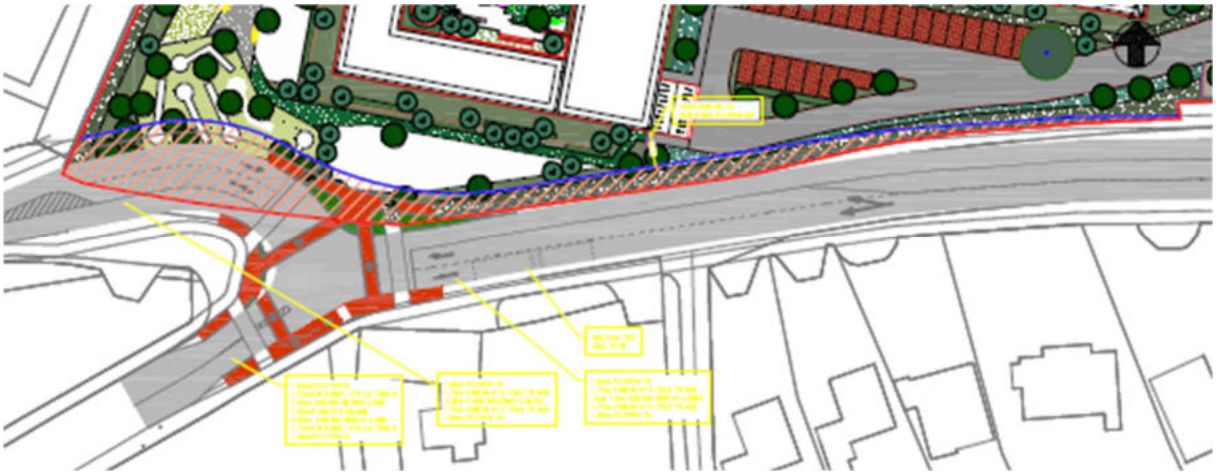

FIGURE 4.4 – PROPOSED IMPROVEMENT SCHEME FOR CHAPEL HILL / LUCAN ROAD JUNCTION (JUNCTION 7)

5 TRIP GENERATION AND ASSIGNMENT (BY USING THE TRICS DATABASE)

5.1 Proposed Development

The purpose of proposed development is to relocate the services / facilities from St. Patrick's University Hospital at Dublin 8 to the Site at Lucan. Within the Site, the existing St. Edmundsbury House (refer to **Figure 5.1**) associated with its services provided to patients will be kept as a part of the proposed development. Another existing structure as shown in Detail A of **Figure 5.1** will be demolished for construction of a new building for adolescent unit, which includes the current services provided to patients from this existing structure and part of the services provided to patient from St. Patrick's University Hospital. After completion of the proposed development, all services / facilities at St. Patrick's University Hospital will be relocated to the new buildings, including adolescent unit, adult main hospital, individual therapy rooms and facilities building, of the proposed development at Lucan.

The existing St. Edmundsbury Hospital at Lucan consists of 52 beds to provide services to public. After completion of the proposed development, the new St. Edmundsbury Hospital will increase from the existing 52 beds to a total of 214 beds. Therefore, the net increase of beds is 162.

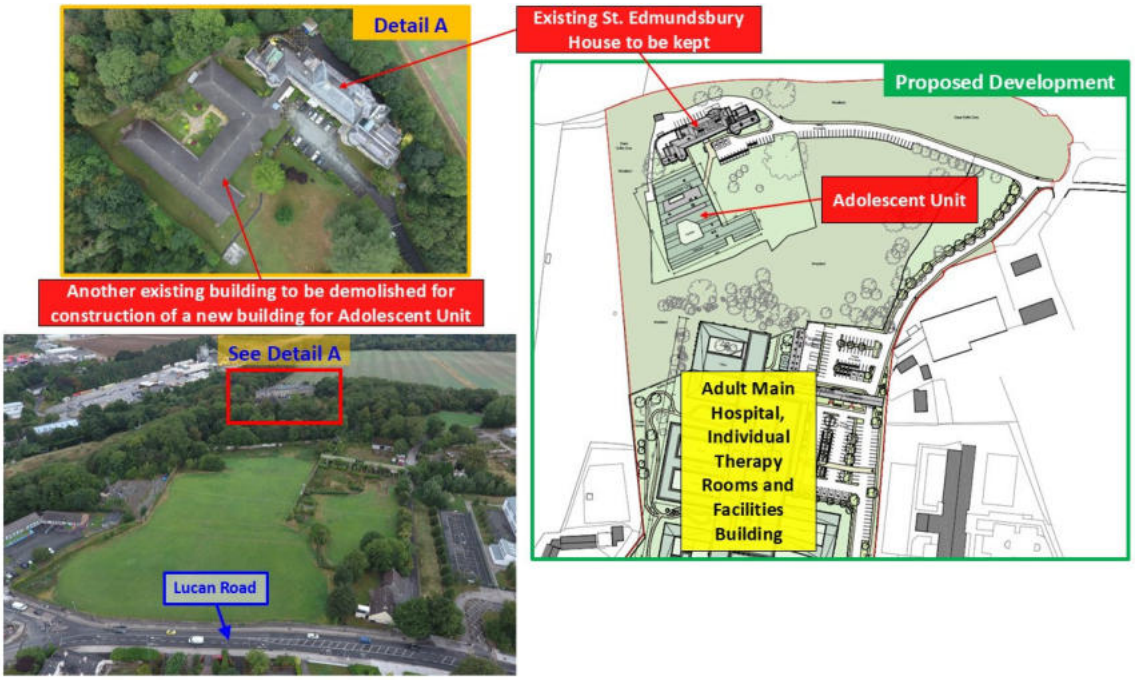

FIGURE 5.1 – EXISTING AND PROPOSED STRUCTURES

5.2 Net Trip Generation By Using the TRICS Database

The Trip Rate Information Computer System (TRICS) database was interrogated to derive the potential development trip generation rates. As the traffic count survey at Lucan on 22nd February 2023 as mentioned in Section 3.1 can capture the trip generated from the existing St. Edmundsbury Hospital (i.e. St. Edmundsbury House), therefore, the net trip generated for the proposed development is only included the trip generated from the new buildings of proposed development (including adolescent unit, adult main hospital, individual therapy rooms and facilities building) in order to provide a robust assessment.

Utilising data supplied by the TRICS database (7.9.4), **Table 5.1** details the estimated net trip generation for the proposed development during the morning and evening peak hours being considered for this study. The full TRICS output files are contained in **Appendix 2**.

TABLE 5.1 – NET TRIP GENERATION FOR THE PROPOSED DEVELOPMET BY USING THE TRICS DATABASE

Proposed Development	Time	Factor	TRICS Arrival Rate	TRICS Departure Rate	Net Hourly Trips	
					Trips In	Trips Out
Adult Main Hospital, Individual Therapy Rooms and Facilities Buildings	AM Peak Hour	312 Employees	0.190 (per employee)	0.051 (per employee)	59	16
	PM Peak Hour		0.102 (per employee)	0.187 (per employee)	32	58
Adolescent Unit	AM Peak Hour	27 Employees	0.190 (per employee)	0.051 (per employee)	5	1
	PM Peak Hour		0.102 (per employee)	0.187 (per employee)	3	5
Total	AM Peak Hour	-	-	-	**64**	**17**
	PM Peak Hour		-	-	**35**	**63**

5.3 Modal Choice

In order to produce a robust assessment of the traffic impact of the proposed development, this study assumes that all net trips generated by the proposed development will be by car and the peak trip generation will coincide with the morning and evening peak periods for the adjoining junctions in order to provide a "worst-case" scenario.

5.4 Trip Distribution and Assessment Years

It was assumed for the purposes of this study that the future development traffic will mirror existing travel flows when exiting and entering the development. Moreover, the internal road between the Eastern Vehicular Access (Junction 2) and the proposed development as shown in **Figure 4.1** will be only assigned for emergency vehicles and medium / heavy goods vehicles so it is anticipated that there is a tiny traffic using the above-mentioned internal road in normal operation. Therefore, it was assumed that the net trip generation (utilising the TRICS database) to/from the new buildings (including adult main hospital, individual therapy rooms, facilities buildings and adolescent unit) within the proposed development will only use the Western Vehicular Access (Junction 1).

5.4.1 Trip Distribution at Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road

In order to obtain the latest trips to/from the Site, another traffic count survey was undertaken at Junction 1 of Lucan (refer to **Figure 1.2**), which is a main entrance to the existing St. Edmundsbury Hospital, on Tuesday, 21st May 2024. The count was carried out over the 12-hour period from 07:00 hours to 19:00 hours and included both the morning and evening peak periods. Data was collected in 15-minute intervals. A full transcription of the traffic count survey at the Junction 1 of Lucan is included in **Appendix 3** herein.

During the operational phase, all vehicles (except emergency vehicles and medium / heavy goods vehicles) will travel to/from the Site through Junction 1 only. However, vehicles are currently travelling to/from the Site through Junction 1 and Junction 2. Therefore, to determine the modal split at Junction 1 during the operational phase, the total trips to/from the existing St. Edmundsbury Hospital, which is equal to the trips to/from the existing St. Edmundsbury Hospital through Junction 1 (based on the traffic count survey on 21st May 2024) plus the trips to/from the existing St. Edmundsbury Hospital through Junction 2 (based on the traffic count survey on 22nd February 2023), shall be considered.

Currently, traffic congestion along Lucan Road occurs between 07:00 and 10:00 and between 16:00 and 19:00. Therefore, the highest total trips to/from the existing St. Edmundsbury Hospital (through Junction 1 and Junction 2) between 07:00 and 10:00, and between 16:00 and 19:00 have been used for modal split at Junction 1 in the morning and evening peak hours respectively during the operational phase. For a period between 07:00 and 10:00, the highest total trips to/from the existing St. Edmundsbury Hospital was identified as 08:00-09:00. For a period between 16:00 and 19:00, the highest total trips to/from the existing St. Edmundsbury Hospital was identified as 18:00-19:00.

Figure 5.2 and **Figure 5.3** illustrates the trips to/from the Site through Junction 1 (based on the traffic count survey on 21st May 2024) and through Junction 2 (based on the traffic count survey on 22nd February 2023) respectively at the identified morning (08:00-09:00) and evening (18:00-19:00) periods.

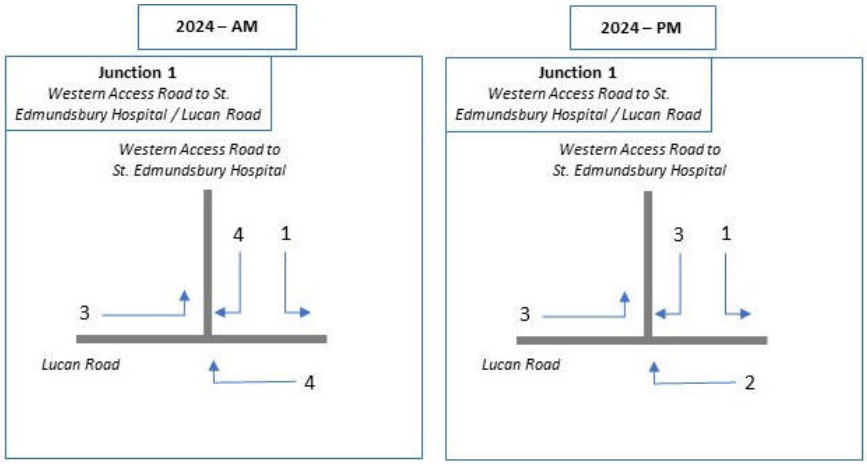

FIGURE 5.2 – TRIPS TO/FROM THE EXISTING ST. EDMUNDSBURY HOSPITAL VIA JUNCTION 1 ON 21ST MAY 2024 (FOR AM AT 08:00-09:00 AND FOR PM AT 18:00-19:00)

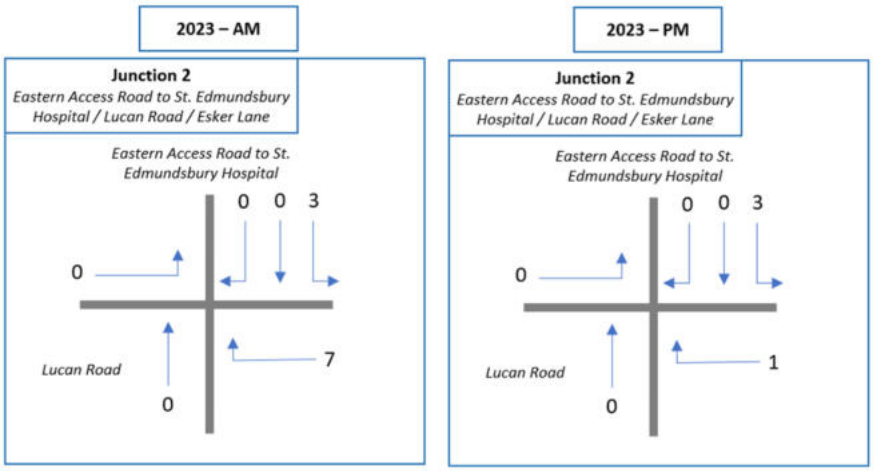

FIGURE 5.3 – TRIPS TO/FROM THE EXISTING ST. EDMUNDSBURY HOSPITAL AT JUNCTION 2 ON 22ND FEBRUARY 2023 (FOR AM AT 08:00-09:00 AND FOR PM AT 18:00-19:00)

Table 5.2 presents the modal split at Junction 1 for the proposed development during the operational phase based on the highest total trips to/from the existing St. Edmundsbury Hospital through Junction 1 and Junction 2 (For AM between 07:00 and 10:00, and for PM between 16:00 and 19:00).

TABLE 5.2 – MODAL SPLIT AT JUNCTION 1 FOR THE PROPOSED DEVELOPMENT DURING THE OPERATIONAL PHASE

Trip	Time	Morning Peak Hour		Evening Peak Hour	
		Traffic Count Data*	Modal Split	Traffic Count Data*	Modal Split
Arrival	Turn left from Lucan Road (arriving from Junction 7)	3	21%	3	50%
	Turn right from Lucan Road (arriving from Junction 3)	11	79%	3	50%
Departure	Turn left to Lucan Road (towards Junction 3)	4	50%	4	57%
	Turn right to Lucan Road (towards Junction 7)	4	50%	3	43%

*Note: * The highest total trips to/from the existing St. Edmundsbury Hospital through Junction 1 and Junction 2.*

Table 5.2 revealed that in the morning peak hour, 21% and 79% vehicles currently turn left (i.e. arriving from Junction 7) and right (i.e. arriving from Junction 3) respectively from Lucan Road into the Site while 50% and 50% of vehicles from the Site currently turn eastward (towards Junction 3) and westward (towards Junction 7) respectively.

In the evening peak hour, 50% and 50% vehicles currently turn left (i.e. arriving from Junction 7) and right (i.e. arriving from Junction 3) respectively from Lucan Road into the Site while 57% and 43% of vehicles from the Site currently turn eastward (towards Junction 3) and westward (towards Junction 7) respectively.

During the operational phase, the trip distributions at Junction 1 were based on the modal split approach as mentioned above while the future development traffic distribution at the surrounding junctions will mirror existing traffic patterns i.e. development generated flows will be split through the junctions proportionally to existing flows.

Assuming planning permission is granted for the development in year 2023 and allowing for a 4-year construction period, it is estimated that the proposed development will be fully operational by the year 2027. For the purpose of this study, 2027 is assumed as the Year of Opening. Therefore, traffic analysis associated with this study will focus on the following future development operational scenarios:

Residential Development Year of Opening – 2027; and
15 Year Design Horizon – 2042.

The projected 2027 and 2042 design year traffic flows have been calculated by factoring up the 2023 recorded traffic flows in accordance with the TII Publications Project Appraisal Guidelines for National Roads document 'Unit 5.3 Travel Demand Projections, Table 6.1: Link-Based Growth Rates: Metropolitan Area Annual Growth Rates by using the central growth rate factors to create the "without" development scenario. Additional net traffic flows due to the proposed development has been then applied to these future year flows to create the **"**with**"** development scenario.

5.5 Net Trip Generation as a Percentage of Existing Traffic

Expected net trip generation for the proposed development was estimated utilising the TRICS database and was revealed to be in total 64 trips inbound and 17 trips outbound in the morning peak hour, and 35 trips inbound and 63 trips outbound in the evening peak hour.

An exercise was carried out to quantify the expected development net trip generation as a proportion of existing traffic flows on the surrounding road network to determine if a detailed traffic impact assessment is required for all of the junctions included within the scoping study.

It is anticipated that the future background traffic flows shall be factored up in accordance with Table 6.1 of Transport Infrastructure Ireland Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections under central growth factor scenario. In view of the above reasons, the existing traffic flows will be used instead of future traffic flows in order to provide a robust analysis and a "worst-case" scenario.

Based on the trip distribution approach as mentioned in Section 5.4, the result of this trip distribution and assignment exercise (by using the TRICS database) is presented in **Table 5.3** and **Table 5.4** following.

TABLE 5.3 – DEVELOPMENT AM PEAK HOUR NET TRIP GENERATION AS A PERCENTAGE OF EXISTING ROAD NETWORK TRAFFIC FLOW (BY USING THE TRICS DATABASE)

Junction	Junction AM Peak Traffic	TRICS Database	
		Development Net Generated Traffic	Percentage
Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road	1,316	81	**6.2%**
Junction 2 – Eastern Access Road to St. Edmundsbury Hospital / Lucan Road / Esker Lane	1,800	58	3.2%
Junction 3 – R136 / Lucan Road	2,173	57	2.6%
Junction 4 – Lucan Road / Access to Hermitage Golf Club	1,056	4	0.4%
Junction 5 – R136 / N4 Slip Road (Eastbound)	1,823	53	2.9%
Junction 6 – R136 / N4 Slip Road (Westbound)	2,450	51	2.1%
Junction 7 – Chapel Hill / Lucan Road	1,364	23	1.7%

As demonstrated by **Table 5.3**, the ratio of estimated net trip (by using the TRICS database) associated with the proposed development to the existing traffic flows is less than 5% for Junction 2 to Junction 7 in the morning peak hour.

TABLE 5.4 - DEVELOPMENT PM PEAK HOUR NET TRIP GENERATION AS A PERCENTAGE OF EXISTING ROAD NETWORK TRAFFIC FLOW (BY USING THE TRICS DATABASE)

Junction	Junction PM Peak Traffic	TRICS Database	
		Development Net Generated Traffic	Percentage
Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road	1,414	98	**6.9%**
Junction 2 – Eastern Access Road to St. Edmundsbury Hospital / Lucan Road / Esker Lane	1,655	53	3.2%
Junction 3 – R136 / Lucan Road	2,046	52	2.5%
Junction 4 – Lucan Road / Access to Hermitage Golf Club	1,000	19	1.9%
Junction 5 – R136 / N4 Slip Road (Eastbound)	1,808	33	1.8%
Junction 6 – R136 / N4 Slip Road (Westbound)	2,592	32	1.2%
Junction 7 – Chapel Hill / Lucan Road	1,464	45	3.1%

As demonstrated by **Table 5.4**, the ratio of estimated net trip (by using the TRICS database) associated with the proposed development to the existing traffic flows is less than 5% for Junction 2 to Junction 7 in the evening peak hours.

In view of the above analysis for Junction 2 to Junction 7, the estimated net trips associated with the proposed development represent a tiny proportion of existing traffic flows on the surrounding road network and less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists).

As a result of this negligible increase in traffic volumes on the surrounding road network, it is not required to undertake any traffic capacity assessments for Junction 2 to Junction 7 in this study. It is reasonable to assume that the number of net trips generated by the proposed development will remain close to a constant number in future years while background traffic levels will show a steady increase. This will result in the traffic impact of the proposed development decreasing even further in future years.

However, it is acknowledged that Junction 1 is greater than the 5% of the traffic flow on the existing road network where congestion exists or the location is sensitive. Additionally, as requested by the South Dublin County Council, Junction 3, Junction 5 to Junction 7 have also been selected for conducting a traffic capacity assessment in order to have a better understanding of this minimal traffic impact due to the proposed development. Therefore, a capacity assessment on Junction 1, Junction 3 and Junction 5 to Junction 7 were undertaken by using the Transport Research Laboratory's (TRL) Priority Intersection Capacity and Delay (PICADY) and Optimised Signal Capacity and Delay (OSCADY) traffic modelling software for priority junction and signalized junction.

The above-mentioned junctions were modelled for the 2023 Baseline Year, 2027 Opening Year and 2042 Design Year (Opening Year plus 15 years) in the morning and evening peak hours.

To demonstrate the direct traffic impact associated with the proposed development, the traffic modelling exercise was carried out for the "without" development and **"**with**"** development scenarios.

5.6 Modal Shift Assumptions

With provision of active travel facilities and enhancement of public transport services in the vicinity of the proposed development, it is anticipated that the amount of people walking, cycling and using public transport will increase and the number of journeys in private vehicles will decrease. As such, a modal shift from private car to walking, cycling and public transport is expected for this development. As the proposed improvement works as mentioned in Section 4.2 will be carried out at Junction 7, therefore, it is proposed to carry out the traffic analysis at Junction 7 in both "without allowing for modal shift" approach and "allowing for modal shift" approach for the **"**with**"** development scenario.

According to the Table 7.0 of South Dublin County Development Plan 2022-2028, it sets modal share target for car from 62% in 2016 to 50% in 2042 as shown in **Table 5.5**.

TABLE 5.5 – EXISTING AND TARGET MODE SHARE
(SOURCE: SOUTH DUBLIN COUNTY DEVELOPMENT PLAN 2022-2028)

Mode	SDCC Existing Mode Share (%)	SDCC Target Mode Share (%)
Walk	13	15
Cycle	5	10
Bus	17	20
Train	3	5
Private (Car, Van, HGV, Motorcycle)	62	50

The outcome of modal share for car in 2023 Baseline Year and 2027 Opening Year can be obtained by interpolating the modal share for car in 2016 and 2042. **Table 5.6** below presents the modal share for car in 2023 Baseline Year, 2027 Opening Year and 2042 Design Year.

TABLE 5.6 – MODAL SHARE FOR CAR AND PERCENTAGE CHANGE OF CAR BASED N 2023 BASELINE YEAR

Mode	Mode share of Car	% Change (Based on 2023 Baseline Year)
2016	62%	-
2023 Baseline Year	58.8%	-
2027 Opening Year	56.9%	1.9%
2042 Design Year	50%	8.8%

Therefore, 1.9% and 8.8% of traffic reduction, either for background traffic or new trips, were applied on Junction 7 in 2027 Opening Year and 2042 Design Year respectively in a "allowing for modal shift" approach.

5.7 Network Traffic Flow (By Using the TRICS Database)

Reference is drawn to **Figure 5.4** to **Figure 5.9** below for the traffic count surveys (in PCU[1]) on 22nd February 2023 and estimated future traffic flows (in PCU) in a "without allowing for modal shift" approach in the morning and evening peak hours at Junction 1, Junction 3 and Junction 5 to Junction 7 by using the TRICS database.

5.7.1 2023 Baseline Year Traffic Flow

Figure 5.4 and **Figure 5.5** illustrate the 2023 Baseline Year scenario traffic flows in the morning and evening peak hours from traffic count surveys.

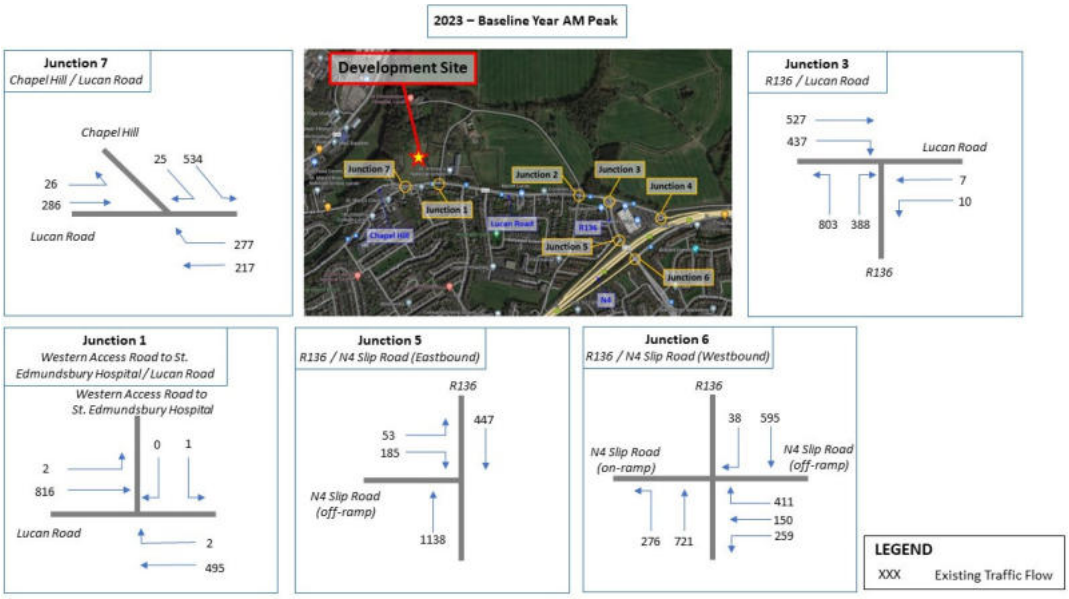

FIGURE 5.4 – 2023 BASELINE YEAR TRAFFIC FLOWS IN THE MORNING PEAK HOUR

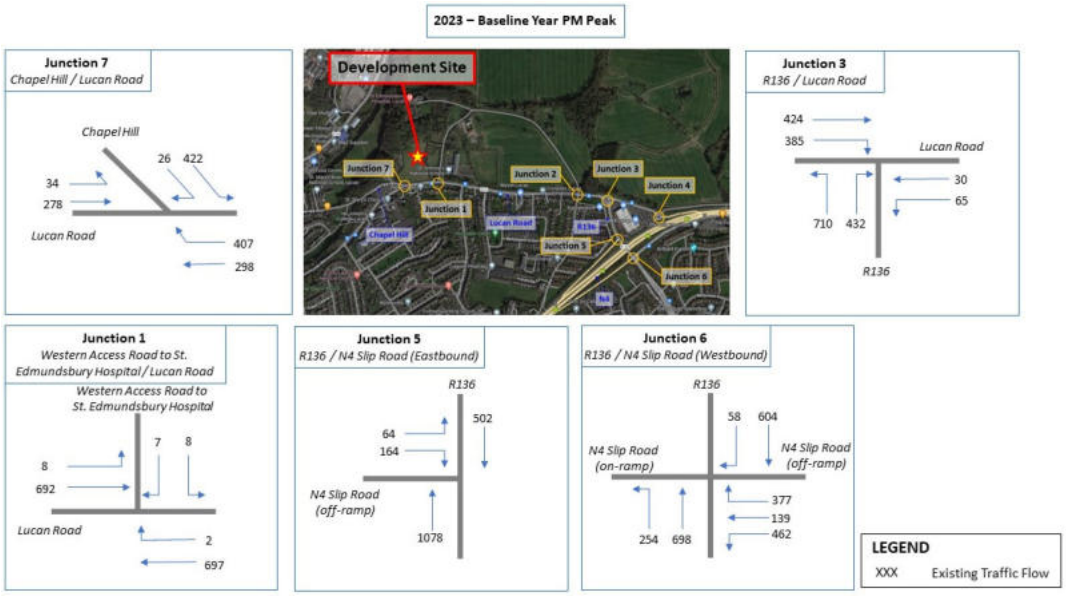

FIGURE 5.5 – 2023 BASELINE YEAR TRAFFIC FLOWS IN THE EVENING PEAK HOUR

[1] *PCU means Passenger Car Unit. A passenger car equivalent is essentially the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single car. PCU conversation factors for different type of vehicles are listed as following: 1 car / taxi / LGV = 1 PCU, 1 OGV1 = 1.5 PCU, 1 OGV2 = 2.3 PCU, 1 PSV = 2 PCU, 1 motor cycle = 0.4 PCU and 1 pedal cycles = 0.2 PCU.*

5.7.2 Network Traffic Flows By Using the TRICS Database

By using the TRICS database, **Figure 5.6** and **Figure 5.7** present the 2027 Opening Year traffic flows in the morning and evening peak hours for the "without" development and "with" development scenarios while **Figure 5.8** and **Figure 5.9** illustrate the 2042 Design Year Horizon traffic flows in the morning and evening peak hours for the "without" development and "with" development scenarios.

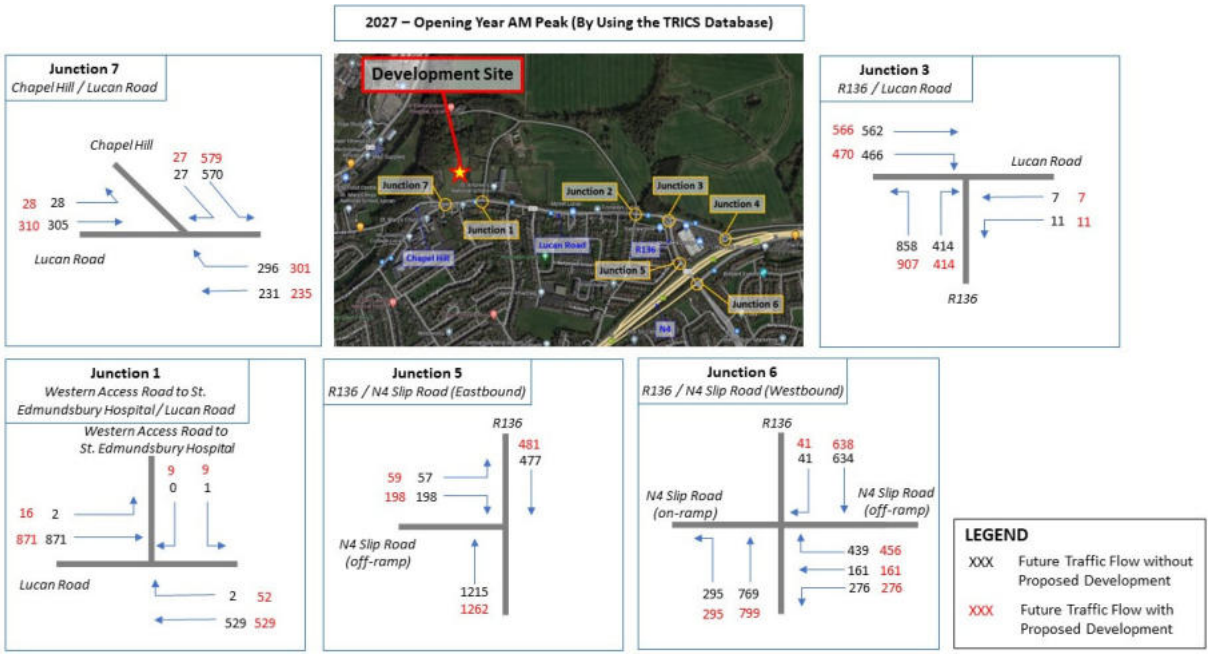

FIGURE 5.6 – 2027 OPENING YEAR TRAFFIC FLOWS IN THE MORNING PEAK HOUR (BY USING THE TRICS DATABASE)

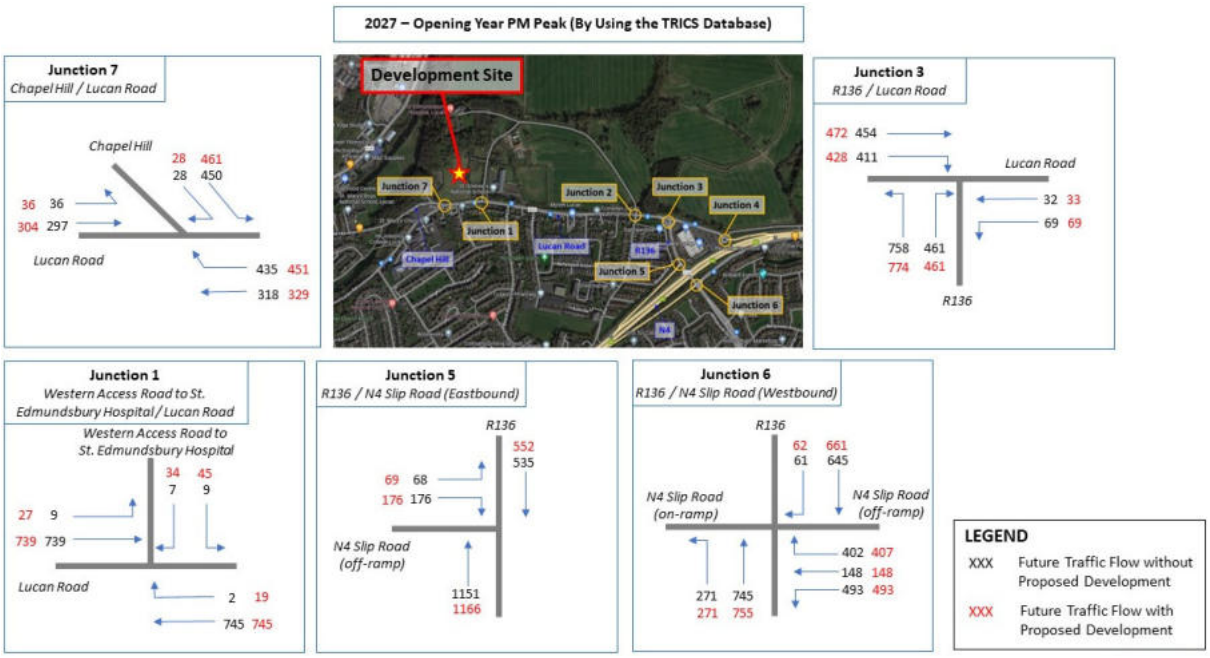

FIGURE 5.7 – 2027 OPENING YEAR TRAFFIC FLOWS IN THE EVENING PEAK HOUR (BY USING THE TRICS DATABASE)

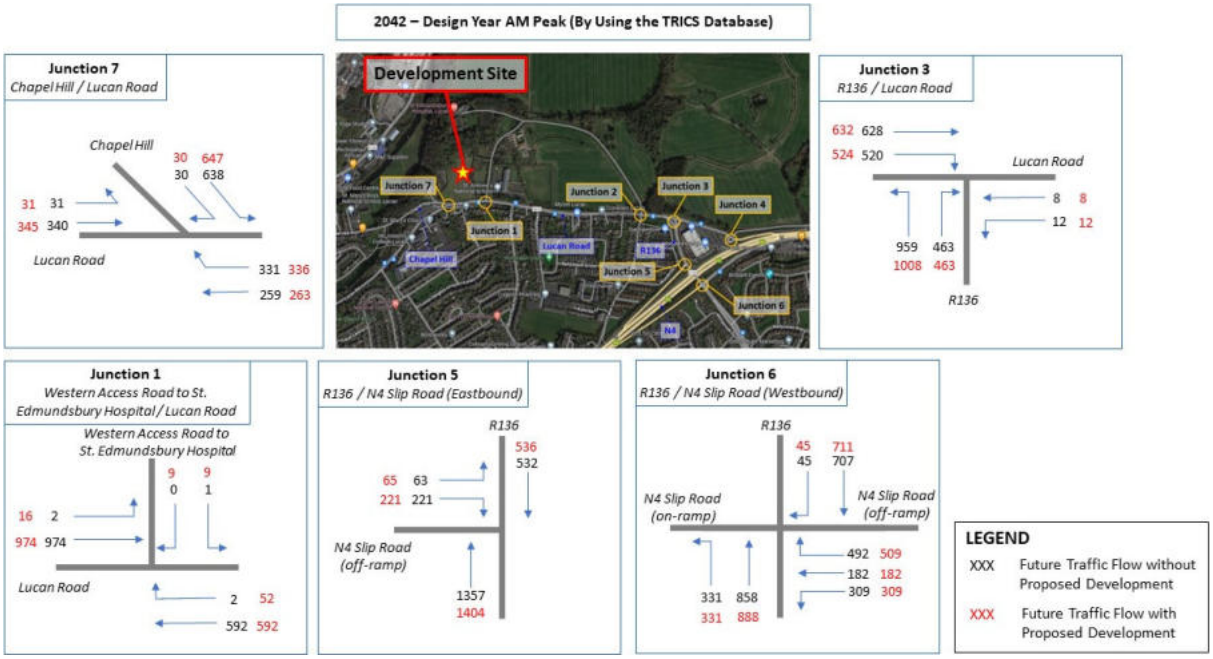

FIGURE 5.8 – 2042 DESIGN YEAR TRAFFIC FLOWS IN THE MORNING PEAK HOUR (BY USING THE TRICS DATABASE)

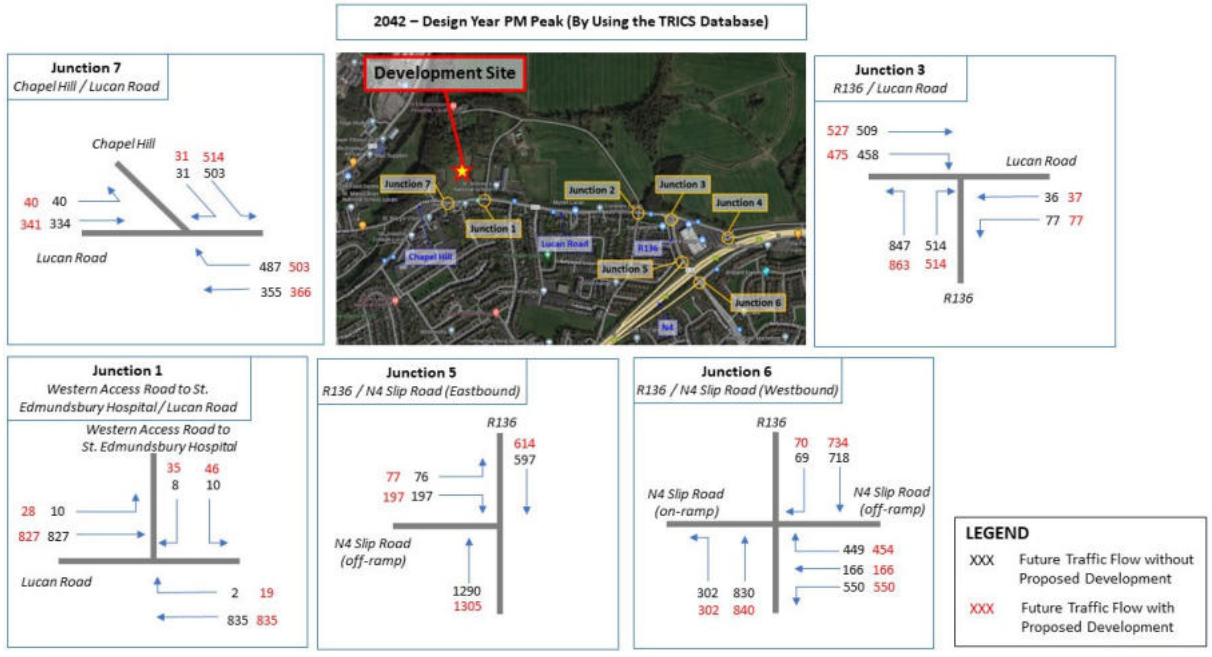

FIGURE 5.9 – 2042 DESIGN YEAR TRAFFIC FLOWS IN THE EVENING PEAK HOUR (BY USING THE TRICS DATABASE)

6 TRAFFIC IMPACT (BY USING THE TRICS DATABASE)

6.1 Background

To assess the current performance of the junctions under consideration and traffic impacts due to the proposed development, capacity assessments were undertaken using TRL's PICADY and OSCADY software on the following junctions:

Junction 1 - Western Access Road to St. Edmundsbury Hospital / Lucan Road (PICADY);
Junction 3 - R136 / Lucan Road (OSCADY);
Junction 5 - R136 / N4 Slip Road (eastbound) (OSCADY);
Junction 6 - R136 / N4 Slip Road (westbound) (OSCADY); and
Junction 7 - Chapel Hill / Lucan Road (OSCADY).

The junctions were modelled for the 2023 Baseline Year, 2027 Opening Year and 2042 Design Year Horizon for the morning and evening peak hours using the flow diagrams as shown in **Figure 5.4** to **Figure 5.9** in the previous section herein. Each junction was modelling using their own peak times as outlined in **Table 3.1**.

To demonstrate the direct traffic impact associated with the proposed development, the traffic modelling exercise was carried out for the "without" development and "with" development scenarios.

6.2 Junction Capacity Analysis for 2023 Baseline Year

A traffic capacity assessment of the Junction 1, Junction 3 and Junction 5 to Junction 7 were undertaken utilising the surveyed results as shown in **Figure 5.4** and **Figure 5.5**, and TRL's PICADY and OSCADY traffic modelling software. A summary of the results of junction capacity analysis for the 2023 Baseline Year during the morning and evening peak hours is shown in **Table 6.1** to **Table 6.5** following.

The criteria utilised for the assessment of priority junction capacity is Ratio of Flow to Capacity (RFC) while the criteria utilised for the assessment of signalised junction capacity is Degree of Saturation (DOS). The RFC and DOS provide a basis for judging the acceptability of junction designs. Typically, a RFC of less than 0.85 normal design threshold for priority junction, and a DOS of less than 0.9 normal design threshold for signalised junction are considered to indicate satisfactory performance.

Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road

TABLE 6.1 – 2023 BASELINE YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 1

Approach Arm	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
	AM	PM	AM	PM	AM	PM
Lucan Road West	-	-	-	-	-	-
Western Access Road to St. Edmundsbury Hospital	0	0.05	0	0	0	11
Lucan Road East	0	0	0	0	8	7

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a priority junction. The results shown in **Table 6.1** demonstrate that Junction 1 is currently operating within the normal design threshold in both the morning and evening peak hours in 2023 baseline scenario.

Junction 3 – R136 / Lucan Road

TABLE 6.2 – 2023 BASELINE YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 3

Approach Arm	Max. DOS		Max. Queue (PCU)	
	AM*	PM*	AM*	PM*
Lucan Road East	0.07	0.39	1	3
R136	0.97	0.91	25	30
Lucan Road West	1.09	1.05	65	46

*Note: * For the AM and PM peak hours, the queue length from the downstream is extending to Junction 3 and stopping the traffic travelling from R136 to Lucan Road westbound occasionally when the traffic light is green / flashing amber. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.2** demonstrate that R136 arm and Lucan Road West arm on this junction are operating over the normal design threshold in both the morning and evening peak hours in 2023 baseline scenario, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Junction 5 – R136 / N4 Slip Road (Eastbound)

TABLE 6.3 – 2023 BASELINE YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 5

Approach Arm	Max. DOS		Max. Queue (PCU)	
	AM*	PM*	AM*	PM*
R136 South	0.91	0.91	17	18
N4 Slip Road (off-ramp)	0.88	0.78	10	8
R136 North	0.32	0.38	5	6

*Note: * For the AM and PM peak hours, the queue lengths from the downstream junctions (i.e. Junction 3 and Junction 6) are extending to Junction 5 and stopping the traffic travelling to R136 southward / northward occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.3** demonstrate that R136 South arm on this junction is operating slightly over the normal design threshold in both the morning and evening peak hours in 2023 baseline scenario, resulting in queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Junction 6 – R136 / N4 Slip Road (Westbound)

TABLE 6.4 – 2023 BASELINE YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 6

Approach Arm	Max. DOS		Max. Queue (PCU)	
	AM*	PM*	AM*	PM*
R136 North	0.63	0.64	11	12
N4 Slip Road (off-ramp)	0.83	0.93	21	29
R136 South	0.95	0.92	27	24
N4 Slip Road (on-ramp)	-	-	-	-

*Note: * For the AM and PM peak hours, the queue lengths from the downstream junctions (i.e. Junction 5) are extending to Junction 6 and stopping the traffic travelling to R136 southward / northward occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.4** demonstrate that R136 South arm on this junction in the morning peak hour, and N4 Slip

Road (off-ramp) arm and R136 South arm on this junction in the evening peak hour are operating slightly over the normal design threshold in 2023 baseline scenario, resulting in queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Junction 7 – Chapel Hill / Lucan Road

TABLE 6.5 – 2023 BASELINE YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 7

Approach Arm	Max. DOS		Max. Queue (PCU)	
	AM*	PM**	AM*	PM**
Lucan Road West	0.64	0.59	9	8
Chapel Hill	1.01	1.20	29	58
Lucan Road East	0.95	1.36	22	155

*Note: * For the AM peak hour, the queue length from the downstream junction (i.e. Junction 2) is extending to Junction 7 and stopping the traffic moving eastward from Lucan Road West arm / Chapel Hill arm to Lucan Road East arm occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

*** For the PM peak hour, the queue length from the downstream junction (Chapel Hill / Main Street / R109 Junction) is extending to Junction 7 and stopping the traffic moving westward from Lucan Road East arm / Lucan Road West arm to Chapel Hill arm occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.5** demonstrate that Chapel Hill arm and Lucan Road East arm on this junction are operating over the normal design threshold in both the morning and evening peak hours in 2023 baseline scenario, resulting in substantial queues and delays for motorists. **Table 6.5** also indicates that in the evening peak hour, the queue length[2] at Lucan Road East arm on this junction is extending to the Junction 3 – R136 / Lucan Road. This analysis concurs with observation made on site. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

6.3 Operational Phase 2027 Opening Year – Junction Capacity Analysis (By Using the TRICS Database)

A traffic capacity of the Junction 1, Junction 3 and Junction 5 to Junction 7 were undertaken utilising the future traffic flows as shown in **Figure 5.6** and **Figure 5.7**, and TRL's PICADY and OSCADY traffic modelling software. A summary of the results of the analysis for the 2027 year of opening, "without" development and **"**with**"** development scenarios by using the TRICS database, in the morning and evening peak hours is shown in **Table 6.6** and **Table 6.10** following.

[2] *Assuming that a vehicle length of pcu is 5.5 metres.*

Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road

TABLE 6.6 – 2027 OPENING YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 1 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
		AM	PM	AM	PM	AM	PM
Lucan Road West	Without Development	-	-	-	-	-	-
	With Development	-	-	-	-	-	-
Western Access Road to St. Edmundsbury Hospital	Without Development	0	0.05	0	0	0	11
	With Development	0.07	0.26	0	0	13	15
Lucan Road East	Without Development	0	0	0	0	8	7
	With Development	0.13	0.04	0	0	9	8

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a priority junction. The results shown in **Table 6.6** demonstrate that Junction 1 will operate within the normal design threshold in both the morning and evening peak hours in 2027 for both the "without" development and "with" development scenarios.

Junction 3 – R136 / Lucan Road

TABLE 6.7 – 2027 OPENING YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 3 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM*	AM*	PM*
Lucan Road East	Without Development	0.08	0.41	1	3
	With Development	0.08	0.42	1	3
R136	Without Development	1.04	0.97	34	38
	With Development	1.04	1.01	34	46
Lucan Road West	Without Development	1.16	1.12	101	73
	With Development	1.17	1.15	106	85

*Note: * For the AM and PM peak hours, it is anticipated that the queue length from the downstream will extend to Junction 3 and stop the traffic travelling from R136 to Lucan Road westbound occasionally when the traffic light is green / flashing amber. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.7** demonstrate the R136 arm and Lucan Road West arm on this junction will exceed the normal design threshold in both the morning and evening peak hours in 2027 for both the "without" development and "with" development scenarios, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues / delays.

Additionally, **Table 5.3** and **Table 5.4** show that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 baseline year in the morning and evening peak hours for this junction are 2.6% and 2.5% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the

proposed development. Additionally, shift working pattern will be implemented by the new hospital in order to reduce the trip generation in the morning and evening peak hours. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on this junction so traffic from the proposed development will not have significant impact on this junction.

Junction 5 – R136 / N4 Slip Road (Eastbound)

TABLE 6.8 – 2027 OPENING YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 5 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM*	AM*	PM*
R136 South	Without Development	0.97	0.98	24	26
	With Development	0.99	0.99	31	29
N4 Slip Road (off-ramp)	Without Development	0.94	0.83	13	10
	With Development	0.94	0.83	13	10
R136 North	Without Development	0.34	0.41	5	7
	With Development	0.34	0.42	5	7

*Note: * For the AM and PM peak hours, it is anticipated that the queue lengths from the downstream junctions (i.e. Junction 3 and Junction 6) will extend to Junction 5 and stop the traffic travelling to R136 southward / northward occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.8** demonstrate the R136 South arm and N4 Slip Road (off-ramp) arm on this junction in the morning peak hour, and R136 South arm on this junction in the evening peak hour will slightly exceed the normal design threshold in 2027 for both the "without" development and "with" development scenarios, resulting in queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues / delays.

Additionally, **Table 5.3** and **Table 5.4** show that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 baseline year in the morning and evening peak hours for this junction are 2.9% and 1.8% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. Additionally, shift working pattern will be implemented by the new hospital in order to reduce the trip generation in the morning and evening peak hours. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on this junction so traffic from the proposed development will not have significant impact on this junction.

Junction 6 – R136 / N4 Slip Road (Westbound)

TABLE 6.9 – 2027 OPENING YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 6 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM*	AM*	PM*
R136 North	Without Development	0.67	0.68	12	13
	With Development	0.67	0.70	12	13
N4 Slip Road (off-ramp)	Without Development	0.89	1.00	24	38
	With Development	0.92	1.00	26	38
R136 South	Without Development	1.01	0.98	39	32
	With Development	1.05	0.99	51	34
N4 Slip Road (on-ramp)	Without Development	-	-	-	-
	With Development	-	-	-	-

*Note: * For the AM and PM peak hours, it is anticipated that the queue lengths from the downstream junctions (i.e. Junction 5) will extend to Junction 6 and stop the traffic travelling to R136 southward / northward occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.9** demonstrate the N4 Slip Road (off-ramp) arm and R136 South arm on this junction will approach to / exceed the normal design threshold in both the morning and evening peak hours in 2027 for both the "without" development and "with" development scenarios, resulting in queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues / delays.

Additionally, **Table 5.3** and **Table 5.4** show that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 baseline year in the morning and evening peak hours for this junction are 2.1% and 1.2% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. Additionally, shift working pattern will be implemented by the new hospital in order to reduce the trip generation in the morning and evening peak hours. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on this junction so traffic from the proposed development will not have significant impact on this junction.

Junction 7 – Chapel Hill / Lucan Road

TABLE 6.10 – 2027 OPENING YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 7 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM**	AM*	PM**
Without Proposed Improvement Scheme as mentioned in Section 4.2 in a "Without Allowing for Modal Shift" Approach as mentioned in Section 5.6					
Lucan Road West	Without Development	0.68	0.63	10	9
	With Development	0.69	0.65	10	9
Chapel Hill	Without Development	1.08	1.28	44	82
	With Development	1.09	1.32	49	93
Lucan Road East	Without Development	1.01	1.45	31	205
	With Development	1.03	1.50	34	239
With Proposed Improvement Scheme as mentioned in Section 4.2 in a "Without Allowing for Modal Shift" Approach as mentioned in Section 5.6					
Lucan Road West	With Development	0.93	0.98	16	19
Chapel Hill	With Development	0.95	0.99	22	24
Lucan Road East	With Development	0.60	1.04	13	49
With Proposed Improvement Scheme as mentioned in Section 4.2 in a "Allowing for Modal Shift" Approach as mentioned in Section 5.6					
Lucan Road West	With Development	0.91	0.97	14	18
Chapel Hill	With Development	0.94	0.92	20	18
Lucan Road East	With Development	0.59	0.99	13	34

*Note: * For the AM peak hour, it is anticipated that the queue length from the downstream junction (i.e. Junction 2) will extend to Junction 7 and stop the traffic moving eastward from Lucan Road West arm / Chapel Hill arm to Lucan Road East arm occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

*** For the PM peak hour, it is anticipated that the queue length from the downstream junction (Chapel Hill / Main Street / R109 Junction) will extend to Junction 7 and stop the traffic moving westward from Lucan Road East arm / Lucan Road West arm to Chapel Hill arm occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.10** demonstrate that based on the existing junction layout in a "without allowing for modal shift" approach as mentioned in Section 5.6, the Chapel Hill arm and Lucan Road East arm on this junction will exceed the normal design threshold in both the morning and evening peak hours in 2027 for both the "without" development and "with" development scenarios, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues / delays.

Additionally, **Table 5.3** and **Table 5.4** show that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 baseline year in the morning and evening peak hours for this junction are 1.7% and 3.1% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. Additionally, shift working pattern will be implemented by the new hospital in order to reduce the trip generation in the morning and evening peak hours. In view of the above analysis, the

proposed development will have a negligible increase in traffic volumes on this junction so traffic from the proposed development will not have significant impact on this junction.

To relieve the traffic congestion and enhance the safety of vulnerable road users at this junction, it is proposed to carry out the improvement works as mentioned in Section 4.2. The results shown in **Table 6.10** demonstrate that with the proposed improvement scheme in a "without allowing for modal shift" approach as mentioned in Section 5.6, Junction 7 will exceed the normal design threshold in both the morning and evening peak hours in 2027 for the "with" development scenario. However, with the proposed improvement scheme in a "allowing for modal shift" approach as mentioned in Section 5.6, Junction 7 will slightly exceed the normal design threshold (but still less than its theoretical capacity of 1.0) in both the morning and evening peak hours in 2027 for the "with" development scenario. Additionally, the proposed improvement scheme can reduce the highest DOS for AM on Chapel Hill arm from 1.09 to 0.94 and PM on Lucan Road East arm from 1.50 to 0.99. Therefore, it is considered that the proposed improvement scheme can relieve the traffic congestion when compared to the "with" development scenario (based on the existing junction layout).

6.4 Operational Phase 2042 (Opening Year plus 15 Years) – Junction Capacity Analysis (By Using the TRICS Database)

A traffic capacity assessment of the Junction 1, Junction 3 and Junction 5 to Junction 7 were undertaken utilising the future traffic flows as shown in **Figure 5.8** and **Figure 5.9**, and TRL's PICADY and OSCADY traffic modelling software. A summary of the results of the analysis for the 2042 design year (opening year plus 15 years), "without" development and "with" development scenarios by using the TRICS database, in the morning and evening peak hours is shown in **Table 6.11** and **Table 6.15** following.

Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road

TABLE 6.11 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 1 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
		AM	PM	AM	PM	AM	PM
Lucan Road West	Without Development	-	-	-	-	-	-
	With Development	-	-	-	-	-	-
Western Access Road to St. Edmundsbury Hospital	Without Development	0	0.07	0	0	0	13
	With Development	0.08	0.31	0	0	15	18
Lucan Road East	Without Development	0.01	0	0	0	8	8
	With Development	0.14	0.05	0	0	10	8

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a priority junction. The results shown in **Table 6.15** demonstrate that Junction 1 will operate within the normal design threshold in both the morning and evening peak hours in 2042 for both the "without" development and "with" development scenarios.

Junction 3 – R136 / Lucan Road

TABLE 6.12 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 3 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM*	AM*	PM*
Lucan Road East	Without Development	0.09	0.46	1	4
	With Development	0.09	0.46	1	4
R136	Without Development	1.16	1.08	60	81
	With Development	1.16	1.10	61	89
Lucan Road West	Without Development	1.30	1.26	194	142
	With Development	1.31	1.28	202	160

*Note: * For the AM and PM peak hours, it is anticipated that the queue length from the downstream will extend to Junction 3 and stop the traffic travelling from R136 to Lucan Road westbound occasionally when the traffic light is green / flashing amber. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.12** demonstrate that the R136 arm and Lucan Road West arm on this junction will exceed the normal design threshold in both the morning and evening peak hours in 2042 for both the "without" development and "with" development scenarios, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Additionally, **Table 5.3** and **Table 5.4** that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 baseline year in the morning and evening peak hours for this junction are 2.6% and 2.5% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. Additionally, shift working pattern will be implemented by the new hospital in order to reduce the trip generation in the morning and evening peak hours. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on this junction so traffic from the proposed development will not have significant impact on this junction.

Junction 5 – R136 / N4 Slip Road (Eastbound)

TABLE 6.13 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 5 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM*	AM*	PM*
R136 South	Without Development	1.07	1.09	66	77
	With Development	1.11	1.11	90	85
N4 Slip Road (off-ramp)	Without Development	1.05	0.93	20	13
	With Development	1.05	0.93	20	13
R136 North	Without Development	0.38	0.45	6	8
	With Development	0.38	0.47	6	8

*Note: * For the AM and PM peak hours, it is anticipated that the queue lengths from the downstream junctions (i.e. Junction 3 and Junction 6) will extend to Junction 5 and stop the traffic travelling to R136 southward / northward occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.13** demonstrate that the R136 South arm and N4 Slip Road (off-ramp) arm on this junction will exceed the normal design threshold in both the morning and evening peak hours in 2042 for both the "without" development and "with" development scenarios, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Additionally, **Table 5.3** and **Table 5.4** that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 baseline year in the morning and evening peak hours for this junction are 2.9% and 1.8% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. Additionally, shift working pattern will be implemented by the new hospital in order to reduce the trip generation in the morning and evening peak hours. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on this junction so traffic from the proposed development will not have significant impact on this junction.

Junction 6 – R136 / N4 Slip Road (Westbound)

TABLE 6.14 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 6 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM*	AM*	PM*
R136 North	Without Development	0.75	0.76	14	15
	With Development	0.75	0.78	14	16
N4 Slip Road (off-ramp)	Without Development	0.99	1.11	34	66
	With Development	1.03	1.11	40	67
R136 South	Without Development	1.13	1.09	82	66
	With Development	1.17	1.10	100	72
N4 Slip Road (on-ramp)	Without Development	-	-	-	-
	With Development	-	-	-	-

*Note: * For the AM and PM peak hours, it is anticipated that the queue lengths from the downstream junctions (i.e. Junction 5) will extend to Junction 6 and stop the traffic travelling to R136 southward / northward occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.14** demonstrate that the N4 Slip Road (off-ramp) arm and R136 South arm on this junction will exceed the normal design threshold in both the morning and evening peak hours in 2042 for both the "without" development and "with" development scenarios, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Additionally, **Table 5.3** and **Table 5.4** that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 baseline year in the morning and evening peak hours for this junction are 2.1% and 1.2% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. Additionally, shift working pattern will be implemented by the new hospital in order to reduce the trip generation in the morning and evening peak hours. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on this junction so traffic from the proposed development will not have significant impact on this junction.

Junction 7 – Chapel Hill / Lucan Road

TABLE 6.15 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 7 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM**	AM*	PM**
Without Proposed Improvement Scheme as mentioned in Section 4.2 in a "Without Allowing for Modal Shift" Approach as mentioned in Section 5.6					
Lucan Road West	Without Development	0.76	0.71	11	11
	With Development	0.77	0.72	12	11
Chapel Hill	Without Development	1.21	1.43	83	136
	With Development	1.22	1.47	89	148
Lucan Road East	Without Development	1.13	1.62	60	321
	With Development	1.15	1.67	65	357
With Proposed Improvement Scheme as mentioned in Section 4.2 in a "Without Allowing for Modal Shift" Approach as mentioned in Section 5.6					
Lucan Road West	With Development	1.04	1.10	27	36
Chapel Hill	With Development	1.07	1.10	45	47
Lucan Road East	With Development	0.67	1.16	15	96
With Proposed Improvement Scheme as mentioned in Section 4.2 in a "Allowing for Modal Shift" Approach as mentioned in Section 5.6					
Lucan Road West	With Development	0.95	0.97	17	18
Chapel Hill	With Development	0.95	0.91	22	17
Lucan Road East	With Development	0.60	0.99	13	35

*Note: * For the AM peak hour, it is anticipated that the queue length from the downstream junction (i.e. Junction 2) will extend to Junction 7 and stop the traffic moving eastward from Lucan Road West arm / Chapel Hill arm to Lucan Road East arm occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

*** For the PM peak hour, it is anticipated that the queue length from the downstream junction (Chapel Hill / Main Street / R109 Junction) will extend to Junction 7 and stop the traffic moving westward from Lucan Road East arm / Lucan Road West arm to Chapel Hill arm occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 6.15** demonstrate that based on the existing junction layout in a "without allowing for modal shift" approach as mentioned in Section 5.6, the Chapel Hill arm and Lucan Road East arm on this junction will exceed the normal design threshold in both the morning and evening peak hours in 2042 for both the "without" development and "with" development scenarios, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Additionally, **Table 5.3** and **Table 5.4** that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 baseline year in the morning and evening peak hours for this junction are 1.7% and 3.1% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. Additionally, shift working pattern will be implemented by the new hospital in order to reduce the trip generation in the morning and evening peak hours. In view of the above analysis, the

proposed development will have a negligible increase in traffic volumes on this junction so traffic from the proposed development will not have significant impact on this junction.

To relieve the traffic congestion and enhance the safety of vulnerable road users at this junction, it is proposed to carry out the improvement works as mentioned in Section 4.2. The results shown in **Table 6.15** demonstrate that with the proposed improvement scheme in a "without allowing for modal shift" approach as mentioned in Section 5.6, Junction 7 will exceed the normal design threshold in both the morning and evening peak hours in 2042 for the "with" development scenario. However, with the proposed improvement scheme in a "allowing for modal shift" approach as mentioned in Section 5.6, Junction 7 will slightly exceed the normal design threshold (but still less than its theoretical capacity of 1.0) in both the morning and evening peak hours in 2042 for the "with" development scenario. Additionally, the proposed improvement scheme can reduce the highest DOS for AM on Chapel Hill arm from 1.22 to 0.95 and PM on Lucan Road East arm from 1.67 to 0.99. Therefore, it is considered that the proposed improvement scheme can relieve the traffic congestion when compared to the "with" development scenario (based on the existing junction layout).

6.5 Traffic Impacts During Construction

The duration of the construction phase and the resource level and trips associated with the construction stage will be decided by the Contractor in accordance with contractual restrictions and may fluctuate depending on the sequence and type of work being carried out at any one time.

During construction, trucks and vans will be delivering materials to the site on a daily basis. It is estimated that the arrivals of deliveries to the site are expected to be evenly spread throughout the day.

A Construction Stage Traffic Management Plan will be developed and agreed with South Dublin County Council prior to undertaking any construction works and full consultation with South Dublin County Council, An Garda Siochana, the Fire Service, the Ambulance service and other relevant same stakeholders will be carried out. All traffic management plans, including working times, shall be agreed with and approved by South Dublin County Council Transportation Department in advance of implementation. A Construction Manager shall be appointed to liaise directly with the various sections of the Council.

The construction management plan will take into account construction vehicle routing and timing to mitigate any issues with vehicles on public roads. The following provisions shall be provided to minimize the impacts to the public road network during Construction Stage:

Tracked excavators will be moved to and from the site on low-loaders and will not be permitted to drive on the street pavements;
Wheel washers / judder bars will be placed at all site access points to minimise the migration of detritus onto the public roads. The roads will be inspected and cleaned on a regular basis; and
Haul vehicles will be covered after loading to ensure there is no risk of construction material falling.

7 TRIP GENERATION AND TRAFFIC IMPACT (BY USING THE TRAFFIC COUNT SURVEYS)

Apart from estimating the net trip generation for the proposed development based on the TRICS database as mentioned in Section 5.2, another two traffic count surveys at St. Patrick's University Hospital at Dublin 8 and at Junction 1 of Lucan (refer to **Figure 1.2**) were also undertaken on 2nd May 2024 and 21st May 2024 respectively for estimation of the net trip generation for the proposed development.

Based on the scope of proposed development, total trip generation for the proposed development is equal to the trip generated from the existing St. Edmundsbury Hospital at Lucan (i.e. 52 beds) plus the net trip generated for the proposed development (i.e. 162 net increase of beds). As the traffic count survey on 22nd February 2023 as mentioned in Section 3.1 can capture the trip generated from the existing St. Edmundsbury Hospital at Lucan (i.e. 52 beds), therefore, the net trip generation for the proposed development is equal to the trip generated from the net increase of beds (i.e. 162 beds) for the proposed development. The following sections present the net trip generation for the proposed development by using the traffic count survey at St. Patrick's University Hospital at Dublin 8 and traffic count surveys at Lucan.

7.1 Net Trip Generation (By Using the Traffic Count Survey at St. Patrick's University Hospital at Dublin 8 on 2nd May 2024)

7.1.1 Net Trip Generation (By Using the Traffic Count Survey at St. Patrick's University Hospital)

Currently, St. Patrick's University Hospital at Dublin 8 has two site entrances as shown in **Figure 7.1**. In order to estimate the net trip generation for the proposed development from St. Patrick's University Hospital, a traffic count survey at the site entrances of St. Patrick's University Hospital was undertaken on Thursday, 2nd May 2024.

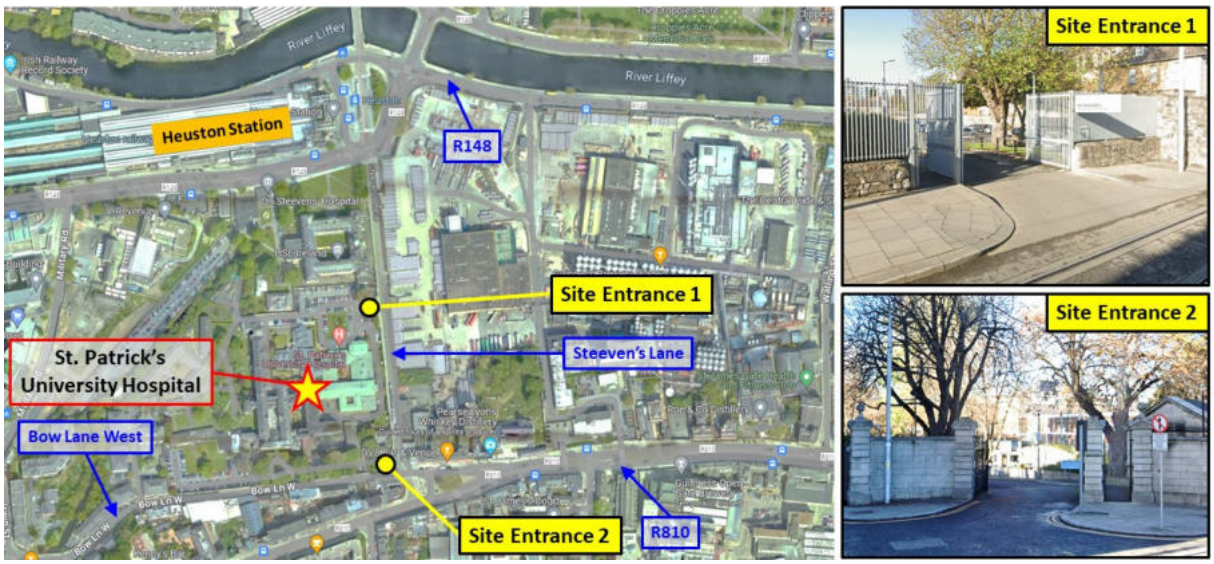

FIGURE 7.1 – EXISTING SITE ENTRANCES OF ST. PATRICK'S UNIVERSITY HOSPITAL AT DUBLIN 8

The count, which captured trips inbound and trips outbound of St. Patrick's University Hospital, was carried out over the 12-hour period from 07:00 hours to 19:00 hours and included both the morning and evening peak periods. Data was collected in 15-minute intervals. A full transcription of the traffic count survey at the site entrances of St. Patrick's University Hospital is included in **Appendix 4** herein.

According to the aforementioned traffic count survey, the highest total trips to/from St. Patrick's University Hospital between 07:00 and 10:00 was identified as 07:00-08:00 while the highest total trips to/from St. Patrick's University Hospital between 16:00 and 19:00 was identified as 16:00-17:00.

The existing St. Patrick's University Hospital at Dublin 8 consists of 265 beds to provide services to public while the existing St. Edmundsbury Hospital at Lucan consists of 52 beds to provide services to public. After completion of the proposed development, the new hospital will increase from the existing 52 beds to a total of 214 beds. Therefore, the net increase of beds is 162.

To ensure a more accurate and locally based assessment, the predicted net trips to/from the proposed development have been calculated by examining the highest total trips (between 07:00 and 10:00 and between 16:00 and 19:00) to/from the existing St. Patrick's University Hospital at Dublin 8 based on the traffic count survey on 2nd May 2024. In order to produce a robust and conservative scenario, a tolerance of 10% was added to the net hourly trips to account for daily fluctuations.

Additionally, as the public transport services adjacent to St. Patrick's University Hospital at Dublin 8 is better than the public transport services adjacent to the proposed development at Lucan, so it is anticipated that after completion of the proposed development, the actual trip generation at the Site for relocation of services / facilities from St. Patrick's University Hospital will increase slightly when compared to the traffic count survey obtained from St. Patrick's University Hospital on Thursday, 2nd May 2024. To take into account of different degree of public transport services provided between St. Patrick's University Hospital at Dublin 8 and the proposed development at Lucan, another 25% additional trips was added to the net hourly trips.

During the operational phase, only emergency vehicles and medium / heavy goods vehicles will be allowed to use the Eastern Vehicular Access (Junction 2). Thus, the estimated net trip generation for the proposed development, which is based on the OGV1, OGV2 and PSV recorded in the aforementioned traffic count survey, will travel to/from the proposed development via Eastern Vehicular Access (Junction 2). The remaining estimated net traffic, which is based on the P/C, M/C, Cars and LGV recorded in the aforementioned traffic count survey, will travel to/from the proposed development via Western Vehicular Access (Junction 1). In consideration of number of bed at the existing St. Patrick's University Hospital at Dublin 8 (i.e. 265 beds) and additional beds (i.e. 162 beds) for the proposed development, the adjusted net hourly trips (i.e. additional 162 beds) for the proposed development in the morning and evening peak hours was estimated as shown in **Table 7.1**.

TABLE 7.1 – NET TRIP GENERATION FOR THE PROPOSED DEVELOPMENT (BY USING TRAFFIC COUNT SURVEY AT ST. PATRICK'S UNIVERSITY HOSPITAL AT DUBLIN 8 ON 2ND MAY 2024)

No. of Bed at Existing St. Patrick's University Hospital	Time	No. of Trips as per Traffic Count Survey at St. Patrick's University Hospital on 2nd May 2024				Adjusted Net Hourly Trips for Additional 162 Bed*			
						Junction 1		Junction 2	
		P/C, M/C, Car & LGV		OGV1, OGV2 & PSV		P/C, M/C, Car & LGV		OGV1, OGV2 & PSV	
		Trips In	Trips Out	Trips In	Trips Out	Trips In	Trips Out	Trips In	Trips Out
265	AM	69	23	0	2**	58	19	0	2**
	PM	8	47	0	2**	7	40	0	2**

*Note: * The adjusted net hourly trips for proposed development = [No. of Trips as per Traffic Count ÷ No. of Bed at Existing St. Patrick's University Hospital at Dublin 8 (i.e. 265 beds)] × Net increase of beds (i.e. 162) × (1+10%) × (1+25%).*

*** Based on the trip distributions proportionally to the 2023 recorded traffic flows, it is anticipated that all trips out for OGV1, OGV2 and PSV will travel to/from the Junction 3 via the Eastern Vehicular Access (Junction 2) in both the morning and evening peak hours.*

7.1.2 2024 Design Year Traffic Flows (By Using the Traffic Count Survey at St. Patrick's University Hospital at Dublin 8)

Based on the trip distribution approach as mentioned in Section 5.4 above, **Figure 7.2** and **Figure 7.3** illustrate the 2042 Design Year Horizon traffic flows in the morning and evening peak hours for the "without" development and "with" development scenarios by using the traffic count survey at St. Patrick's University Hospital at Dublin 8 on 2nd May 2024.

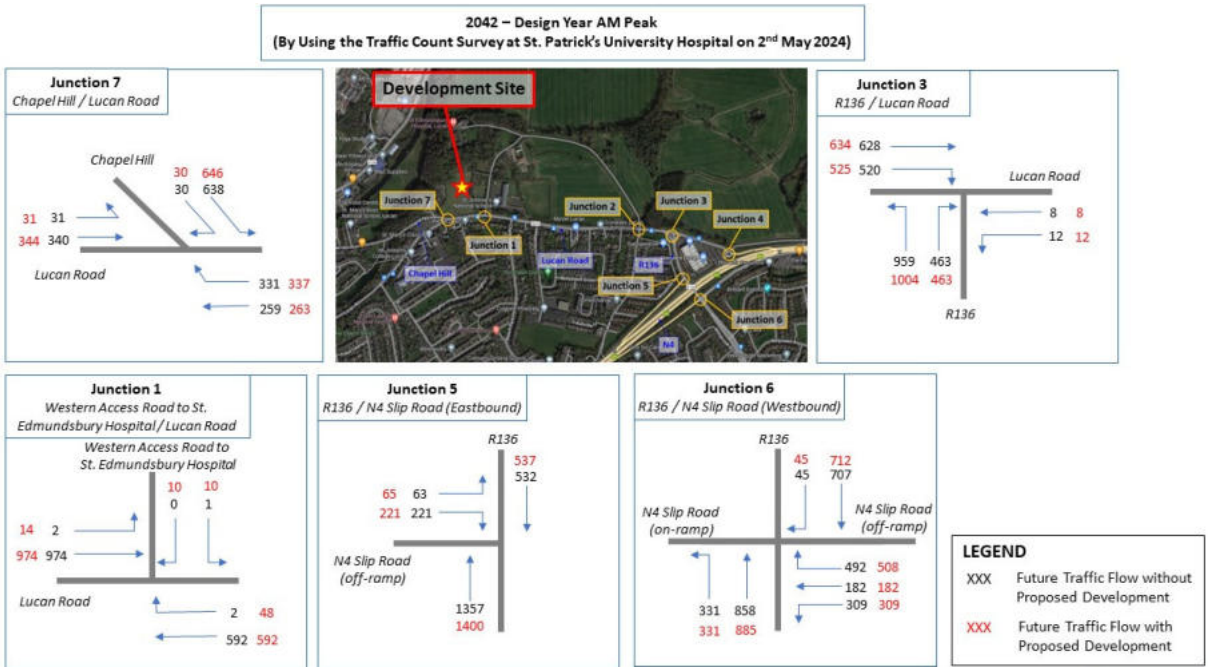

FIGURE 7.2 – 2042 DESIGN YEAR TRAFFIC FLOWS IN THE MORNING PEAK HOUR (BY USING THE TRAFFIC COUNT SURVEY AT ST. PATRICK'S UNIVERSITY HOSPITAL ON 2ND MAY 2024)

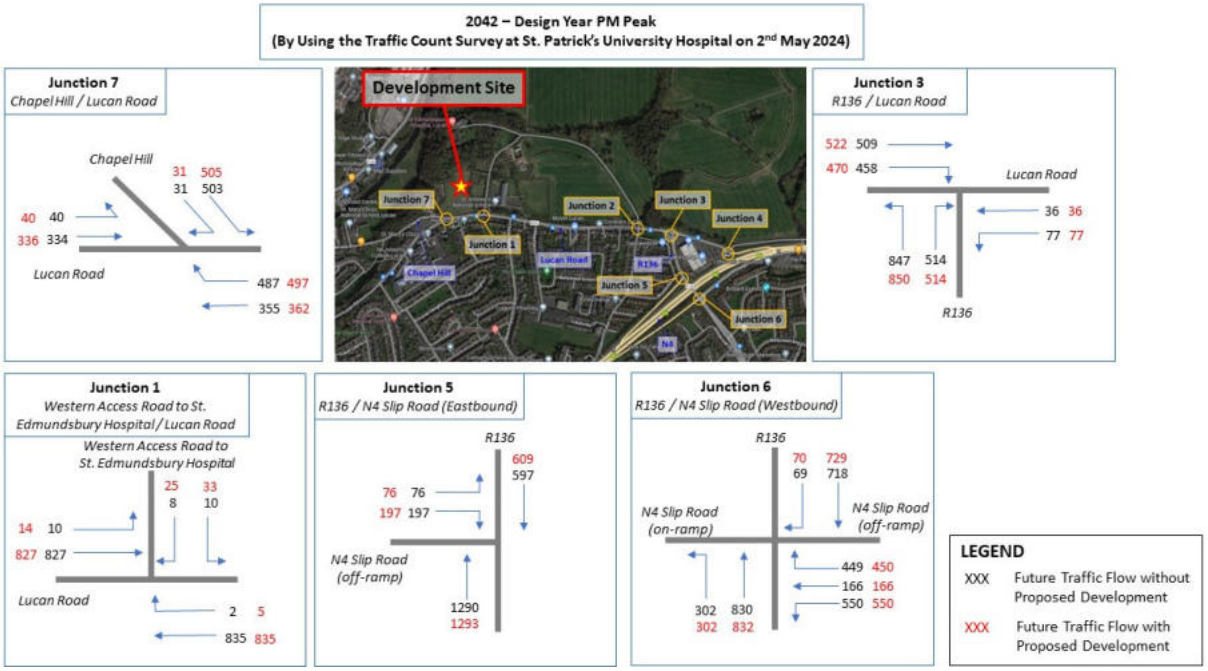

FIGURE 7.3 – 2042 DESIGN YEAR TRAFFIC FLOWS IN THE EVENING PEAK HOUR (BY USING THE TRAFFIC COUNT SURVEY AT ST. PATRICK'S UNIVERSITY HOSPITAL ON 2ND MAY 2024)

7.2 Net Trip Generation (By Using the Traffic Count Survey at Lucan)

7.2.1 Net Trip Generation (By Using the Traffic Count Survey at Lucan)

The existing St. Edmundsbury Hospital at Lucan consists of 52 beds to provide services to public. After completion of the proposed development, the new St. Edmundsbury Hospital will increase from the existing 52 beds to a total of 214 beds. Therefore, the net increase of beds is 162.

For estimation of the net trip generation for the proposed development, a traffic count survey at Junction 1 of Lucan (refer to **Figure 1.2**) was undertaken on Tuesday, 21st May 2024 as mentioned in Section 5.4.

The count was carried out over the 12-hour period from 07:00 hours to 19:00 hours and included both the morning and evening peak periods. Data was collected in 15-minute intervals. A full transcription of the traffic count survey at the Western Vehicular Access (Junction 1) is included in **Appendix 3** herein.

Currently, vehicles are travelling to/from the existing St. Edmundsbury Hospital through Junction 1 and Junction 2. Therefore, the total trips to/from the existing St. Edmundsbury Hospital, which is equal to the trips to/from the existing St. Edmundsbury Hospital through Junction 1 (based on the traffic count survey on 21st May 2024) plus the trips to/from the existing St. Edmundsbury Hospital through Junction 2 (based on the traffic count survey on 22nd February 2023), shall be considered.

Referring to the Section 5.4 above, the highest total trips to/from the existing St. Edmundsbury Hospital (through Junction 1 and Junction 2) between 07:00 and 10:00 was identified as 08:00-09:00 while the highest total trips to/from the existing St. Edmundsbury Hospital between 16:00 and 19:00 was identified as 18:00-19:00.

To ensure a more accurate and locally based assessment, the predicted net trips to/from the proposed development have been calculated by examining the highest total trips (for AM between 07:00 and 10:00 and for PM between 16:00 and 19:00) to/from the existing St. Edmundsbury Hospital based on the traffic count surveys at Junction 1 on 21st May 2024 and at Junction 2 on 22nd February 2023. In order to produce a robust and conservative scenario, a tolerance of 10% was added to the net hourly trips to account for daily fluctuations.

During the operational phase, only emergency vehicles and medium / heavy goods vehicles will be allowed to use the Eastern Vehicular Access (Junction 2). However, no OGV1, OGV2 and PSV were recorded in the aforementioned traffic count surveys at Lucan during the identified morning and evening periods. Therefore, all estimated net traffic, which is based on the P/C, M/C, Cars and LGV recorded in the aforementioned traffic count surveys at Lucan, will travel to/from the proposed development via Western Vehicular Access (Junction 1). In consideration of the number of bed at the existing St. Edmundsbury Hospital at Lucan (i.e. 52 beds) and additional beds (i.e. 162 beds) for the proposed development, the adjusted net hourly trips (i.e. additional 162 beds) for the proposed development in the morning and evening peak hours during the operational phase was estimated as shown in **Table 7.2**.

TABLE 7.2 – NET TRIP GENERATION FOR THE PROPOSED DEVELOPMENT (BY USING THE TRAFFIC COUNT SURVEYS AT LUCAN)

No. of Bed at Existing St. Edmundsbury Hospital	Time	No. of Total Trips as per Traffic Count Surveys at Junction 1 on 21st May 2024 and at Junction 2 on 22nd February 2023				Adjusted Net Hourly Trips for Additional 162 Bed*			
						Junction 1		Junction 2	
		P/C, M/C, Car & LGV		OGV1, OGV2 & PSV		P/C, M/C, Car & LGV		OGV1, OGV2 & PSV	
		Trips In	Trips Out	Trips In	Trips Out	Trips In	Trips Out	Trips In	Trips Out
52	AM	14	8	0	0	48	27	0	0
	PM	6	7	0	0	21	24	0	0

*Note: * The adjusted net hourly trips for proposed development = [No. of Trips as per Traffic Count ÷ No. of Bed at Existing St. Edmundsbury Hospital at Lucan (i.e. 52 beds)] × Net increase of beds (i.e. 162) × (1+10%).*

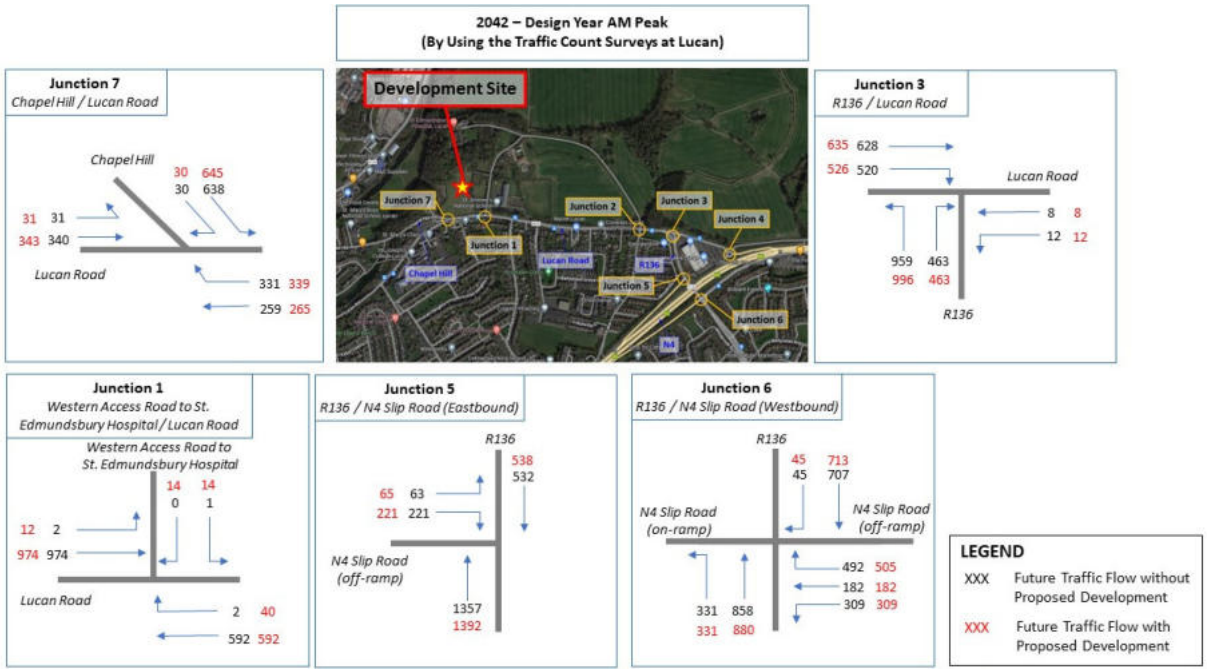

FIGURE 7.4 – 2042 DESIGN YEAR TRAFFIC FLOWS IN THE MORNING PEAK HOUR (BY USING THE TRAFFIC COUNT SURVEYS AT LUCAN)

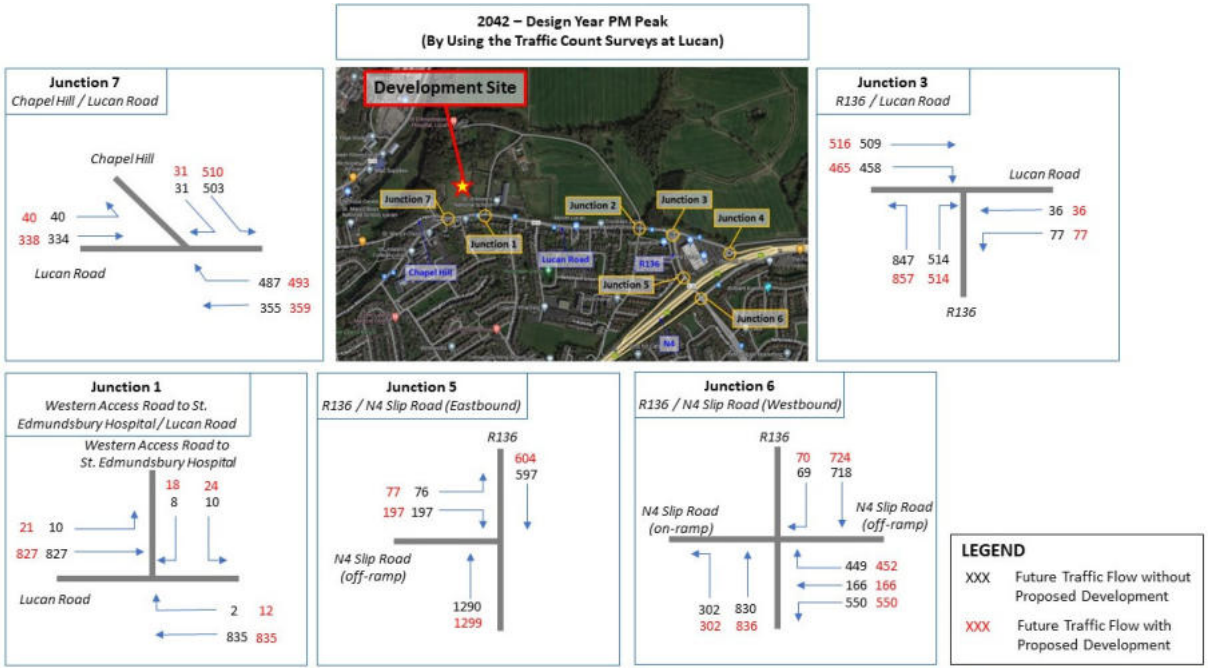

FIGURE 7.5 – 2042 DESIGN YEAR TRAFFIC FLOWS IN THE EVENING PEAK HOUR (BY USING THE TRAFFIC COUNT SURVEYS AT LUCAN)

7.3 Comparison

7.3.1 Comparison of Net Trip Generation for the Proposed Development

In view of the above, three methods (i.e. using the TRICS Database, traffic count survey at St. Patrick's University Hospital and traffic count surveys at Lucan) were considered to estimate the net trip generation for the proposed development. **Table 7.3** summarizes the net trip generation for the proposed development based on the aforementioned methods.

TABLE 7.3 – COMPARISON OF NET HOURLY TRIPS FOR THE PROPOSED DEVELOPMENT BASED ON DIFFERENT METHODS

Method for Estimation of Net Trip Generation for the Proposed Development	Period	Net Hourly Trips for the Proposed Development		
		Trips In	Trips Out	Total Trips
By using the TRICS Database	AM	64	17	81
	PM	35	63	98
By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	AM	58	21*	79
	PM	7	42*	49
By using the traffic count surveys at Lucan	AM	48	27	75
	PM	21	24	45

*Note: * By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024 for estimation of net trip generation for the proposed development, it is anticipated that 2 PCUs of total trips-out will travel from the Site to Junction 3 via the Eastern Vehicular Access (Junction 2) in both the morning and evening peak hours while the remaining trips-out (i.e. 19 trips-out in the morning peak hour and 40 trips-out in the evening peak hour) will travel from the Site via the Western Vehicular Access (Junction 1). For other scenarios, all net trips-in or trips-out for the proposed development will travel to/from the Site via the Western Vehicular Access (Junction 1) only in both the morning and evening peak hours.*

Table 7.3 demonstrates that the total net trip generation for the proposed development by using the TRICS database is greater than the total net trip generation by using the traffic count survey at St. Patrick's University Hospital at Dublin 8 or traffic count surveys at Lucan. It is because generally, the TRICS database provides an average data to calculate the trip generation for developments. However, using the traffic count survey at St.

Patrick's University Hospital at Dublin 8 or traffic count surveys at Lucan can provide a more accurate, specific and locally based assessment. It should be also noted that the total net trip generation for the proposed development by using the traffic count survey at St. Patrick University Hospital and traffic count surveys at Lucan are similar. **Table 7.3** also revealed that with implementation of the current measures (i.e. shift working pattern, etc.) in the Workplace Travel Plan for both St. Patrick's University Hospital at Dublin 8 and the existing St. Edmundsbury Hospital at Lucan, it can effectively reduce the net trip generation in the morning and evening peak hours when compared to the net trip generation by using the TRICS database.

7.3.2 Comparison of Net Trip Generation as a Percentage of Existing Traffic

Based on the trip distribution approach as mentioned in Section 5.4 above, the result of the trip distribution and assignment exercise by using the TRICS database, traffic count survey at St. Patrick's University Hospital on 2nd May 2024 and traffic count surveys at Lucan is presented in **Table 7.4**.

TABLE 7.4 – COMPARISON OF DEVELOPMENT AM AND PM PEAK HOURS NET TRIP GENERATION AS A PERCENTAGE OF EXISTING ROAD NETWORK TRAFFIC FLOW

Junction	Peak Hour	Junction AM Peak Traffic	TRICS Database		Traffic Count Survey at St. Patrick's University Hospital		Traffic Count Surveys at Lucan	
			Development Net Generated Traffic	%	Development Net Generated Traffic	%	Development Net Generated Traffic	%
Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road	AM	1,316	81	**6.2%**	77	**5.9%**	75	**5.7%**
	PM	1,414	98	**6.9%**	47	3.3%	45	3.2%
Junction 2 – Eastern Access Road to St. Edmundsbury Hospital / Lucan Road / Esker Lane	AM	1,800	58	3.2%	57	3.2%	51	2.8%
	PM	1,655	53	3.2%	28	1.7%	24	1.4%
Junction 3 – R136 / Lucan Road	AM	2,173	57	2.6%	56	2.6%	50	2.3%
	PM	2,046	52	2.5%	28	1.4%	24	1.2%
Junction 4 – Lucan Road / Access to Hermitage Golf Club	AM	1,056	4	0.4%	6	0.6%	7	0.7%
	PM	1,000	19	1.9%	12	1.2%	7	0.7%
Junction 5 – R136 / N4 Slip Road (Eastbound)	AM	1,823	53	2.9%	50	2.7%	43	2.4%
	PM	1,808	33	1.8%	15	0.8%	17	0.9%
Junction 6 – R136 / N4 Slip Road (Westbound)	AM	2,450	51	2.1%	48	2.0%	41	1.7%
	PM	2,592	32	1.2%	15	0.6%	16	0.6%
Junction 7 – Chapel Hill / Lucan Road	AM	1,364	23	1.7%	22	1.6%	24	1.8%
	PM	1,464	45	3.1%	21	1.4%	21	1.4%

As demonstrated by **Table 7.4**, the ratio of estimated net trip (by using the aforementioned three methods) associated with the proposed development to the existing traffic flows for Junction 2 to Junction 7 in both the morning and evening peak hours are also less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Additionally, the ratio of estimated net trip (by using the traffic count survey at St. Patrick's University Hospital at Dublin 8 or traffic count surveys at

Lucan) associated with the proposed development to the existing traffic flows are generally less than to the ratio (by using the TRICS database) for Junction 1 to Junction 7 in both the morning and evening peak hours.

It should be also noted that the ratio of net trip (by using the traffic count survey at St. Patrick's University Hospital at Dublin 8 or traffic count surveys at Lucan) associated with the proposed development to the existing traffic flows for Junction 7 are less than 1.8% in both the morning and evening peak hours.

In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on Junction 2 to Junction 7.

7.3.3 Comparison of Traffic Impact

A traffic capacity assessment of the Junction 1, Junction 3 and Junction 5 to Junction 7 were undertaken. A summary of the results of the analysis for the 2042 design year is shown in **Table 7.5** and **Table 7.9.**

Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road

Table 7.5 summarized the analysis results at Junction 1 in 2042 for both the "without" development and "with" development scenarios by using the TRICS database, traffic count survey at St. Patrick's University Hospital at Dublin 8 on 2nd May 2024 and traffic count surveys at Lucan.

TABLE 7.5 – COMPARISON OF JUNCTION CAPACITY ANALYSIS FOR JUNCTION 1 IN 2042 DESIGN YEAR

Approach Arm	Scenario	Method for Estimation of Net Trip Generation for the Proposed Development	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
			AM	PM	AM	PM	AM	PM
Lucan Road West	Without Development	-	-	-	-	-	-	-
	With Development	By using the TRICS Database	-	-	-	-	-	-
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	-	-	-	-	-	-
		By using the traffic count surveys at Lucan	-	-	-	-	-	-
Western Access Road to St. Edmundsbury Hospital	Without Development	-	0	0.07	0	0	0	13
	With Development	By using the TRICS Database	0.08	0.31	0	0	15	18
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	0.09	0.22	0	0	15	16
		By using the traffic count surveys at Lucan	0.12	0.16	0	0	16	15
Lucan Road East	Without Development	-	0.01	0	0	0	8	8
	With Development	By using the TRICS Database	0.14	0.05	0	0	10	8
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	0.12	0.01	0	0	9	8
		By using the traffic count surveys at Lucan	0.10	0.03	0	0	9	8

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a priority junction. The results shown in **Table 7.5** demonstrate that Junction 1 will operate within the normal design threshold in both the

morning and evening peak hours in 2042 for both the "without" development and "with" development scenarios by using the aforementioned three methods.

Junction 3 – R136 / Lucan Road

Table 7.6 summarizes the analysis results at Junction 3 in 2042 for both the "without" development and "with" development scenarios by using the TRICS database, traffic count survey at St. Patrick's University Hospital at Dublin 8 on 2nd May 2024 and traffic count surveys at Lucan.

TABLE 7.6 – COMPARISON OF JUNCTION CAPACITY ANALYSIS FOR JUNCTION 3 IN 2042 DESIGN YEAR (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Method for Estimation of Net Trip Generation for the Proposed Development	Max. DOS		Max. Queue (PCU)	
			AM*	PM*	AM*	PM*
Lucan Road East	Without Development	-	0.09	0.46	1	4
	With Development	By using the TRICS Database	0.09	0.46	1	4
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	0.09	0.46	1	4
		By using the traffic count surveys at Lucan	0.09	0.46	1	4
R136	Without Development	-	1.16	1.08	60	81
	With Development	By using the TRICS Database	1.16	1.10	61	89
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	1.16	1.11	61	90
		By using the traffic count surveys at Lucan	1.16	1.09	61	86
Lucan Road West	Without Development	-	1.30	1.26	194	142
	With Development	By using the TRICS Database	1.31	1.28	202	160
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	1.31	1.27	205	150
		By using the traffic count surveys at Lucan	1.31	1.28	207	155

*Note: * For the AM and PM peak hours, it is anticipated that the queue length from the downstream will extend to Junction 3 and stop the traffic travelling from R136 to Lucan Road westbound occasionally when the traffic light is green / flashing amber. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. **Table 7.6** demonstrates that Junction 3 will exceed the normal design threshold (with the highest DOS for AM at 1.30 and for PM at 1.26 on Lucan Road West arm) in both the morning and evening peak hours in 2042 for the "without" development scenario. **Table 7.6** also demonstrates that by using different methods for estimation of net trip generation, the operating capacity on this junction in both the morning and evening peak hours in 2042 for the "with" development scenario are similar (with the highest DOS for AM at 1.31 and for PM at 1.28 on Lucan Road West arm) and slightly increase when compared to the analysis results in both the morning and evening peak hours in 2042 for the "without" development scenario (with the highest DOS for AM at 1.30 and for PM at 1.26 on Lucan Road West arm).

Junction 5 – R136 / N4 Slip Road (Eastbound)

Table 7.7 summarizes the analysis results at Junction 5 in 2042 for both the "without" development and "with" development scenarios by using the TRICS database, traffic count survey at St. Patrick's University Hospital at Dublin 8 on 2nd May 2024 and traffic count surveys at Lucan.

TABLE 7.7 – COMPARISON OF JUNCTION CAPACITY ANALYSIS FOR JUNCTION 5 IN 2042 DESIGN YEAR

Approach Arm	Scenario	Method for Estimation of Net Trip Generation for the Proposed Development	Max. DOS		Max. Queue (PCU)	
			AM*	PM*	AM*	PM*
R136 South	Without Development	-	1.07	1.09	66	77
	With Development	By using the TRICS Database	1.11	1.11	90	85
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	1.10	1.10	88	79
		By using the traffic count surveys at Lucan	1.10	1.10	84	82
N4 Slip Road (off-ramp)	Without Development	-	1.05	0.93	20	13
	With Development	By using the TRICS Database	1.05	0.93	20	13
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	1.05	0.93	20	13
		By using the traffic count surveys at Lucan	1.05	0.93	20	13
R136 North	Without Development	-	0.38	0.45	6	8
	With Development	By using the TRICS Database	0.38	0.47	6	8
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	0.38	0.46	6	8
		By using the traffic count surveys at Lucan	0.38	0.46	6	8

*Note: * For the AM and PM peak hours, it is anticipated that the queue lengths from the downstream junctions (i.e. Junction 3 and Junction 6) will extend to Junction 5 and stop the traffic travelling to R136 southward / northward occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. **Table 7.7** demonstrates that Junction 5 will exceed the normal design threshold (with the highest DOS for AM at 1.07 and for PM at 1.09 on R136 South arm) in both the morning and evening peak hours in 2042 for the "without" development scenario. **Table 7.7** also demonstrates that by using different methods for estimation of net trip generation, the operating capacity on this junction in both the morning and evening peak hours in 2042 for the "with" development scenario are similar (with the highest DOS for AM at 1.11 and for PM at 1.11 on R136 South arm) and slightly increase when compared to the analysis results in both the morning and evening peak hours in 2042 for the "without" development scenario (with the highest DOS for AM at 1.07 and for PM at 1.09 on R136 South arm).

Junction 6 – R136 / N4 Slip Road (Westbound)

Table 7.8 summarizes the analysis results at Junction 6 in 2042 for both the "without" development and "with" development scenarios by using the TRICS database, traffic count survey at St. Patrick's University Hospital at Dublin 8 on 2nd May 2024 and traffic count surveys at Lucan.

TABLE 7.8 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 6 (BY USING THE TRICS DATABASE)

Approach Arm	Scenario	Method for Estimation of Net Trip Generation for the Proposed Development	Max. DOS		Max. Queue (PCU)	
			AM*	PM*	AM*	PM*
R136 North	Without Development	-	0.75	0.76	14	15
	With Development	By using the TRICS Database	0.75	0.78	14	16
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	0.75	0.77	14	15
		By using the traffic count surveys at Lucan	0.75	0.76	14	15
N4 Slip Road (off-ramp)	Without Development	-	0.99	1.11	34	66
	With Development	By using the TRICS Database	1.03	1.11	40	67
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	1.03	1.11	40	67
		By using the traffic count surveys at Lucan	1.02	1.11	39	67
R136 South	Without Development	-	1.13	1.09	82	66
	With Development	By using the TRICS Database	1.17	1.10	100	72
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	1.16	1.09	98	67
		By using the traffic count surveys at Lucan	1.16	1.10	95	70
N4 Slip Road (on-ramp)	Without Development	-	-	-	-	-
	With Development	By using the TRICS Database	-	-	-	-
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	-	-	-	-
		By using the traffic count surveys at Lucan	-	-	-	-

*Note: * For the AM and PM peak hours, it is anticipated that the queue lengths from the downstream junctions (i.e. Junction 5) will extend to Junction 6 and stop the traffic travelling to R136 southward / northward occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. **Table 7.8** demonstrates that Junction 6 will exceed the normal design threshold (with the highest DOS for AM at 1.13 on R136 South arm and for PM at 1.11 on N4 Slip Road (off-ramp) arm) in both the morning and evening peak hours in 2042 for the "without" development scenario. **Table 7.8** also demonstrates that by using different methods for estimation of net trip generation, the operating capacity on this junction in both the morning and evening peak hours in 2042 for the "with" development scenario are similar (with the highest DOS for AM at 1.17 on R136 South arm and for PM at 1.11 on N4 Slip Road (off-ramp) arm) and slightly increase when compared to the analysis results in both the morning and evening peak hours in 2042 for the "without" development scenario (with the highest DOS for AM at 1.13 on R136 South arm and for PM at 1.11 on N4 Slip Road (off-ramp) arm).

Junction 7 – Chapel Hill / Lucan Road

Table 7.9 summarizes the analysis results at Junction 7 in 2042 for both the "without" development and "with" development scenarios by using the TRICS database, traffic count survey at St. Patrick's University Hospital at Dublin 8 on 2nd May 2024 and traffic count surveys at Lucan.

TABLE 7.9 – COMPARISON OF JUNCTION CAPACITY ANALYSIS FOR JUNCTION 7 IN 2042 DESIGN YEAR

Approach Armt	Scenario	Method for Estimation of Net Trip Generation for the Proposed Development	Max. DOS		Max. Queue (PCU)	
			AM*	PM*	AM*	PM*
Without Proposed Improvement Scheme as mentioned in Section 4.2 in a "Without Allowing for Modal Shift" Approach as mentioned in Section 5.6						
Lucan Road West	Without Development	-	0.76	0.71	11	11
	With Development	By using the TRICS Database	0.77	0.72	12	11
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	0.77	0.71	11	10
		By using the traffic count surveys at Lucan	0.77	0.72	11	11
Chapel Hill	Without Development	-	1.21	1.43	83	136
	With Development	By using the TRICS Database	1.22	1.47	89	148
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	1.22	1.44	88	138
		By using the traffic count surveys at Lucan	1.22	1.45	88	143
Lucan Road East	Without Development	-	1.13	1.62	60	321
	With Development	By using the TRICS Database	1.15	1.67	65	357
		By using the traffic count survey at St. Patrick's University Hospital on 2nd May 2024	1.15	1.65	66	343
		By using the traffic count surveys at Lucan	1.16	1.64	68	334
With Proposed Improvement Scheme as mentioned in Section 4.2 in a "Allowing for Modal Shift" Approach as mentioned in Section 5.6						
Lucan Road West	With Development	By using the TRICS Database	0.95	0.97	17	18
Chapel Hill	With Development	By using the TRICS Database	0.95	0.91	22	17
Lucan Road East	With Development	By using the TRICS Database	0.60	0.99	13	35

*Note: * For the AM peak hour, it is anticipated that the queue length from the downstream junction (i.e. Junction 2) will extend to Junction 7 and stop the traffic moving eastward from Lucan Road West arm / Chapel Hill arm to Lucan Road East arm occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

*** For the PM peak hour, it is anticipated that the queue length from the downstream junction (Chapel Hill / Main Street / R109 Junction) will extend to Junction 7 and stop the traffic moving westward from Lucan Road East arm / Lucan Road West arm to Chapel Hill arm occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. **Table 7.9** demonstrates that in a "without allowing for modal shift" approach, Junction 7 will exceed the normal design threshold (with the highest DOS for AM at 1.21 on Chapel Hill arm and for PM at 1.62 on Lucan Road East arm) in both the morning and evening peak hours in 2042 for the "without" development scenario. **Table 7.9** also

demonstrates that by using different methods for estimation of net trip generation, the operating capacity in the morning peak hour in 2042 for the "with" development scenario are almost the same (with the highest DOS for AM at 1.22 on Chapel Hill arm) and slightly increase when compared to the analysis results in the morning peak hour in 2042 for the "without" development scenario (with the highest DOS for AM at 1.21 on Chapel Hill arm). In the evening peak hour in 2042 for the "with" development scenario, the operating capacity by using different methods for estimation of net trip generation are similar (with the highest DOS for PM at 1.64 – 1.67 on Lucan Road East arm) and slightly increase when compared to the analysis results in the evening peak hour in 2042 for the "without" development scenario (with the highest DOS for PM at 1.62 on Lucan Road East arm).

However, by using the traffic count survey at St. Patrick's University Hospital at Dublin 8 for assessment, **Table 7.9** shows that Junction 7 will have a better operating capacity (with the highest DOS for PM at 1.65 on Lucan Road East arm) in the evening peak hour in 2042 for the "with" development scenario when compared to the analysis results by using the TRICS database (with the highest DOS for PM at 1.67 on Lucan Road East arm).

By using the traffic count surveys at Lucan for assessment, **Table 7.9** shows that Junction 7 will also have a better operating capacity (with the highest DOS for PM at 1.64 on Lucan Road East arm) in the evening peak hour in 2042 for the "with" development scenario when compared to the analysis results by using the TRICS database (with the highest DOS for PM at 1.67 on Lucan Road East arm).

It is because with implementation of the current measures (i.e. shift working pattern, etc.) in the Workplace Travel Plan for both St. Patrick's University Hospital at Dublin 8 and the existing St. Edmundsbury Hospital at Lucan, it can effectively reduce the net trip generation in the morning and evening peak hours when compared to the net trip generation by using the TRICS database. It should be also noted that the TRICS database provides an average data to calculate the trip generation for developments. Thus, using the traffic count survey at St. Patrick's University Hospital at Dublin 8 or traffic count surveys at Lucan can also provide a more accurate and locally based assessment. After using the traffic count survey at St. Patrick's University Hospital at Dublin 8 or traffic count surveys at Lucan, the results shown in **Table 7.9** also demonstrate that the impact on Junction 7 will be mainly due to regular background traffic growth but not the proposed development per se so traffic from the proposed development will not have significant impact on this junction.

Table 7.9 also indicates that the assessment results by using the TRICS database is the "worst-case" scenario. To relieve the traffic congestion and enhance the safety of vulnerable road users at Junction 7, it is proposed to carry out the improvement works as mentioned in Section 4.2. The results shown in **Table 7.9** demonstrate that in a "allowing for modal shift" approach as mentioned in Section 5.6, the proposed improvement scheme can relieve the traffic congestion when compared to the "with" development scenario (based on the existing junction layout) by using the TRICS database for assessment.

8 TRIP GENERATION AND TRAFFIC IMPACT (BY USING THE ANTICIPATED CAR PARKING UTILIZATION)

8.1 Assumption

To minimize the traffic impacts to public, the hospital (except facilities building) will schedule their staff to work shifts in 2 timeslots (i.e. 07:00 to 19:00 and 19:00 to 07:00). For facilities building, the staff will work from 07:00 to 18:30. Additionally, a shuttle bus from the existing St. Patrick's University Hospital at Dublin 8 will be provided and will arrive the hospital at Lucan between 06:00 and 07:00 for daytime staff, and between 18:00 and 19:00 for night-time staff. Similarly, this shuttle bus will leave the hospital at Lucan between 07:00 and 08:00 for night-time staff, and between 19:00 and 20:00 for daytime staff. Moreover, the hospital will schedule visiting hours (i.e. 10:00 to 12:00, 14:00 to 16:00 and 19:00 to 21:00), which are outside the busiest hours of the surrounding road network. It should be also noted that the hospital will provide a day service to patients between 07:30 and 18:00. During the operational phase, emergency vehicles and medium / heavy goods vehicles (i.e. delivery vehicles) will be only allowed to travel to/from the site via the Eastern Vehicular Access (Junction 2).

To estimate the car parking utilization and net trip generation for staff and visitors, the following key assumptions were made:

75% of staff working between 07:00 and 19:00 (day shift) while the remaining 25% of staff working between 19:00 and 07:00 (night shift);
There will be temporary overlap in parking between one shift arriving and one shift leaving;
Assuming 50% staff driving to the new hospital;
Assuming 50% of visitors and patients driving to the new hospital;
Visitors and patients will generally stay in hospital for 1.5 hours and 2 hours respectively;
Assuming 3 delivery vehicles (i.e. 7 PCU) per hour arriving to the new hospital from 10:00 to 16:00; and
Assuming 3 emergency vehicles per hour arriving to the new hospital from 00:00 to 24:00.

8.2 Anticipated Car Parking Utilization

8.2.1 No. of Staff in Daytime and Night-time

It is anticipated that total 366 staff will work in the new hospital. Based on the above assumptions made in Section 8.1, **Table 8.1** summarized the number of staff working in daytime and night-time. **Table 8.1** shows that the total number of staff working in daytime and night-time are 278 and 88 respectively.

As the traffic count survey at Lucan on 22nd February 2023 as mentioned in Section 3.1 can capture the trip generated from the existing St. Edmundsbury Hospital (i.e. St. Edmundsbury House), therefore, the net trip generated for the proposed development is only included the trip generated from the new buildings of proposed development (including adolescent unit, adult main hospital, individual therapy rooms and facilities building). **Table 8.1** also shows that the net increase of staff working in daytime and night-time are 258 and 81 respectively.

TABLE 8.1 – NUMBER OF STAFF WORKING IN DAYTIME AND NIGHT-TIME

Type of Building	Number of Staff		
	Daytime	Night-time	Total
Adult Main Hospital, Individual Therapy Rooms and Adolescent Unit	244	81	325
Facilities Building	14	0	14
Net Increase*	**258**	**81**	**339**
St. Edmundsbury House**	20	7	27
Total	**278**	**88**	**366**

*Note: * The net trip generated for the proposed development is only included the trip generated from the new buildings of proposed development (including adolescent unit, adult main hospital, individual therapy rooms and facilities building).*
*** The existing St. Edmundsbury House (associated with its services provided to patients) within the site will be kept.*

8.2.2 Target Mode of Transport

Assuming 50% staff driving to the new hospital, **Table 8.2** demonstrates that the total number of staff driving to work in daytime and night-time are 139 and 45 respectively, which were used for estimation of the car parking utilization for staff. Additionally, the net increase of staff driving to work in daytime and night-time are 129 and 41 respectively, which were used for estimation of net trip generation for staff due to the proposed development.

TABLE 8.2 – NUMBER OF STAFF DRIVING TO WORK IN DAYTIME AND NIGHT-TIME

Mode of Transport	Target Modal Split	Type of Building	Number of Staff Driving to Work	
			Daytime	Night-time
Car	50%	Adult Main Hospital, Individual Therapy Rooms, Adolescent Unit and Facilities Building (**Net Increase***)	129	41
		St. Edmundsbury House	10	4
		Total:	**139**	**45**

*Note: * The net trip generated for the proposed development is only included the trip generated from the new buildings of proposed development (including adolescent unit, adult main hospital, individual therapy rooms and facilities building).*

8.2.3 Anticipated Car Parking Utilization

Apart from the car parking utilization for staff, car parking utilization for visitors and patients shall be also considered. It is anticipated that total 180 visitors will go the hospital during the scheduled visiting hours (i.e. 10:00 to 12:00, 14:00 to 16:00 and 19:00 to 21:00) and 200 patients will go to the hospital during the opening time of day services provided (i.e. 07:30 to 18:00).

In view of the above sections, the anticipated car parking utilization for staff and visitors (including patients) throughout a day are presented in **Table 8.3**.

TABLE 8.3 – ANTICIPATED CAR PARKING UTILIZATION FOR STAFF AND VISITORS (INCLUDING PATIENTS)

	Hour Ending																					
Type	01:00		02:00		03:00		04:00		05:00		06:00		07:00		08:00		09:00		10:00		11:00		12:00	
Staff	45	45	45	45	45	45	45	45	45	45	45	45	45	184	184	139	139	139	139	139	139	139	139	139
Visitor*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	12	18	24	24	33	42	51	51	42
Total	45	45	45	45	45	45	45	45	45	45	45	45	45	184	190	151	157	163	163	172	181	190	190	181

	Hour Ending																					
Type	13:00		14:00		15:00		16:00		17:00		18:00		19:00		20:00		21:00		22:00		23:00		00:00	
Staff	139	139	139	139	139	139	139	139	139	139	139	139	139	184	177	45	45	45	45	45	45	45	45	45
Visitor*	33	24	24	33	42	51	51	42	33	24	18	12	6	9	18	27	27	18	9	0	0	0	0	0
Total	172	163	163	172	181	190	190	181	172	163	157	151	145	193	**195**	72	72	63	54	45	45	45	45	45

*Remark: * Including Patients*

The anticipated maximum car parking utilization for staff and visitors (including patients) is 195 parking spaces, which is the period for daytime staff leaving the hospital between 19:00 and 19:30. It should be also noted that this maximum car parking utilization (195 parking spaces) is close to the proposed car parking spaces (i.e. 214 parking spaces) within the proposed development.

8.3 Anticipated Net Trip Generation (By Using the Car Parking Utilization)

As the traffic count survey at Lucan on 22nd February 2023 as mentioned in Section 3.1 can capture the trip generated from the existing St. Edmundsbury Hospital (i.e. St. Edmundsbury House), therefore, the net trip generated for the proposed development is only included the trip generated from the new buildings of proposed development (including adolescent unit, adult main hospital, individual therapy rooms and facilities building).

8.3.1 Estimation of Net Trips Generation for the Proposed Development

Table 8.2 indicates that the net increase of staff driving to work in daytime and night-time are 129 and 41 respectively. It is anticipated that net increase of visitors is 170 who will go the aforementioned new buildings during the scheduled visiting hours (i.e. 10:00 to 12:00, 14:00 to 16:00 and 19:00 to 21:00). Additionally, the net increase of patients is 100 patients who will go to the aforementioned new buildings during the opening time of day services provided (i.e. 07:30 to 18:00). Based on the above assumptions made in Section 8.1, the net trip in & out for staff and visitors (including patients) can be estimated. **Table 8.4** presents the net hourly trips generation for the proposed development at Junction 1 throughout a day.

TABLE 8.4 – NET TRIP GENERATION FOR THE PROPOSED DEVELOPMENT AT JUNCTION 1 THROUGHOUT A DAY

Description	Time											
	00:00-01:00	01:00-02:00	02:00-03:00	03:00-04:00	04:00-05:00	05:00-06:00	06:00-07:00	07:00-08:00	08:00-09:00	09:00-10:00	10:00-11:00	11:00-12:00
Net Trip In	0	0	0	0	0	0	131	3	3	3	11	11
Net Trip Out	0	0	0	0	0	0	0	43	0	3	3	11
Total Net Trips	0	0	0	0	0	0	131	46	3	6	14	22

Description	Time											
	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	19:00-20:00	20:00-21:00	21:00-22:00	22:00-23:00	23:00-24:00
Net Trip In	3	3	11	11	3	0	43	8	8	0	0	0
Net Trip Out	11	3	3	11	11	3	10	124	8	8	0	0
Total Net Trips	14	6	14	22	14	3	53	132	16	8	0	0

8.4 Traffic Impact (Bys Using the Car Parking Utilization)

8.4.1 2023 Background Traffic Flows

As mentioned in Section 3.1, traffic count survey at Lucan was undertaken on 22nd February 2023 from 07:00 to 19:00. To estimate the background hourly traffic flows outside the 07:00-19:00, the TII Traffic Count Data for an ATC on N04 between Jn01 N4/M50 and Jn02 Liffey Valley, Liffey Valley, Co. Dublin (TMU N04 000.0W), which is approximately 2.8 km from the proposed development, was adopted. The location and full traffic flows on 22nd February 2023, which is the same day of traffic count survey conducted, for this ATC station are contained in **Appendix 5**. **Table 8.5** presents the 2023 recorded hourly traffic flows (within 07:00-19:00) and estimated hourly traffic flows (outside 07:00-19:00) based on the TII Traffic Count Data at Junction 1.

TABLE 8.5 – 2023 RECORDED / ESTIMATED HOURLY TRAFFIC FLOWS AT JUNCTION 1

Time	00:00-01:00	01:00-02:00	02:00-03:00	03:00-04:00	04:00-05:00	05:00-06:00
Background Traffic Flows	129*	75*	66*	73*	128*	313*
Time	**06:00-07:00**	**07:00-08:00**	**08:00-09:00**	**09:00-10:00**	**10:00-11:00**	**11:00-12:00**
Background Traffic Flows	1145*	1,280	1,306	1,316	1,091	1,045
Time	**12:00-13:00**	**13:00-14:00**	**14:00-15:00**	**15:00-16:00**	**16:00-17:00**	**17:00-18:00**
Background Traffic Flows	1,128	1,246	1,414	1,342	1,310	1,402
Time	**18:00-19:00**	**19:00-20:00**	**20:00-21:00**	**21:00-22:00**	**22:00-23:00**	**23:00-24:00**
Background Traffic Flows	1,118	893*	639*	453*	326*	186*

*Note: * The total background hourly traffic flows were estimated based on the TII Traffic Count Data as shown in Appendix 5.*

8.4.2 Total Hourly Traffic Flows (Background Hourly Traffic Flows plus Net Hourly Trips Generation)

In view of the **Table 8.4** and **Table 8.5** above, the total hourly traffic flows at Junction 1, which is equal to the 2023 background hourly traffic flows plus the net hourly trips generation for the proposed development, is presented in **Table 8.6**.

TABLE 8.6 – TOTAL HOURLY TRAFFIC FLOWS AT JUNCTION 1 (BACKGROUND HOURLY TRAFFIC FLOWS PLUS HOURLY TRIPS GENERATION)

Description	Time											
	00:00-01:00	01:00-02:00	02:00-03:00	03:00-04:00	04:00-05:00	05:00-06:00	06:00-07:00	07:00-08:00	08:00-09:00	09:00-10:00	10:00-11:00	11:00-12:00
Background Traffic Flows	129	75	66	73	128	313	1145	1280	1306	1316	1091	1045
Total Net Trips (In & Out)	0	0	0	0	0	0	131	46	3	6	14	22
Total Traffic Flows	129	75	66	73	128	313	1276	1326	1309	1322	1105	1067

Description	Time											
	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	19:00-20:00	20:00-21:00	21:00-22:00	22:00-23:00	23:00-24:00
Background Traffic Flows	1128	1246	1414	1342	1310	1402	1118	893	639	453	326	186
Total Net Trips (In & Out)	14	6	14	22	14	3	53	132	16	8	0	0
Total Traffic Flows	1142	1252	1428	1364	1324	1405	1171	1025	655	461	326	186

Table 8.6 shows that the highest total hourly traffic flows (i.e. 1,326) in the morning period was identified as 07:00-08:00, which is the period for night-time staff leaving the hospital. Additionally, the total hourly traffic flows (i.e. 1,326) between 07:00 and 08:00 is similar to the background traffic flows at the busiest hours (i.e. 1,316 between 09:00-10:00). It should be also noted that daytime staff will arrive the hospital between 06:00 and 07:00, which is outside the busiest hours (i.e. 07:00-10:00) of the surrounding road network in the morning period.

Table 8.6 also demonstrates that the total hourly traffic flows (i.e. 1,171) between 18:00 and 19:00 (which is the period for night-time staff arriving to the hospital) is higher than the total hourly traffic flows (i.e. 1,025) between 19:00 and 20:00 (which is the period for daytime staff leaving the hospital). However, the aforementioned total hourly traffic flows (i.e. 18:00-19:00 and 19:00-20:00) are also less than the background hourly traffic flows at the busiest hour (i.e. 1,402 between 17:00-18:00) in the evening. It should be also noted that the daytime staff leaving the hospital between 19:00 and 20:00, which is outside the busiest hours (i.e. 16:00-19:00) in the evening period. Therefore, it is anticipated that with implementation of shift working patterns, the proposed development will not cause significant impact on the surrounding road network in the evening.

In consideration of traffic impact during the staff shifting periods (i.e. 06:00-08:00 and 18:00-20:00), a capacity assessment in the morning (07:00-08:00) and evening (18:00-19:00) periods were selected for analysis because it has the highest total traffic flows at shifting periods in the morning and evening periods.

8.4.3 Net Trip Generation as a Percentage of Existing Traffic

Based on the traffic count surveys at Junction 1 on 21st May 2024 and at Junction 2 on 22nd February 2023, 69% and 31% vehicles currently turn left (i.e. arriving from Junction 7) and right (i.e. arriving from Junction 3) respectively from Lucan Road into the Site for a period between 07:00 and 08:00 while 78%. Additionally, 22% of vehicles from the Site currently turn eastward (towards Junction 3) and westward (towards Junction 7) respectively for a period between 07:00 and 08:00. For a period between 18:00 and 19:00, 50% and 50% vehicles currently turn left (i.e. arriving from Junction 7) and right (i.e. arriving from Junction 3) respectively from Lucan Road into the Site while 57% and 43% of vehicles from the Site currently turn eastward (towards Junction 3) and westward (towards Junction 7) respectively. This modal split will be applied to the trip distribution at Junction 1 for this exercise. The future development traffic distribution at the surrounding junctions will mirror existing traffic patterns i.e. development generated flows will be split through the junctions proportionally to existing flows in the morning (07:00-08:00) and evening (18:00-19:00) periods. The result of this trip distribution and assignment exercise (by using the car parking utilization) in the morning (07:00-08:00) and evening (18:00-19:00) periods is presented in following.

TABLE 8.7 – DEVELOPMENT AM HOUR (07:00-08:00) NET TRIP GENERATION AS A PERCENTAGE OF EXISTING ROAD NETWORK TRAFFIC FLOW (BY USING THE CAR PARKING UTILIZATION)

Junction	Junction AM (07:00-08:00) Traffic	Car Parking Utilization	
		Development Net Generated Traffic	Percentage
Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road	1,280	46	3.6%
Junction 2 – Eastern Access Road to St. Edmundsbury Hospital / Lucan Road / Esker Lane	1,378	40	2.9%
Junction 3 – R136 / Lucan Road	1,880	40	2.1%
Junction 4 – Lucan Road / Access to Hermitage Golf Club	1,056	23	2.2%
Junction 5 – R136 / N4 Slip Road (Eastbound)	1,592	17	1.1%
Junction 6 – R136 / N4 Slip Road (Westbound)	2,072	17	0.8%
Junction 7 – Chapel Hill / Lucan Road	1,315	12	0.9%

As demonstrated by **Table 8.7**, the ratio of estimated net trip (by using the car parking utilization) associated with the proposed development to the existing traffic flows is less than 5% for all concerned junctions in the morning hour (07:00-08:00).

TABLE 8.8 – DEVELOPMENT PM HOUR (18:00-19:00) NET TRIP GENERATION AS A PERCENTAGE OF EXISTING ROAD NETWORK TRAFFIC FLOW (BY USING THE CAR PARKING UTILIZATION)

Junction	Junction PM (18:00-19:00) Traffic	Car Parking Utilization	
		Development Net Generated Traffic	Percentage
Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road	1,118	53	4.7%
Junction 2 – Eastern Access Road to St. Edmundsbury Hospital / Lucan Road / Esker Lane	1,449	33	2.3%
Junction 3 – R136 / Lucan Road	1,788	32	1.8%
Junction 4 – Lucan Road / Access to Hermitage Golf Club	744	5	0.7%
Junction 5 – R136 / N4 Slip Road (Eastbound)	1,588	27	1.7%
Junction 6 – R136 / N4 Slip Road (Westbound)	2,396	26	1.1%
Junction 7 – Chapel Hill / Lucan Road	1,140	26	2.3%

As demonstrated by **Table 8.8**, the ratio of estimated net trip (by using the car parking utilization) associated with the proposed development to the existing traffic flows is less than 5% for all concerned junctions in the evening hour (18:00-19:00).

As a result of this negligible increase in traffic volumes on the surrounding road network, it is not necessary to undertake any traffic capacity assessments for all concerned junctions in this exercise according to the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists).

However, as requested by the South Dublin County Council, Junction 3, Junction 5 to Junction 7 have also been selected for conducting a traffic capacity assessment. Additionally, Junction 1 has been selected for conducting a traffic capacity assessment because it is a main entrance for the proposed development. Therefore, a capacity assessment on Junction 1, Junction 3 and Junction 5 to Junction 7 were undertaken in order to have a better understanding of this minimal traffic impact due to the proposed development.

8.4.4 Network Traffic Flow By Using the Car Parking Utilization

Figure 8.1 and **Figure 8.2** illustrate the 2042 Design Year Horizon traffic flows in the morning (07:00-08:00) and evening (18:00-19:00) periods for the "without" development and "with" development scenarios by using the car parking utilization.

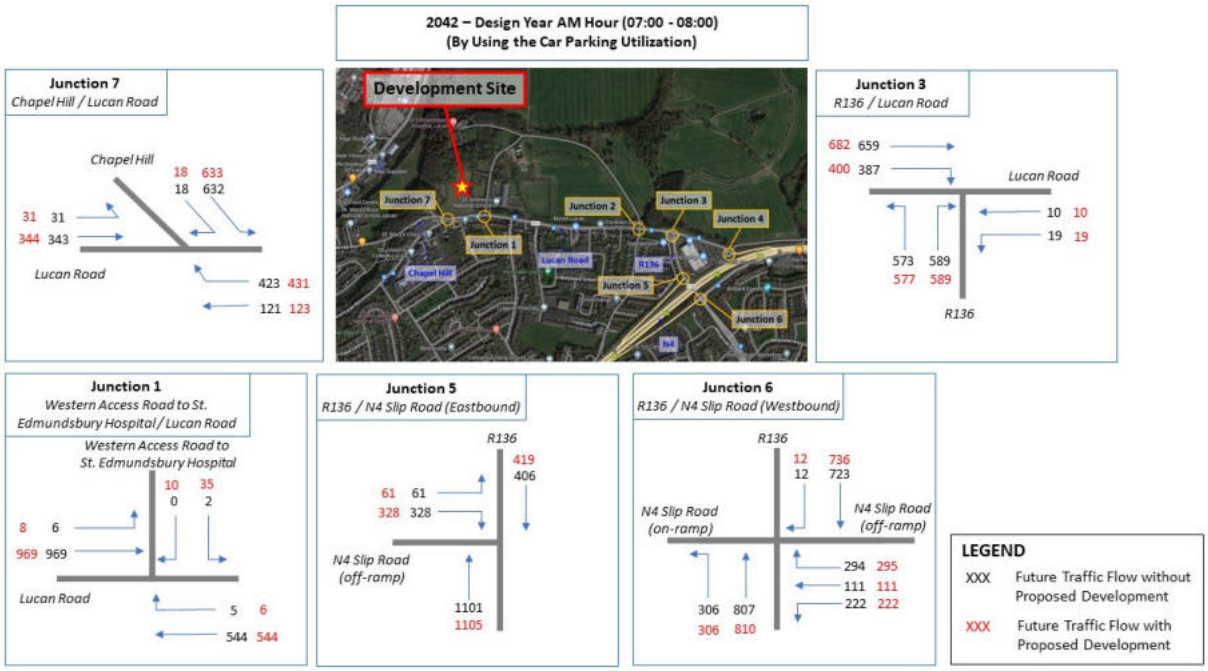

FIGURE 8.1 – 2042 DESIGN YEAR TRAFFIC FLOWS IN THE MORNING HOUR (07:00-08:00) (BY USING THE CAR PARKING UTILIZATION)

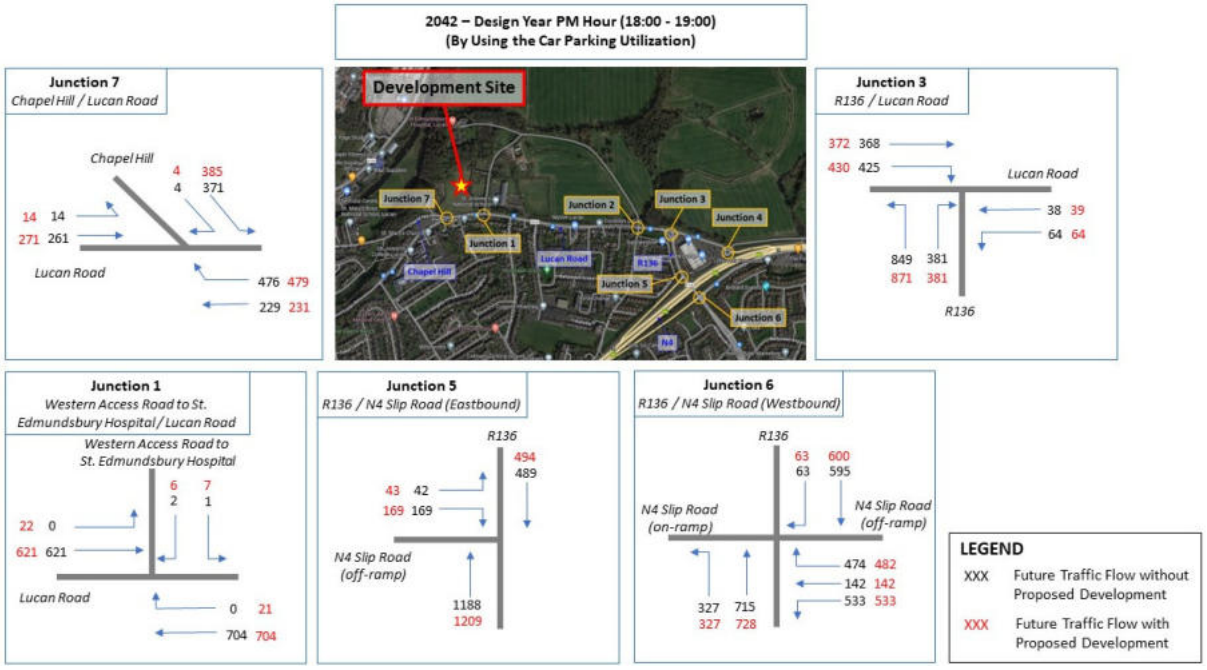

FIGURE 8.2 – 2042 DESIGN YEAR TRAFFIC FLOWS IN THE EVENING HOUR (18:00-19:00) (BY USING THE CAR PARKING UTILIZATION)

8.4.5 Operational Phase 2042 – Junction Capacity Analysis (By Using the Car Parking Utilization)

A traffic capacity assessment of the Junction 1, Junction 3 and Junction 5 to Junction 7 were undertaken utilising the future traffic flows as shown in **Figure 8.1** and **Figure 8.2**, and TRL's PICADY and OSCADY traffic modelling software. A summary of the results of the analysis for the 2042 design year (opening year plus 15 years), "without" development and "with" development scenarios by using the car parking utilization, in the morning (07:00-08:00) and evening (18:00-19:00) hours is shown in **Table 8.9** and **Table 8.13** following.

Junction 1 – Western Access Road to St. Edmundsbury Hospital / Lucan Road

TABLE 8.9 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 1 (BY USING THE CAR PARKING UTILIZATION)

Approach Arm	Scenario	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
		AM	PM	AM	PM	AM	PM
Lucan Road West	Without Development	-	-	-	-	-	-
	With Development	-	-	-	-	-	-
Western Access Road to St. Edmundsbury Hospital	Without Development	0	0	0	0	0	0
	With Development	0.14	0.04	0	0	12	10
Lucan Road East	Without Development	0.01	0	0	0	9	0
	With Development	0.02	0.04	0	0	9	7

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a priority junction. The results shown in **Table 8.9** demonstrate that Junction 1 will operate within the normal design threshold in both the morning (07:00-08:00) and evening (18:00-19:00) hours in 2042 for both the "without" development and "with" development scenarios.

Junction 3 – R136 / Lucan Road

TABLE 8.10 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 3 (BY USING THE CAR PARKING UTILIZATION)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM*	AM*	PM*
Lucan Road East	Without Development	0.13	0.41	1	3
	With Development	0.13	0.44	1	3
R136	Without Development	1.25	1.08	93	67
	With Development	1.25	1.09	93	71
Lucan Road West	Without Development	1.28	1.04	165	42
	With Development	1.30	1.08	183	53

*Note: * For the AM (07:00-08:00) and PM (18:00-19:00) hours, it is anticipated that the queue length from the downstream will extend to Junction 3 and stop the traffic travelling from R136 to Lucan Road westbound occasionally when the traffic light is green / flashing amber. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 8.10** demonstrate that Junction 3 will exceed the normal design threshold in both the morning (07:00-08:00) and evening (18:00-19:00) hours in 2042 for both the "without" development and "with" development scenarios, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Additionally, **Table 8.7** and **Table 8.8** that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 baseline year in the morning (07:00-08:00) and evening (18:00-19:00) hours for this junction are 2.1% and 1.8% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on this junction in the morning (07:00-08:00) and evening (18:00-19:00) hours. The results shown in **Table 8.10** also demonstrate that the impact on this Junction will be mainly due to regular background traffic growth but not the proposed development per se (with the highest DOS for AM increased from 1.28 to 1.30 on Lucan Road West arm and for PM increased from 1.08 to 1.09 on R136 arm) so traffic from the proposed development will not have significant impact on this junction.

Junction 5 – R136 / N4 Slip Road (Eastbound)

TABLE 8.11 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 5 (BY USING THE CAR PARKING UTILIZATION)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM*	AM*	PM*
R136 South	Without Development	0.97	1.00	26	32
	With Development	0.98	1.01	27	38
N4 Slip Road (off-ramp)	Without Development	0.96	0.86	17	9
	With Development	0.96	0.86	17	9
R136 North	Without Development	0.32	0.37	5	6
	With Development	0.33	0.37	6	6

*Note: * For the AM (07:00-08:00) and PM (18:00-19:00) hours, it is anticipated that the queue lengths from the downstream junctions (i.e. Junction 3 and Junction 6) will extend to Junction 5 and stop the traffic travelling to R136 southward / northward occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 8.11** demonstrate that Junction 5 will exceed the normal design threshold in both the morning (07:00-08:00) and evening (18:00-19:00) hours in 2042 for both the "without" development and "with" development scenarios, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Additionally, **Table 8.7** and **Table 8.8** that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 in the morning (07:00-08:00) and evening (18:00-19:00) hours for this junction are 1.1% and 1.7% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on this junction in the morning (07:00-08:00) and evening (18:00-19:00) hours. The results shown in **Table 8.11** also demonstrate that the impact on this Junction will be mainly due to regular background traffic growth but not the proposed development per se (with the highest DOS for AM increased from 0.97 to 0.98 on R136 South arm and for PM increased from 1.00 to 1.01 on R136 South arm) so traffic from the proposed development will not have significant impact on this junction.

Junction 6 – R136 / N4 Slip Road (Westbound)

TABLE 8.12 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 6 (BY USING THE CAR PARKING UTILIZATION)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM*	AM*	PM*
R136 North	Without Development	0.67	0.65	10	13
	With Development	0.68	0.66	11	13
N4 Slip Road (off-ramp)	Without Development	0.76	1.02	17	46
	With Development	0.76	1.02	17	47
R136 South	Without Development	0.91	0.98	24	33
	With Development	0.91	1.00	24	37
N4 Slip Road (on-ramp)	Without Development	-	-	-	-
	With Development	-	-	-	-

*Note: * For the AM (07:00-08:00) and PM (18:00-19:00) hours, it is anticipated that the queue lengths from the downstream junctions (i.e. Junction 5) will extend to Junction 6 and stop the traffic travelling to R136 southward / northward occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 8.12** demonstrate that Junction 6 will exceed the normal design threshold in both the morning (07:00-08:00) and evening (18:00-19:00) hours in 2042 for both the "without" development and "with" development scenarios, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Additionally, **Table 8.7** and **Table 8.8** that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 in the morning (07:00-08:00) and evening (18:00-19:00) hours for this junction are 0.8% and 1.1% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on this junction in the morning (07:00-08:00) and evening (18:00-19:00) hours. The results shown in **Table 8.12** also demonstrate that the impact on this Junction will be mainly due to regular background traffic growth but not the proposed development per se (with the highest DOS for AM (i.e. 0.91) on R136 South arm and for PM (i.e. 1.02) on N4 Slip Road (off-ramp) arm remain unchanged) so traffic from the proposed development will not have significant impact on this junction.

Junction 7 – Chapel Hill / Lucan Road

TABLE 8.13 – 2042 DESIGN YEAR JUNCTION CAPACITY ANALYSIS FOR JUNCTION 7 (BY USING THE CAR PARKING UTILIZATION)

Approach Arm	Scenario	Max. DOS		Max. Queue (PCU)	
		AM*	PM**	AM*	PM**
Without Proposed Improvement Scheme as mentioned in Section 4.2 in a "Without Allowing for Modal Shift" Approach as mentioned in Section 5.6					
Lucan Road West	Without Development	0.77	0.51	11	7
	With Development	0.77	0.53	11	8
Chapel Hill	Without Development	1.19	1.06	79	29
	With Development	1.20	1.10	79	35
Lucan Road East	Without Development	1.10	1.39	49	169
	With Development	1.12	1.40	55	173
With Proposed Improvement Scheme as mentioned in Section 4.2 in a "Without Allowing for Modal Shift" Approach as mentioned in Section 5.6					
Lucan Road West	With Development	1.04	0.78	26	10
Chapel Hill	With Development	1.04	0.74	38	11
Lucan Road East	With Development	0.63	0.89	14	23
With Proposed Improvement Scheme as mentioned in Section 4.2 in a "Allowing for Modal Shift" Approach as mentioned in Section 5.6					
Lucan Road West	With Development	0.94	0.71	16	9
Chapel Hill	With Development	0.95	0.68	21	10
Lucan Road East	With Development	0.57	0.81	13	19

*Note: * For the AM (07:00-08:00) hour, it is anticipated that the queue length from the downstream junction (i.e. Junction 2) will extend to Junction 7 and stop the traffic moving eastward from Lucan Road West arm / Chapel Hill arm to Lucan Road East arm occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

*** For the PM (18:00-19:00) hour, it is anticipated that the queue length from the downstream junction (Chapel Hill / Main Street / R109 Junction) will extend to Junction 7 and stop the traffic moving westward from Lucan Road East arm / Lucan Road West arm to Chapel Hill arm occasionally when the traffic light is green. Thus, this blocking effect was included in our assessment.*

The normal design threshold for the degree of saturation (DOS) is 0.9 for a signalized junction. The results shown in **Table 8.13** demonstrate that based on the existing junction layout in a "without allowing for modal shift" approach, Junction 7 will exceed the normal design threshold in both the morning (07:00-08:00) and evening (18:00-19:00) hours in 2042 for both the "without" development and "with" development scenarios, resulting in substantial queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

Additionally, **Table 8.7** and **Table 8.8** that the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 in the morning (07:00-08:00) and evening (18:00-19:00) hours for this junction are 0.9% and 2.3% respectively, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on this junction in the morning (07:00-08:00) and evening (18:00-19:00)

hours. The results shown in **Table 8.13** also demonstrate that the impact on this Junction will be mainly due to regular background traffic growth but not the proposed development per se (with the highest DOS for AM increased from 1.19 to 1.20 on Chapel Hill arm and for PM increased from 1.39 to 1.40 on Lucan Road East arm) so traffic from the proposed development will not have significant impact on this junction.

To relieve the traffic congestion and enhance the safety of vulnerable road users at this junction, it is proposed to carry out the improvement works as mentioned in Section 4.2. The results shown in **Table 8.13** demonstrate that with the proposed improvement scheme in a "without allowing for modal shift" approach as mentioned in Section 5.6, Junction 7 will operate within the normal design threshold in the evening (18:00-19:00) hours in 2042 for the "with" development scenario but it will exceed the normal design threshold in the morning (07:00-08:00) hour in 2042 for the "with" development scenario. However, with the proposed improvement scheme in a "allowing for modal shift" approach as mentioned in Section 5.6, Junction 7 will operate within the normal design threshold in the evening (18:00-19:00) hours in 2042 for the "with" development scenario but it will operate slightly exceed the normal design threshold (but still less than its theoretical capacity of 1.0) in the morning (07:00-08:00) hour in 2042 for the "with" development scenario. The analysis results also demonstrate that the proposed improvement scheme can reduce the highest DOS for AM (07:00-08:00) on Chapel Hill arm from 1.20 to 0.95. Therefore, it is considered that the proposed improvement scheme can relieve the traffic congestion when compared to the "with" development scenario (based on the existing junction layout).

8.4.6 Summary

The graphs of total hourly traffic flows, which is equal to the 2023 background traffic flows plus net trips generation for the proposed development, through a day at Junction 1 were shown in **Appendix 6**. By using the car parking utilization for estimation of net trip generation, an analysis for a staff shifting periods is summarized as follows:

The daytime staff will arrive the hospital between 06:00 and 07:00 and leave the hospital between 19:00 and 20:00. Both periods are also outside the busiest hours of the road network (i.e. 07:00-10:00 and 16:00-19:00).

In the morning, the night-time staff will leave the hospital between 07:00 and 08:00. However, the total traffic flows (i.e. 1,326) between 07:00 and 08:00 is similar to the background traffic flows at the busiest hours (i.e. 1,316 between 09:00-10:00).

In the evening, the night-time staff will arrive the hospital between 18:00 and 19:00. However, the total traffic flows (i.e. 1,171) between 18:00 and 19:00 is less than the background hourly traffic flows at the busiest hour (i.e. 1,402 between 17:00-18:00).

The visiting time is scheduled from 10:00 to 12:00, 14:00 to 16:00, and 19:00 to 21:00, which are also outside the busiest hours of the road network.

In view of the above, the proposed development will not cause significant impact to the road network.

9 PARKING PROVISION

9.1 Proposed Car Parking Provision

As the Site is located outside 800 metres of a train or LUAS station, it will be classified as Zone 1 in accordance with the Table 12.25 of South Dublin County Development Plan 2022-2028, which states a maximum of 1 car parking space per 100m^2 Gross Floor Area (GFA). A summary of the car parking required is presented in **Table 9.1** following:-

TABLE 9.1 – CAR PARKING COMPLIANCE

Land-Use	Type of Building	Max. Car Parking Required (South Dublin County Development Plan 2022-2028)	GFA (m^2)	Max. Parking Required
Hospital	Adult Main Hospital, Individual Therapy Rooms, Facilities Buildings, Adolescent Unit and St. Edmundsbury House	1 space per 100m^2 GFA	21,524	215

Within the proposed development, it is proposed to provide a total of 214 car-parking spaces for staff and visitors. This is less than the recommended maximum car parking spaces (i.e. 215 car parking spaces) as required in the South Dublin County Development Plan 2022-2028 as shown in Table 9.1. Moreover, 2 additional minibus parking spaces will be provided for the hospital's general operation.

As the site location is well serviced by existing public transports (i.e. existing bus services as mentioned in Section 2.3) and emerging transports (i.e. BusConnects and Luas Lucan as mentioned in Section 2.4), it can encourage the staff and visitors to use public transport to access the site. To further encourage staff and visitors to use sustainable forms of transport (i.e. walking, cycling and public transport), the hospital will consider implementing the following mitigation measures:

- providing shuttle bus services for staff between the existing hospital at Dublin 8 and the proposed development;
- providing parking spaces at the existing Dublin 8 hospital for staff availing of the above-mentioned shuttle bus services;
- implementing the paid parking for visitors to encourage use of public transport; and
- encouraging appointment times and visitor times to coincide with maximum public bus availability.

With reference to the existing National Forensic Mental Health Service (NFMHS) in Portrane, Co. Dublin, which has a similar nature of services/works to the proposed development, it provides 170 bed facilities and 255 car parking spaces for both staff and visitors. This equates to a provision rate of 1.5 car parking spaces per bed. Within the proposed development, it is proposed to provide about 214 bed facilities and 214 car parking spaces for both staff and visitors. Thus, this equates to a provision rate of 1.0 car parking space per bed, which is less than the provision rate (i.e. 1.5 car parking spaces per bed) for NFMHS.

It should also be noted that many staff (i.e. medical staff) live far away from the proposed development, and they have to travel long distances to/from work. Thus, they have no other practical option than driving to work. In view of the above analysis, provision of 214 car parking spaces, which is less than the recommended maximum car parking spaces (i.e. 215 car parking spaces) as required in the South Dublin County Development Plan 2022-2028, is considered reasonable for the proposed development.

A proactive approach to car parking management will be adopted by the management company to ensure that there will be no overspill onto adjacent areas. This will include the implementation of a Mobility Management Plan to encourage the use of sustainable transport modes.

9.2 Proposed Bicycle Parking Provision

According to the South Dublin County Development Plan 2022-2028, the "Hospital" land-use requires 1 bicycle parking space per 5 staff for long-term use and 1 bicycle parking space per 10 beds for short stay. A summary of the bicycle parking required is presented in **Table 9.2** following:-

TABLE 9.2 – BICYCLE PARKING COMPLIANCE

Land-Use	Type of Building	Max. Car Parking Required (South Dublin County Development Plan 2022-2028)		Proposed Development		Min. Parking Required	
		Long-term	Short Stay	Staff	Bed	Long-term	Short Stay
Hospital	Adult Main Hospital, Individual Therapy Rooms, Facilities Buildings, Adolescent Unit and St. Edmundsbury House	1 per 5 staff	1 per 10 beds	366	214	73	21
					Total:	**94**	

It is proposed to provide a total of 160 bicycle-parking spaces within the development, inclusive of 104 bicycle parking spaces for staff and 56 parking spaces for visitors. This exceeds the minimum bicycle parking requirement of 94 bicycle-parking spaces as required in the South Dublin County Development Plan 2022-2028 as shown in **Table 9.2**. Additionally, designated sheltered and secure bicycle parking will be provided within the proposed development.

10 SUMMARY & CONCLUSION

This report has been designed to specifically address potential traffic issues associated with the proposed St. Edmundsbury Hospital, Lucan, Co. Dublin. In doing so, the assessment has addressed:

Existing traffic behaviour;
Trip generation rates to/from the proposed development;
Existing and future road network capacity;
Traffic impact of the proposal; and
Proposed car and bicycle parking.

A vehicle turning movement survey was undertaken on Wednesday, 22nd February 2023 at seven junctions in the surrounding area, which captured all turning movements at the junctions from 07:00 to 19:00 and the trip generated from the existing structures within the Site. These junctions were selected as they are considered the junctions most likely to be affected by traffic associated with the proposed development:

Junction 1 - Western Access Road to St. Edmundsbury Hospital / Lucan Road;
Junction 2 - Eastern Access Road to St. Edmundsbury Hospital / Lucan Road / Esker Lane;
Junction 3 - R136 / Lucan Road;
Junction 4 - Lucan Road / Access to Hermitage Golf Club;
Junction 5 - R136 / N4 Slip Road (eastbound);
Junction 6 - R136 / N4 Slip Road (westbound); and
Junction 7 - Chapel Hill / Lucan Road.

Based on the scope of proposed development, total trip generation for the proposed development is equal to the trip generated from the existing St. Edmundsbury Hospital at Lucan plus the net trip generated for the proposed development. As the traffic count survey at Lucan on 22nd February 2023 can capture the trip generated from the existing St. Edmundsbury Hospital, therefore, the net trip generation for the proposed

development (excluding the existing St. Edmundsbury Hospital) was used for trip distribution to the surrounding junctions and assessment.

Expected net trip generation for the proposed development was estimated utilising the TRICS database and was revealed to be in total 64 trips inbound and 17 trips outbound in the morning peak hour, and 35 trips inbound and 63 trips outbound in the evening peak hour.

An exercise was carried out to quantify the expected development net trip generation as a proportion of existing traffic flows on the surrounding road network to determine if a detailed traffic impact assessment is required for all of the junctions included within the scoping study. For Junction 2 to Junction 7, the estimated trips associated with the proposed development represent a tiny proportion of existing traffic flows on the surrounding road network and are less than the thresholds for traffic impact assessment noted in Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Thus, a full traffic impact assessment was ***not*** necessary for Junction 2 to Junction 7. However, it was identified that Junction 1 was greater than 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists in either the morning or evening peak periods. Additionally, as requested by the South Dublin County Council, Junction 3, Junction 5 to Junction 7 have also been selected for conducting a traffic capacity assessment in order to have a better understanding of this minimal traffic impact due to the proposed development. Therefore, a capacity assessment on Junction 1, Junction 3 and Junction 5 to Junction 7 were undertaken using TRL's PICADY and OSCADY traffic modelling software for priority junctions and signalized junctions.

2023 Baseline Year

In 2023 baseline year, Junction 1 is currently operating within the normal design threshold in both the morning and evening peak hours. However, Junction 3 and Junction 5 to Junction 7 are currently operating over the normal design threshold in both the morning and evening peak hours, resulting in queues and delays for motorists.

2027 Opening Year and 2042 Design Year (Opening Year plus 15 years)

In the 2027 opening year and 2042 design year, Junction 1 will also operate within the normal design threshold in both the morning and evening peak hours for both the "without" development and "with" development scenarios.

Junction 3, and Junction 5 to Junction 7 will exceed the normal design threshold in both the morning and evening peak hours in 2027 and 2042 for both the "without" development and "with" development scenarios, resulting in queues and delays for motorists. However, the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 baseline year in the morning and evening peak hours for Junction 3, and Junction 5 to Junction 7 are also less than 3.1%, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. Additionally, shift working pattern will be implemented by the new hospital in order to reduce the trip generation in the morning and evening peak hours. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on Junction 3, and Junction 5 to Junction 7 so traffic from the proposed development will not have significant impact on these junctions.

Net Trip Generation and Traffic Impact (By Using the Traffic Count Surveys Approach)

Apart from estimating the net trip generation for the proposed development based on the TRICS database, another two traffic count surveys at St. Patrick's University Hospital at Dublin 8 and at Junction 1 of Lucan were undertaken on 2nd May 2024 and 21st May 2024 respectively to facilitate the estimation of the net trip generation for the proposed development.

The existing St. Patrick's University Hospital at Dublin 8 consists of 265 beds to provide services to public while the existing St. Edmundsbury Hospital at Lucan consists of 52 beds to provide services to public. After completion of the proposed development, the new hospital will increase from the existing 52 beds to a total of 214 beds. Therefore, the net trip generation for the proposed development is equal to the trip generated from the net increase of beds (i.e. 162 beds) for the proposed development.

Utilising the traffic count survey at St. Patrick's University Hospital on 2nd May 2024, expected net trip generation for the proposed development was estimated and was revealed to be in total 58 trips inbound and 21 trips outbound in the morning peak hour, and 7 trips inbound and 42 trips outbound in the evening peak hour. Utilising the traffic count surveys at Lucan, expected net trip generation for the proposed development was estimated and was revealed to be in total 48 trips inbound and 27 trips outbound in the morning peak hour, and 21 trips inbound and 24 trips outbound in the evening peak hour.

The analysis results demonstrate that total net trip generation for the proposed development by using the TRICS database is greater than the total net trip generation by using the traffic count survey at St. Patrick's University Hospital at Dublin 8 or traffic count surveys at Lucan. It is because generally, the TRICS database provides an average data to calculate the trip generation for developments. However, using the traffic count survey at St. Patrick's University Hospital or traffic count surveys at Lucan can provide a more accurate, specific and locally based assessment. It should be also noted that the total net trip generation for the proposed development by using the traffic count survey at St. Patrick University Hospital and traffic count surveys at Lucan are similar. The analysis also revealed that with implementation of the current measures (i.e. shift working pattern, etc.) in the Workplace Travel Plan for both St. Patrick's University Hospital at Dublin 8 and the existing St. Edmundsbury Hospital at Lucan, it can effectively reduce the net trip generation in the morning and evening peak hours when compared to the net trip generation by using the TRICS database.

After using the traffic count survey at St. Patrick's University Hospital at Dublin 8 or traffic count surveys at Lucan, the analysis results demonstrate that the impact on Junction 3, and Junction 5 to Junction 7 will be mainly due to regular background traffic growth but not the proposed development per se so traffic from the proposed development will not have significant impact on this junction.

Net Trip Generation and Traffic Impact (By Using the Car Parking Utilization Approach)

Anticipated car parking utilization for the proposed development is also adopted to estimate the net hourly trip generation throughout a day for assessment. It is anticipated that the net increase of staff driving to work in daytime and night-time are 129 and 41 respectively. After consideration of the total traffic flows in 24 hours, which is equal to the 2023 background traffic flows plus net trips generation for the proposed development, the analysis results show that the highest total hourly traffic flows (i.e. 1,326) in the morning period was identified as 07:00-08:00, which is the period for night-time staff leaving the hospital. Additionally, the total hourly traffic flows (i.e. 1,326) between 07:00 and 08:00 is similar to the background traffic flows at the busiest hours (i.e. 1,316 between 09:00-10:00). It should be also noted that daytime staff will arrive the hospital between 06:00 and 07:00, which is outside the busiest hours (i.e. 07:00-10:00) of the surrounding road network in the morning period.

In the evening, the total hourly traffic flows (i.e. 1,171) between 18:00 and 19:00 (which is the period for night-time staff arriving to the hospital) is higher than the total hourly traffic flows (i.e. 1,025) between 19:00 and 20:00 (which is the period for daytime staff leaving the hospital). However, the aforementioned total hourly traffic flows (i.e. 18:00-19:00 and 19:00-20:00) are also less than the background hourly traffic flows at the busiest hour (i.e. 1,402 between 17:00-18:00). It should be also noted that the daytime staff leaving the hospital between 19:00 and 20:00, which is outside the busiest hours (i.e. 16:00-19:00) in the evening period. In consideration of traffic impact during the staff shifting periods, a capacity assessment in the morning (07:00-08:00) and evening (18:00-19:00) periods were selected for assessment.

By using the car parking utilization, expected net trip generation for the proposed development was estimated and was revealed to be in total 3 trips inbound and 43 trips outbound in the morning hour (07:00-08:00), and 43 trips inbound and 10 trips outbound in the evening hour (18:00-19:00).

In the 2042 design year, Junction 1 will also operate within the normal design threshold in both the morning (07:00-08:00) and evening (18:00-19:00) hours for both the "without" development and "with" development scenarios.

Junction 3, and Junction 5 to Junction 7 will exceed the normal design threshold in both the morning (07:00-08:00) and evening (18:00-19:00) hours in 2042 for both the "without" development and "with" development scenarios, resulting in queues and delays for motorists. Additionally, the ratio of estimated net trips associated with the proposed development to the traffic flows in 2023 in the morning (07:00-08:00) and evening (18:00-19:00) hours for Junction 3, and Junction 5 to Junction 7 are also less than 2.3%, which are less than the thresholds for traffic impact assessment as stated in the Table 2.1 of TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). Moreover, the new hospital will employ a Workplace Travel Coordinator, who will prepare the Mobility Management Plan to supervise the use of private cars on Site and that opportunities for employees / visitors to use alternative modes of transport (i.e. walking, cycling and public transport) are maximised, resulting in further reduction of net trip generation by the proposed development. In view of the above analysis, the proposed development will have a negligible increase in traffic volumes on Junction 3, and Junction 5 to Junction 7 in the morning (07:00-08:00) and evening (18:00-19:00) hours. The results also demonstrate that the impact on Junction 3, and Junction 5 to Junction 7 will be mainly due to regular background traffic growth but not the proposed development per se so traffic from the proposed development will not have significant impact on these junctions.

Proposed Improvement Scheme at Junction 7 (Chapel Hill / Lucan Road Junction) in a "with allowing a modal shift" approach

With provision of active travel facilities and enhancement of public transport services in the vicinity of the proposed development, it is anticipated that the amount of people walking, cycling and using public transport will increase and the number of journeys in private vehicles will decrease. As such, a modal shift from private car to walking, cycling and public transport is expected for this development. As the proposed improvement works will be carried out at Junction 7 to relieve the traffic congestion and enhance the safety of vulnerable road users, it is also proposed to carry out the traffic analysis at Junction 7 in "without allowing for modal shift" approach and "allowing for modal shift" approach for the **"**with**"** development scenario. Therefore, 1.9% and 8.8% of traffic reduction, either for background traffic or new trips, were applied on Junction 7 in 2027 Opening Year and 2042 Design Year respectively in a "allowing for modal shift" approach.

In a "allowing for modal shift" approach, the proposed improvement scheme can relieve the traffic congestion when compared to the "with" development scenario (based on the existing junction layout).

Parking Provision

Within the proposed development, it is proposed to provide a total of 214 car-parking spaces for staff and visitors. This is less than the recommended maximum car parking spaces (i.e. 215 car parking spaces) as required in the South Dublin County Development Plan 2022–2028. Moreover, two additional minibus parking spaces will be provided for the hospital's general operation.

In addition, it is proposed to provide a total of 160 bicycle-parking spaces within the development, inclusive of 104 bicycle parking spaces for staff (long-stay) and 56 bicycle parking spaces for visitors (short-stay). This exceeds the minimum bicycle parking requirement of 94 bicycle-parking spaces as required in the South Dublin County Development Plan 2022–2028.

The study concludes that, from a traffic and transportation perspective, the proposed development as described herein will not result in any significant residual traffic or road safety impacts. On this basis, the proposed development is considered acceptable and should be granted planning permission.

APPENDIX 1 – TRAFFIC COUNT DATA AT LUCAN ON 22ND FEBRUARY 2023

APPENDIX 2 – TRICS OUTPUT FILES

APPENDIX 3 – TRAFFIC COUNT DATA AT JUNCTION 1 OF LUCAN ON 21ST MAY 2024

APPENDIX 4 – TRAFFIC COUNT DATA AT ST. PATRICK'S UNIVERSITY HOSPITAL AT DUBLIN 8 ON 2ND MAY 2024

APPENDIX 5 – LOCATION AND FULL TRAFFIC FLOWS ON 22ND FEBRUARY 2023 FOR N04 BETWEEN JN N4/M50 AND JN02 LIFFEY VALLEY, CO. DUBLIN (TMU N04 000.0W) ON 22ND FEBRUARY 2023

APPENDIX 6 – GRAPHS SHOWING THE TRAFFIC IMPACTS AT JUNCTION 1

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