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Canterbury VISUM Model Option Tests

2026 Do-Minimum Model Summary Note

June 2012

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Document Control Sheet

BPP 04 F8
Version 7 April 2011

Client: Canterbury City Council
Project: Canterbury
Job No: B1806100
Document Title: 2026 Do – Minimum Model Summary Note

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	Document Status	DRAFT		

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DATE June 2012	INITIALS [redacted]	INITIALS [redacted]	INITIALS [redacted]	INITIALS [redacted]
	Document Status	Draft		

REVISION	NAME	NAME	NAME	NAME
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	Document Status			

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DATE	INITIALS	INITIALS	INITIALS	INITIALS
	Document Status			

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Contents

1 Introduction

1.1 Introduction

Jacobs UK Ltd were appointed in May 2008 by Kent County Council (KCC) in association with Canterbury City Council (CCC) to develop a VISUM transport model of Canterbury City and its satellite towns to support the Local Development Framework (LDF) process. It is a 4-stage multimodal transport model developed to assess demand from car travel, commercial road vehicles, park & ride, bus and rail services.

The study area is shown in **Figure 1-A**.

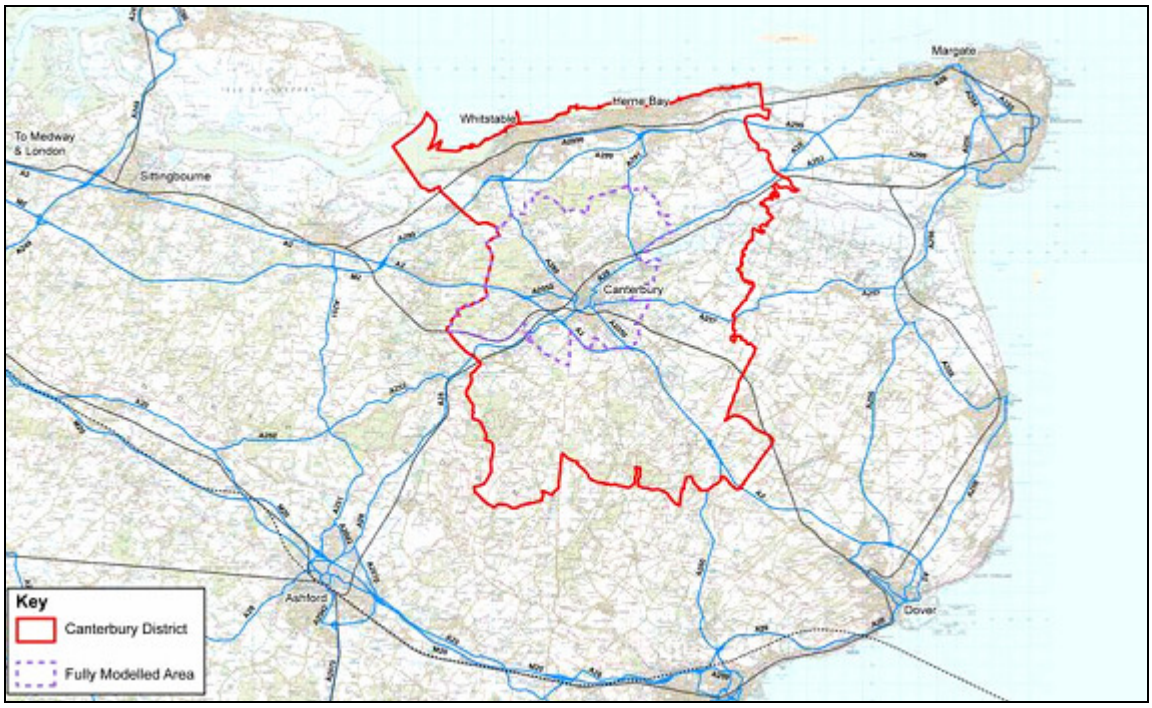


Figure 1-A Study area

Canterbury City Council commissioned Jacobs to develop forecast year models for 2026. The 2026 Do-minimum scenario will act as the benchmark for option testing.

This note details the development assumptions and transport measures included in the 2026 Do Minimum model, the processes involved and a summary of preliminary output from the model.

2 Trip Ends and Reference Matrix

2.1 Outline

The development of the 2026 Do Minimum model involved creating trip-ends from forecast land-use data and trip rates/TEMPRO. These trip-ends with the base trip-ends are used to create a reference matrix. This is followed by running the demand model and assignment.

Trip-ends were created for both the internal zones (fundamentally Canterbury District) and the external zones (rest of Kent and beyond). This is for all trip movements except through-traffic ('external to external') and LGV/HGVs. For these exceptions the base matrices were growthed using TEMPRO and NRTF (National Road Traffic Forecast). TEMPRO is a database reflecting the National Trip End Model.

For the internal zones the trip-ends are calculated by adjusting the base trip-ends, with demographic and car-ownership forecasts ('background growth') and adding to trip ends from the forecast land-use data. For the external zones the trip-ends, ignoring 'through-traffic' as mentioned, are the base trip-ends growthed by local factors derived from the TEMPRO database.

2.2 Land-use

The land-use provided by Canterbury County Council (CCC) was the planning permissions (P) data from 2008-11, future housing permissions data (2011-16) and the current expected future allocations (A). The total quantum is approximately 5,000 houses and 285,000 sqm of commercial development. Commercial data is broken down further as differing trip rates are required; with most of the allocation being approximately 180,000 sqm of B1. The data is summarised in **Table 2-A**., and broken down in **Appendix A**

A couple of amendments were incorporated in discussions with CCC. Little Barton Farm (70,000sqm) was excluded from the allocations, and two 'Development Principles' sites were added at St Martin's hospital and Kingsmead Field. All development has been assumed complete by 2026.

Households (P)	Households (A)	Commercial (P)	Commercial (A)
3,600 (including 1,700 between 2008-11)	1,300 (including 'Development Principles' sites	170,000sqm (including 35,000sqm between 2008-11)	115,000sqm

Table 2-A Land-use data for Do-minimum (rounded values)

2.3 Trip Ends

The land-use data is converted to trip-ends by established trip rates. The trip rates used are based on TRICS, a database which provides departures/arrivals for varying land-uses. As TRICS is predominantly for highway-trips and is not by journey purpose, estimates were applied for creating public transport trip-ends and the disaggregation to journey purpose.

The journey purposes are Home-based work (HBW), Home-based other (HBO), Non-home base other (NHBO) and Employer's Business (EB). There is also a further disaggregation of home-based other into education and non-education which occurs after this stage.

The dominant highway rates, household departures and B1 arrivals for the AM and B1 departures and household arrivals for the PM, are given as **Table 2-B**.

	HBW	HBO	NHBO	EB
Household per unit (AM departures)	0.35	0.31	0.01	0.02
B1 per 100sqm (AM arrivals)	2.11	0	0.04	0.18
B1 per 100sqm (PM departures)	1.95	0	0.10	0.10
Household per unit (PM arrivals)	0.39	0.35	0.01	0.02

Table 2-B Highway Trip Rates (3hr peak periods)

The generated trip-ends are given in **Table 2-C**.

	AM	PM
Highway HBW Departures	2257	4420
Highway HBO (education) Departures	797	579
Highway HBO (non-education) Departures	824	1111
Highway NHBO Departures	167	179
Highway EB Departures	642	523
Highway HBW Arrivals	4116	2575
Highway HBO (education) Arrivals	2156	1731
Highway HBO (non-education) Arrivals	318	182
Highway NHBO Arrivals	384	210
Highway EB Arrivals	352	541
Bus HBW Departures	147	269
Bus HBO (education) Departures	12	67
Bus HBO (non-education) Departures	44	18
Bus HBW Arrivals	289	144
Bus HBO (education) Arrivals	16	47
Bus HBO (non-education) Arrivals	40	19
Rail HBW Departures	247	492
Rail HBO (education) Departures	3	19
Rail HBO (non-education) Departures	12	2
Rail HBW Arrivals	483	308
Rail HBO (education) Arrivals	7	13
Rail HBO (non-education) Arrivals	9	3

Table 2-C Trip Ends (3hr peak periods)

2.4 Reference matrix

Reference matrices were created from the trip-ends by the means of furnessing the base matrix to the reference trip-ends making appropriate adjustments for the local development profile. Matrices were created by time-peak, journey-purpose and mode.

2.5 Assignment and network

These matrices are assigned to the 2026 Do-minimum network to extract 'cost-skim' information for the demand model. The output from the demand model is the basis for the final assignment of trips.

The 2026 Do-minimum network is the base network plus committed alterations. The changes incorporated were the completed Wincheap London-bound on-slip, the proposed Westgate Towers bus-gate, and the proposed Wincheap Relief Road and mini-gyratory. There are also public transport changes with the HS1 domestic services, increases in bus frequencies and the Sturry Road bus lane.

For the 2026 Do Minimum model the Wincheap Relief Road has been modelled based on an outline concept and preliminary assumptions about route standards, junctions etc. Network performance may indicate the necessity to revise or modify these assumptions for subsequent model runs. Similarly the remodelling of the network around the Westgate Towers may also highlight parts of the highway that may need revisiting.

3 Demand Model / Final Assignment / Output

3.1 Demand Model

The demand model facilitates adjustment of the reference matrices based on differences in utility. The distribution and mode-choice of the trips are both represented in the demand model.

In addition to the demand model, a subsequent mode choice stage to determine Park-and-Ride mode choice is undertaken. This stage incorporates the existing three sites and a new fourth Park-and-Ride site at Harbledown.

3.2 Final Assignment / Output

After the completion of the Park-and-Ride (P&R) model the final assignment is available for interrogation. The key model outputs that have been extracted from the Do Minimum model are travel demand, mode choice, traffic flows and travel times. Additional data can be extracted for comparison with subsequent options to be tested.

3.2.1 Travel Demand

The total travel demand, including highway and public transport trips, within the 2026 Forecast models increase by 9% to 10% compared to the Base models (**Table 3-A**). Highway travel demand increases by 8% to 10% while trips by public transport increase by 15% to 16%.

	AM Peak			PM Peak		
	Highway	Public Transport	Total	Highway	Public Transport	Total
Base Model	30426	3525	33951	29796	2803	32599
2026 Do Minimum	32796	4045	36849	32729	3260	35989
% change	7.8%	15.0%	8.5%	9.8%	16.3%	10.4%

Table 3-A Base Model and 2026 Do Minimum Model Mode Choice (person trips)

3.2.2 Mode choice

The Home-based Work (HBW) and Home-based Other (HBO) journey mode choice results for the 2026 Do Minimum models compared to the base models are summarised in **Table 3-B**.

	AM Peak			PM Peak		
Base Model	**Car**	**Bus**	**Rail**	**Car**	**Bus**	**Rail**
HBW	96%	3%	1%	94%	4%	2%
HBO	76%	18%	6%	88%	7%	5%
2026 Do Minimum Model	**Car**	**Bus**	**Rail**	**Car**	**Bus**	**Rail**
HBW	95%	3%	2%	91%	7%	2%
HBO	78%	17%	5%	88%	7%	5%

Table 3-B Base Model and 2026 Do Minimum Model Mode Choice (person trips)

The 2026 Do Minimum model mode choice indicates that over 90% of the Home-based Work (HBW) person trips are made by car. A lower proportion of the Home-based Other (HBO) trips are made by car, balanced by a higher proportion of bus and rail trips. There is a small shift in the PM peak proportion of HBW trips made by car and bus compared to the Base Model.

The car demand is split into car-all-the-way and P&R groups. This demand is then assigned to the network. **Table 3-C** summarises the total car trips and indicates the proportion of car trips that are diverted to the park and ride sites.

	AM Peak			PM Peak		
	All Car trips	P&R car trips	% car trips to P&R	All Car trips	P&R car trips	% car trips to P&R
Base Model	28513	827	2.9%	27729	879	3.2%
2026 Do Minimum	30050	1560	5.2%	29778	1199	4.0%

Table 3-C Base Model and 2026 Do Minimum Model - Park and Ride Trips

3.2.3 Trip Purpose

Table 3-D summarises the composition of trips in the AM and PM peak for the Base Model and 2026 Do Minimum model. The trips purposes reflect the travel demand generated by the existing land use and anticipated development.

There is an overall increase of 20% in home based person trips in the AM peak and 18% in the PM peak. The largest increase is in HBO trips.

	AM Peak			PM Peak		
	HBW	HBO	Total	HBW	HBO	Total
Base Model	68976	9851	78826	66048	12198	78247
2026 Do Minimum	82118	12436	94554	75336	17248	92584
% change	19%	26%	20%	14%	41%	18%

Table 3-D

3.2.4 Link Flows

Flows have been extracted on selected links which make up representative Inner and Outer Cordons around Canterbury itself. These cordons, which pick up the radial routes including those from Whitstable and Herne Bay provide an indication of the pattern of inbound and outbound movement to Canterbury. The cordons are shown in **Figure 3-A** and their total flows are summarised in **Table 3-E**.

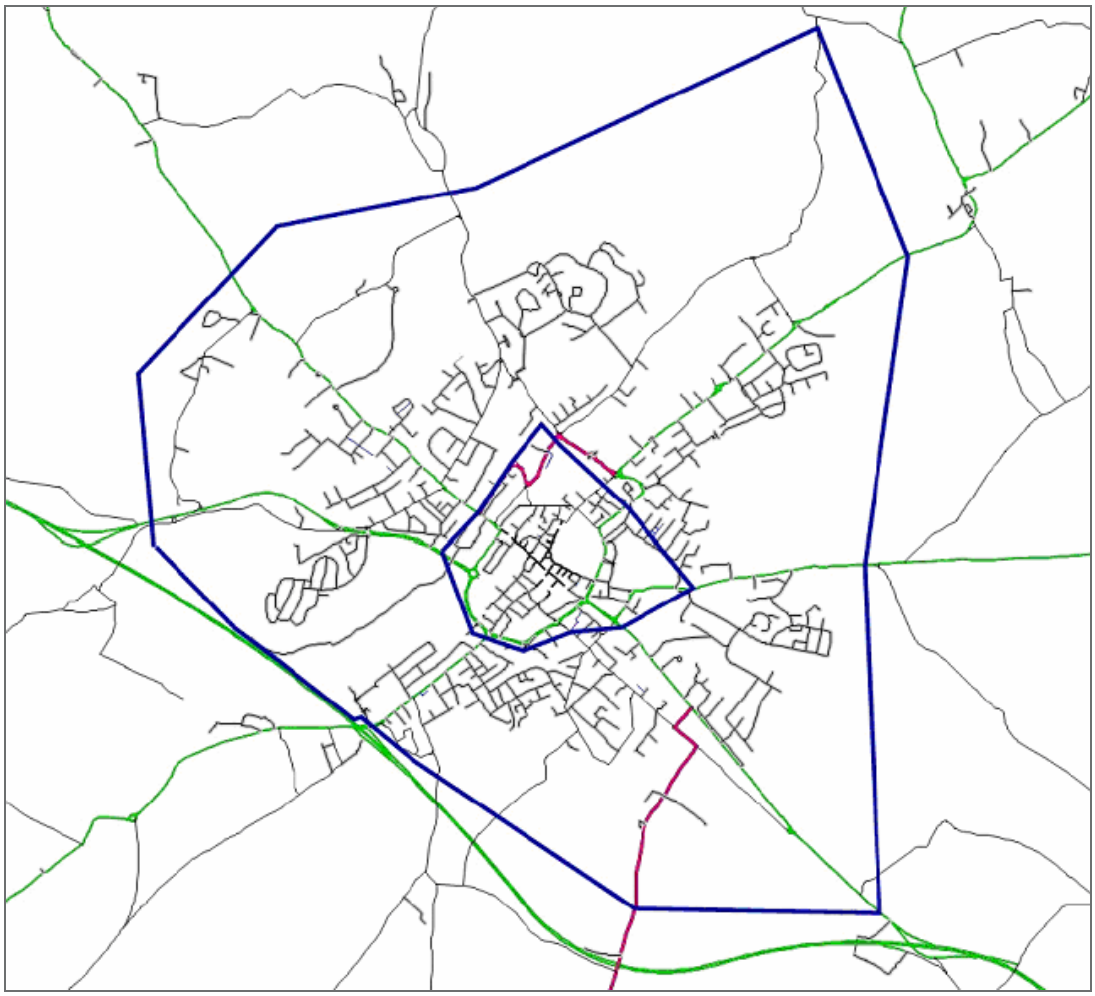


Figure 3-A Cordons

	Base		2026	
Inner Cordon	**AM**	**PM**	**AM**	**PM**
Inner Inbound	7500	5900	7900	6200
Inner Outbound	5900	6700	7000	7400
Outer Cordon	**AM**	**PM**	**AM**	**PM**
Outer Inbound	9300	4500	10300	5500
Outer Outbound	4400	8000	5500	8400

Table 3-E Base model and 2026 Do Minimum model Cordon flows

Inbound traffic is higher than the outbound traffic in the AM peak for both cordons in the Base model and the 2026 Do Minimum model. The reverse is true for the PM peak for both cordons. The highest peak demand is inbound in the AM peak, crossing the outer cordon. This would suggest that the basic pattern of traffic demand appears to remain reasonable stable. **Table 3-F** shows the % change in traffic volumes crossing the inner and outer cordons between the Base and 2026 Do minimum model. The inner cordon inbound flows increase by between 5 and 6% in the AM and PM peak periods while the outbound movements increase by up to 18%.

The outer cordon indicates significant increase in traffic volumes of 26% outbound in the AM peak and 23% inbound in the PM peak.

	% Change from Base model	
	AM	**PM**
Inner Inbound	6%	5%
Inner Outbound	18%	10%
Outer Cordon	**AM**	**PM**
Outer Inbound	11%	23%
Outer Outbound	26%	5%

Table 3-F Percentage change in Cordon flows

3.2.5 Travel Times

Travel times provide a useful indication of network performance. Travel times have been extracted on key radial routes to the city centre for the Base year and 2026 Forecast year models are summarised in **Table 3-G** and **Table 3-H** below.

	Route	Direction	Base model (mins:secs)	2026 Do MIn (mins:secs)	Difference (mins:secs)
1	A2050 Harbledown	EB	07:01	08:14	01:13
		WB	01:59	02:13	00:14
2	A290 Whitstable Rd	SB	05:33	07:05	01:32
		NB	04:46	17:56	13:10
3	Tyler Hill	SB	03:11	04:13	01:02
		NB	02:43	02:45	00:02
4	Broad Oak Road	WB	03:14	04:09	00:55
		EB	02:29	02:30	00:01
5	A28 Sturry Rd	WB	06:31	07:10	00:39
		EB	03:29	05:42	02:13
6	A28 Wincheap	EB	07:52	09:40	01:48
		WB	02:57	04:45	01:48
7	A2050 New Dover Rd	NB	07:56	11:48	03:52
		SB	03:44	03:57	00:13
8	Old Dover Road	NB	05:35	07:20	01:45
		SB	04:50	09:34	04:44
9	A257 Littlebourne Rd	WB	15:23	19:00	03:37
		EB	04:18	05:25	01:07

Table 3-G Base model and 2026 Do Minimum model Journey Times – AM Peak

	Route	Direction	Base model (mins:secs)	2026 Do Mln (mins:secs)	Difference (mins:secs)
1	A2050 Harbledown	EB	02:24	04:06	01:42
		WB	02:52	03:57	01:05
2	A290 Whitstable Rd	SB	03:49	03:38	-00:11
		NB	03:35	05:32	01:57
3	Tyler Hill	SB	03:01	04:09	01:08
		NB	02:55	03:16	00:21
4	Broad Oak Road	WB	02:34	02:41	00:07
		EB	03:06	03:32	00:26
5	A28 Sturry Rd	WB	03:50	15:52	12:02
		EB	03:42	11:57	08:15
6	A28 Wincheap	EB	08:30	14:15	05:45
		WB	04:59	25:33	20:34
7	A2050 New Dover Rd	NB	04:08	09:11	05:03
		SB	04:58	10:14	05:16
8	Old Dover Road	NB	05:51	10:40	04:49
		SB	04:44	07:11	02:27
9	A257 Littlebourne Rd	WB	06:08	11:34	05:26
		EB	04:20	05:19	00:59

Table 3-H Base model and 2026 Do Minimum model Journey Times – PM Peak

The majority of the routes selected show a general increase in travel time in the 2026 forecast scenario. This reflects the additional travel demand on the network in 2026 and indicates areas where the network is coming under pressure.

The difference in travel times between the base year and 2026 forecast year vary with direction, route and time of day. These times reflect not only changes in the quantity and type of travel demand but also the traffic rerouting in response to the 2026 network changes ie Wincheap, A2 on slip and Westgate Towers.

The A290 Whitstable Road has a minor decrease in travel time of 11 seconds southbound in the PM peak. Northbound travel time increases significantly in both peak periods as traffic reroutes around the town to avoid the Westgate Towers.

Travel times for the A28 Wincheap are significantly higher in the PM peak especially in the westbound direction. This is a consequence of delays along the altered route around Wincheap and the combination of traffic movements out of town and around the retail zones.

3.2.6 Level of Congestion

The level of congestion and traffic pressure across the highway network is reflected in the volume of traffic on the links and the extent of junctions delay. This is most clearly illustrated in plots showing link flow volume to capacity ratio and plots showing average turning delays at junctions.

The ratio of traffic volume to link capacity across the network provides a useful indication of the traffic pressure. Plots showing link volume to capacity ratio for the base and forecast models are shown in **Appendix C**.

Links with significant levels of traffic approaching their assumed operational capacity (65 to 85%) are shown in green. Links with issues of congestion and flows between 85 and 95% of their assumed operational capacity are shown in orange and links with significant congestion and flows in excess of capacity are shown in red.

Plots showing the average turn delay at junctions are housed in **Appendix D**. Junctions with average turn delays between 1 and 2 minutes are highlighted in yellow, those with average delays between 2 and 3 minutes are shown in orange and junctions with delays over 3 minutes are shown in red.

It should be noted that in some locations junctions in close proximity and smaller links may be obscured.

The level of congestion and traffic pressure across the highway network is reflected in the volume of traffic on the links and the extent of junction delay. There is an increase in the number of links highlighted as having significant volumes of traffic compared to the base and also an increase in the number of junctions with higher levels of turning delay. Different sections of the network are affected by high levels of flow and longer turning delays in the AM and PM peaks.

4 Summary

The existing highway network in Canterbury is already under significant pressure with high volumes of traffic during the peak periods. Additional housing, retail and employment based development already planned will inevitably generate additional travel demand and stress on the highway network. Travel delay and congestion create a poor environment for the local economy. The objective for the future will be to optimise the use of highway and public transport networks to enable people to travel around in the most convenient and efficient way, maintaining a health economy for Canterbury.

The Forecast Do Minimum models have been developed to include planned development and infrastructure improvements expected to be in place by 2026. These models will provide a benchmark against which alternative forecast scenarios can be assessed.

The 2026 Do Minimum total travel demand, on the highway and by public transport, increases by around 10% compared to the base models and this increase is reflected in the highway demand. However public transport sector increases by around 16% as a significant number of trips are attracted to bus and rail.

Across the 2026 models there is an overall increase in travel time compared to the base as may be expected. There are differences between the AM peak and PM peak travel times on the routes selected. The pattern of travel across the network is impacted on by the quantity and nature of travel demand in the AM and PM peaks as well as by the modifications to the infrastructure and provision of Park and Ride facilities. The forecast model includes changes to routing around the Westgate Towers to limit car access, a Wincheap Relief Road and the northbound A2 on-slip from the A28 which were not included in the base model. These schemes will have an impact on the choice of routes available for traffic.

Congestion on the network and the provision of an additional park and ride site contribute to the increase in the proportion of car trips diverting to park and ride. 2026 Park and Ride trips account for around 5% of total car trips to the city in the peak period.

The increase in the level of congestion and delay across the network in the 2026 Do Minimum models is evident. The composition of trips in the AM and PM peak models differs and this is reflected in the different impact of the increase in travel demand on the network.

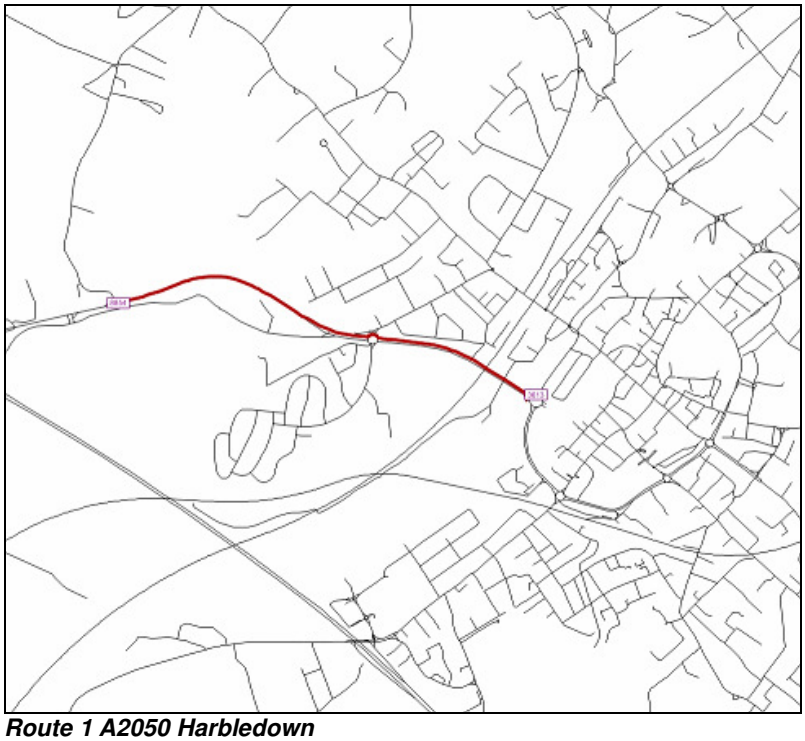
From a modelling perspective, the target for the forecast options to be tested will be to cater for the maximum travel demand while minimising the impact on the highway network. This will reflect the most efficient use of the network.

Appendix A Land-use

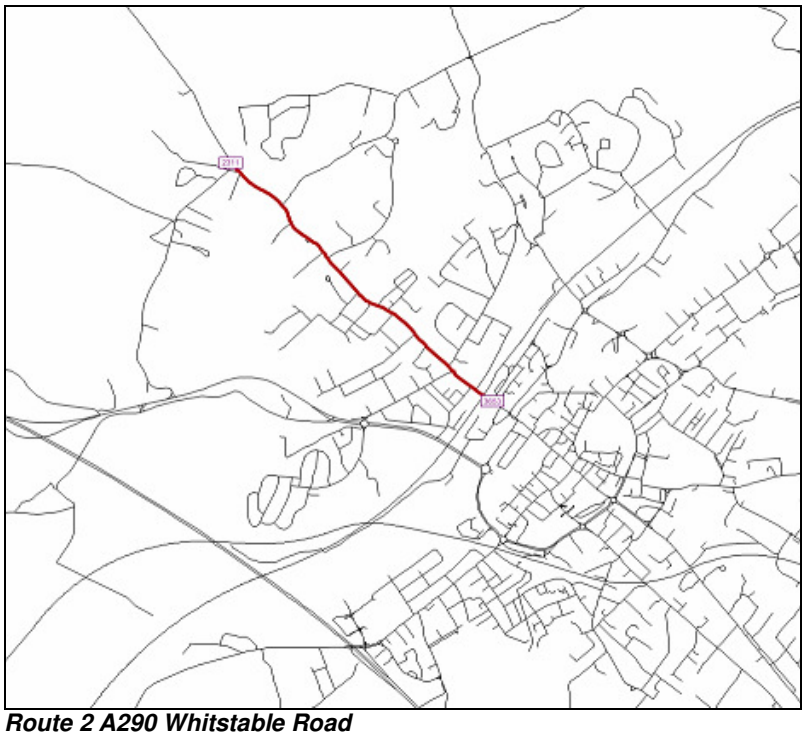
Land use	Quantum (housing units or commercial sqm)
Houses (completions)	1675
Houses (permissions)	1955
Houses (allocations)	1058
Houses (development principles)	300
B1 Completions	30938
B2 Completions	1857
B8 Completions	1567
A1 permissions	743
A2 permissions	5652
B1 permissions	65488
B2 permissions	23656
B8 permissions	33087
CD permissions	7138
A1 allocations	0
A2 allocations	0
B1 allocations	74044
B2 allocations	0
B8 allocations	37089
CD allocations	2976

Breakdown of land-use as processed by Jacobs.

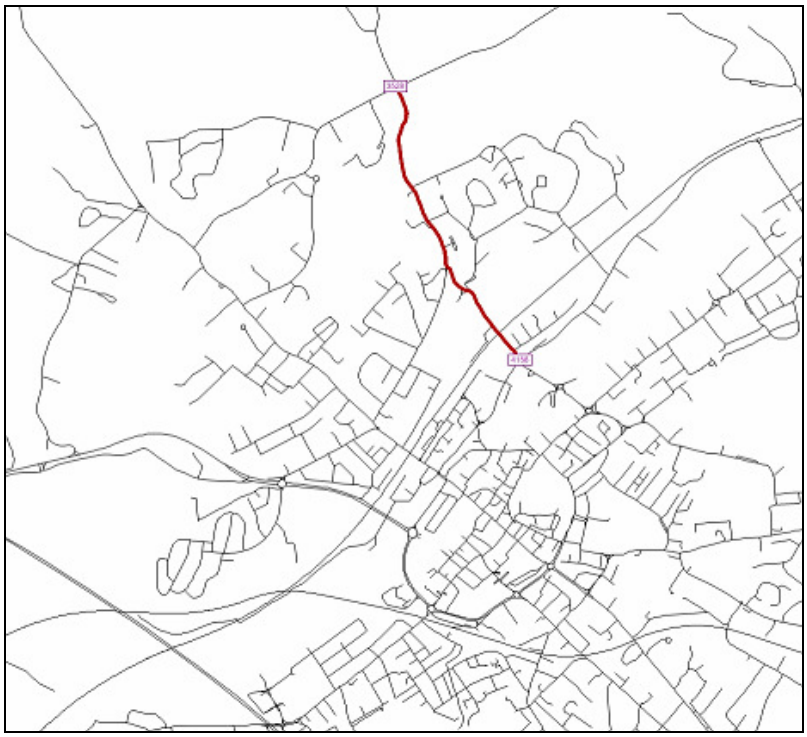
Appendix B Travel Time Routes



Route 1 A2050 Harbledown

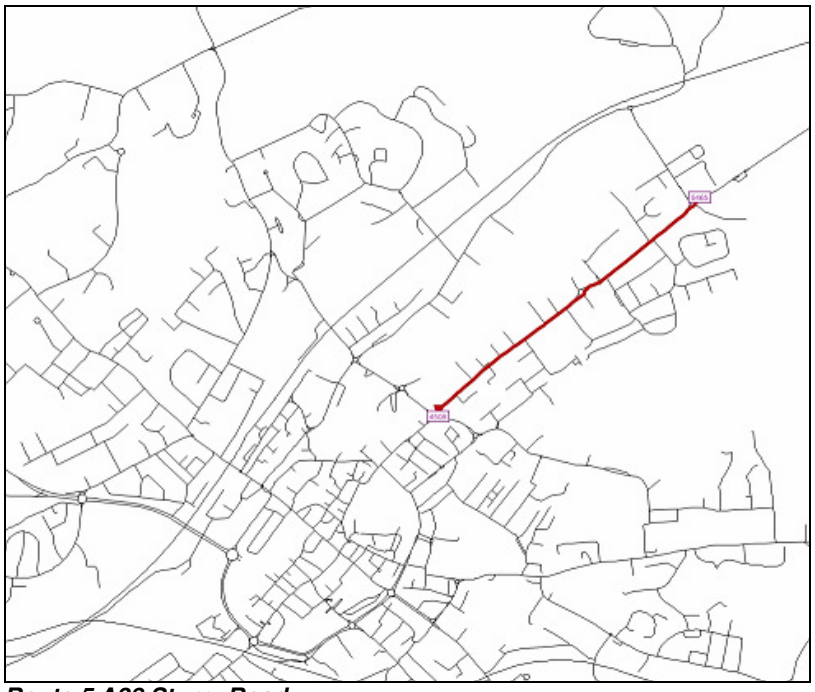


Route 2 A290 Whitstable Road

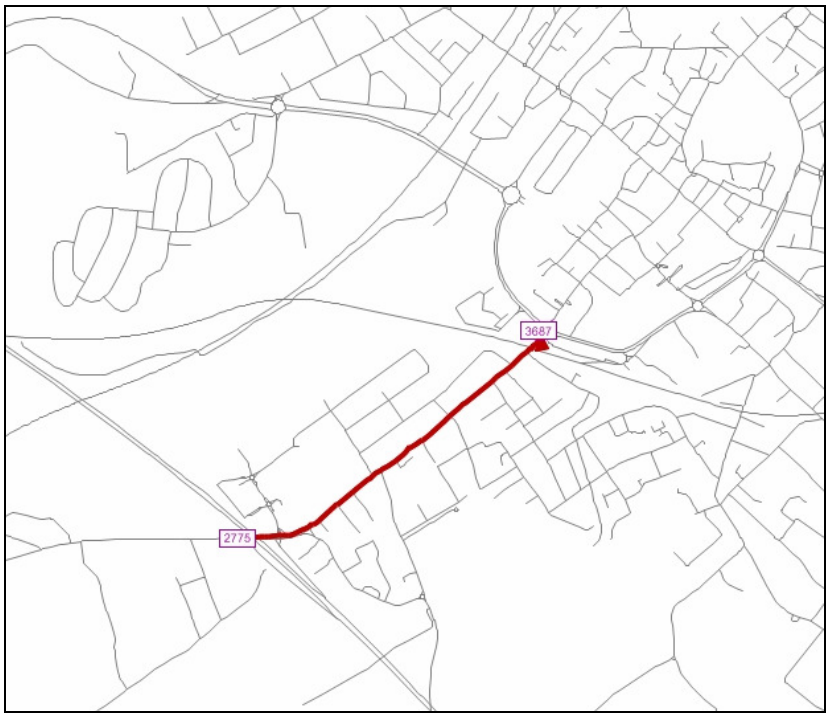


Route 3 Tyler Hill

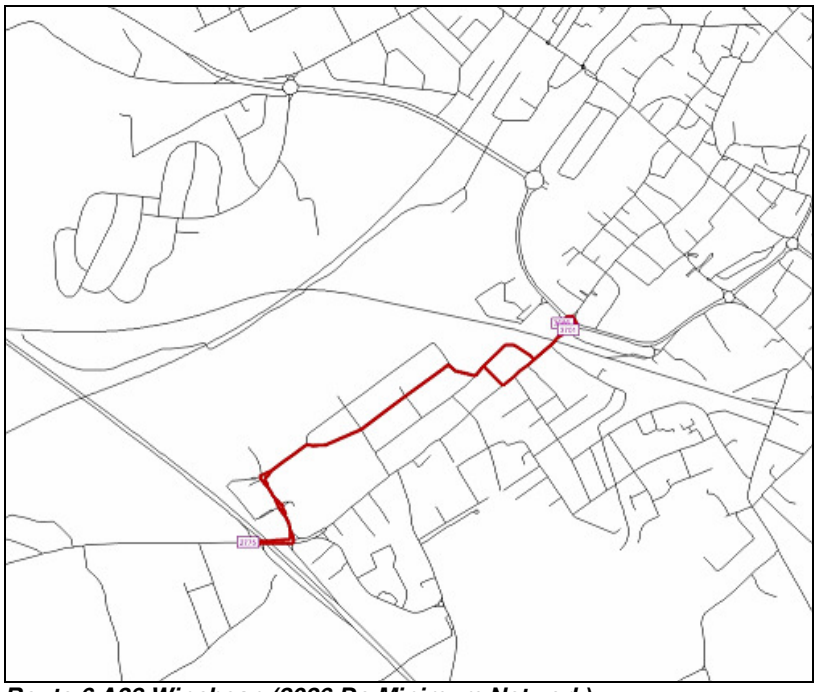
Route 4 Broad Oak Road



Route 5 A28 Sturry Road

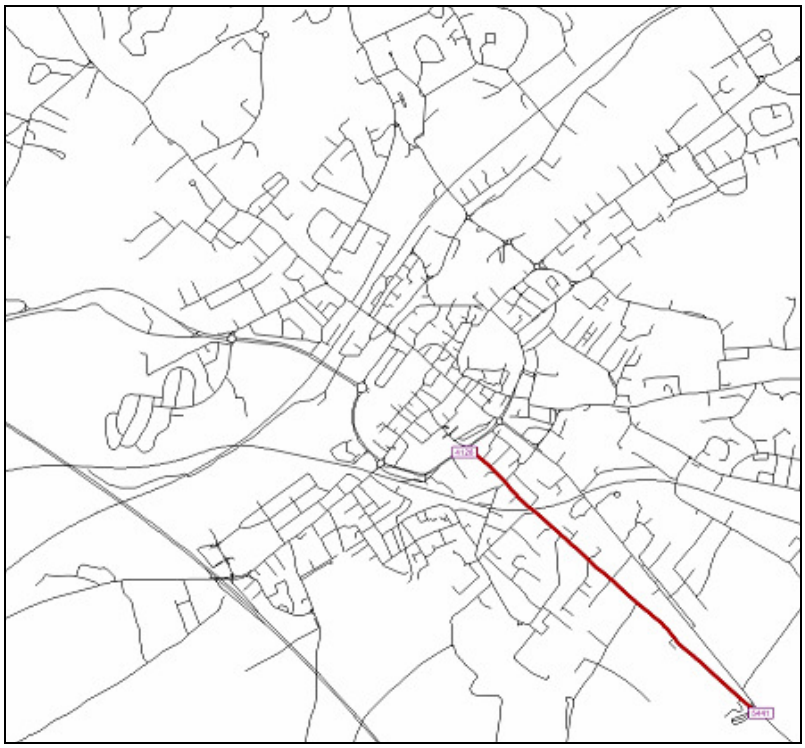


Route 6 A28 Wincheap (base model)

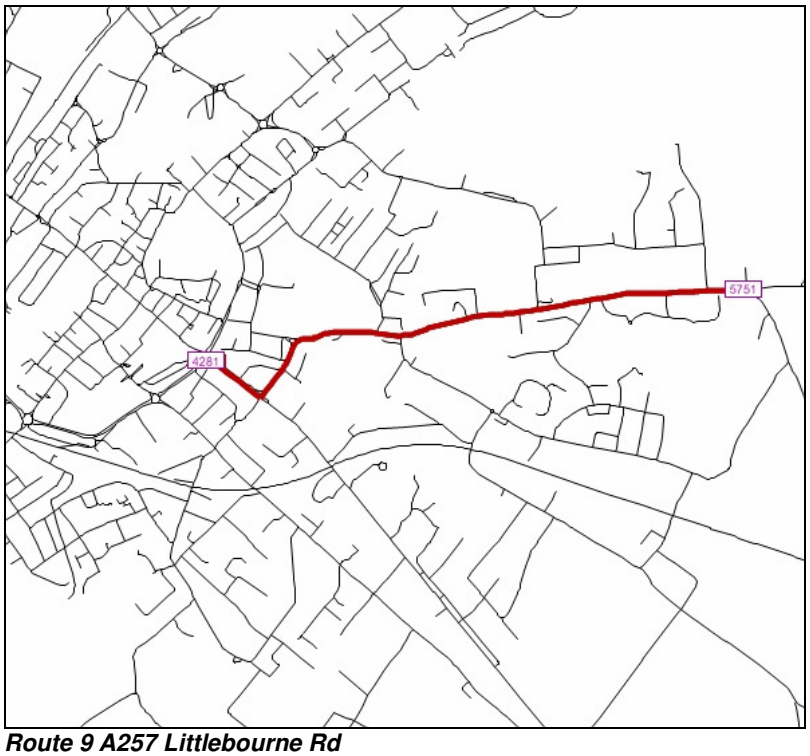


Route 6 A28 Wincheap (2026 Do Minimum Network)

Route 7 A2050 New Dover Road

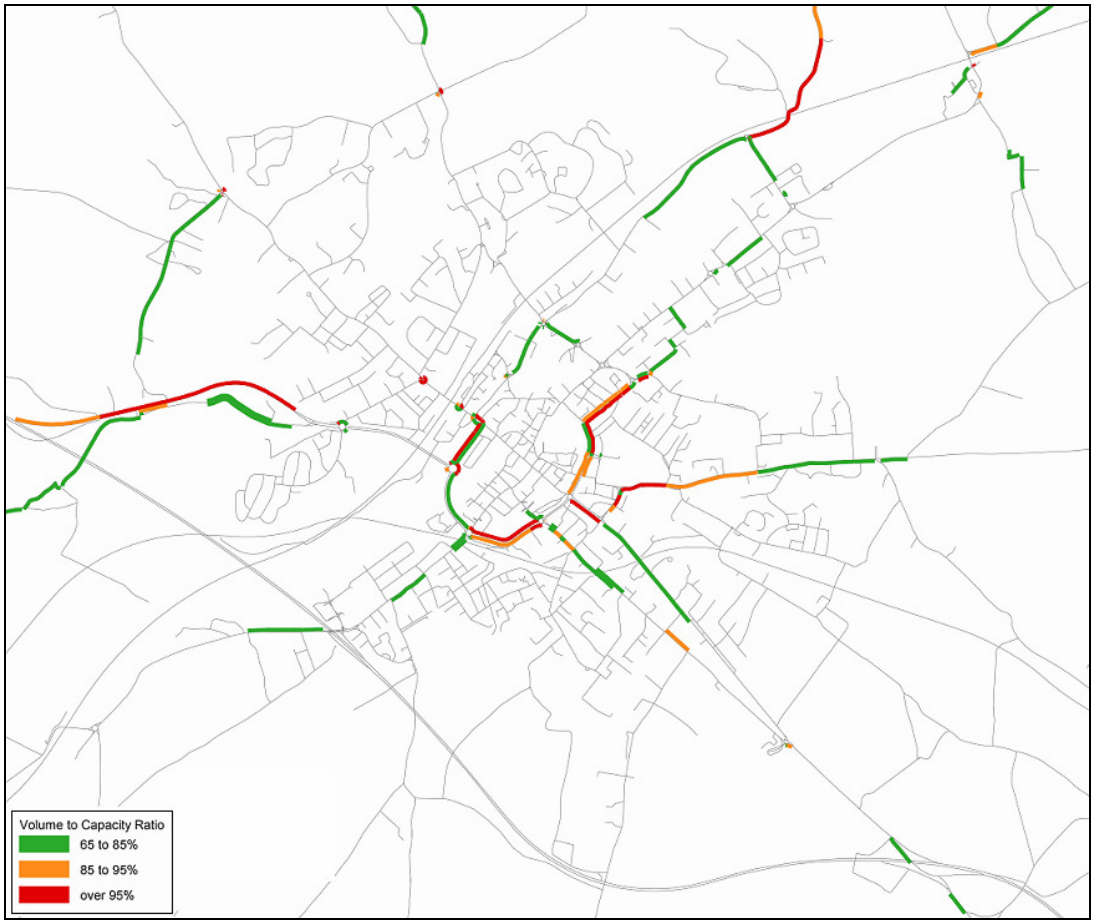


Route 8 Old Dover Road

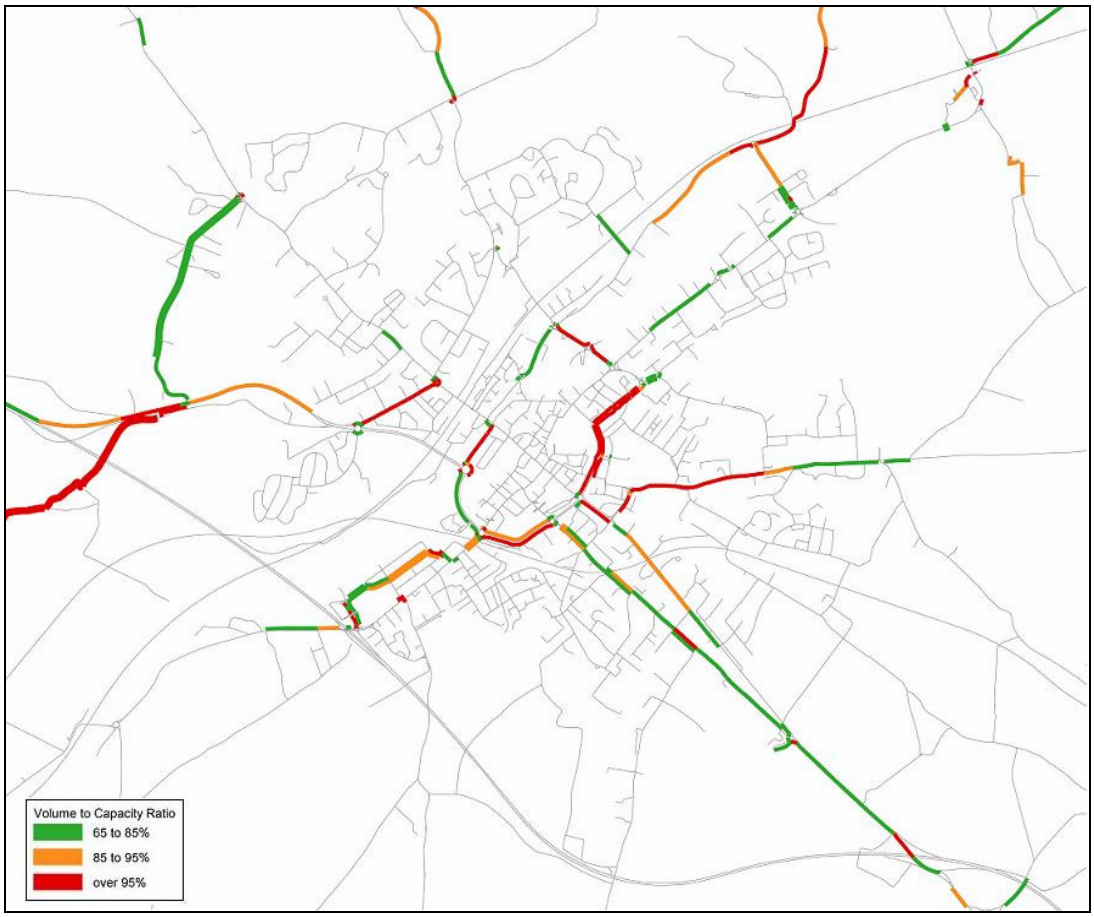


Route 9 A257 Littlebourne Rd

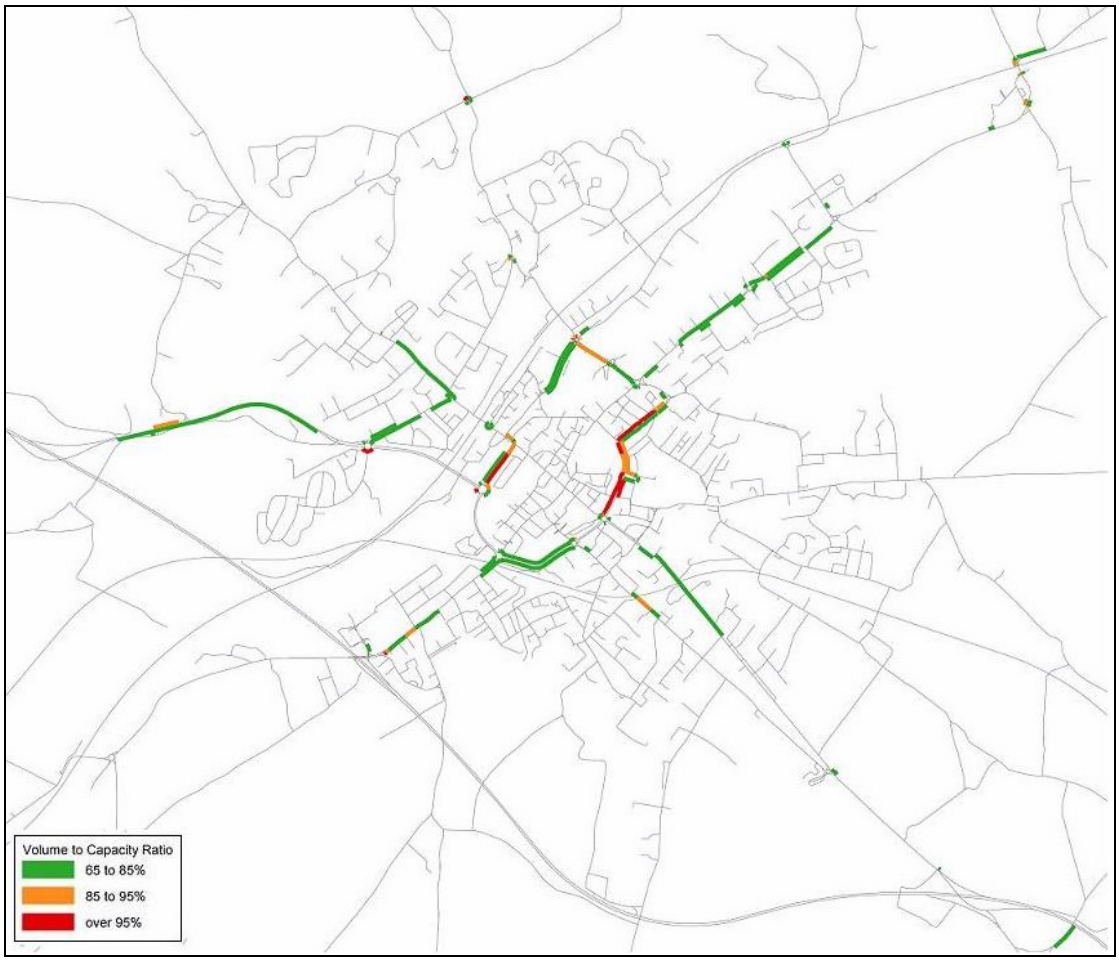
Appendix C Link Volume to Capacity Ratio



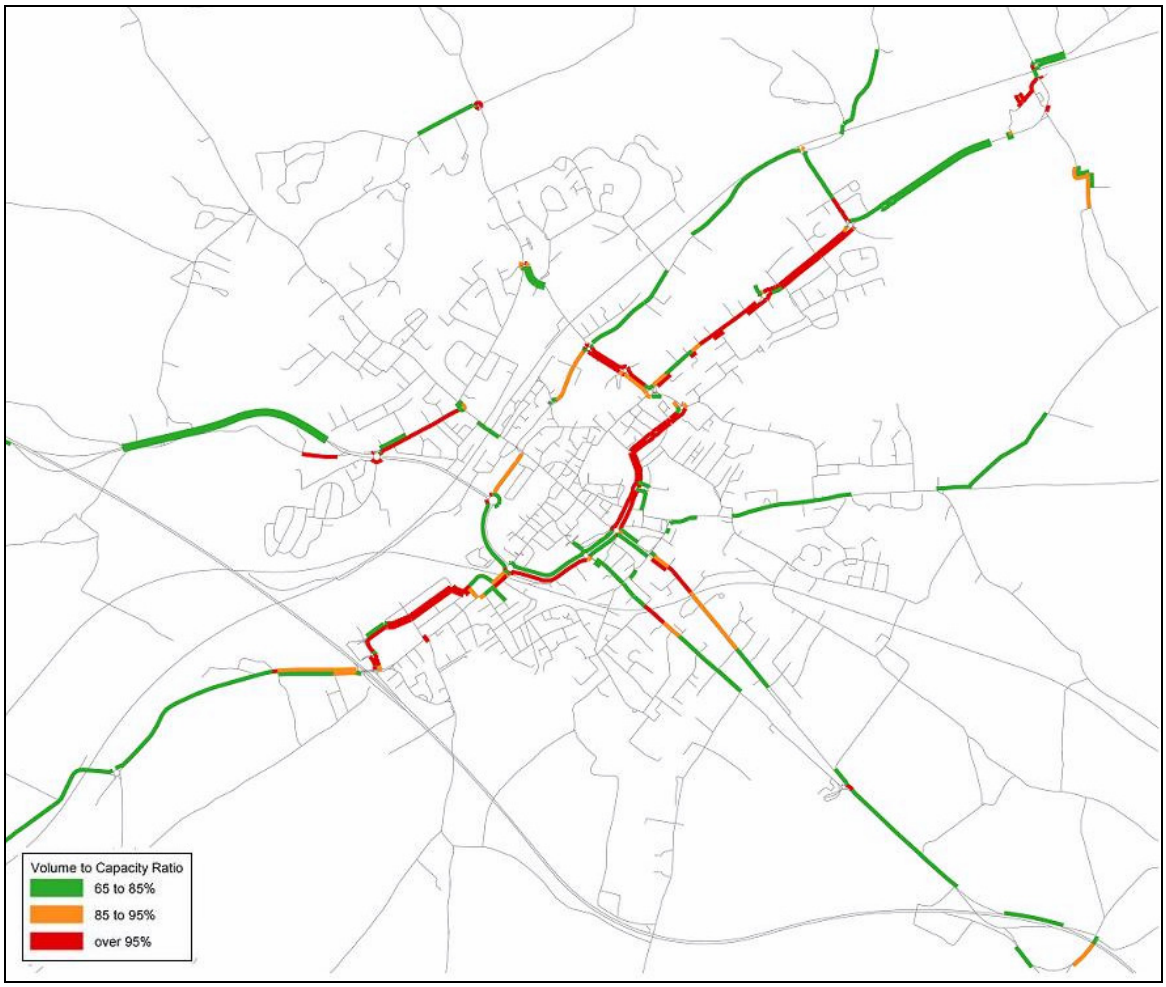
Link Volume to Capacity AM Base



Link Volume to Capacity AM 2026



Link Volume to Capacity PM Base



Link Volume to Capacity PM 2026

Appendix D Junction Delay

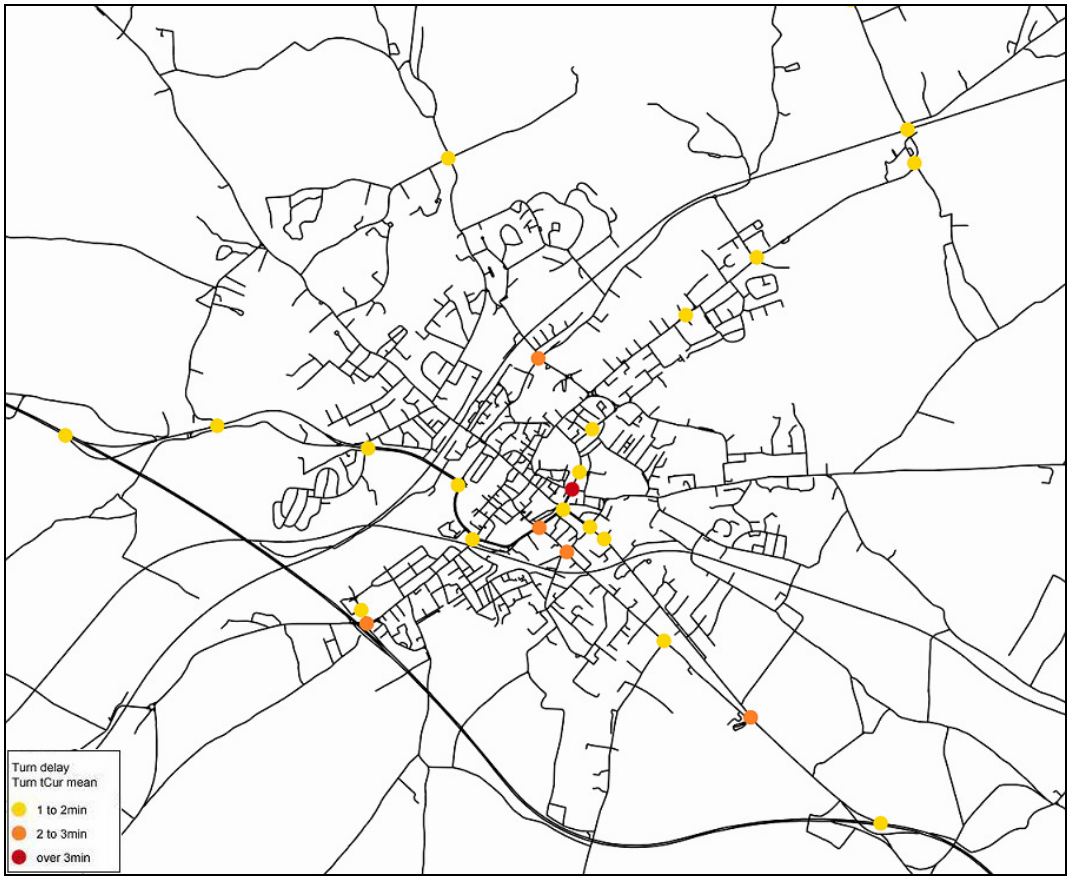
**Mean Turn Delay is arithmetic average of delays across all turning movements of this junction*

Mean Turn Delay AM Base

**Mean is arithmetic average of delays across all turning movements of this junction*

Mean Turn Delay AM 2026 Do Min

Mean Turn Delay PM Base



Mean Turn Delay PM 2026 Do Min