

20076-02-001

PROPOSED RESIDENTIAL DEVELOPMENT
AT LANDS AT CAPDOO & ABBEYLANDS,
CLANE, CO. KILDARE

Traffic Impact Assessment

for

Westar Investments Limited

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1 INTRODUCTION

1 Introduction

1.1 INTRODUCTION

Roadplan Consulting were commissioned by Westar Investments Limited to prepare a Traffic Impact Assessment for the proposed residential development at lands at Capdoo & Abbeylands, Clane, Co. Kildare.

In preparing this report, Roadplan Consulting has made reference to:

- The Kildare County Development Plan 2017 - 2023.
- The Institute of Highways and Transportation *Guidelines on the Preparation of Traffic Impact Assessments*.
- The *TII Transport Assessment Guidelines*.
- The *TII National Traffic Model*.

1.2 OBJECTIVES

The objective of this report is to examine the traffic implications of the proposed mixed development in terms of how it can integrate with existing traffic in the area. The report will determine and quantify the extent of additional trips generated by the development, and the impact of such trips on the operational performance of the local road network and junctions, in particular the existing R403 / Brooklands / Capdoo Park crossroads and the existing R403 / Alexandra Walk / The Avenue roundabout.

1.3 STUDY METHODOLOGY

The methodology adopted for this report is summarised as follows:

- A traffic count was undertaken by Irish Traffic Surveys during a 12-hour period (07:00 to 19:00). Count information was obtained at the existing R403 / Brooklands / Capdoo Park crossroads and the existing R403 / Alexandra Walk / The Avenue roundabout.
- Existing Traffic Assessment – A spreadsheet model was created which contains the base year DO-NOTHING traffic count data described above. The traffic count data was used to develop a PICADY model of the existing R403 / Brooklands / Capdoo Park crossroads and an ARCADY model of the existing R403 / Alexandra Walk / The Avenue roundabout.

Traffic signal poles are installed at the R403 / Brooklands / Capdoo Park crossroads junction. However, the signals are currently not operational. The traffic count data was also used to develop a TRANSYT model of the R403 / Brooklands / Capdoo Park junction to assess the operational performance of the signals.

- Future Year Assessment – The estimated future year traffic volumes on the study area road network, as a result of the increase in background traffic and the additional development related traffic was used to assess the future operational performance of the junctions both at the year of opening of the development, 5 and 15 years after opening.
- Parking Requirements – Car parking provision for the proposed development was assessed against the parking standards as set out in the Kildare County Development Plan.

1.4 STRUCTURE OF REPORT

Following this introduction, the report is set out as follows:

- Chapter 2 provides details of the proposed development;
- Chapter 3 provides an overview of the existing traffic conditions and the local road network, identifying any existing issues related to traffic flow or road infrastructure;

- Chapters 4 and 5 outline the analysis as described in the Study Methodology above. The analysis examines trip generation, distribution and resulting junction operational performance with the development in place;
- Chapter 6 establishes the parking requirements for the development using the county development plan and the design standards for new apartments and sets out how these needs are provided for;
- Chapter 7 addresses road safety, pedestrian and public transport; and
- Chapter 8 presents the conclusions and a summary of the report.

2 PROPOSED DEVELOPMENT

2 Proposed Development

2.1 SITE LOCATION

The proposed residential development is located at lands at Capdoo & Abbeylands, Clane, Co. Kildare. The development is bounded by residential dwellings to the west and south, the river Liffey to the east and agricultural lands to the north and east as shown on Figure 2.1 'Site Location Map'.

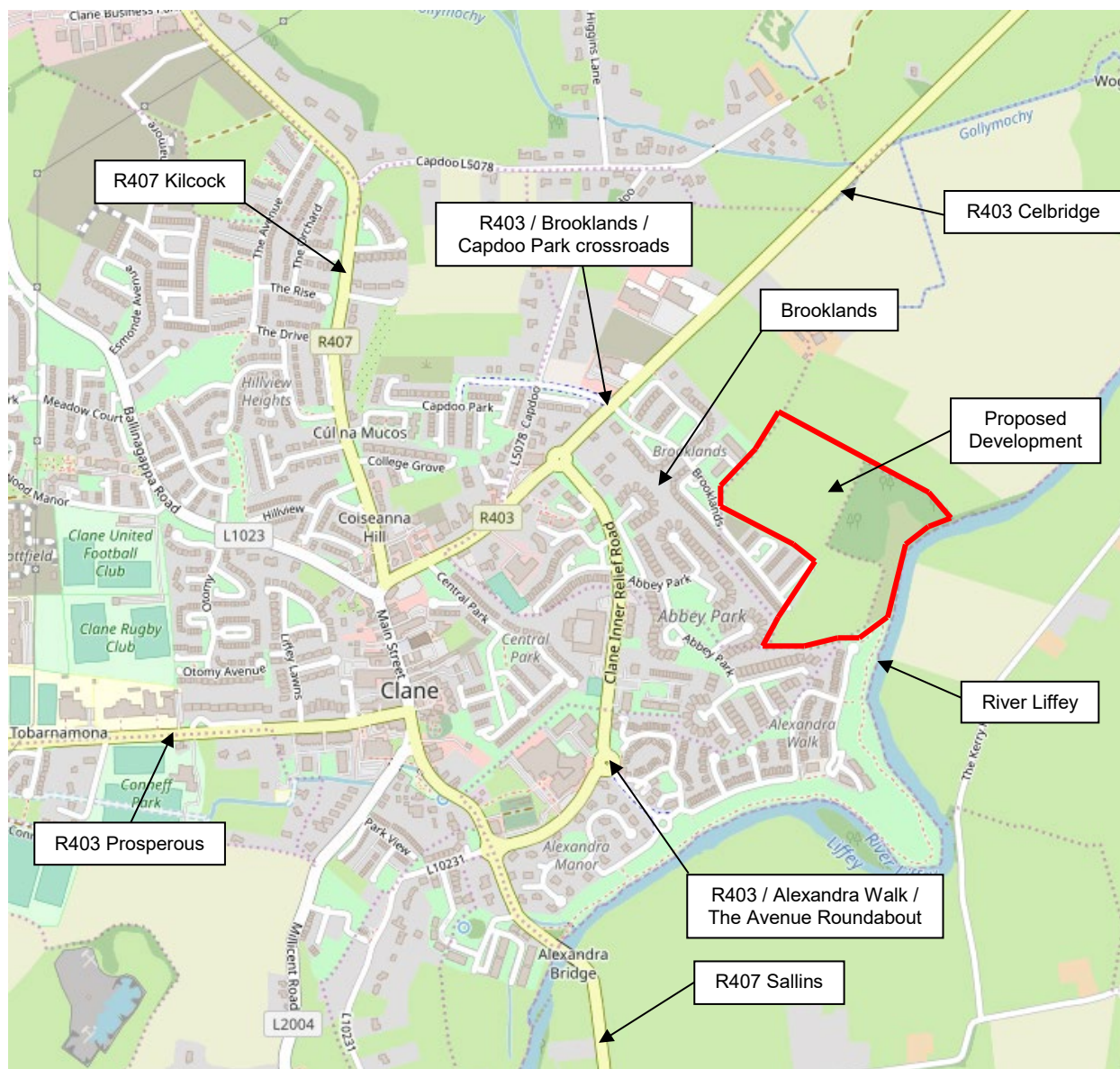


Figure 2.1: Site Location Map

2.2 EXISTING LAND USE

The existing site is currently undeveloped at present.

2.3 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed development consists of residential dwellings, apartments and a crèche as shown in table 2.1 and 2.2 *Development Schedule*.

Table 2.1 – Development Schedule

Item	Unit	Quantity
Residential Dwelling	No.	121
Duplex Dwelling	No.	68
Apartments	No.	144
Crèche	Sqm	485

Access to the proposed residential development will be via the existing R403 / Brooklands / Capdoo Park crossroads and the existing R403 / Alexandra Walk / The Avenue roundabout. A layout of the proposed development and its access points are shown on the Architect's drawing which is contained in Appendix A – Drawings.

3 EXISTING AND PROPOSED TRAFFIC CONDITIONS

3 Existing and Proposed Traffic Conditions

3.1 EXISTING TRAFFIC FLOWS

A traffic count was undertaken during a 12-hour period (07:00 to 19:00). The count data is provided in Appendix B – Traffic Counts. Count information was obtained at the following junctions:

- R403 / Brooklands / Capdoo Park crossroads
- R403 / Alexandra Walk / The Avenue roundabout

The traffic flows during the AM and PM peak hours were abstracted from the surveyed data and are shown in the following tables:

R403 / Brooklands / Capdoo Park Crossroads

AM Peak Existing (07:30 – 08:30)

From / To	R403 Celbridge	Brooklands	R403 Clane	Capdoo Park	Totals
R403 Celbridge	0	1	285	10	296
Brooklands	31	0	58	1	90
R403 Clane	799	9	0	14	822
Capdoo Park	39	3	15	0	57
Totals	869	13	358	25	1265

Peak Existing (17:30 – 18:30)

From / To	R403 Celbridge	Brooklands	R403 Clane	Capdoo Park	Totals
R403 Celbridge	0	24	797	42	863
Brooklands	6	0	32	3	41
R403 Clane	365	43	0	36	444
Capdoo Park	18	0	11	0	29
Totals	389	67	840	81	1377

R403 / Alexandra Walk / The Avenue Roundabout

AM Peak Existing (07:30 – 08:30)

From / To	R403 (east)	Alexandra Walk	R403 (west)	The Avenue	Totals
R403 (east)	0	29	313	1	343
Alexandra Walk	72	0	85	0	157
R403 (west)	362	21	0	4	387
The Avenue	10	0	6	0	16
Totals	444	50	404	5	903

Peak Existing (17:30 – 18:30)

From / To	R403 (east)	Alexandra Walk	R403 (west)	The Avenue	Totals
R403 (east)	0	49	580	9	638
Alexandra Walk	31	0	31	0	62
R403 (west)	440	70	3	10	523
The Avenue	3	0	3	0	6
Totals	474	119	617	19	1229

A summary of the count data for the peak hour flows is contained in Appendix C – Traffic Flow Sheets.

3.2 EXISTING ROAD NETWORK

Brooklands road is a cul-de-sac and provides access from the R403 to a number of residential developments. It is proposed to access the development via Brooklands road. The cross-section of Brooklands road is as follows:

- 6m wide carriageway.
- 2m wide footpaths with a 1m wide grass verge are located on either side of the carriageway.
- Street lighting is provided along Brooklands road.
- The speed limit on Brooklands road is 50kph.

Alexandra Walk road is a cul-de-sac and provides access from the R403 to a number of residential developments. It is proposed to access the development via Alexandra Walk. At the access to the development Alexandra Walk access road has the following cross-section:

- 6m wide carriageway.
- 2m wide footpath located on the west side of the carriageway.
- Street lighting is provided along Alexandra Walk access road.
- The speed limit on Alexandra Walk access road is 50kph.

The R403 is a regional road which travels in an east to west direction. To the east the R403 links Clane with Celbridge and to the M4, to the west the R403 links with other small and medium towns such as Prosperous and Allenwood. The R403 has the following characteristics at the location of the access onto Brooklands road

- 6.5m wide carriageway.
- 2m wide footpaths are located on the north and south sides of the carriageway. The footpaths provide pedestrian access to Clane and other surrounding residential developments.
- Street lighting is provided along the R403.
- The speed limit on the R403 is 50kph.

3.3 ROAD COLLISIONS

Information on road collisions was taken from the Road Safety Authority website and is provided hereunder in Figure 3.4.

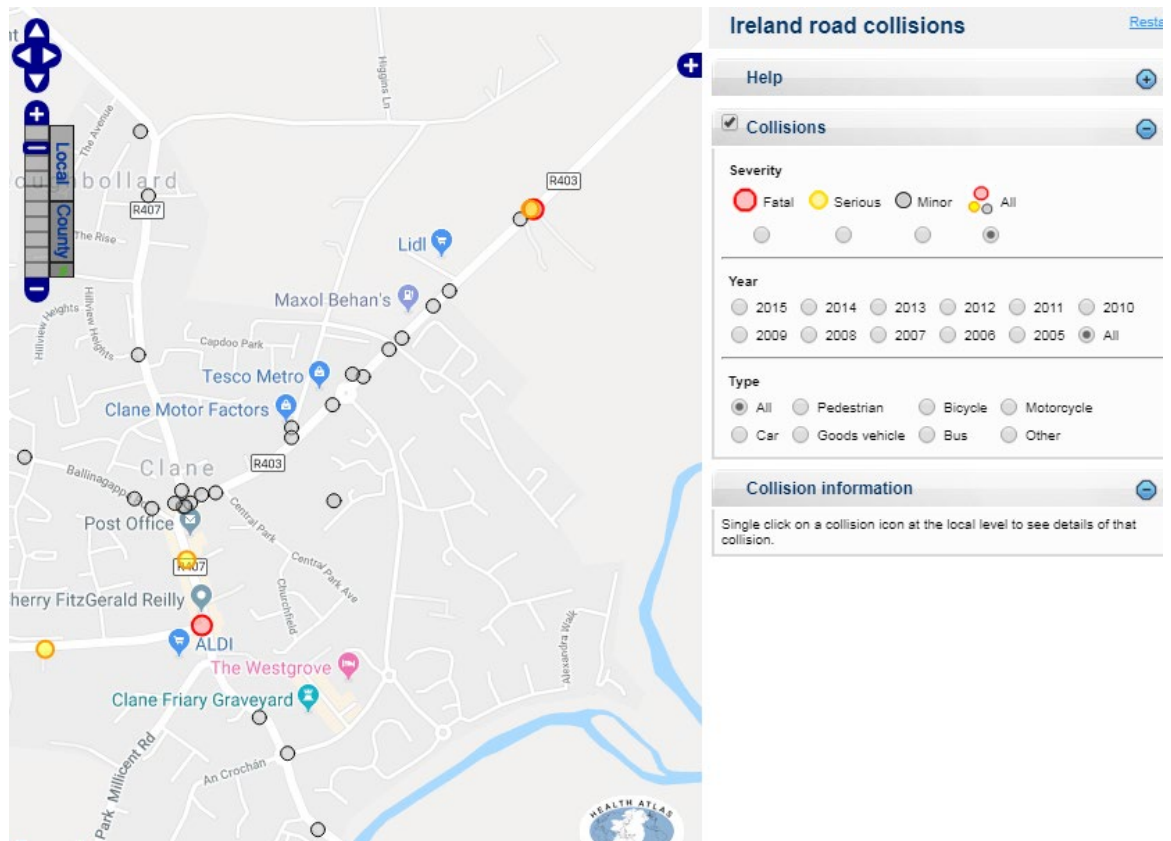


Fig 3.4: Road collisions

There have been two minor collisions at the R403 / Brooklands / Capdoo Park crossroads junction in the period of eleven years (from 2005 to 2015). There are no collisions recorded along Brooklands access road or at the existing R403 / Alexandra Walk / The Avenue roundabout.

3.4 PROPOSED ROAD NETWORK IMPROVEMENTS

The Kildare County Development Plan 2017-2023 has identified two locations along the R403 for road improvement works, "County boundary at Backweston to Clane via Celbridge and Clane to Junction with R402 via Prosperous, Allenwood & Derrinturn". However, it is not expected that these improvements would have a significant bearing on the development proposal.

4 TRAFFIC GENERATION & TRIP DISTRIBUTION

4 Traffic Generation and Trip Distribution

4.1 DEVELOPMENT TRIP GENERATION

The TRICS database has been used to predict the trip generation to and from the proposed development for the AM and PM peak periods. Full details of the TRICS information used for the assessments are provided in Appendix D - TRICS information.

4.1.1 Houses / Duplex

The category of "Residential / Houses Privately Owned" has been interrogated as the most appropriate development type category for this part of the development and the trip rates for the AM and PM peak periods are shown below:

Trip rates per number of Units

	Trip rate to development	Trip rate from development
AM Peak	0.20	0.40
PM Peak	0.45	0.27

For the proposed 189 residential dwellings with access onto Brooklands road this would give the following trips to and from the proposed development:

Trip Generation – 189 Dwellings

	Trip rate to development	Trip rate from development
AM Peak	37	75
PM Peak	85	51

4.1.2 Apartments

The category of "Residential / Flats Privately Owned" has been interrogated as the most appropriate development type category for this part of the development and the trip rates for the AM and PM peak periods are shown below:

Trip rates per number of Units

	Trip rate to development	Trip rate from development
AM Peak	0.05	0.15
PM Peak	0.12	0.07

For the proposed 144 apartments with access onto Brooklands road this would give the following trips to and from the proposed development:

Trip Generation – 144 Apartments

	Trip rate to development	Trip rate from development
AM Peak	7	21
PM Peak	17	10

4.1.3 Crèche

The category of "Education / Nursery" has been interrogated as the most appropriate development type category for this part of the development and the trip rates for the AM and PM peak periods are shown below:

Trip rates per number of Units

	Trip rate to development	Trip rate from development
AM Peak	5.93	4.11
PM Peak	2.99	3.22

For the proposed Crèche of 485sqm with access onto Brooklands road this would give the following trips to and from the proposed development:

Trip Generation – 485sqm

	Trip rate to development	Trip rate from development
AM Peak	28	19
PM Peak	14	15

4.1.4 Total Development Trip Generation Summary

To summarise, the combined trips that are predicted to be generated by the proposed development are shown in the table below:

Trip Generation – Total Development

	Trip rate to development	Trip rate from development	Total
AM peak	72	115	187
PM peak	116	76	192

4.2 TRIP DISTRIBUTION

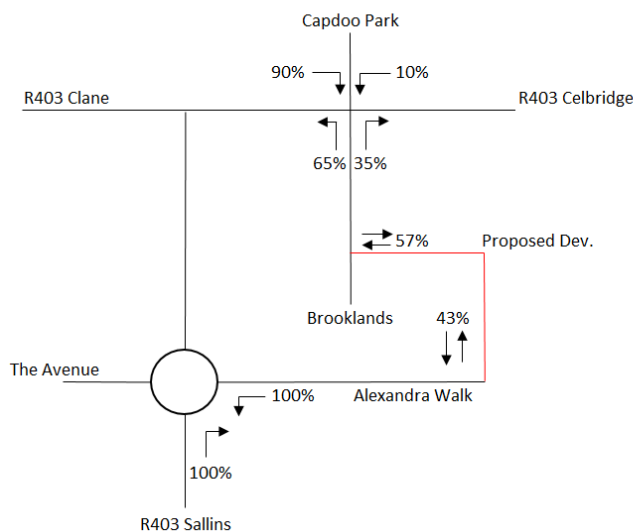
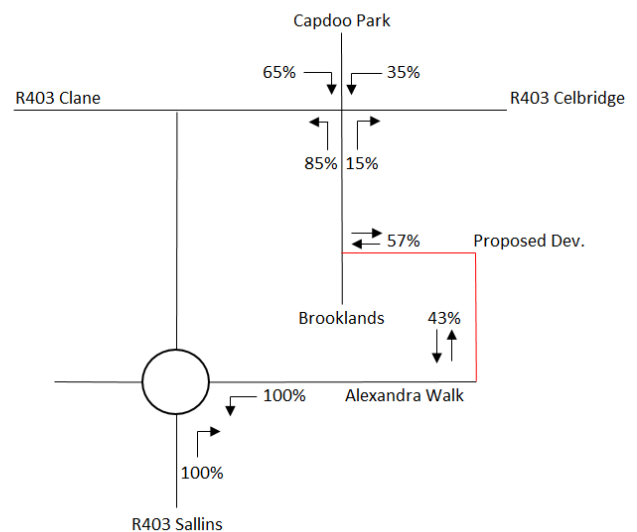
The access to the proposed development will be via the existing R403 / Brooklands / Capdoo Park crossroads and the existing R403 / Alexandra Walk / The Avenue roundabout. An origin / destination survey was carried out over a 3-day period from the 5th March 2019 to the 8th March 2019. The survey indicated that percentage of existing traffic arriving and departing to and from Clane are as follows:

- 23% to / from the R407 Kilcock direction
- 34% to / from the R403 Celbridge direction
- 28% to / from the R407 Sallins direction
- 15% to / from the R403 Prosperous direction

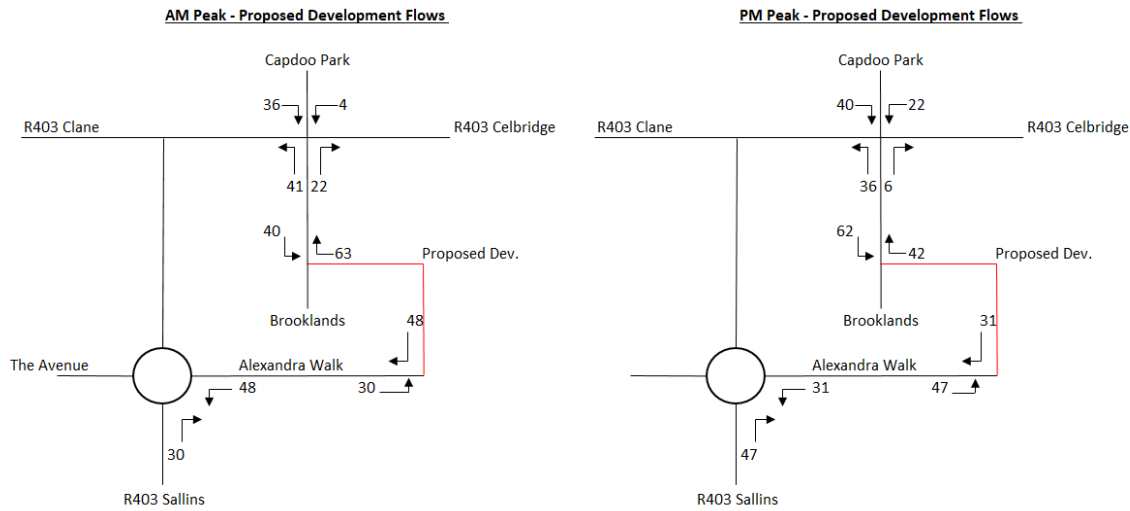
Using the above data, it is assumed that the development traffic will distribute as follows:

- 57% of the development traffic will arrive / depart via the R403 / Brooklands / Capdoo Park crossroads and
- 43% of the development traffic will arrive / depart via the R403 / Alexandra Walk / The Avenue roundabout.

The following diagrams show the existing and proposed traffic distribution percentage for the AM and PM peak at the existing R403 / Brooklands / Capdoo Park crossroads and the R403 / Alexandra Walk / The Avenue roundabout.

AM Peak - Existing & Proposed Trip Distribution (Percentage)**PM Peak - Existing & Proposed Trip Distribution (Percentage)**

Using the proposed directional splits shown above and the trips generated by the proposed development outlined in 4.1, the following diagrams show the turning movements of predicted development traffic at the R403 / Brooklands / Capdoo Park crossroads and the existing R403 / Alexandra Walk / The Avenue roundabout during the AM and PM peak hours:

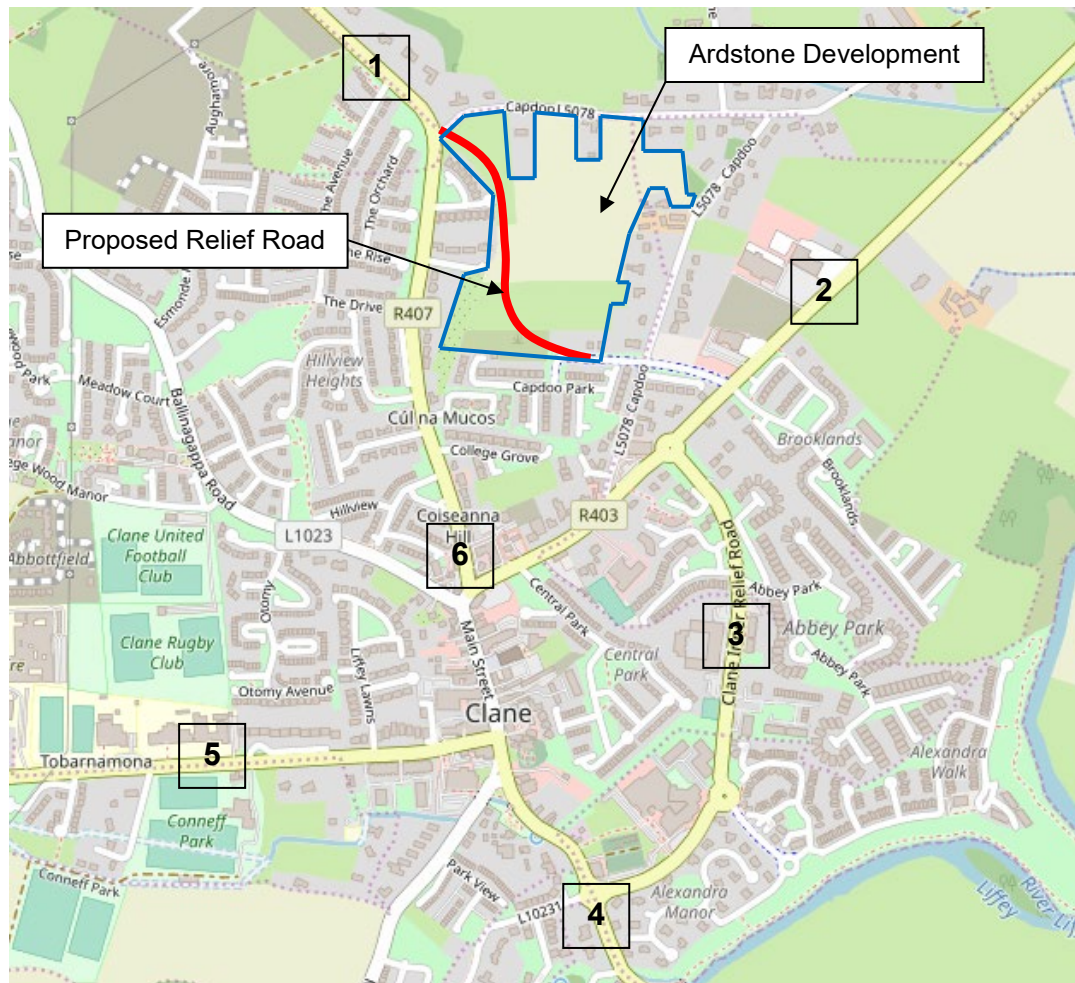


4.3 SENSITIVITY TESTING OF FUTURE DEVELOPMENT

There are lands located to the north of the proposed development which are zoned residential and are in the ownership of Ardstone Homes. Access to this potential future development would be via the existing R403 / Brooklands / Capdoo Park crossroads. For this reason, a capacity assessment has been undertaken to determine the impact that the possible future residential development will have on the existing R403 / Brooklands / Capdoo Park crossroads in the design year 2037 with the proposed residential development also operational.

As part of the Ardstone residential development it is proposed to provide a relief road through the development which will provide a connection from the R407 / L5078 priority junction to the R403 / Brooklands / Capdoo Park crossroads. The proposed relief road will have an impact on the travel pattern of traffic using the network surrounding Clane town. The alignment of the relief road and the location of Ardstone development is shown on the site map below.

In order to assess the impact that the relief road will have on the surrounding network an origin / destination survey was carried out. The origin / destination survey was carried out over a 3-day period from the 5th March 2019 to the 8th March 2019. Data was collected from 6 number origin / destination points. The location of each origin / destination point is shown on the site map below and the survey results are contained in Appendix B – Traffic Surveys. In addition to the above a 12-hour baseline traffic count was carried out at each of the 6 locations.



The origin / destination percentage splits for the 6 sites are indicated on the table below.

Origin / Destination	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Site 1	-	10%	9%	34%	7%	40%
Site 2	7%	-	25%	28%	23%	17%
Site 3	9%	55%	-	21%	4%	11%
Site 4	24%	42%	12%	-	10%	12%
Site 5	9%	52%	4%	22%	-	13%
Site 6	33%	26%	7%	22%	12%	-

With the relief road in place it is assumed that all vehicle trips travelling from site 1 to sites 2 and 3 will divert via the relief road and all vehicle trips travelling from sites 2 and 3 to site 1 will divert via the relief road. In addition, it is assumed that 40% of vehicles trips travelling to / from site 1 to site 4 will divert via the relief road.

Using the percentage splits shown in the table above it is assumed that 33% (10% + 9% + 14%) of the existing vehicle trips originating from site 1 will divert via the relief road and 26% (7% + 9% + 10%) of the existing vehicle trips originating from site 2, 3 and 4 will divert via the relief road.

Using the baseline traffic counts carried out at site 1 and the percentage splits shown above the predicted two-way flow of background traffic that will travel via the relief road during the AM and PM peak hours are indicated in the table below:

Proposed Relief Road - Diverted Trips

	Northbound	Southbound
AM Peak	89	88
PM Peak	97	95

The Ardstone development has been granted planning permission by An Bord Pleanala (ref no. ABP-304632-19). The development consists of 366 residential units (184 dwellings and 182 apartments).

The TRICS database has been used to predict trip generation to and from the proposed development for the AM and PM peak periods.

4.3.1 Residential Dwellings

Residential - Houses Privately Owned has been used as most appropriate category for this possible future development, and the trip rates for the AM and PM peak periods are shown below:

Residential (Houses Privately Owned) – Trip rates per House

	Arrivals to development	Departures from development
AM Peak	0.20	0.40
PM Peak	0.45	0.27

The predicted number of houses for the residential zoned land is 184. This results in the following trips to and from the proposed site:

Trip Generation – 184 No. Houses

	Trips to development	Trips from development
AM Peak	36	72
PM Peak	81	49

4.3.2 Apartments

The category of “Residential / Flats Privately Owned” has been interrogated as the most appropriate development type category for this part of the development and the trip rates for the AM and PM peak periods are shown below:

Trip rates per number of Units

	Trip rate to development	Trip rate from development
AM Peak	0.05	0.15
PM Peak	0.12	0.07

For the proposed 182 apartments with access onto Brooklands road this would give the following trips to and from the proposed development:

Trip Generation – 182 Apartments

	Trip rate to development	Trip rate from development
AM Peak	9	27
PM Peak	22	13

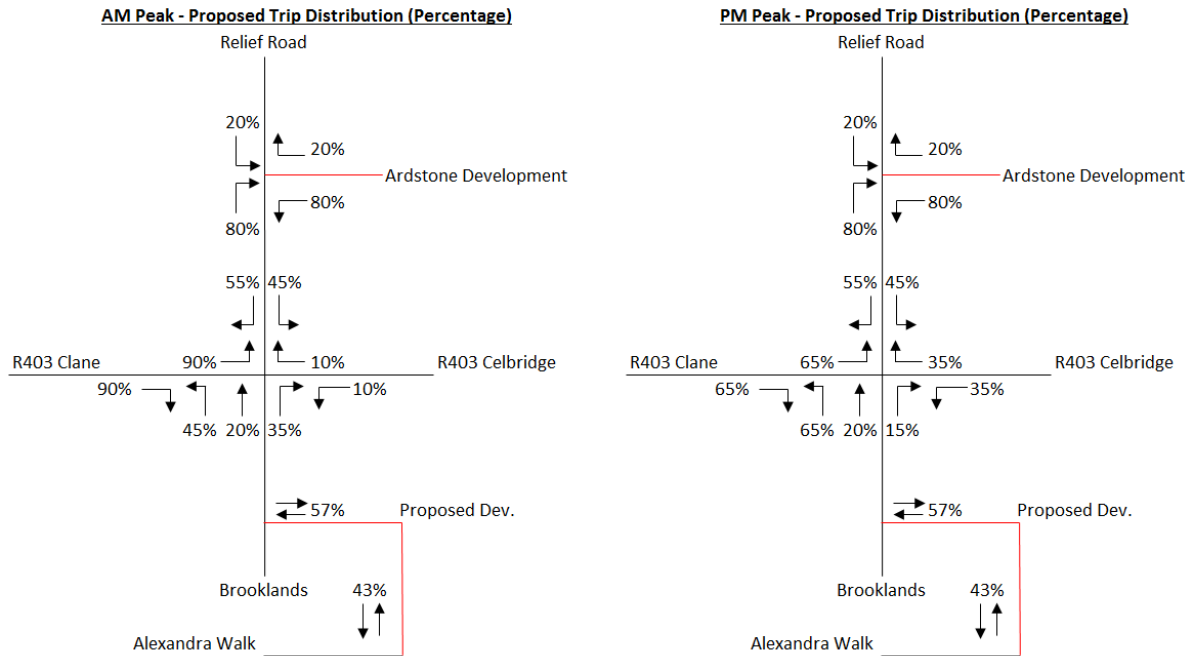
4.3.3 Total Development Trip Generation Summary

To summarise, the combined trips that are predicted to be generated by the proposed development are shown in the table below:

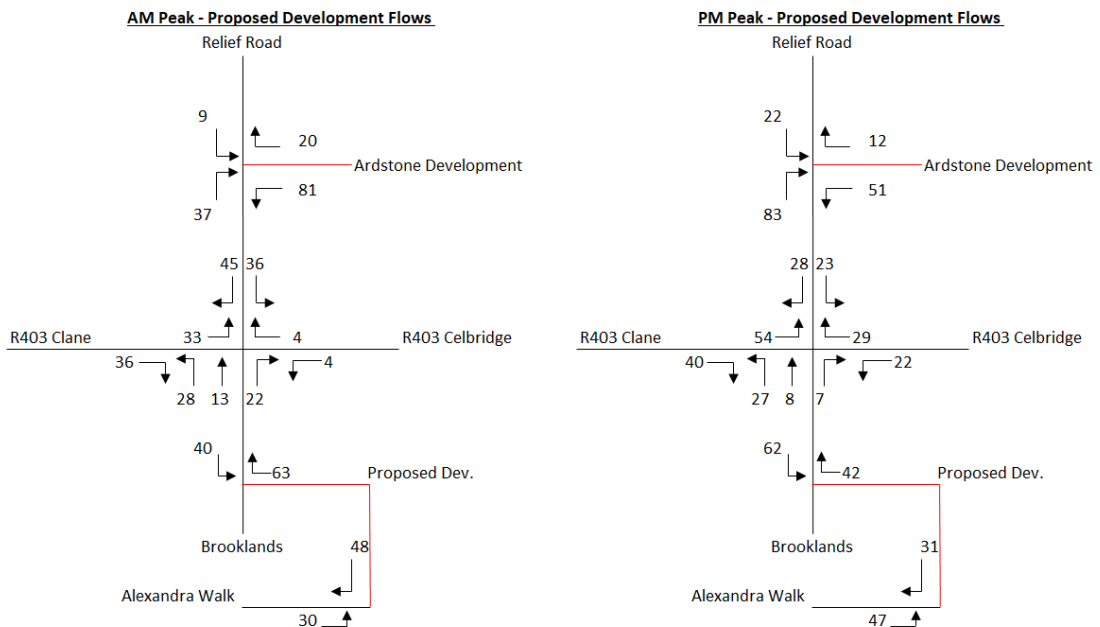
Trip Generation – Total Development

	Trip rate to development	Trip rate from development	Total
AM peak	46	101	147
PM peak	105	63	168

The construction of the proposed relief road as part of the Ardstone residential development will result in a re-distribution of the proposed residential flows associated with the Brooklands development. The following diagrams show the proposed traffic distribution percentage for the AM and PM peak at the existing R403 / Brooklands / Capdoo Park crossroads in 2037 when the proposed relief road and the Ardstone residential development is operational.



Using the proposed directional splits shown above and the trips generated by the proposed development outlined in 4.1 and the Ardstone Development outlined in 4.3, the following diagrams show the turning movements of predicted development traffic at the R403 / Brooklands / Capdoo Park crossroads during the AM and PM peak hours:



4.4 FUTURE YEAR TRAFFIC GROWTH

The TII issues a range of forecasts: low growth, medium growth and high growth. The implementation of policies relating to Smarter Travel and to public transport will act a deterrent to high growth in car-based travel. Low growth factors are however likely to be equally unrealistic at present in the Clane Area, so we have used medium growth factors in our assessment.

The zone in which the site is located is numbered 494 in the TII National Traffic Model. The growth factors are as follows:

Zone	2019 Existing	2022 development completion	2027 5 years after dev. completion	2037 15 years after dev. completion
494	1	5.88%	16.49%	27.18%

These percentages have been used to predict the increase in background traffic that will occur in future years. Full summary tables and predicted future traffic flows for 2022, 2027 and 2037 future years are included in Appendix C – Traffic Flow Sheets.

5 OPERATIONAL ASSESSMENTS

5 Operational Assessments

5.1 INTRODUCTION

Traffic generated by the proposed development will have some effect on the local road network surrounding the site. The following junction was assessed:

- R403 / Brooklands / Capdoo Park Crossroads
- R403 / Alexandra Walk / The Avenue Roundabout

5.2 R403 / BROOKLANDS / CAPDOO PARK CROSSROADS

Capacity assessments have been undertaken using the computer program PICADY for the AM and PM peak hours.

The following tables summarise the existing situation and the effects that the proposed development will have on this junction in 2022, 2027 and 2037 using the existing and predicted traffic flows shown in Appendix C – Traffic Flow Sheets. Full PICADY printouts are provided in Appendix E – PICADY Results.

The parameters shown in the tables are defined as follows:

Ratio of Flow to Capacity (RFC) is a factor indicating the flow on a junction arm relative to its capacity. An RFC of 1.0 means the junction has reached its ultimate capacity and an RFC of 0.85 means that the junction has reached its reserve capacity.

Avg. Queue is the average number of vehicles queued over the time period on the junction approach.

Queue delay is the average number of seconds delay to each vehicle in the time period.

Total Delay is the total number of vehicle hours of delay to all vehicles at the junction over the time period.

5.2.1 Existing Assessment (Base Flows)

The following tables show the predicted RFC values (Ratio of Flow to Capacity), average queue lengths, average vehicle delay and total delays for the existing crossroads junction using the existing traffic flows.

AM Peak – Base Flows

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 Celbridge	0.03	0	9	0.59
Brooklands	0.26	0	13	
R403 Clane	0.02	0	7	
Capdoo Park	0.14	0	18	

PM Peak – Base Flows

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 Celbridge	0.08	0	7	0.44
Brooklands	0.18	0	14	
R403 Clane	0.10	0	8	
Capdoo Park	0.04	0	13	

The summary predictions shown in the tables above indicate that there are no queues and minimal delays at this junction at present during the AM and PM peak hours.

5.2.2 Design Year Assessments (2022 With Development)

The following tables show the predicted RFC values (Ratio of Flow to Capacity), average queue lengths, average vehicle delay and total delays for the existing junction using the predicted traffic flows for 2022 including the proposed development.

AM Peak – 2022 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 Celbridge	0.02	0	9	1.24
Brooklands	0.45	1	18	
R403 Clane	0.08	0	6	
Capdoo Park	0.11	0	19	

PM Peak – 2022 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 Celbridge	0.10	0	7	0.88
Brooklands	0.35	1	18	
R403 Clane	0.20	0	9	
Capdoo Park	0.04	0	16	

The summary predictions shown in the tables above indicate that there will be minimal queues and small delays in the AM and PM peak hour at the junction in 2022, planned year of opening.

5.2.3 Design Year Assessments (2027 With Development)

The following tables show the predicted RFC values (Ratio of Flow to Capacity), average queue lengths, average vehicle delay and total delays for the existing junction using the predicted traffic flows for 2027 including the proposed development.

AM Peak – 2027 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 Celbridge	0.02	0	9	1.56
Brooklands	0.51	1	21	
R403 Clane	0.08	0	6	
Capdoo Park	0.13	0	22	

PM Peak – 2027 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 Celbridge	0.11	0	7	1.10
Brooklands	0.42	1	22	
R403 Clane	0.22	0	9	
Capdoo Park	0.04	0	17	

The summary predictions shown in the tables above indicate that there will be minimal queues and small delays in the AM and PM peak hour at the junction in 2027, five years after development completion.

5.2.4 Design Year Assessments (2037 With Development)

The following tables show the predicted RFC values (Ratio of Flow to Capacity), average queue lengths, average vehicle delay and total delays for the existing junction using the predicted traffic flows for 2037 including the proposed development.

AM Peak – 2037 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 Celbridge	0.03	0	10	2.05
Brooklands	0.58	1	26	
R403 Clane	0.09	0	6	
Capdoo Park	0.15	0	27	

PM Peak – 2037 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 Celbridge	0.12	0	7	1.36
Brooklands	0.48	1	28	
R403 Clane	0.25	0	10	
Capdoo Park	0.06	0	20	

The summary predictions shown in the tables above indicate that there will be minimal queues and small delays in the AM and PM peak hour at the junction in 2037, fifteen years after development completion.

5.2.5 Design Year Assessments (2037 With Development + Sensitivity Flows)

The following tables show the predicted RFC values (Ratio of Flow to Capacity), average queue lengths, average vehicle delay and total delays for the existing junction using the predicted traffic flows for 2037 including the proposed development Ardstone residential development.

AM Peak – 2037 with Development + Sensitivity Flows

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 Celbridge	0.17	0	12	44.26
Brooklands	0.68	2	44	
R403 Clane	0.09	0	6	
Capdoo Park	1.53	29	569	

PM Peak – 2037 with Development + Sensitivity Flows

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 Celbridge	0.33	1	7	11.360
Brooklands	0.43	1	29	
R403 Clane	0.28	1	9	
Capdoo Park	1.02	8	181	

Sensitivity testing of the proposed development, the Ardstone residential development with the relief road open indicates that the during the AM and PM peak hour the junction will be at its ultimate capacity with queues and delays.

5.3 R403 / ALEXANDRA WALK / THE AVENUE ROUNDABOUT

Capacity assessments have been undertaken using the computer program ARCADY for the AM and PM peak hours.

The following tables summarise the existing situation and the effects that the proposed development will have on this junction in 2022, 2027 and 2037 using the existing and predicted traffic flows shown in Appendix C – Traffic Flow Sheets. Full ARCADY printouts are provided in Appendix F – ARCADY Results.

5.3.1 Existing Assessment (Base Flows)

The following tables show the predicted RFC values (Ratio of Flow to Capacity), average queue lengths, average vehicle delay and total delays for the existing roundabout junction using the existing traffic flows.

AM Peak – Base Flows

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 (east)	0.21	0	2	0.73
Alexandra Walk	0.13	0	3	
R403 (west)	0.31	0	3	
The Avenue	0.02	0	5	

PM Peak – Base Flows

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 (east)	0.38	1	3	1.15
Alexandra Walk	0.05	0	3	
R403 (west)	0.38	1	4	
The Avenue	0.01	0	6	

The summary predictions shown in the tables above indicate that there are minimal queues and delays at this junction at present during the AM and PM peak hours.

5.3.2 Design Year Assessments (2022 With Development)

The following tables show the predicted RFC values (Ratio of Flow to Capacity), average queue lengths, average vehicle delay and total delays for the existing junction using the predicted traffic flows for 2022 including the proposed development.

AM Peak – 2022 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 (east)	0.22	0	2	0.91
Alexandra Walk	0.18	0	3	
R403 (west)	0.34	1	4	
The Avenue	0.03	0	6	

PM Peak – 2022 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 (east)	0.41	1	3	1.40
Alexandra Walk	0.08	0	3	
R403 (west)	0.44	1	4	
The Avenue	0.01	0	6	

The summary predictions shown in the tables above indicate that there will be minimal queues and delays in the AM and PM peak at the junction in 2022, planned year of opening.

5.3.3 Design Year Assessments (2027 With Development)

The following tables show the predicted RFC values (Ratio of Flow to Capacity), average queue lengths, average vehicle delay and total delays for the existing junction using the predicted traffic flows for 2027 including the proposed development.

AM Peak – 2027 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 (east)	0.25	0	3	1.04
Alexandra Walk	0.19	0	3	
R403 (west)	0.38	1	4	
The Avenue	0.03	0	6	

PM Peak – 2027 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 (east)	0.45	1	3	1.60
Alexandra Walk	0.09	0	3	
R403 (west)	0.48	1	4	
The Avenue	0.01	0	6	

The summary predictions shown in the tables above indicate that there will be minimal queues and delays in the AM and PM peak hour at the junction in 2027, five years after development completion.

5.3.4 Design Year Assessments (2037 With Development)

The following tables show the predicted RFC values (Ratio of Flow to Capacity), average queue lengths, average vehicle delay and total delays for the existing junction using the predicted traffic flows for 2037 including the proposed development.

AM Peak – 2037 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 (east)	0.27	0	3	1.19
Alexandra Walk	0.21	0	3	
R403 (west)	0.41	1	4	
The Avenue	0.03	0	6	

PM Peak – 2037 with development

Approach	Predicted RFC value	Avg Queue (vehicles)	Queue delay (secs./veh.)	Total Delay (veh.hrs.)
R403 (east)	0.50	1	4	1.94
Alexandra Walk	0.10	0	3	
R403 (west)	0.52	1	5	
The Avenue	0.01	0	7	

The summary predictions shown in the tables above indicate that there will be small queues and delays in the AM and PM peak hour at the junction in 2037, fifteen years after development completion.

5.4 R403 / BROOKLANDS / CAPDOO PARK SIGNALISED JUNCTION

Currently there are signal poles and signal heads located at the existing R403 / Brooklands / Capdoo Park crossroads junction. The traffic lights are currently not operational at present. However, a capacity assessment has been undertaken using the computer program TRANSYT for the AM and PM peak hours to determine the operational performance of the junction if it was upgraded to a signalised junction.

The following tables summarise the effects that the proposed development and the Ardstone development will have on this junction in 2037 using the existing and predicted traffic flows shown in Appendix C – Traffic Flow Sheets. Full TRANSYT printouts are provided in Appendix G – TRANSYT Results.

The parameters shown in the tables are defined as follows:

Max Degree of Saturation (%) is a ratio of demand to capacity on each approach to the junction, with a value of 100% meaning that demand and capacity are equal and no further traffic is able to progress through the junction. Values over 90% are typically regarded as suffering from traffic congestion, with queues of vehicles beginning to form.

Queue at end of Red is the number of vehicles queued on the approach arm at the end of red.

Average Delay is the average number of seconds delay to each vehicle in the time period.

Practical Reserve Capacity is the capacity available relative to a capacity of 90%. A positive PRC indicates that a junction has spare capacity and may be able to accept more traffic. A negative PRC indicates that the junction is over capacity and is suffering from traffic congestion.

R403 / Brooklands / Capdoo Park Signalised Junction

AM Peak		2020 Base Flows	2022 + Dev Flows	2027 + Dev Flows	2037 + Dev. Flows	2037 + Dev. Flows + Sen. Flows	
R403/ Brooklands/ Capdoo Park Signalised Junction	R403 (east)	Max DoS %	35	37	44	88	97
		Mean Max Que (pcu's)	9	10	12	26	27
		Average delay (s)	15	15	19	62	77
		PRC %	157	143	103	2	-7
	Brooklands	Max DoS %	53	90	97	104	127
		Mean Max Que (pcu's)	5	11	14	17	37
		Average delay (s)	77	125	150	189	401
		PRC %	70	0	-7	-14	-29
	R403 (west)	Max DoS %	81	92	100	107	117
		Mean Max Que (pcu's)	36	50	70	91	156
		Average delay (s)	27	36	55	94	267
		PRC %	11	-2	-10	-16	-23
	Capdoo Park	Max DoS %	29	28	28	31	112
		Mean Max Que (pcu's)	3	2	2	2	25
		Average delay (s)	64	68	68	69	45
		PRC %	364	221	227	189	-20

With traffic signals activated in 2020 the signalised junction will be at capacity with queues and delays during the AM peak hour.

In 2022, 2027 and 2037 with the development in place the signalised junction will be at capacity with queues and delays during the AM peak hour.

Sensitivity testing in 2037, indicates that with the proposed residential development open, the Ardstone residential development open and the relief road open the junction will be at capacity resulting with queues and delays during the AM peak hour.

R403 / Brooklands / Capdoo Park Signalised Junction

PM Peak		2020 Base Flows	2022 + Dev Flows	2027 + Dev Flows	2037 + Dev. Flows	2037 + Dev. Flows + Sen. Flows	
R403/ Brooklands/ Capdoo Park Signalised Junction	R403 (east)	Max DoS %	83	92	98	108	140
		Mean Max Que (pcu's)	36	48	64	108	316
		Average delay (s)	28	38	52	146	531
		PRC %	8	-2	-8	-17	-36
	Brooklands	Max DoS %	26	47	53	54	87
		Mean Max Que (pcu's)	3	5	5	6	7
		Average delay (s)	67	72	73	74	107
		PRC %	244	90	71	66	3
	R403 (west)	Max DoS %	87	101	106	107	101
		Mean Max Que (pcu's)	27	44	59	67	54
		Average delay (s)	66	118	149	155	81
		PRC %	4	-11	-15	-16	-11
	Capdoo Park	Max DoS %	17	19	22	26	82
		Mean Max Que (pcu's)	2	2	2	2	8
		Average delay (s)	66	65	66	67	93
		PRC %	426	386	302	242	9

With traffic signals activated in 2019 the signalised junction will be at its capacity with queues and delays during the PM peak hour.

In 2022, 2027 and 2037 with the development in place the signalised junction will be at capacity with queues and delays during the PM peak hour.

Sensitivity testing in 2037, indicates that with the proposed residential development open, the Ardstone residential development open and the relief road open the junction will be at capacity resulting with queues and delays during the PM peak hour.

5.5 CONCLUSIONS

Junction analyses to assess the effects of traffic generated by the proposed development have been undertaken for the existing R403 / Brooklands / Capdoo Park crossroads and the existing R403 / Alexandra Walk / The Avenue roundabout. The analysis shows that:

- The existing R403 / Brooklands / Capdoo Park crossroads currently operates within capacity with minimal delays and queues during the AM and PM peak hours.
- The existing R403 / Brooklands / Capdoo Park crossroads will continue to operate within capacity with small queues and delays when the proposed development is completed in 2022, year of opening, 2027, five years after opening and in 2037, fifteen years after opening.
- Sensitivity testing of the proposed development, the Ardstone residential development with the relief road open indicates that the existing R403 / Brooklands / Capdoo Park crossroads will operate at its ultimate capacity with queues and delays during the AM and PM peak period.
- The existing R403 / Alexandra Walk / The Avenue roundabout currently operates within capacity with minimal delays and queues during the AM and PM peak hours.
- The existing R403 / Alexandra Walk / The Avenue roundabout will continue to operate within capacity with small queues and delays when the proposed development is

completed in 2022, year of opening, 2027, five years after opening and in 2037, fifteen years after opening.

- Upgrading of the existing R403 / Brooklands / Capdoo Park crossroads to a signalised junction will result in the junction being at capacity resulting in queues and delays at the junction during the AM and PM peak hours with the proposed residential development operational in 2022, 2027 and 2037.
- Sensitivity testing of the proposed development, the Ardstone residential development with the relief road open indicates that upgrading of the existing R403 / Brooklands / Capdoo Park crossroads to a signalised junction will result in the junction being at capacity resulting in queues and delays at the junction during the AM and PM peak hours in 2037.

6 PARKING

6 Parking

6.1 CAR PARKING PROVISION

A total of 514 parking spaces are to be provided within the proposed residential development including 18 parking spaces for the proposed creche development as shown on the architect's drawing contained in Appendix A – Drawings

6.2 CAR PARKING REQUIREMENTS FROM DEVELOPMENT PLAN

The 'Kildare County Development Plan 2017-2023' lists standard provision for car parking and the table below sets out those requirements in relation to the proposed development.

Car parking requirements from the Kildare County Development Plan 2017 – 2023

Parking Standards for Residential Development			
Land-use	Requirements	Quantity	Parking
Residential Dwellings	2 spaces per unit	121 Dwellings	242
Apartments / Duplex	1.5 spaces per unit + 1 visitor space per 4 apartments	212 Apartments / Duplex	371
Crèche	0.5 per staff member plus 1 per 4 children	75 children + 15 staff	26
Total			639

The Kildare County Development Plan indicates that the number of parking spaces required is 639 parking spaces.

The number of parking spaces required for the 200 apartments / duplex units was also assessed using the "Design Standards for New Apartments – Guidelines for Planning Authorities 2018".

the "Design Standards for New Apartments – Guidelines for Planning Authorities 2018" indicates that 1 car space per unit together with an element of visitor parking, such as 1 space for every 3-4 apartments should generally be required.

Therefore, using the above requirements, the table below sets out those requirements in relation to the proposed 212 apartments / duplex.

Car parking requirements from the Design Standards for New Apartments

Parking Standards for Residential Development			
Land-use	Requirements	Quantity	Parking
Apartments / Duplex	1 space per unit + 1 visitor space per 4 apartments	212 Apartments / Duplex	253
Total			253

In summary, the Kildare County Development Plan indicates that 242 parking spaces are required for the residential dwellings and the Design Standards for New Apartments – Guidelines for Planning Authorities 2018 indicates that 253 parking spaces are required for the apartments / duplex giving a total of 495 parking spaces which is adequate to cater for the parking demand of the development.

7 ROAD SAFETY, PEDESTRIANS AND INTERNAL LAYOUT

7 Road Safety, Pedestrians and Internal Layout

7.1 ROAD SAFETY

The Design Manual for Urban Roads and Streets indicates that for a 50km/h speed limit a sightline of 45m at a 2m set-back shall be achieved in both directions.

At the proposed residential access and at the proposed creche access onto Brooklands access road a 45m sightline at a 2m set-back can be achieved in both directions. The visibility splay to the north and south of the proposed accesses is measured from a 2m set-back to the nearside kerb of the road.

7.2 PEDESTRIANS

A 2m wide footpath will be provided internally to cater for pedestrian movement within the development. The proposed internal footpaths within the development will connect to the existing footpath located on Brooklands access road and the existing footpaths located on Alexandra Walk access road.

7.3 INTERNAL LAYOUT

Within the development the spine road is 6m wide.

Parking is provided for each residential dwelling. Parking for Apartments is located adjacent to each apartment block. Parking bays are 2.5m wide x 5m long.

HGV access to the site will be via the proposed access onto Brooklands access road and via Alexandra Walk. The types of HGV's accessing the site would be emergency vehicles and a bin lorry. The internal layout can facilitate HGV movement within the site.

8 CONCLUSIONS AND SUMMARY

8 Conclusions

The main conclusions of this study are summarised as follows:

- The existing R403 / Brooklands / Capdoo Park crossroads currently operates within capacity with minimal delays and queues during the AM and PM peak hours.
- The existing R403 / Brooklands / Capdoo Park crossroads will operate within capacity with small queues and delays when the proposed development is completed in 2022, year of opening, 2027, five years after opening and in 2037, fifteen years after opening.
- Sensitivity testing of the proposed development, the Ardstone residential development with the relief road open indicates that the existing R403 / Brooklands / Capdoo Park crossroads will operate at its ultimate capacity with queues and delays during the AM and PM peak period.
- The existing R403 / Alexandra Walk / The Avenue roundabout currently operates within capacity with minimal delays and queues during the AM and PM peak hours.
- The existing R403 / Alexandra Walk / The Avenue roundabout will operate within capacity with small queues and delays when the proposed development is completed in 2022, year of opening, 2027, five years after opening and in 2037, fifteen years after opening.
- Upgrading of the existing R403 / Brooklands / Capdoo Park crossroads to a signalised junction will result in the junction being at capacity resulting in queues and delays at the junction during the AM and PM peak hours with the proposed residential development operational in 2022, 2027 and 2037.
- Sensitivity testing of the proposed development and the Ardstone residential development with the relief road open indicates that upgrading of the existing R403 / Brooklands / Capdoo Park crossroads to a signalised junction will result in the junction being at capacity resulting in queues and delays at the junction during the AM and PM peak hours in 2037.
- The development provides adequate car parking spaces when assessed in accordance with the Kildare county development plan and the Design Standards for New Apartments – Guidelines for Planning Authorities 2018. Facilities for pedestrians are included in the internal layout.
- Sightlines at the proposed accesses onto Brooklands road are in compliance with the Design Manual for Urban Roads & Streets.

Summary

The existing R403 / Brooklands / Capdoo Park crossroads currently operates within capacity with a maximum RFC value of 0.26 in the AM peak. The proposed development will generate an additional 187 trips in the AM peak and 192 trips in the PM peak.

As a result of increased flows generated by the proposed development and an increase in the background flows the existing R403 / Brooklands / Capdoo Park crossroads will operate within capacity with a maximum RFC value of 0.58 in the AM peak, in 2037, fifteen years after the development has been completed.

The development of the Ardstone residential site will result in the construction of a relief road that will provide a connection from the existing R403 / Brooklands / Capdoo Park crossroads to the R407 / L5078 priority junction. As a result of increase flows generated by the Ardstone residential development and with the proposed residential development operational in 2037 the existing R403 / Brooklands / Capdoo Park crossroads will operate at its ultimate capacity with a maximum RFC value of 1.53 in the AM peak.

Currently traffic signals are provided at the junction however they are not operational at present. Analysis was carried out on the signals in order to determine capacity of the junction if the traffic signals were operational.

The capacity analysis indicated that if the junction operated as a signalised junction it would result in queues and delays with and without the proposed development in place during the AM and PM peak hours.

In terms of road safety, the visibility splays at the existing access from Brooklands onto the R403 are in compliance with the Design Manual for Urban Roads and Streets. In addition, adequate pedestrian facilities are provided at the existing junction to cater for pedestrian movement.

APPENDICES

APPENDIX A – DRAWINGS

APPENDIX B – TRAFFIC COUNTS

APPENDIX C – TRAFFIC FLOW SHEETS

APPENDIX D – TRICS INFORMATION

APPENDIX E – PICADY RESULTS

APPENDIX F – ARCADY RESULTS

APPENDIX F – TRANSYT RESULTS