

# Technical Note

<b>Project:</b>	West Oxfordshire ETI	<b>To:</b>	OCC
<b>Subject:</b>	West Oxfordshire Draft Local Plan Modelling	<b>From:</b>	Nicole Pulici
<b>Date:</b>	5 Jun 2014	<b>cc:</b>	Graham Bown

## 1. Introduction

In May Atkins was commissioned to test the West Oxfordshire District Council's (WODC) new housing developments, which will inform the scale and shape of development across the District up to 2030<sup>1</sup>. The publication of the local plan was delayed in response to the new Strategic Housing Market Assessment (SHMA) for Oxfordshire. In light of a new draft SHMA, WODC require alternative Scenarios to be tested. The purpose of this Technical Note is to provide transport evidence to inform the setting of a new housing target and identification of the strategy to implement it.

The Evaluation of Transport Impacts (ETI) has been undertaken using the Central Oxfordshire Transport Model (COTM) developed by CH2M Hill. The model was developed with a 2007 Base Year to provide forecasts of transport demand in 2030 to support the planning process across Oxfordshire. The model comprises of two elements: a transport network and a representation of transport demand. Atkins have created highway demand Scenarios to reflect the proposed West Oxfordshire 2030 Housing Development Sites but used the existing matrices and highway network model files and cannot be responsible for any omissions or errors resulting from work prior to Atkins's involvement.

This Technical Note briefly describes the approach used to test the new housing development, taking a revised CH2M Hill highway network and a new forecast of demand and presents the impacts of delivering the development specified by the current plan.

## 2. Modelling Approach

### 2.1. Reference Highway Network

Atkins have adapted the CH2M Hill highway network. The network has been modified in a number of small ways:

- Link<sup>2</sup> lengths have been corrected in instances where they were not the same on both sides of a link or where investigations in West Oxfordshire showed that link length was less than crow-fly distance;
- Speed flow curves<sup>3</sup> were adjusted to ensure that they were the same on both sides of a link;
- Speed limits were adjusted to ensure that they were the same on both sides of a link;
- Minor capacity<sup>4</sup> changes made where investigations suggested that capacities were inconsistent with either existing conditions or similar junctions.

These changes were made following investigations associated with schemes rather than an audit approach and issues could remain.

<sup>1</sup> This is due to the Central Oxfordshire Transport Model (COTM) having a forecast year of 2030.

<sup>2</sup> A link is the representation of a stretch of road in the model between two junctions.

<sup>3</sup> Speed flow curves are used within the model to reflect the constraints on traffic imposed by the available network capacity. Speed flow curve relationships estimate the decreases in link speeds which would occur as a result of flow increases, with reference to the characteristics of the road.

<sup>4</sup> Capacity is the amount of traffic that the link can support.

# Technical Note

In addition to the changes highlighted above, the additional developments were connected to the network using stub centroid connectors. The loading point locations for most of the developments were provided by Oxfordshire County Council (OCC) and are illustrated in Appendix A.

There was no detailed information available regarding the location for a number of developments (e.g rural exception sites with planning permission, windfall allowance etc). Therefore these additional developments were distributed in additional zones within the localities (2 for Witney, 2 for Carterton and 1 each for Chipping Norton, Eynsham, Woodstock, Burford and Charlbury) on the assumption that the additional housing is in-fill rather than a ‘grand’ development.

More specifically, for Witney these are 2 zones loading to the North and West of Witney where the actual North and West Witney developments will be loading (numbers 8 and 10 on the maps provided in Appendix A) and similarly, for Carterton these will be 2 zones loading to the Centre and West of Carterton where the actual REEMA Central and West Carterton developments will be loading (numbers 20 and 22 on the maps provided in Appendix A).

## 2.2. Highway Networks

Table 1 outlines the forecast schemes and the network changes applied to reflect the Do Nothing Scenario (i.e. committed schemes or schemes already under construction). Table 2 outlines additional forecast schemes and network changes applied to reflect a number of measures implemented to manage the impacts of the residential targets (Option A). This enables an evaluation of the impact of the additional infrastructure on delivering the housing requirements.

**Table 1. Highway Network Revisions (Do Nothing)**

Improvement	Modelling Changes
A415 Ducklington Lane/Station Lane junction improvement	Signalised junction
Down’s Road/A40 new junction	All movement at grade roundabout
Staple Hill A4095/B4022 existing double mini roundabout at the top of Bridge Street	The layout has been reverted back to a double mini roundabout in line with the existing configuration

**Table 2. Highway Network Revisions (Option A)**

Improvement	Modelling Changes
B4022 Oxford Hill/Jubilee Way junction improvement	Signalised junction with additional capacity on some of the arms
A4095 Woodstock Road west of Jubilee Way junction	Modelled as 30mph to reflect chicane/gate feature
B4477 Access to Carterton Improvement	The scheme improves the B4477 link from Monahan Way to the A40 by straightening and widening (while remaining a single carriageway). The capacity on this link has therefore been increased to reflect the improvements.
West Facing Slips at Shores Green	West facing slips included in network

A further network (Option B) was produced which includes the listed measures above but with an additional scheme outlined in Table 3 below.

**Table 3. Highway Network Revisions (Option B)**

Improvement	Modelling Changes
West facing slips at B4477/A40 junction	West facing slip roads added to the network

# Technical Note

A final network (Option C) was produced which includes the listed measures above from the Do Nothing and Option A Scenarios but with additional schemes outlined in Table 4 below to test how much growth could be put at North Witney before triggering the need for West End Link 2 additional river crossing. Please note that the coding for these schemes was taken from the previous COTM model tests and are only based on very high level design and would need to be looked at in more detail.

**Table 4. Highway Network Revisions (Option C)**

Improvement	Modelling Changes
West End Link 2 (WEL2) additional river crossing	Crossing added joining A4095 Mill Street and B4022 Hailey Road to the north-west of the Bridge Street/West End junction
Northern Perimeter Road	New Road running between Hailey Road and the A4095 added

## 2.3. Demand

The 2030 demand has been reforecast by adding the housing developments to the 2007 Base Year model. The quantity and location of the housing developments can be found in Table 7 and Table 8 and was provided by OCC to produce:

- Scenario 1: additional 11,690 houses;
- Scenario 2: additional 9,447 houses;
- Scenario 3a: same as Scenario 1 i.e. 1500 houses in North Witney;
- Scenario 3b: same as Scenario 1 but with 800 houses in North Witney (additional 10,990 houses); and
- Scenario 3c: same as Scenario 1 but with 200 houses in North Witney (additional 10,390 houses).

It should be noted that:

- these are split into sub-areas (as per the 2012 draft Local Plan); and
- for Scenarios 3b and 3c the difference (reduction) in housing in the North Witney development is assumed NOT to be reallocated elsewhere for the purpose of these tests.

The 2030 demand includes housing developments with the following trip rates from TRICS applied.

**Table 5. Hourly Trip Rates – vehicle per house (TRICS, various suburban locations)**

Type	AM Peak		PM Peak	
	Arrive	Depart	Arrive	Depart
Residential	0.18	0.45	0.39	0.25

Residual TEMPRO based demand has been applied uniformly across each district in Oxfordshire. Outside of Oxfordshire the demand has been factored to TEMPRO levels.

A simple gravity model based on the base year trip distribution was devised and applied to all future year development. Light and heavy goods vehicles have been factored according to National Trip End Model (NTEM).

Resulting levels of forecast traffic growth are shown in Table 6.

# Technical Note

Table 6. 2030 Forecast Matrix Sizes (PCU)

	2007 Base Year	Scenario 1 / 3a	Scenario 2	Scenario 3b	Scenario 3c
AM Cars	84,906	122,395	121,776	122,202	122,037
AM LGV	9,085	13,882	13,882	13,882	13,882
AM HGV	6,604	7,588	7,588	7,588	7,588
<b>AM Total</b>	<b>100,595</b>	<b>143,865</b>	<b>143,246</b>	<b>143,672</b>	<b>143,506</b>
PM Cars	91,057	132,640	131,931	132,419	132,229
PM LGV	6,889	10,526	10,526	10,526	10,526
PM HGV	3,619	4,158	4,158	4,158	4,158
<b>PM Total</b>	<b>101,565</b>	<b>147,324</b>	<b>146,615</b>	<b>147,103</b>	<b>146,914</b>

# Technical Note

**Table 7. Scenario 1 Development**

Sub – Area	Witney	Witney Sites	Carterton	Carterton Sites	Chipping Norton	Chipping Norton sites	Eynsham – Woodstock	Eynsham – Woodstock Sites	Burford - Charlbury	Burford - Charlbury Sites	Totals
<b>(A) Already completed 01/04/11 – 31/03/14</b>	121	Various	128	Various	77	Various	309	Various	143	Various	<b>778</b>
<b>Homes expected to come forward 01/04/14 – 31/03/29</b>											
<b>(B) Adopted Local Plan allocated sites with planning permission</b>	125	Coral Springs					6	Various			<b>343</b>
	176	Buttercross									
	36	Springfield Nursery									
<b>(C) Adopted Local Plan allocated sites without planning permission</b>			250	N. Swinbrook Road	80	Cromwell Park					<b>330</b>
<b>(D) Rural exception sites with planning permission</b>					8	Various	42	Various	5	Various	<b>55</b>
<b>(E) Previously unidentified sites with planning permission</b>	148	Various	321		168	Various	153	Various	128	Various	<b>918</b>
<b>(F) Sites with planning permission subject to S106</b>	1000	West Witney	4	Other Sites			4	Various			<b>1366</b>
			198	Milestone Rd							
			160	New Road, Bampton							
<b>(G) Draft Local Plan (2012) allocations (unless listed elsewhere)</b>	400	East Witney	700	East Carterton							<b>1300</b>
			200	REEMA Central							
<b>(H) Windfall allowance</b>	435	Various	420	Various	240	Various	450	Various	450	Various	<b>1995</b>
<b>(J) New sites and other potentially deliverable sites (SHLAA)</b>	1500	North Witney	50	N. Swinbrook Road	500	Tank Farm	60	Marlborough School	15	Kingham	<b>4605</b>
	50	Welch Way	1000	West Carterton	200	Walterbush Road	200	East Woodstock	30	Sipton u Wychwood	
			500	North of Kilkenny Lane	70	Rockhill Farm (Parker Knoll)	300	West Eynsham	25	Sheep St. Burford	
					25	Castle View	70	Church Road Hanborough	10	Tanners Ln, Burford	
<b>Total</b>	<b>3,991</b>		<b>3,931</b>		<b>1,368</b>		<b>1,594</b>		<b>806</b>		<b>11,690</b>

# Technical Note

**Table 8. Scenario 2 Development**

Sub – Area	Witney	Witney Sites	Carterton	Carterton Sites	Chipping Norton	Chipping Norton sites	Eynsham – Woodstock	Eynsham – Woodstock Sites	Burford - Charlbury	Burford - Charlbury Sites	Totals
<b>(A) Already completed 01/04/11 – 31/03/14</b>	121		128		77		309		143		<b>778</b>
<b>Homes expected to come forward 01/04/14 – 31/03/29</b>											
<b>(B) Adopted Local Plan allocated sites with planning permission</b>	337										<b>337</b>
<b>(C) Adopted Local Plan allocated sites without planning permission</b>			250	N. Swinbrook Road	80	Cromwell Park					<b>330</b>
<b>(D) Rural exception sites with planning permission</b>					8		42		5		<b>55</b>
<b>(E) Previously unidentified sites with planning permission</b>	148		321		168		157		128		<b>922</b>
<b>(F) Sites with planning permission subject to S106</b>	1000	West Witney	362								<b>1362</b>
<b>(G) Draft Local Plan (2012) allocations (unless listed elsewhere)</b>	400	East Witney	700	East Carterton							<b>1300</b>
			200	REEMA Central							
<b>(H) Windfall allowance</b>	375		375		375		375		375		<b>1875</b>
<b>(J) New sites and other potentially deliverable sites (SHLAA)</b>	1000	North Witney	90	Other Small Sites	500	Tank Farm	58	Marlborough School	15	Kingham	<b>2473</b>
	155	Other Small Sites			200	Walterbush Road	320	Other small sites	30	Shipton u Wychwood	
					70	Rockhill Farm (Parker Knoll)					
					25	Castle View					
					15	Other small sites			10	Tanners Ln, Burford	
<b>Total</b>	<b>3,536</b>		<b>2,426</b>		<b>1,518</b>		<b>1,261</b>		<b>706</b>		<b>9,447</b>

# Technical Note

## 3. Impacts

Table 9 gives a summary of the model runs for 2030 AM and PM peak hours:

**Table 9. Model Runs**

	Demand	Supply
1	Scenario 1	Do Nothing
2	Scenario 1	Option A
3	Scenario 1	Option B
4	Scenario 2	Do Nothing
5	Scenario 2	Option A
6	Scenario 2	Option B
7	Scenario 3a	Option C
8	Scenario 3b	Option C
9	Scenario 3c	Option C

The current model runs show that the west facing slips (Option B) are of no benefit. A previous Atkins report<sup>5</sup> already highlighted the fact that:

*“The introduction of the west bound slip roads would only appeal to vehicles originating from Brize Norton Village or the extreme eastern side of Carterton. Any vehicles originating from the centre or west of Carterton would find Shilton Road both quicker and shorter.”*

To demonstrate this, selected journey times were extracted from the model (2030 AM Scenario 1 Option B). Routes A and B illustrated in Figure 1 take 06:12 and 07:10 minutes respectively to reach the A40 at the B4477 junction from the centre of Carterton. It would take an additional 04:02 minutes to reach the Shilton Road / A40 junction if vehicles could access the A40 via the proposed westbound slips. This is a total journey time of 10:14 and 11:12 minutes respectively. In contrast to this, Route C illustrated in Figure 1 takes 05:08 minutes to access the Shilton Road / A40 junction providing a much quicker route. A summary table can be found below.

---

<sup>5</sup> Carterton, Oxfordshire, Scheme Appraisal Report, August 2013

# Technical Note

Figure 1. Journey Routes (Option B)

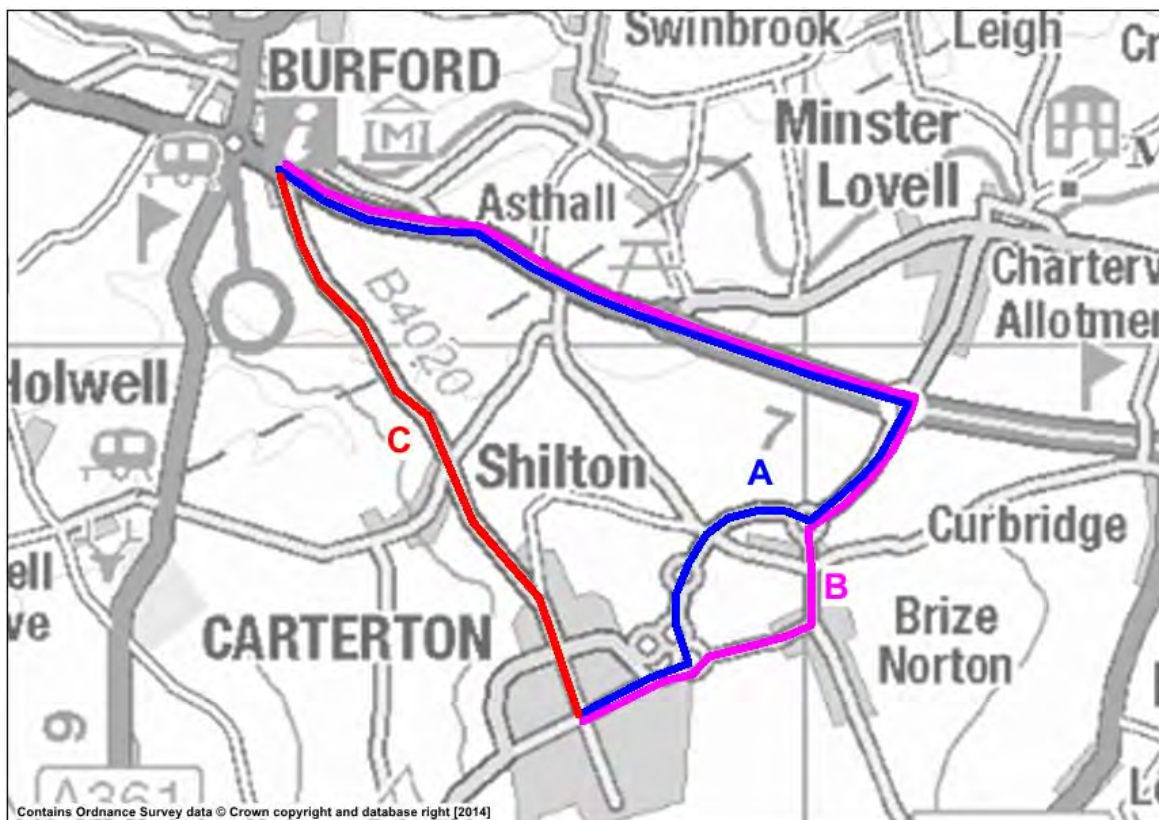


Table 10. Journey Times (Option B)

	Time (mm:ss)	Distance (km)	Average Speed (kph)
Route A	10:14	9918	58
Route B	11:12	9653	52
Route C	05:08	5242	61

This shows that the same findings still stands in terms of journey times and therefore route choice in the latest model runs.

It is therefore suggested that the west facing slips are tested in the new Oxford Strategic Model (OSM) when it is ready as it is more detailed in terms of trip distribution (mobile phone data).

The rest of this report focuses only on the results from the remaining model runs (Do Nothing, Option A and Option C).

### 3.1. Performance of new development sites

The additional development sites were all connected to the network at locations provided by OCC. Most were connected by stub centroid connector to reflect a more realistic access point on the existing highway network as already mentioned above. The following developments each connect to areas of the network forecast to have a high volume to capacity ratio (>85%), as shown in Figure 2 and Figure 3:

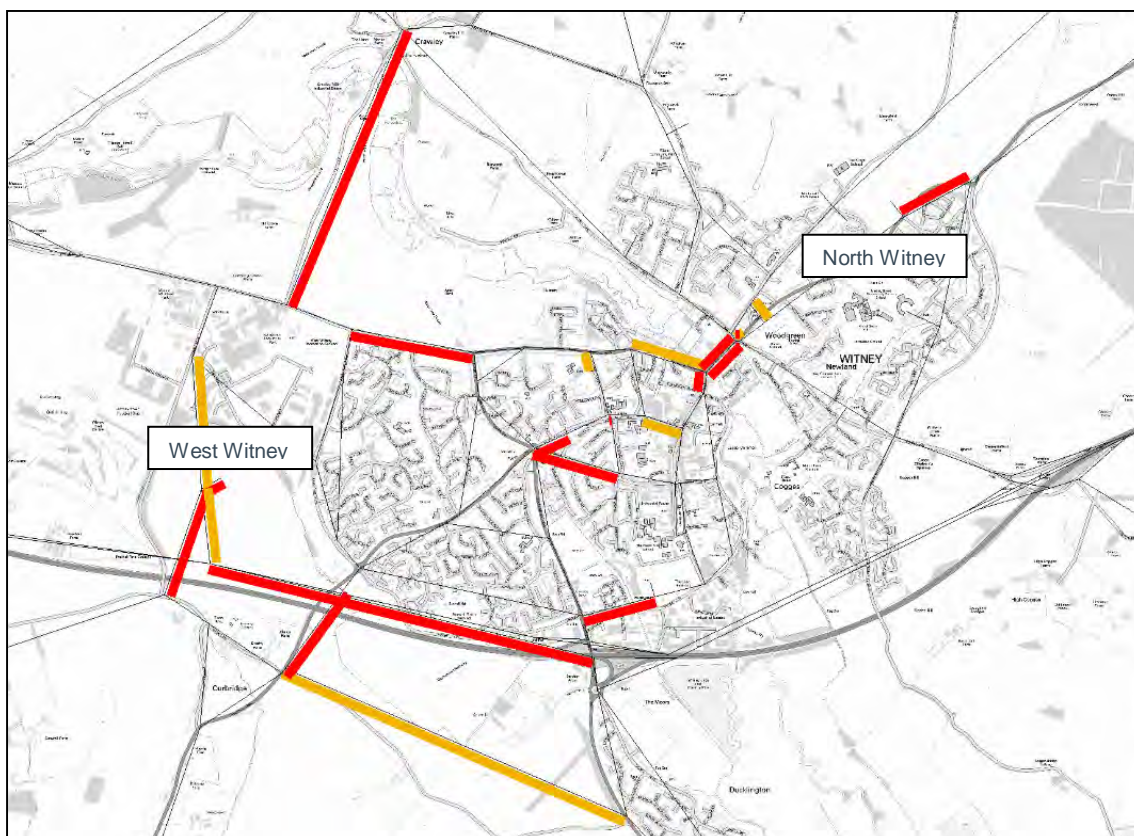
- North Witney, Witney;
- West Witney, Witney;
- REEMA North, Carterton; and
- East Carterton, Carterton.



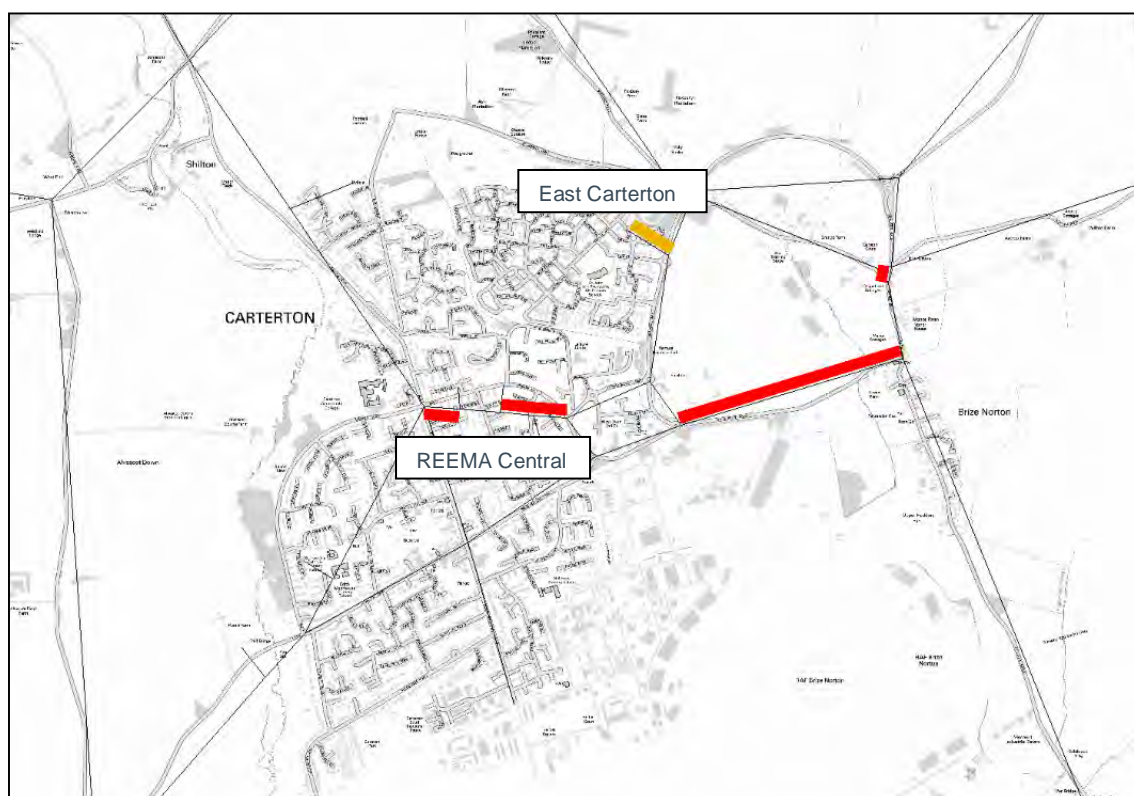
# Technical Note

Consideration would need to be given to the links in the vicinity of these developments.

**Figure 2. Witney Loading Problem Areas**



**Figure 3. Carterton Loading Problem Areas**

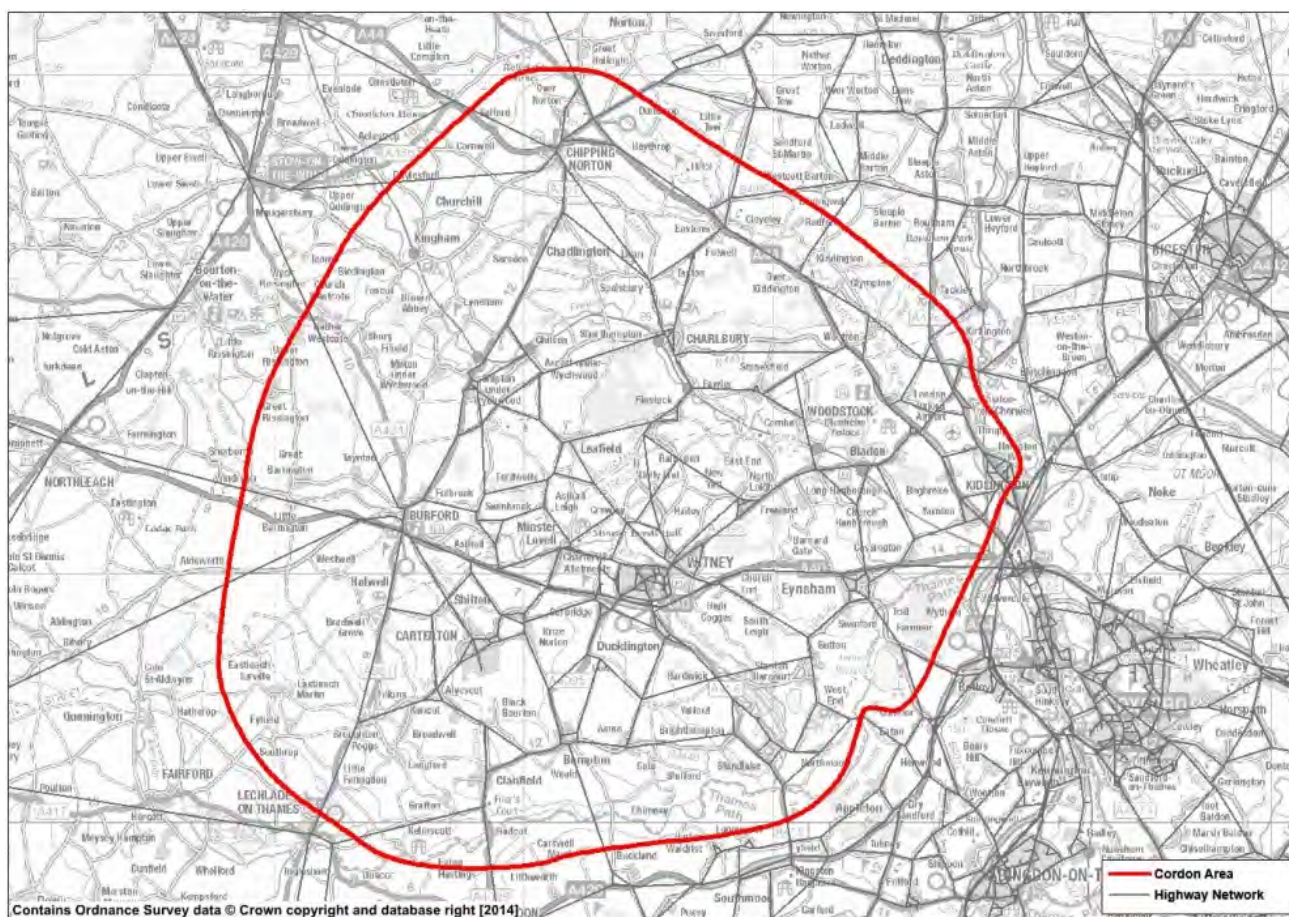


# Technical Note

## 3.2. Network performance

A key measure of the impact of a transport strategy is its performance on delay, distance travelled and average network speed. The network was cordoned so as to better highlight the impact on the network in the area of interest. The cordoned area is shown in Figure 4 below.

Figure 4. Model Cordon Area



The results for all links within West Oxfordshire are shown below.

Table 11. Forecast Network Summary Statistics (AM)

	2030 S1		2030 S2		2030 S3a	2030 S3b	2030 S3c
	Do Nothing	Option A	Do Nothing	Option A	Option C	Option C	Option C
Total Travel Time (pcu-hrs)	9,027	8,917	8,641	8,553	8,915	8,830	8,690
Total Travel Distance (pcu-kms)	431,867	432,378	423,564	425,286	433,492	432,190	427,899
Total Delay (pcu-hrs)	2,073	1,976	1,859	1,748	1,952	1,899	1,849
Average Speed (Overall- km/h)	47.8	48.5	49.0	49.7	48.6	48.9	49.2

# Technical Note

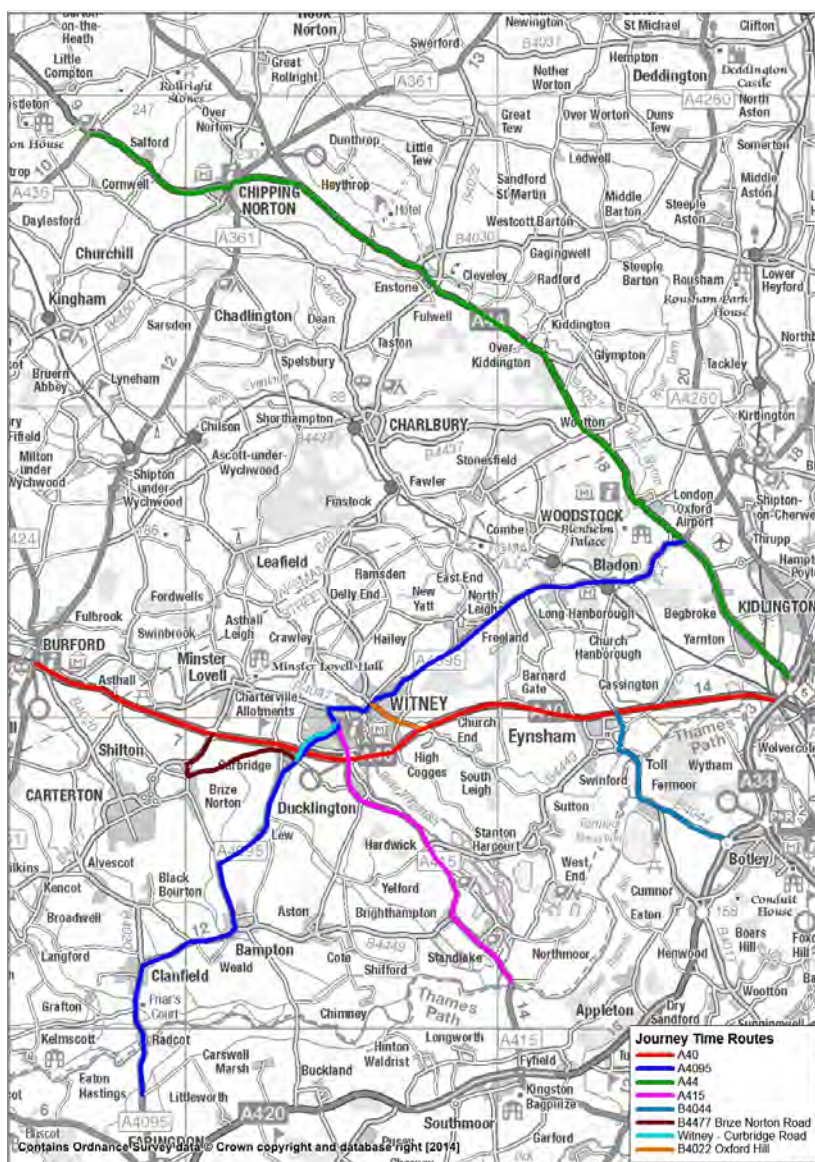
Table 12. Forecast Network Summary Statistics (PM)

	2030 S1		2030 S2		2030 S3a	2030 S3b	2030 S3c
	Do Nothing	Option A	Do Nothing	Option A	Option C	Option C	Option C
Total Travel Time (pcu-hrs)	10,082	9,832	9,751	9,491	9,968	9,856	9,695
Total Travel Distance (pcu-kms)	447,886	448,072	438,828	438,361	448,970	445,646	442,370
Total Delay (pcu-hrs)	2,812	2,601	2,655	2,444	2,720	2,680	2,590
Average Speed (Overall- km/h)	44.4	45.6	45.0	46.2	45.0	45.2	45.6

## 3.3. Journey Time Analysis

Journey times along key routes within the network are shown in Figure 5 and have been summarised in Table 13 and Table 14.

Figure 5. Journey Routes



# Technical Note

**Table 13. Journey Times (AM)**

Route	Direction	Distance (km)	2030 S1		2030 S2		2030 S3a	2030 S3b	2030 S3c
			DN	OpA	DN	OpA	OpC	OpC	OpC
A40	EB	25.30	30:26	30:30	29:49	29:19	30:08	29:55	29:55
	WB	25.30	28:10	27:15	28:00	26:57	27:19	27:17	27:30
A4095	NB	32.24	42:16	40:20	41:37	39:26	40:40	40:25	40:07
	SB	32.24	41:48	39:05	41:15	37:54	37:58	37:34	37:26
A44	NB	30.83	31:45	31:56	31:10	31:42	31:44	31:40	31:36
	SB	30.83	36:27	35:47	35:45	35:49	36:27	36:10	35:49
A415	NB	10.86	12:41	12:04	12:41	12:05	12:04	12:02	12:02
	SB	10.86	14:23	13:11	14:16	13:08	13:14	13:12	13:07
B4044	NB	6.29	11:14	08:28	11:14	08:28	08:28	08:27	08:27
	SB	6.29	19:23	16:40	18:30	15:45	16:26	16:25	15:51
B4477 Brize Norton Road	EB	5.60	06:53	06:42	06:45	06:33	06:42	06:42	06:43
	WB	5.60	07:23	06:31	07:17	06:30	06:32	06:31	06:33
B4022 Oxford Hill, Witney	NB	2.87	05:32	04:51	05:29	04:51	04:46	04:46	04:45
	SB	2.87	06:29	05:35	06:22	05:34	05:58	05:52	05:44
Witney - Curbridge Rd	NB	1.87	04:13	03:29	04:06	03:34	03:33	03:27	03:23
	SB	1.87	03:04	02:21	03:02	02:21	02:22	02:22	02:21

**Table 14. Journey Times (PM)**

Route	Direction	Distance (km)	2030 S1		2030 S2		2030 S3a	2030 S3b	2030 S3c
			DN	OpA	DN	OpA	OpC	OpC	OpC
A40	EB	25.30	25:52	25:00	25:38	24:53	24:50	24:45	24:38
	WB	25.30	38:18	38:58	37:12	38:08	38:29	38:46	38:22
A4095	NB	32.24	42:30	39:09	42:02	38:42	38:33	38:04	37:46
	SB	32.24	47:34	44:35	46:29	43:36	44:58	43:51	43:13
A44	NB	30.83	37:29	37:39	37:26	37:22	37:30	37:35	37:19
	SB	30.83	30:21	30:35	30:23	30:19	30:59	30:56	30:27
A415	NB	10.86	13:21	12:45	13:21	12:49	13:05	13:08	13:03
	SB	10.86	14:09	13:18	14:05	13:12	13:22	13:19	13:11
B4044	NB	6.29	19:32	16:20	18:41	15:28	16:28	16:25	15:51
	SB	6.29	13:16	10:23	13:07	10:18	10:21	10:22	10:23

# Technical Note

Route	Direction	Distance (km)	2030 S1		2030 S2		2030 S3a	2030 S3b	2030 S3c
			DN	OpA	DN	OpA	OpC	OpC	OpC
B4477 Brize Norton Road	EB	5.60	06:59	06:34	06:55	06:33	06:34	06:34	06:34
	WB	5.60	07:33	06:30	07:31	06:30	06:31	06:30	06:31
B4022 Oxford Hill, Witney	NB	2.87	06:43	05:33	06:42	05:33	05:04	05:02	05:03
	SB	2.87	08:00	06:13	08:06	06:08	09:01	08:37	08:25
Witney - Curbridge Rd	NB	1.87	02:50	02:29	02:50	02:29	02:30	02:30	02:30
	SB	1.87	05:45	04:07	05:29	03:45	04:17	04:20	04:17

The journey times show that the B4044 suffers from high delays in the Southbound and Northbound direction for the AM and PM peak hours respectively across all Scenarios, with average speeds along the route down to 19-24 kph when compared to 28-45 kph in the opposite direction. This is due to traffic using the B4044 to access the A40 to Witney from Abingdon / South Oxford.

Comparing **Option A to the Do Nothing** network shows improvements across almost all routes with significant journey time savings along the:

- B4044 in both directions for all Scenarios and time periods of approximately 3 minutes;
- A4095 in both directions for all Scenarios and time periods of between 2 and 3 minutes;
- A415 in the southbound direction for all Scenarios in the AM peak hour of approximately 1 minute;
- B4022 Oxford Hill, Witney in both directions for all Scenarios in the PM peak hour of between 1 and 2 minutes;
- B4477 Brize Norton Road in the westbound direction for all Scenarios in the PM peak hour of approximately 1 minute; and
- Curbridge Road, Witney in the southbound direction for all Scenarios in the PM peak hour of almost 2 minutes.

This shows that the additional highway infrastructure is required to deliver the housing requirements.

Comparing **Scenarios 3a, 3b and 3c** shows that almost all journey time routes remain unchanged (i.e. within 30 seconds of each other) with the slight exception of the A4095 which improves by 33s and 32s in the northbound and southbound direction respectively for the AM peak hour and by 47s and 1m45s in the northbound and southbound direction respectively for the PM peak hour. This is expected due to the reduction in development at North Witney loading onto the A4095.

Comparing **Scenario 1 Option A and Scenario 3a** shows that almost all journey time routes remain broadly unchanged (i.e. within 30 seconds of each other) with the slight exception of the A4095 which improves by over 1 minute in the southbound direction for the AM peak hour and the B4022 Oxford Hill in Witney increasing by almost 3 minutes in the southbound direction for the PM peak hour. The decrease along the A4095 is expected due to the introduction of the Northern Perimeter Road (NPR). Similarly the increase along the B4022 Oxford Hill is expected due to the introduction of the NPR and WEL which increases the flow able to access the B4022.

## 3.4. Summary network performance

For both the wider West Oxfordshire area and more detailed Witney area, Appendix B to Appendix E show model output screenshots including link volume over capacity ratio (>85%) and average junction delay (seconds).

A summary of the traffic impacts is outlined below for each Scenario.

# Technical Note

## 3.4.1. Scenario 1: Option A vs Do Nothing

As expected, the additional transport infrastructure in Option A has a positive impact on the overall network operating conditions. The results show that overall:

- Total travel time decreases by 1% and 2% for the AM and PM peak hours respectively;
- Total travel distance marginally increases;
- Delay reduces by 5% and 8% for the AM and PM peak hours respectively;
- Average speed increases marginally; and
- Journey times along key routes decrease.

## 3.4.2. Scenario 2: Option A vs Do Nothing

Again, as expected, the additional transport infrastructure in Option A has a positive impact on the overall network operating conditions. The results show that overall:

- Total travel time decreases by 1% and 3% for the AM and PM peak hours respectively;
- Total travel distance increases in the AM peak hour but decreases in the PM peak hour;
- Delay reduces by 6% and 8% for the AM and PM peak hours respectively;
- Average speed increases marginally; and
- Journey times along key routes decrease.

## 3.4.3. Option A: Scenario 2 vs Scenario 1

As expected, the lower level of development assumed in Scenario 2 has a positive impact on the overall network operating conditions. The results show that overall:

- Total travel time decreases by 4% and 3% for the AM and PM peak hours respectively;
- Total travel distance decreases by 2% for both AM and PM peak hours;
- Delay reduces by 12% and 6% for the AM and PM peak hours respectively;
- Average speed increases marginally; and
- Journey times along key routes decrease.

## 3.4.4. Scenario 3a/3b/3c

The lower level of development at North Witney has a positive incremental impact on the overall network operating conditions.

Comparing the results between Scenario 3a and 3b shows that overall:

- Total travel time decreases by 1% for both AM and PM peak hours;
- Total travel distance marginally decreases;
- Delay reduces by 3% and 1% for the AM and PM peak hours respectively;
- Average speed remain broadly unchanged; and
- Journey times along key routes remain broadly unchanged.

Comparing the results between Scenario 3a and 3c shows that overall:

- Total travel time decreases by 3% for both AM and PM peak hours;
- Total travel distance decreases by 1% for both AM and PM peak hours;
- Delay reduces by 5% for both AM and PM peak hours;
- Average speed remain broadly unchanged; and
- Journey times along key routes remain broadly unchanged.

WEL (northbound) and Bridge Street (southbound) are both over capacity in Scenario 3a (V/C > 100%) in the AM peak hour. The V/C reduces in Scenarios 3b and 3c to below 100%. Similarly, Welch Way (Westbound) at the junction with Holloway Road is almost at capacity in Scenario 3a in the AM peak hour but reduces to below a V/C of 85% in Scenarios 3b and 3c.

# Technical Note

West End Road (westbound) between Bridge Street and WEL is over capacity in Scenario 3a (V/C > 100%) in the PM peak hour. The V/C reduces in Scenarios 3b and 3c to below 100%. Similarly, Dry Lane (southbound) is almost at capacity in Scenarios 3a and 3b in the PM peak hour but reduced to below a V/C of 85% in Scenario 3c.

The results show that the WEL is required irrespective of the level of development in North Witney (i.e for all Scenarios). This is particularly evident in the PM network plots (Figure 53) which indicate that WEL, Bridge Street and West End Road (between Bridge Street and WEL) have a V/C ratio of over 85% in both directions.

## 3.4.5. Scenario 1 Option A vs Scenario 3a

The additional infrastructure assumed in Scenario 3a has a neutral impact on the overall network operating conditions. The results show that overall:

- Total travel time remains broadly unchanged for the AM and PM peak hours respectively;
- Total travel distance remains broadly unchanged for both AM and PM peak hours;
- Delay remains broadly unchanged for the AM peak hour and reduces by 5% for the PM peak hour;
- Average speed remain broadly unchanged; and
- Journey times along key routes remain broadly unchanged.

The additional infrastructure provides extra capacity in the network but is almost nullified by the high level of demand for travel through Witney, leaving the overall network performance almost unchanged. Even though in percentage terms the travel distance remains broadly unchanged it does in fact reduce by approximately 1000 pcu-kms for both the AM and PM peak hours.

# Technical Note

Table 15. Key Routes Comparison (AM)

Key Route	S1: OpA vs DN	S2: OpA vs DN	Option A: S2 vs S1	Scenario 3a/3b/3c
<b>A40</b>	Reduction in average delay at Witney Road / A40 junction  Congestion reduction along the westbound link approaching A40 / Cassington Road junction	Reduction in average delay at Witney Road / A40 junction  Congestion increase on A40 eastbound between Brize Norton Road and Downs Lane	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>A4095</b>	Reduction in average delay at the Mill Street / Bridge Street junction in Witney  Congestion increase along westbound approach to A4095 / Park Road junction and on eastbound roads through Long Hanborough	Reduction in average delay at the Mill Street / Bridge Street junction in Witney  Reduction in average delay at A4095 / Jubilee Way junction	Reduction in average delay between Boddington Lane to Park Road and Harvest way to Jubilee Way  Reduction in congestion between Millwood End and Church Road and the approach road to Hanborough Rail Station	Minimal variation in delay along this route across all three Scenario 3 tests  Scenarios 3b and 3c reduce congestion along Bridge Street Approach to the Bridge Street / High Street Junction and on A4095 eastbound through Long Hanborough
<b>A44</b>	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>A415</b>	Minimal impact on delay along this route  Congestion on Ducklington Lane approach to Ducklington Lane / Tower Hill Junction reduced	Minimal impact on delay along this route  Congestion on Ducklington Lane approach to Ducklington Lane / Tower Hill Junction reduced	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>B4044</b>	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>B4477 Brize Norton Road</b>	Minimal impact on delay along this route  Congestion reduction on westbound Main Road approach to Main Road / Downs Lane junction	Minimal impact on delay along this route  Congestion reduction on westbound Main Road approach to Main Road / Downs Lane junction	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>B4022 Oxford Hill, Witney</b>	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>Witney - Curbridge Rd</b>	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests



# Technical Note

Table 16. Key Routes Comparison (PM)

Key Route	S1: OpA vs DN	S2: OpA vs DN	Option A: S2 vs S1	Scenario 3a/3b/3c
<b>A40</b>	Reduction in average delay at the Witney Road / A40 junction  Congestion reduction on westbound approach to A40 / Witney Road Junction	Reduction in average delay at the Witney Road / A40 junction  Congestion reduction on westbound approach to A40 / Witney Road Junction	Reduction in average delay at Bundford Road Roundabout  Minimal impact on congestion along this route	Minimal variation in delay along this route across all three Scenario 3 tests  Congestion reduction along eastbound and westbound approaches to A40 / Witney Road junction between all three Scenarios
<b>A4095</b>	Reduction in average delay at the Mill Street / Bridge Street and Bridge Street / Woodgreen Hill junctions  Congestion reduction on Woodgreen Hill approach to Woodgreen Hill / Bridge Street junction and eastbound Burford Road approach to Burford Road / Woodford Way junction	Reduction in average delay at the Mill Street / Bridge Street, Bridge Street / Woodgreen Hill and Mill Street / Woodford Way junctions  Reduction in average delay at the Congestion reduction on eastbound Burford Road approach to Burford Road / Woodford Way junction	Reduction in average delay at the Park Road junction.  Minimal impact on congestion along this route	Improvement in delay at Park Road / A4095 junction near North Leigh in Scenario 3c compared to Scenarios 3a and 3b  Minimal variation in congestion along this route across all three Scenario 3 tests
<b>A44</b>	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>A415</b>	Reduction in average delay at A415 / B4449 and Ducklington Lane / Station Lane junctions  Minimal impact on congestion along this route	Reduction in average delay at A415 / B4449 and Ducklington Lane / Station Lane junctions  Minimal impact on congestion along this route	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>B4044</b>	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>B4477 Brize Norton Road</b>	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>B4022 Oxford Hill, Witney</b>	Reduction in average delay at Oxford Hill / Jubilee Way junction	Reduction in average delay at Oxford Hill / Jubilee Way junction	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests
<b>Witney - Curbridge Rd</b>	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal impact on congestion and delay along this route	Minimal variation in congestion and delay along this route across all three Scenario 3 tests

# Technical Note

## 4. Conclusion

### 4.1. Preliminary Findings

The 2030 model run outputs show that:

- The Option A additional infrastructure is required to aid the delivery of the housing requirements;
- The lower level of development in Scenario 2 has a lower impact on network operating conditions compared to Scenario 1;
- Dry Lane is used for 'rat running' in almost all Scenarios and time periods;
- The A4095 Curbridge Road and A415 Ducklington Lane towards Tower Hill roundabout are over capacity for all Scenarios in the AM peak hour;
- Welch Way and Corn Street towards Tower Hill roundabout are over capacity for all Scenarios in the PM peak hour;
- Bridge Street is over capacity for all time periods and Scenarios;
- WEL is almost exclusively used by traffic to/from the North Witney development;
- WEL is required irrespective of the level of development in North Witney; and
- The west facing slips (Option B) are of no benefit as detailed in Section 3. It is therefore suggested that these are tested in the new Oxford Strategic Model (OSM).

The fact that Bridge Street and WEL are almost at capacity in the Scenario 3 tests is due to the fact that the WEL provides extra capacity in the network but is almost nullified by the high level of demand for travel through Witney.

### 4.2. Next Steps

The WEL and NPR coding was taken from the previous COTM model tests and are only based on very high level design and would need to be looked at in more detail. The signals at these junctions could be optimised as well as the capacities. This will improve their performance but will not necessarily solve it due to the high levels of demand for travel through Witney.

The following network areas need to be addressed:

- Bridge Street mini roundabout junction;
- Dry Lane rat-running; and
- Tower Hill roundabout capacity.

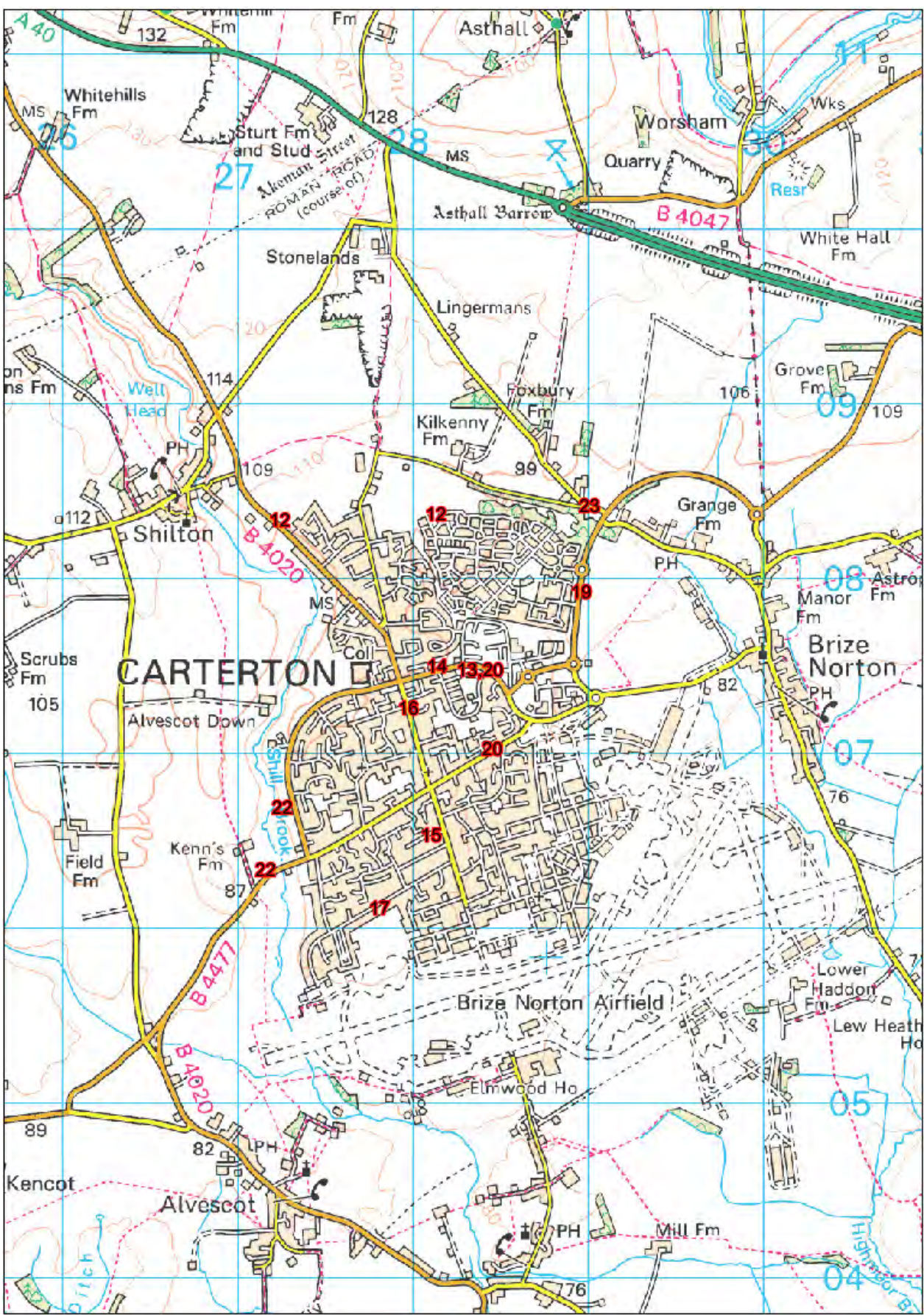
The following Scenarios will be produced to test alternative sites to those identified by WODC:

- Scenario 4: same as Scenario 1 Option A but with no development at North Witney;
- Scenarios 5a/b/c: same as Scenarios 3a/b/c but with optimised signals and capacities on WEL;
- Scenario 6a: same as Scenario 5a but with 1000 dwellings to the North of the A40 at Eynsham (behind current Tesco filling station) instead of North Witney; and
- Scenario 6b: same as Scenario 6a but swapping 1000 dwellings at Eynsham for 1000 at Hanborough Station.



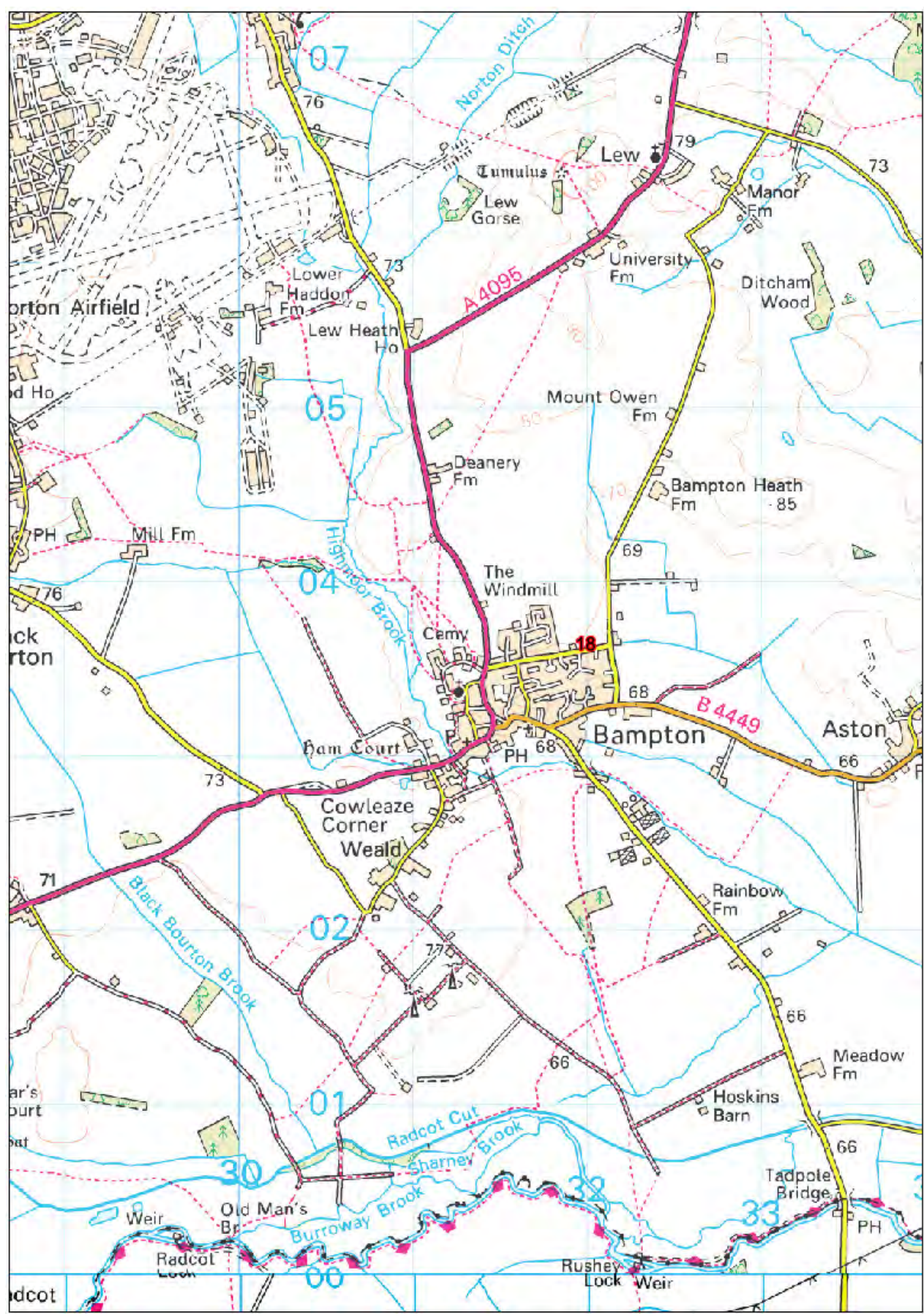
# Technical Note

Figure 7. Carterton Loading Points



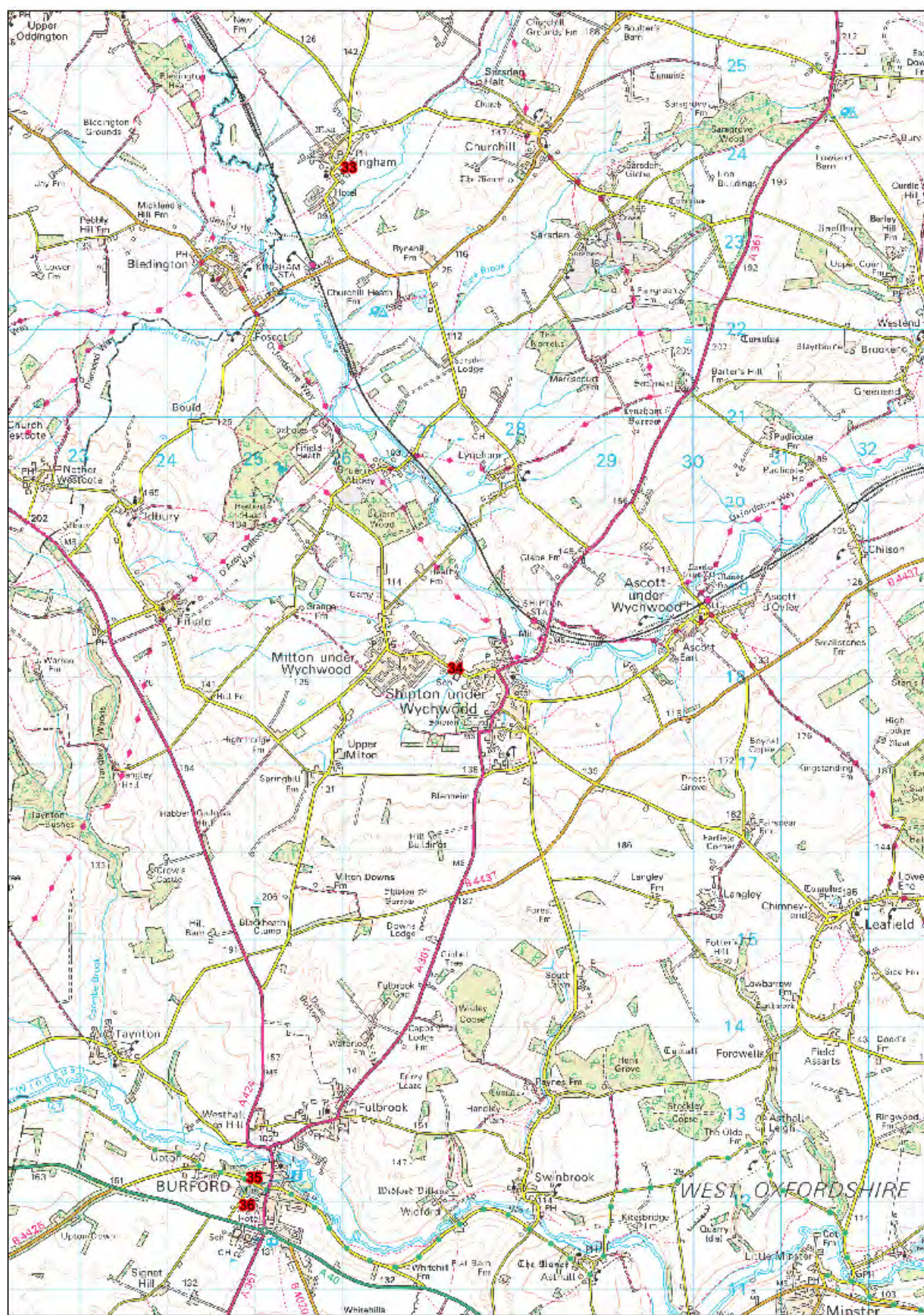
# Technical Note

Figure 8. Bampton Loading Point



# Technical Note

Figure 9. Burford & Kingham Loading Points



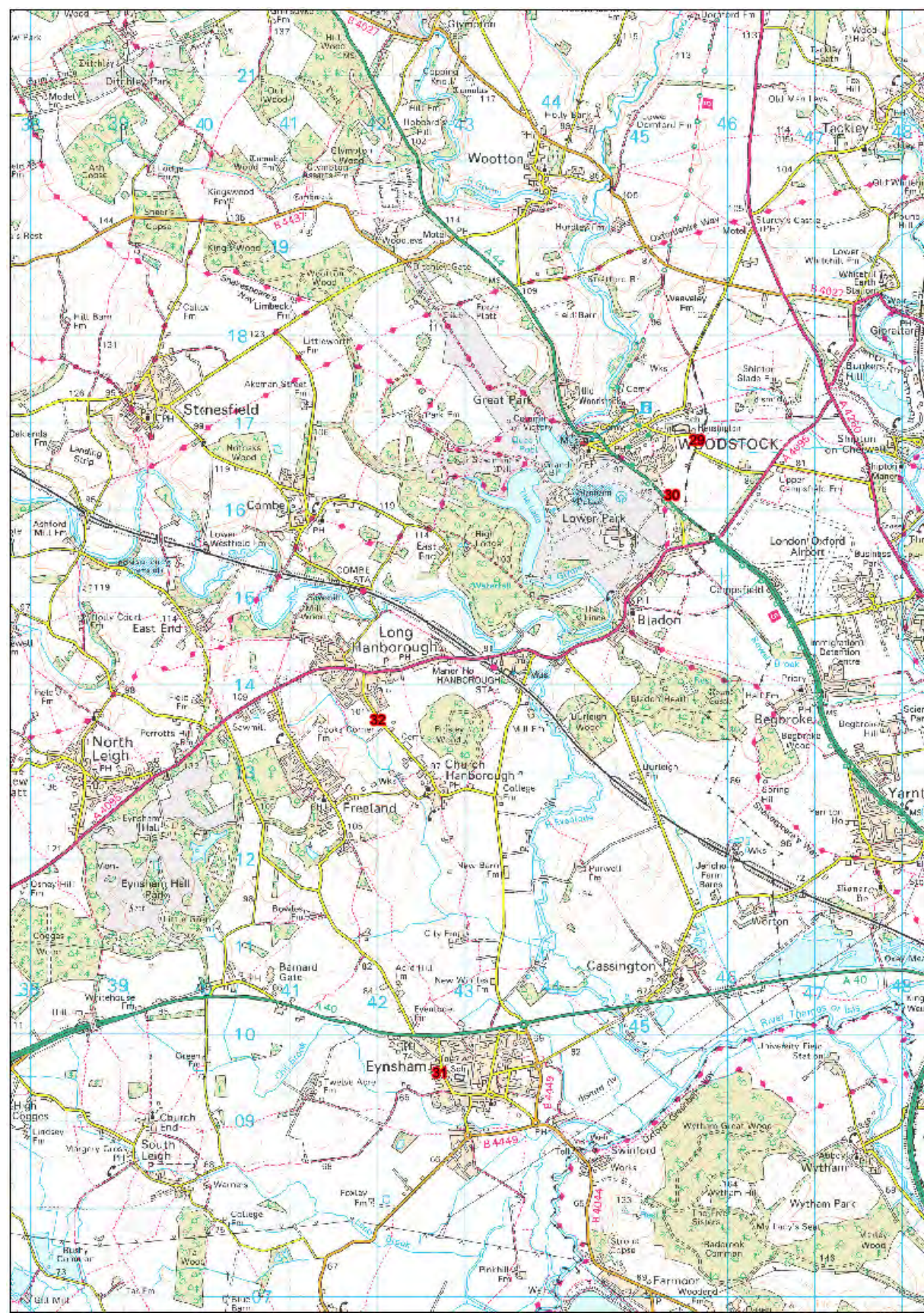
# Technical Note

Figure 10. Chipping Norton Loading Points



# Technical Note

Figure 11. Woodstock & Eynsham Loading Points





# Technical Note

## Appendix B. Volume/Capacity Plots (Area Wide)

Figure 12. 2030 AM Scenario 1 Do Nothing – Volume / Capacity (%)

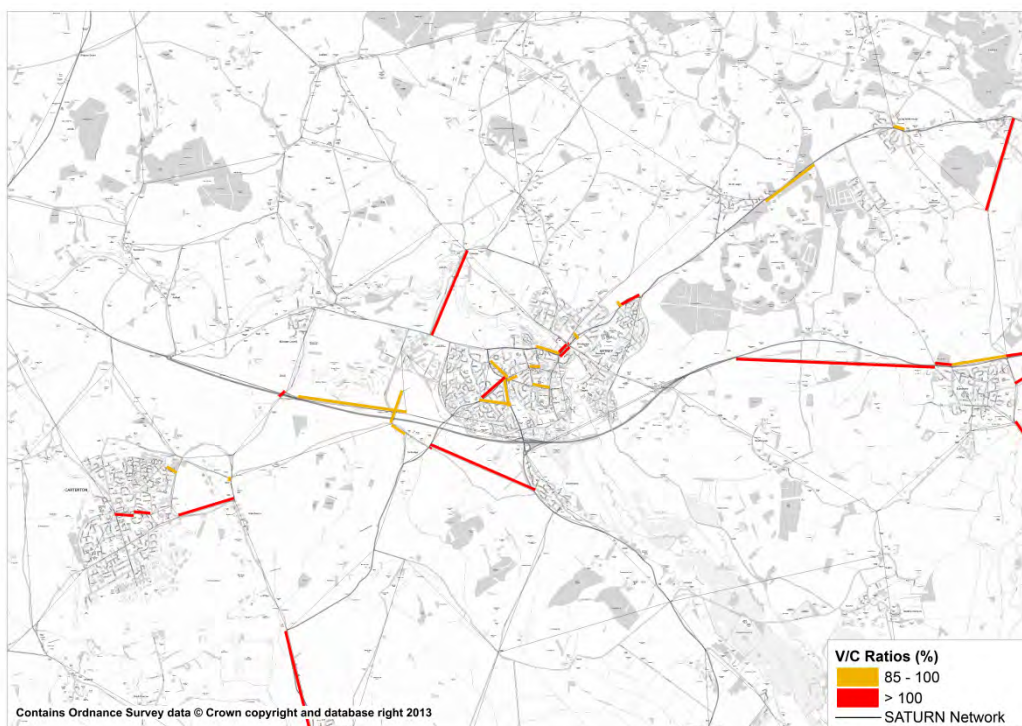
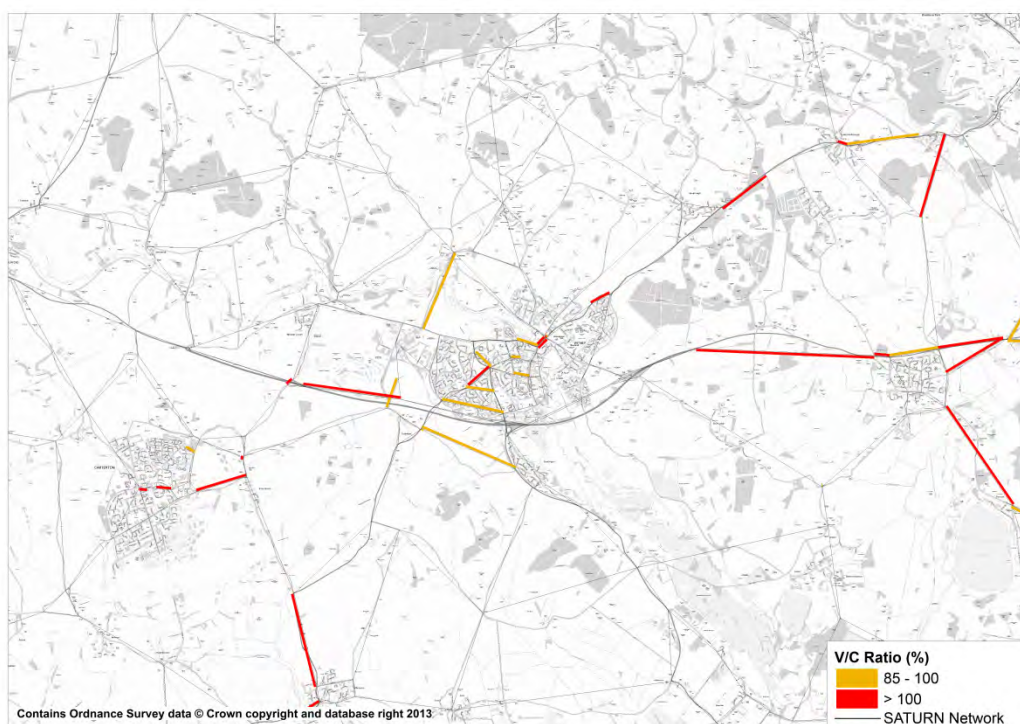


Figure 13. 2030 AM Scenario 1 Option A – Volume / Capacity (%)



# Technical Note

Figure 14. 2030 AM Scenario 2 Do Nothing – Volume / Capacity (%)

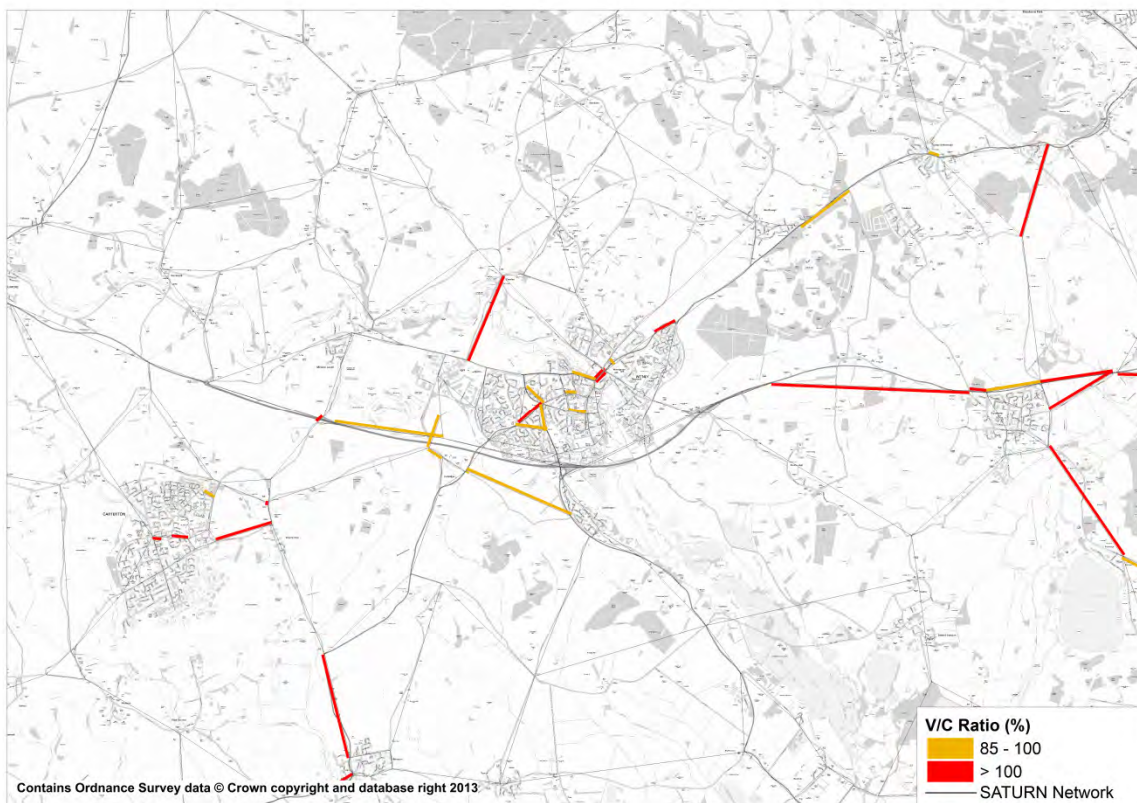
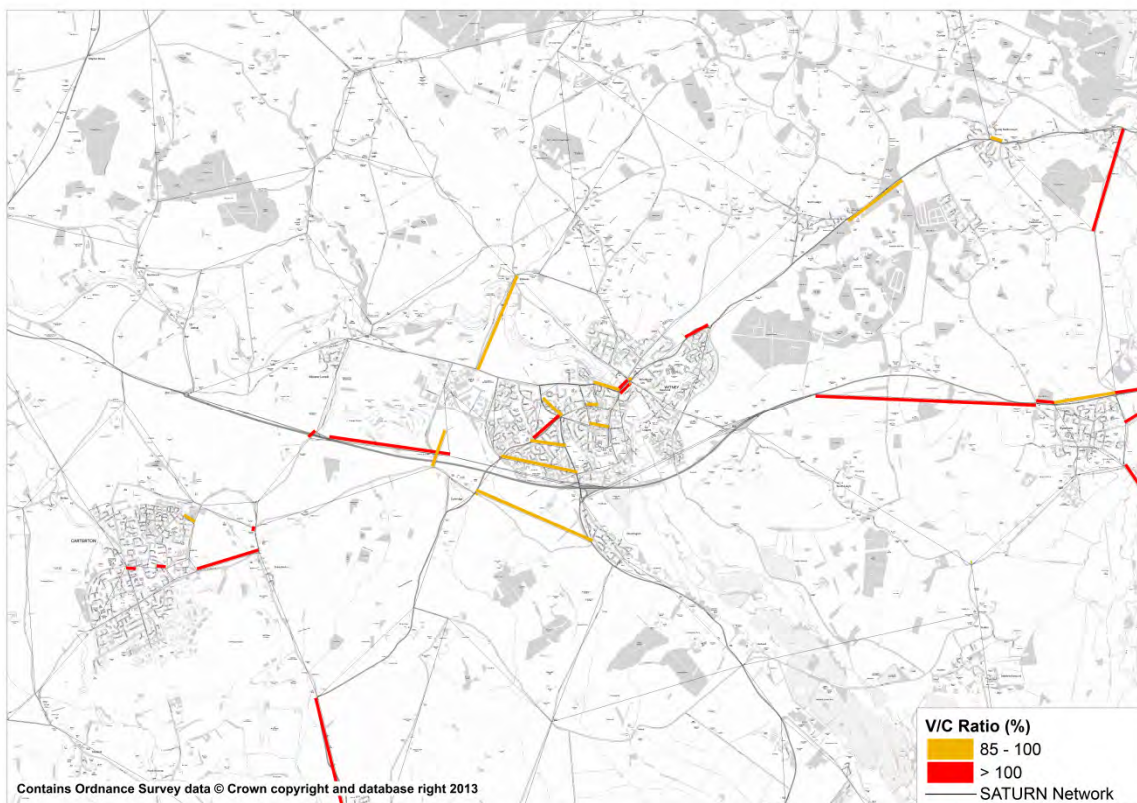


Figure 15. 2030 AM Scenario 2 Option A – Volume / Capacity (%)



# Technical Note

Figure 16. 2030 AM Scenario 3a Option C – Volume / Capacity (%)

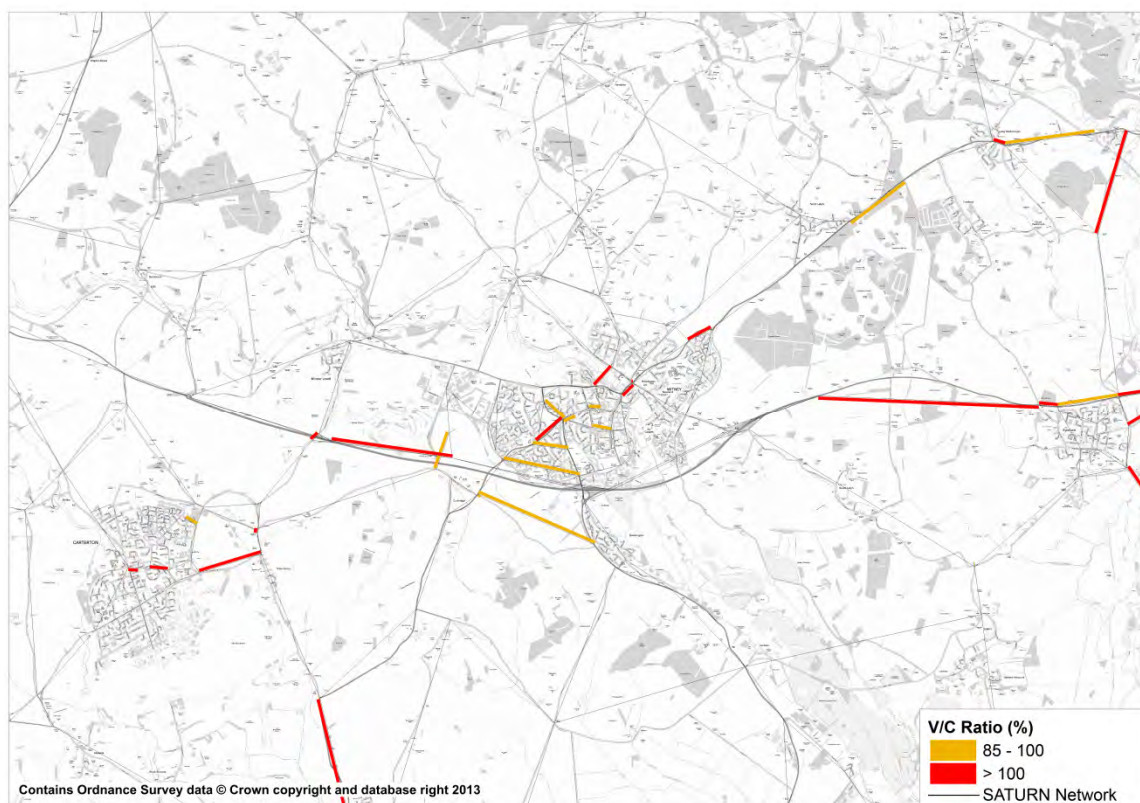
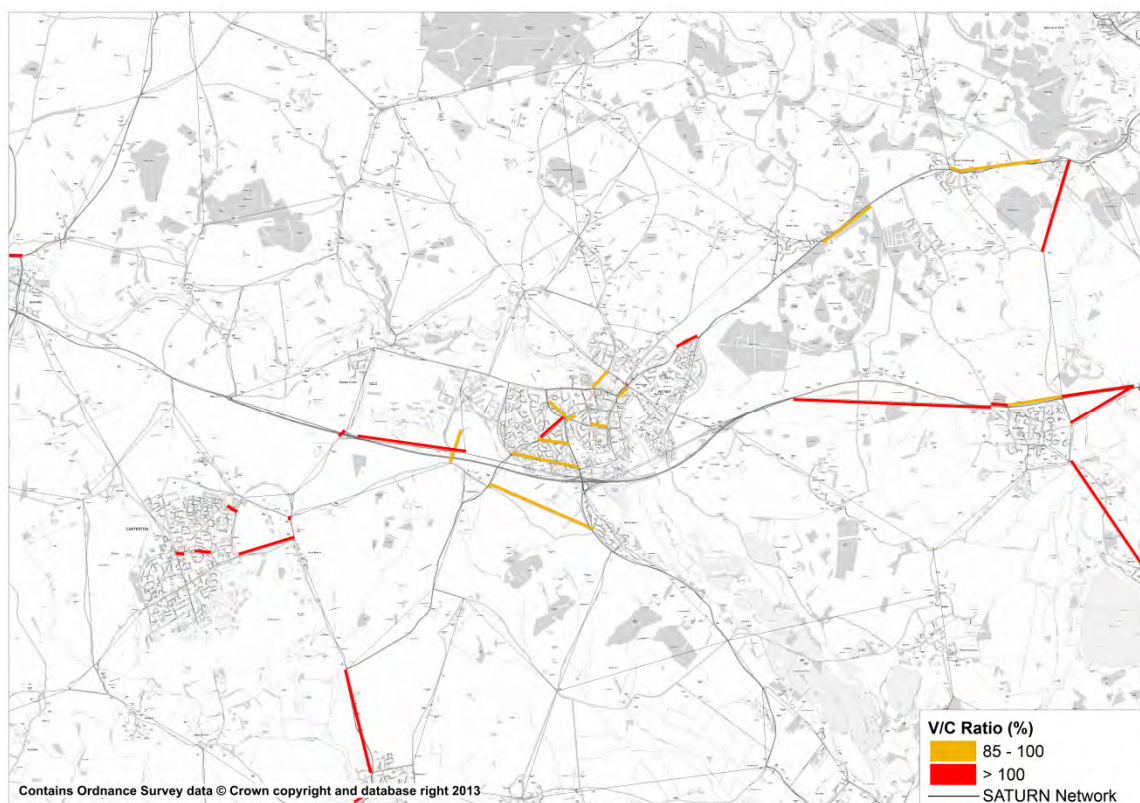


Figure 17. 2030 AM Scenario 3b Option C – Volume / Capacity (%)



# Technical Note

Figure 18. 2030 AM Scenario 3c Option C – Volume / Capacity (%)

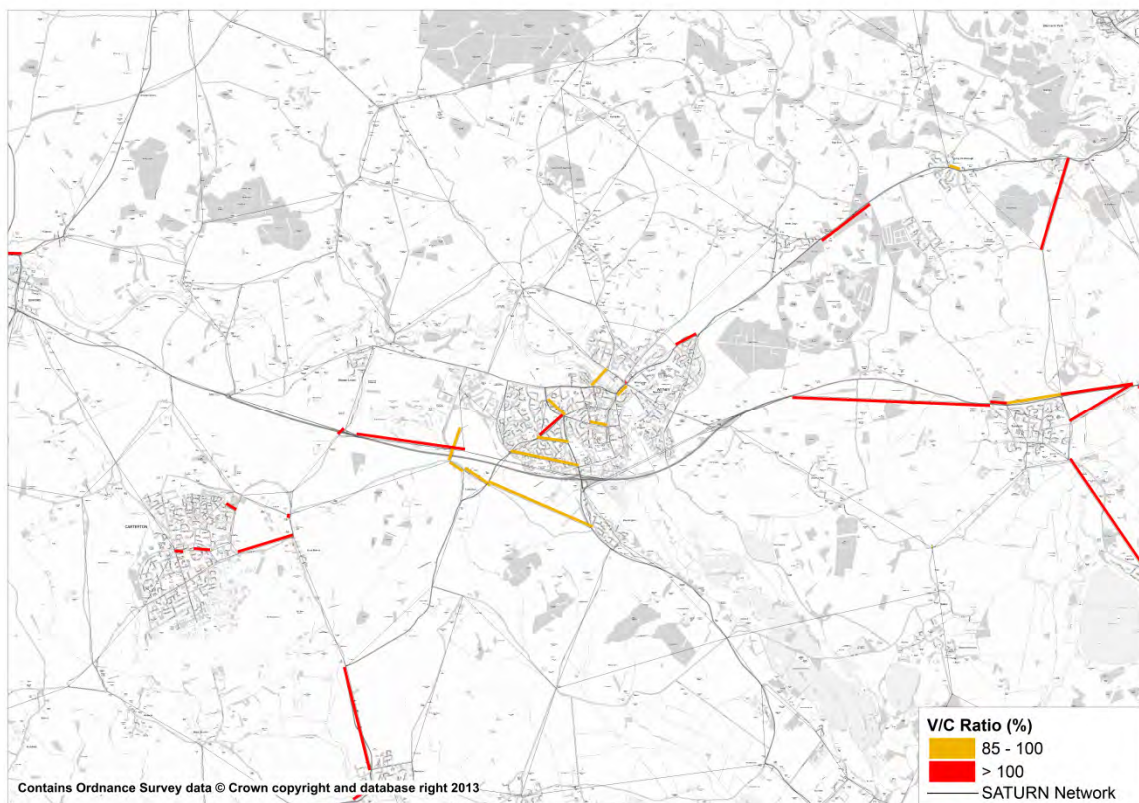
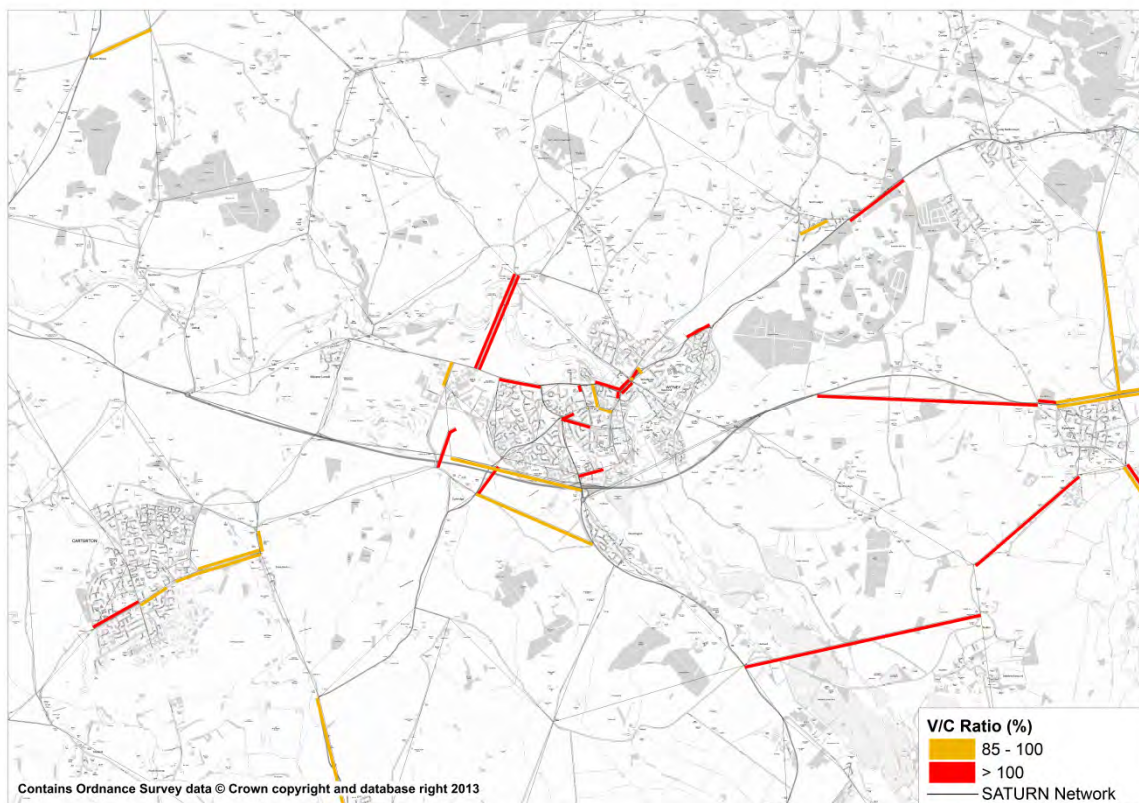


Figure 19. 2030 PM Scenario 1 Do Nothing – Volume / Capacity (%)



# Technical Note

Figure 20. 2030 PM Scenario 1 Option A – Volume / Capacity (%)

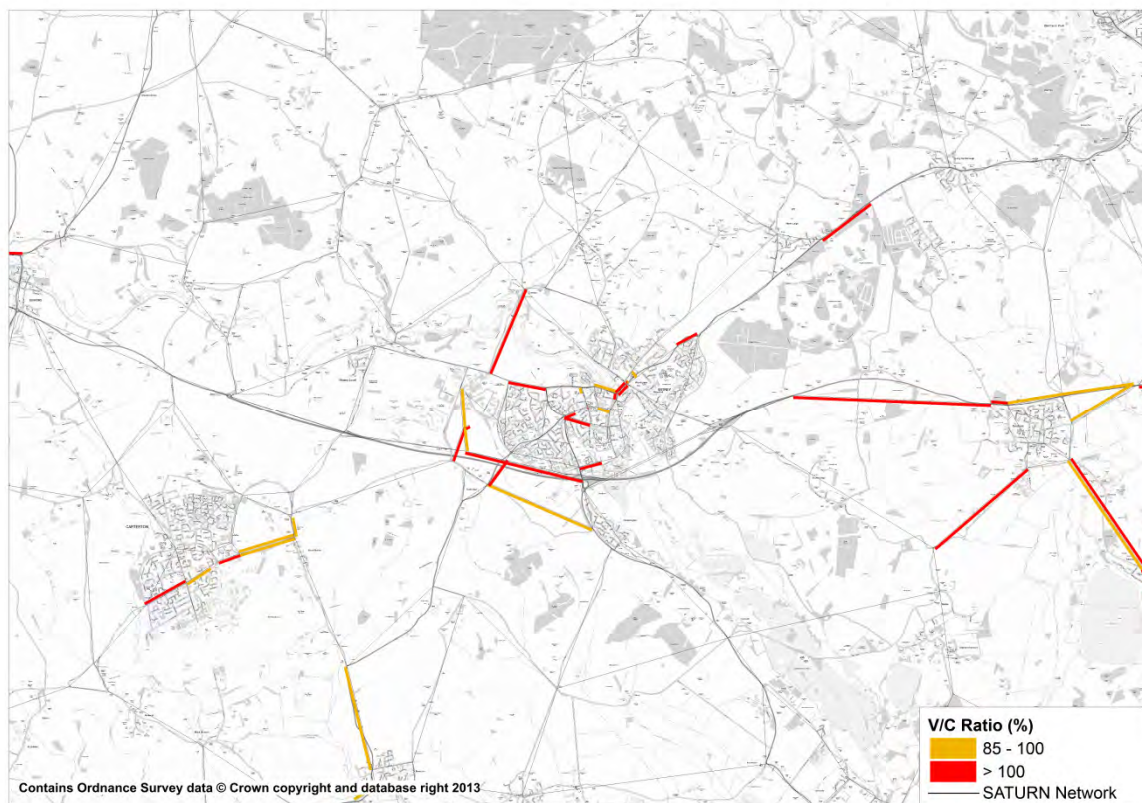
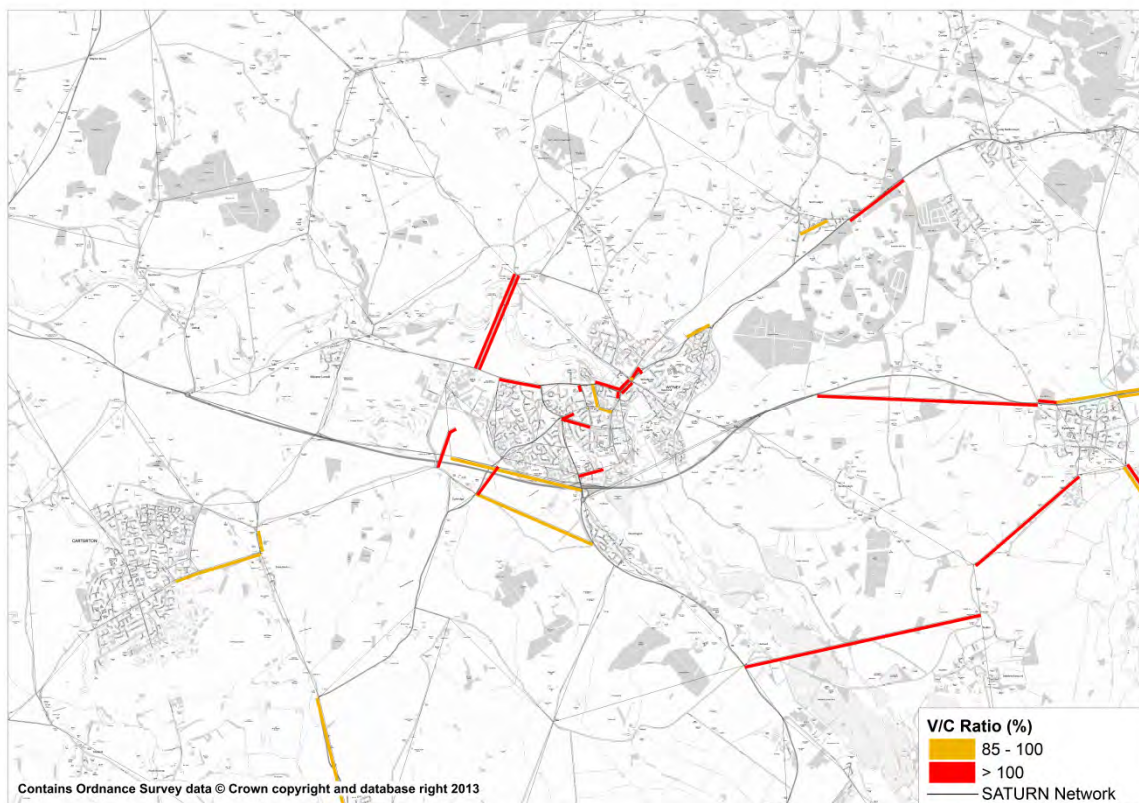


Figure 21. 2030 PM Scenario 2 Do Nothing – Volume / Capacity (%)



# Technical Note

Figure 22. 2030 PM Scenario 2 Option A – Volume / Capacity (%)

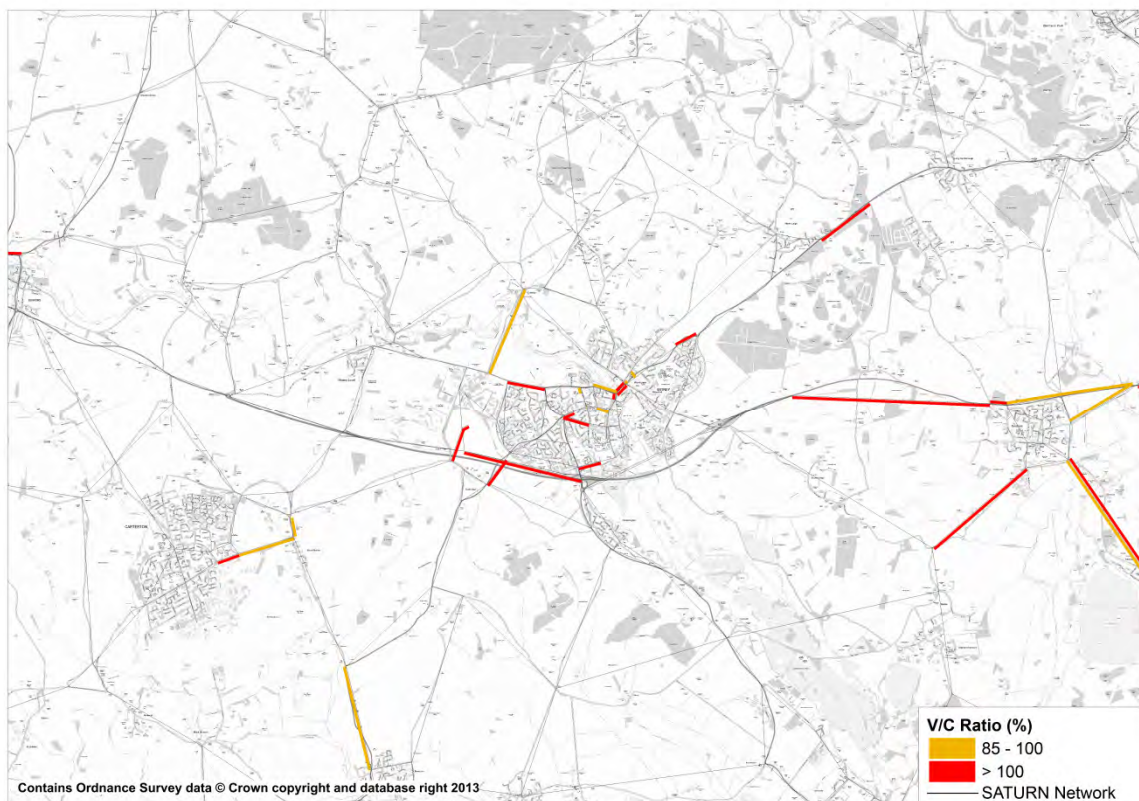
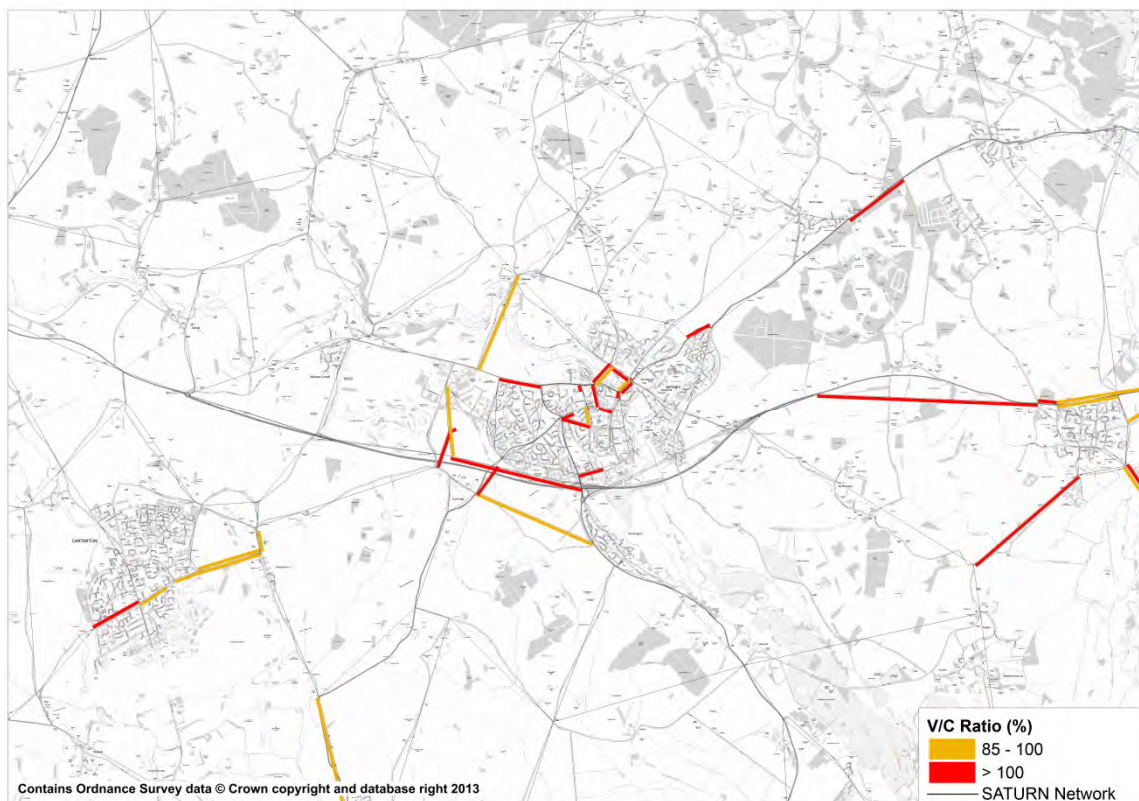


Figure 23. 2030 PM Scenario 3a Option C – Volume / Capacity (%)



# Technical Note

Figure 24. 2030 PM Scenario 3b Option C – Volume / Capacity (%)

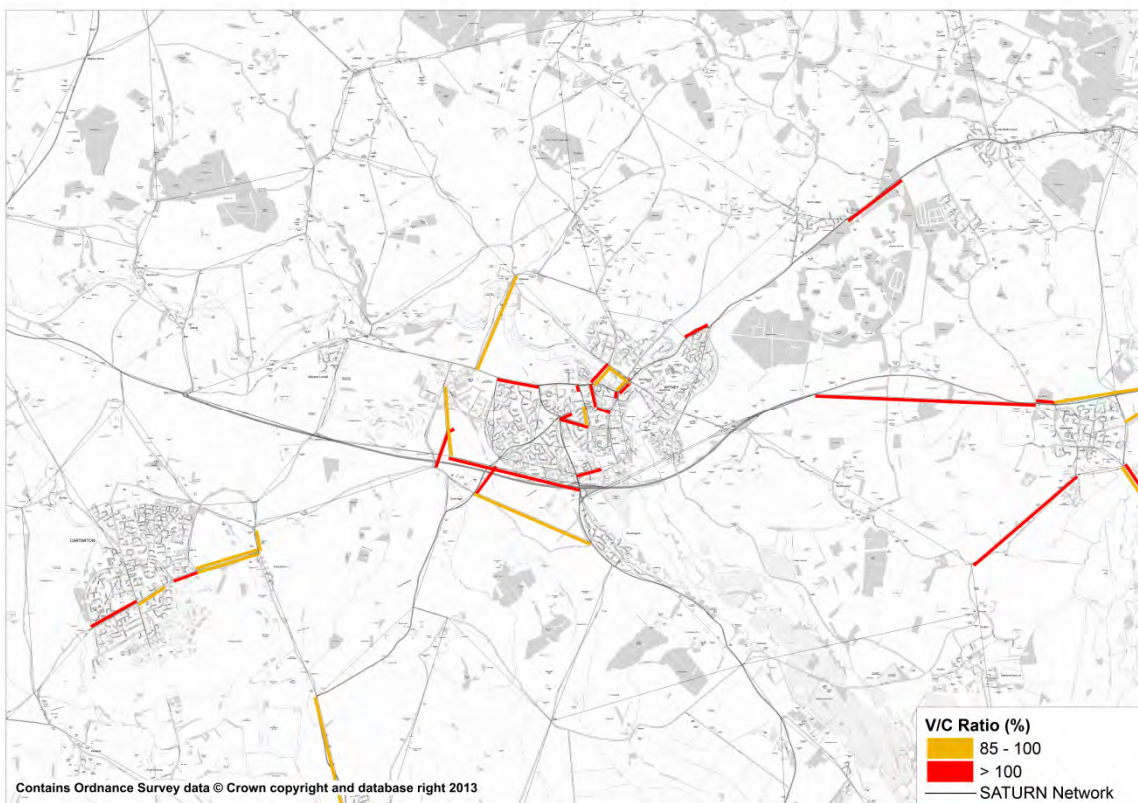
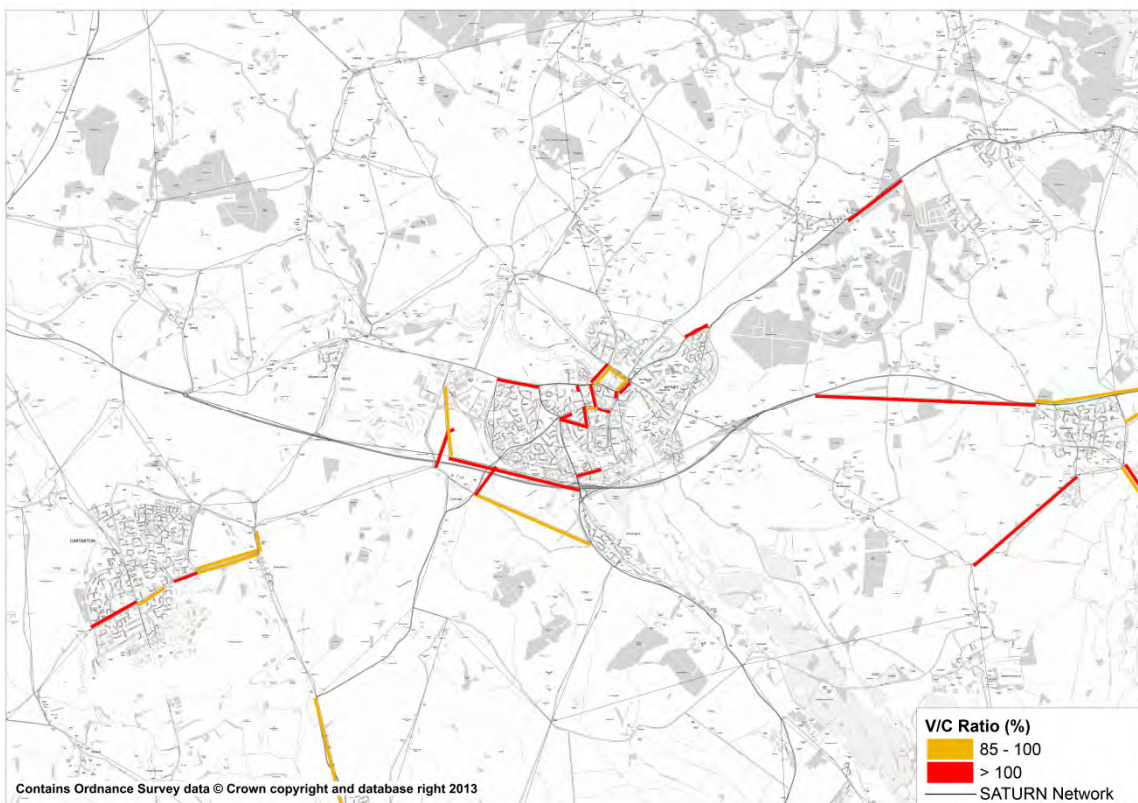


Figure 25. 2030 PM Scenario 3c Option C – Volume / Capacity (%)



# Technical Note

## Appendix C. Average Jct Delay Plots (Area Wide)

Figure 26. 2030 AM Scenario 1 Do Nothing – Average Junction Delay (s)



Figure 27. 2030 AM Scenario 1 Option A – Average Junction Delay (s)





# Technical Note

Figure 28. 2030 AM Scenario 2 Do Nothing – Average Junction Delay (s)



Figure 29. 2030 AM Scenario 2 Option A – Average Junction Delay (s)



# Technical Note

Figure 30. 2030 AM Scenario 3a Option C – Average Junction Delay (s)



Figure 31. 2030 AM Scenario 3b Option C – Average Junction Delay (s)

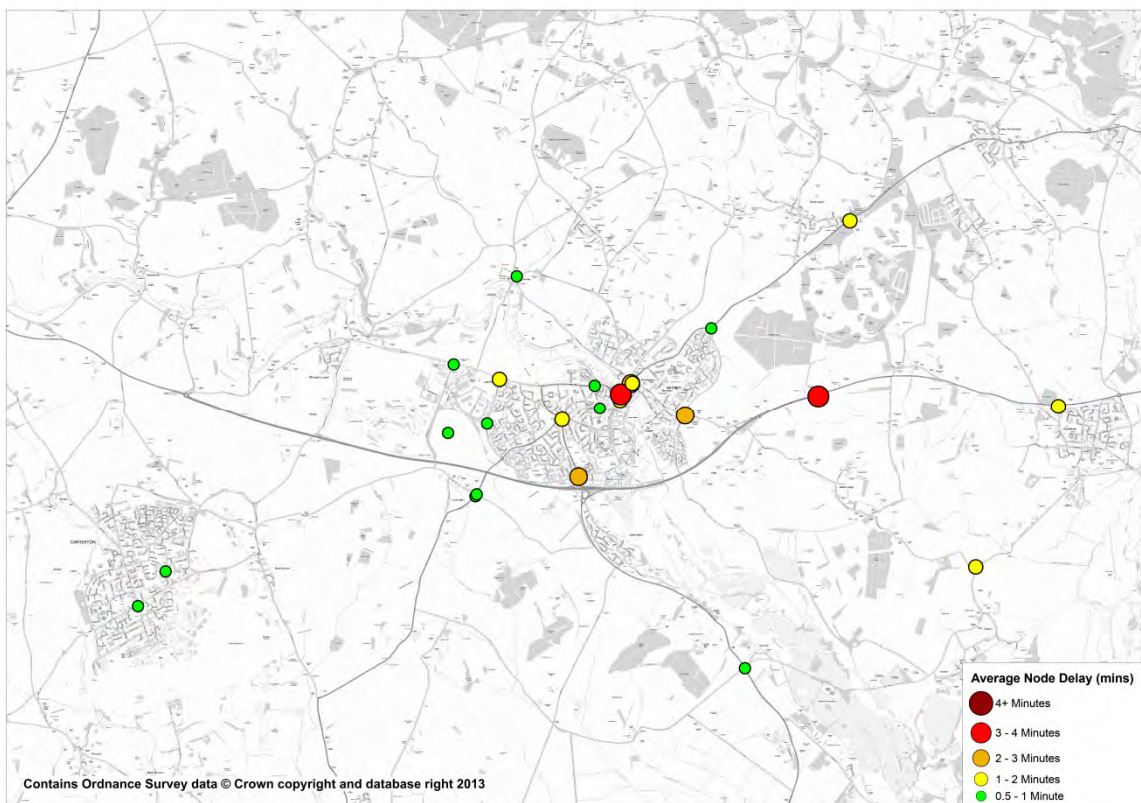


# Technical Note

Figure 32. 2030 AM Scenario 3c Option C – Average Junction Delay (s)



Figure 33. 2030 PM Scenario 1 Do Nothing – Average Junction Delay (s)



# Technical Note

Figure 34. 2030 PM Scenario 1 Option A – Average Junction Delay (s)

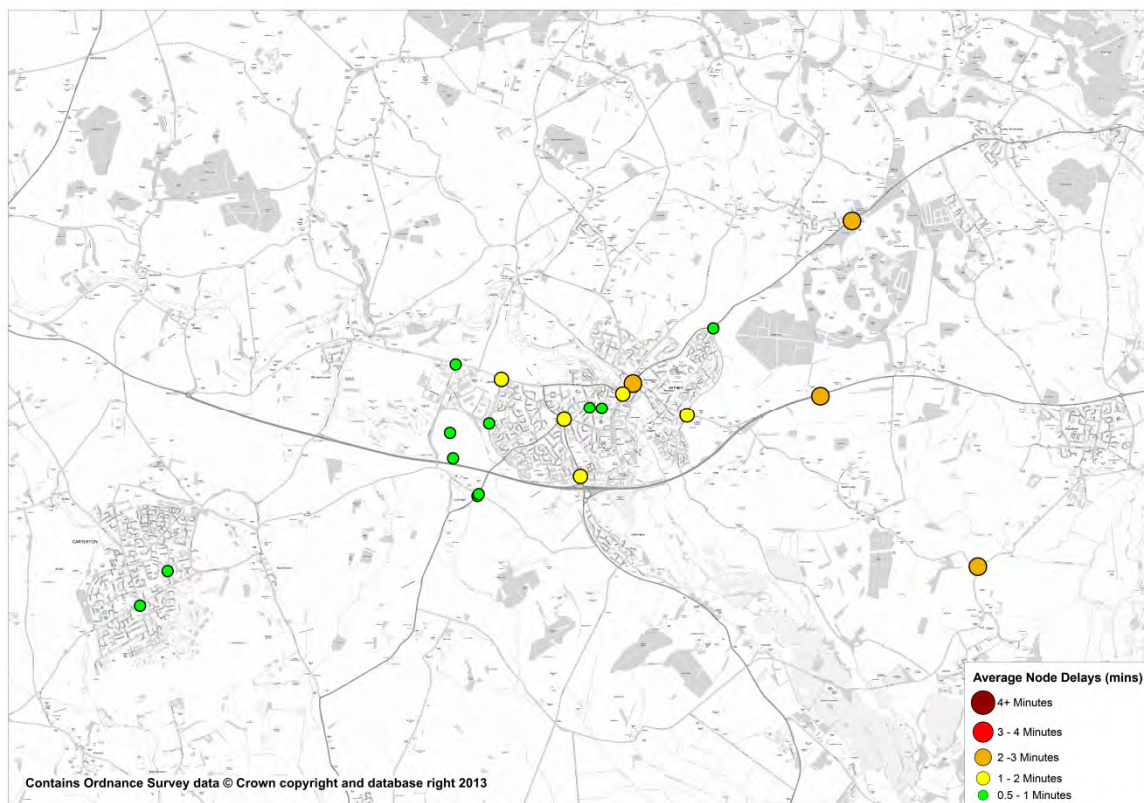
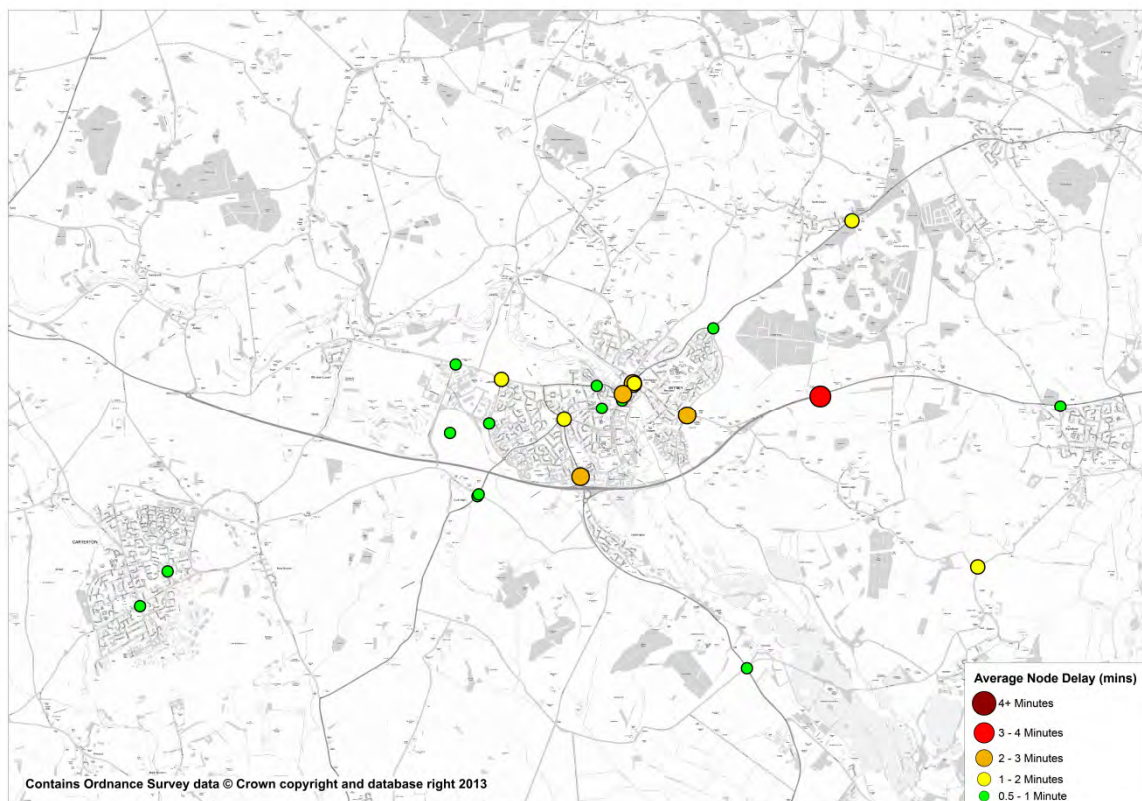


Figure 35. 2030 PM Scenario 2 Do Nothing – Average Junction Delay (s)



# Technical Note

Figure 36. 2030 PM Scenario 2 Option A – Average Junction Delay (s)

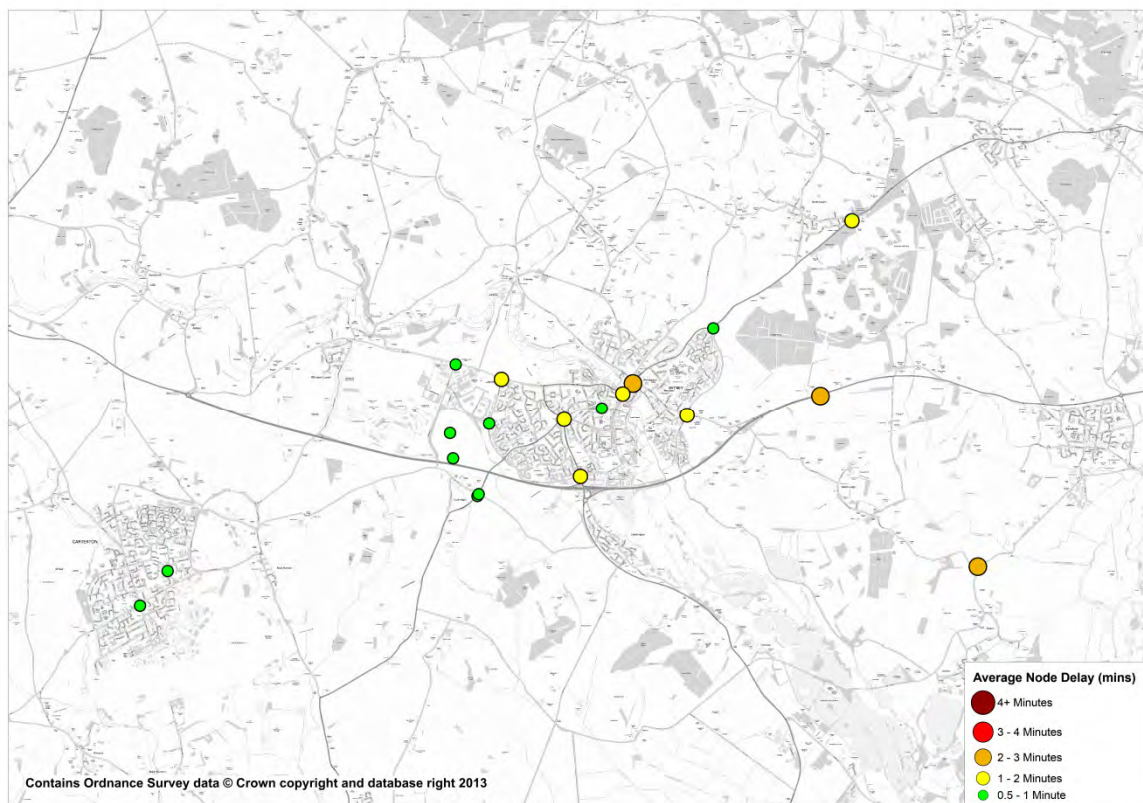
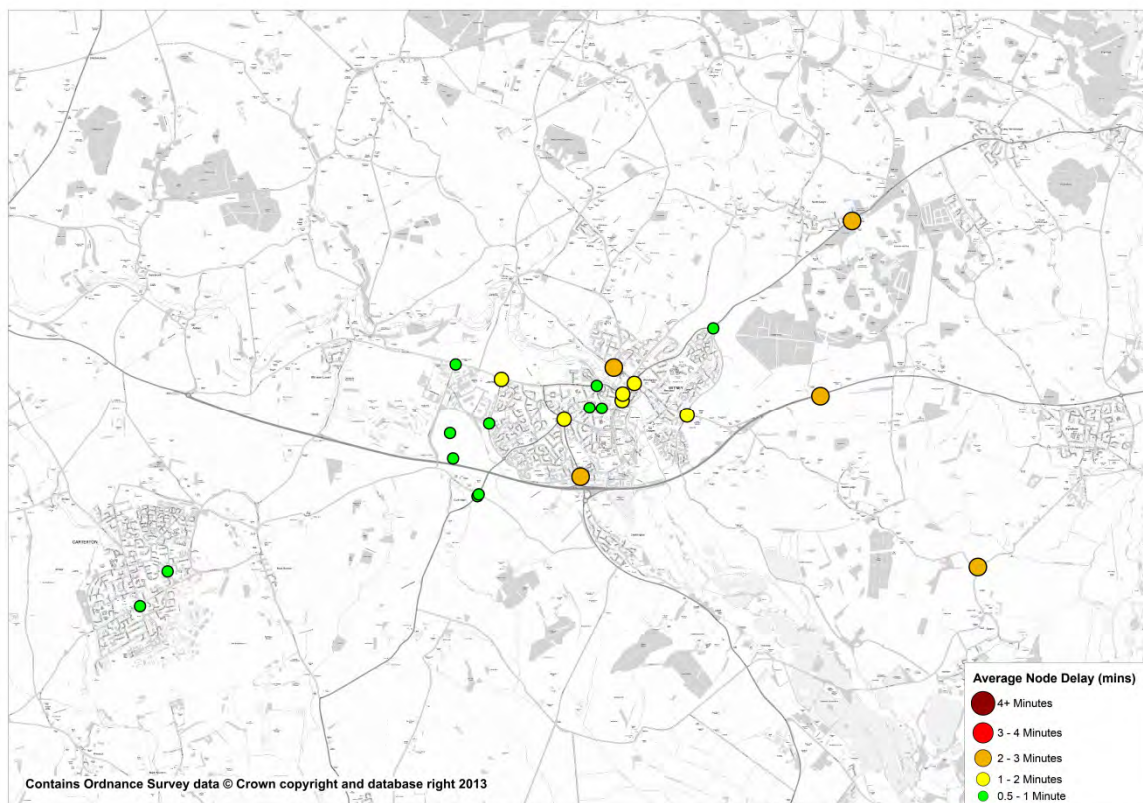


Figure 37. 2030 PM Scenario 3a Option C – Average Junction Delay (s)



# Technical Note

Figure 38. 2030 PM Scenario 3b Option C – Average Junction Delay (s)

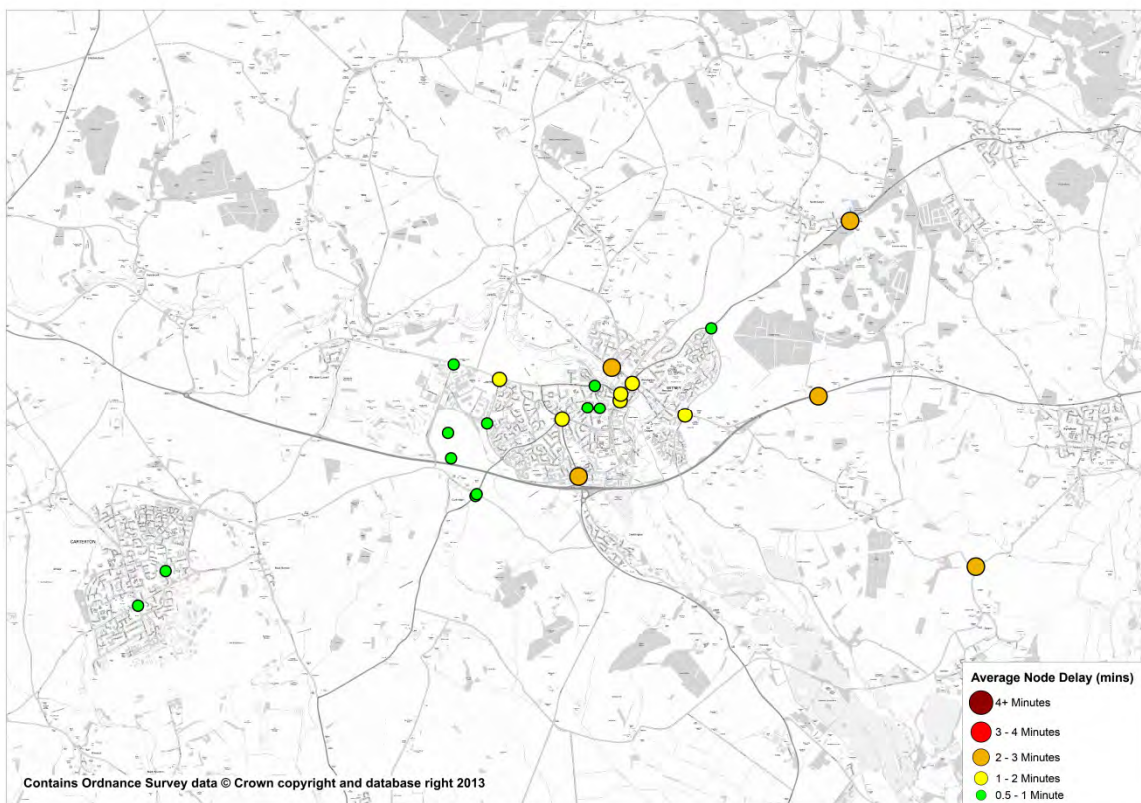
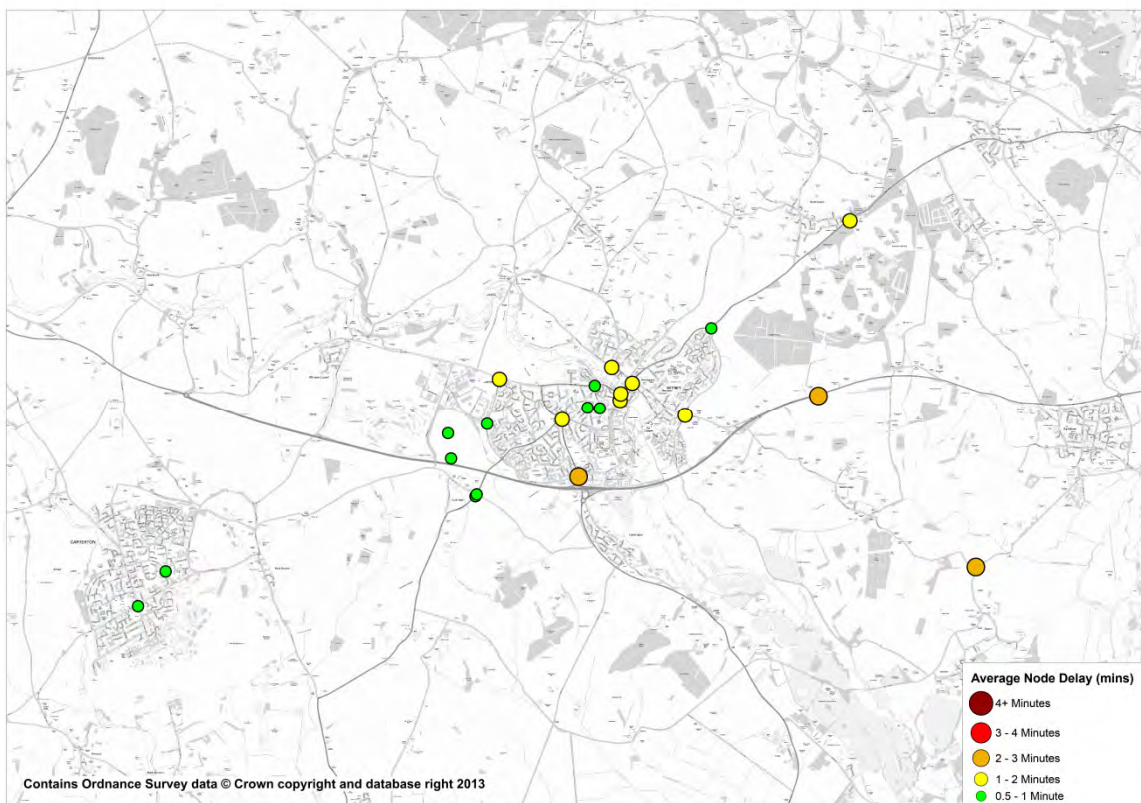


Figure 39. 2030 PM Scenario 3c Option C – Average Junction Delay (s)



# Technical Note

## Appendix D. Volume/Capacity Plots (Witney)

Figure 40. 2030 AM Scenario 1 Do Nothing – Volume / Capacity (%)

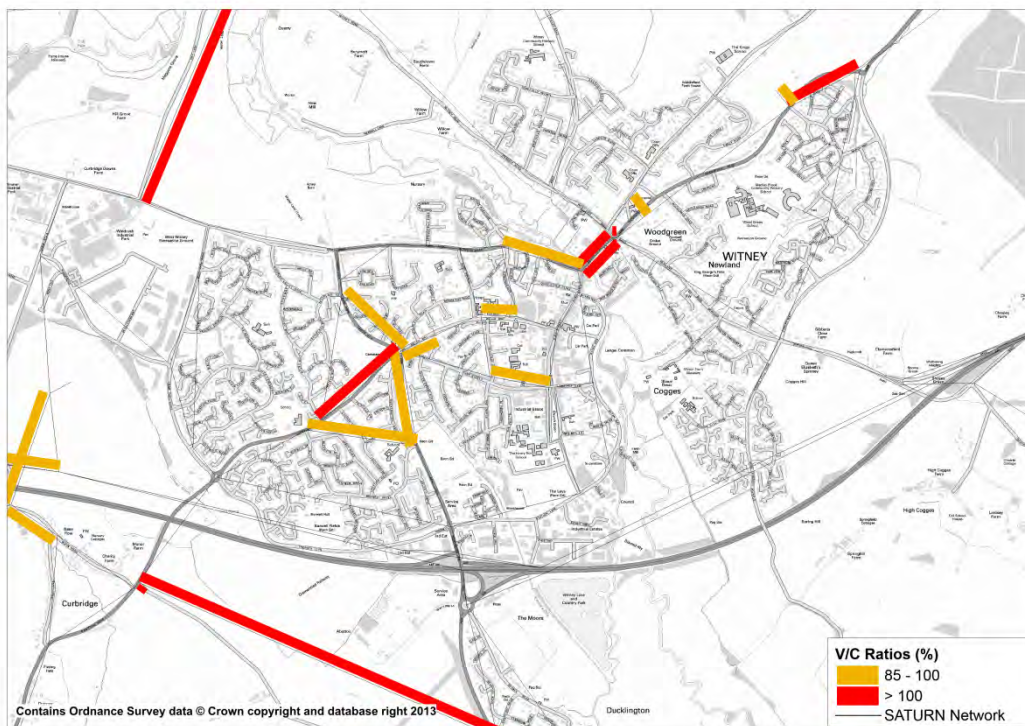
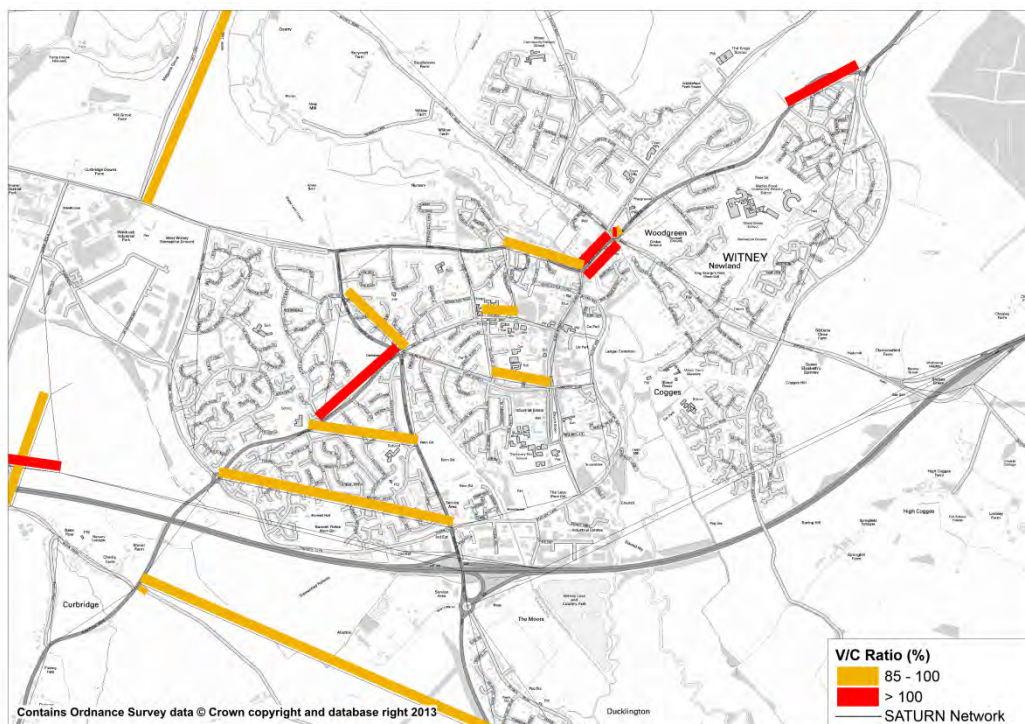


Figure 41. 2030 AM Scenario 1 Option A – Volume / Capacity (%)



# Technical Note

Figure 42. 2030 AM Scenario 2 Do Nothing – Volume / Capacity (%)

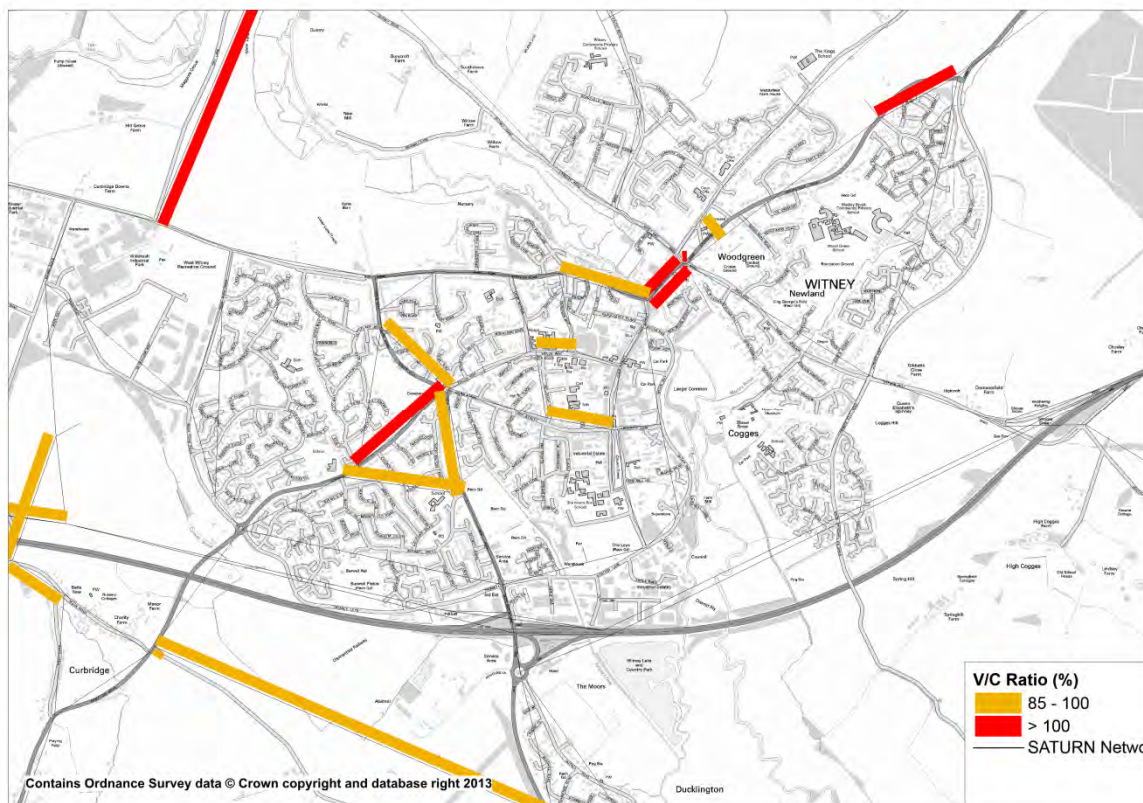
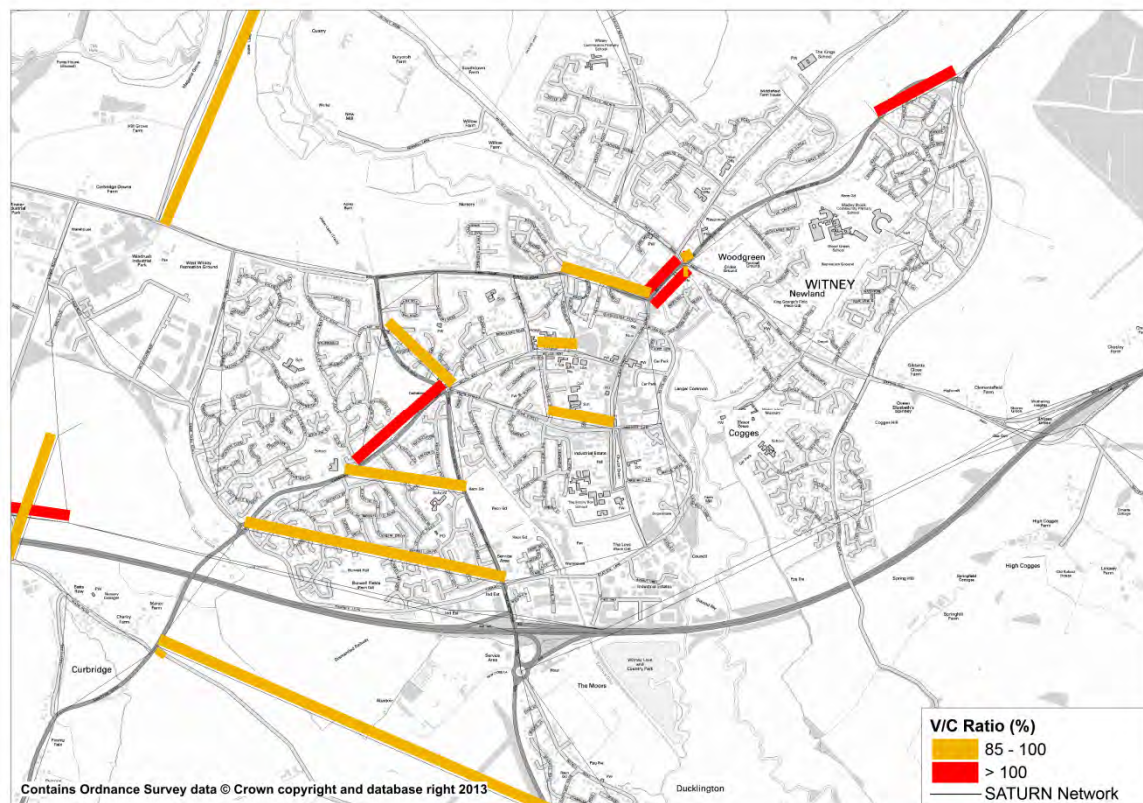


Figure 43. 2030 AM Scenario 2 Option A – Volume / Capacity (%)





# Technical Note

Figure 44. 2030 AM Scenario 3a Option C – Volume / Capacity (%)

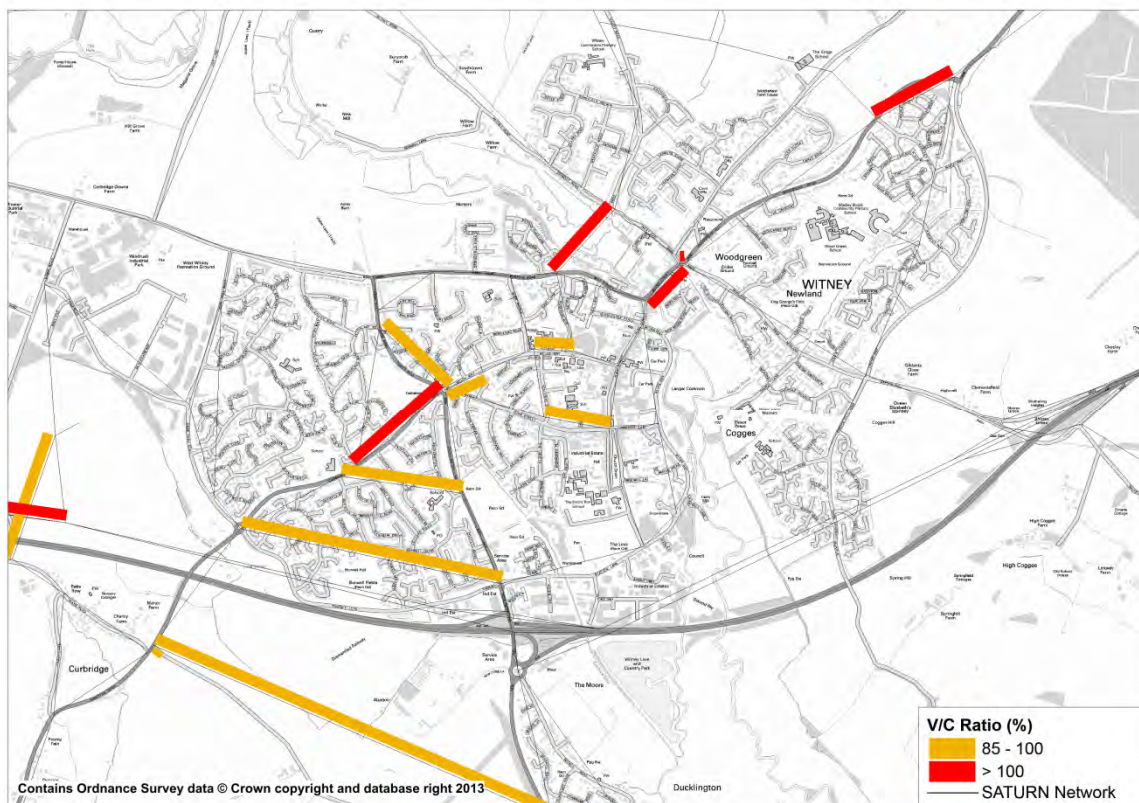
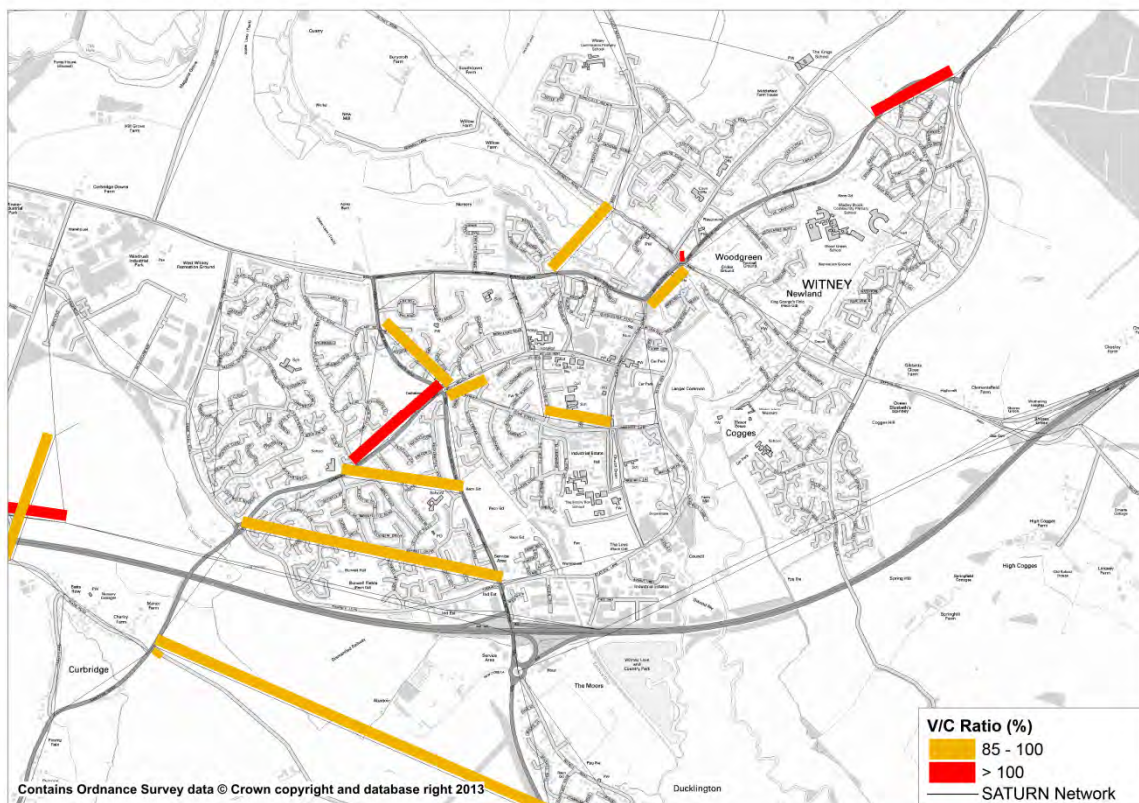


Figure 45. 2030 AM Scenario 3b Option C – Volume / Capacity (%)



# Technical Note

Figure 46. 2030 AM Scenario 3c Option C – Volume / Capacity (%)

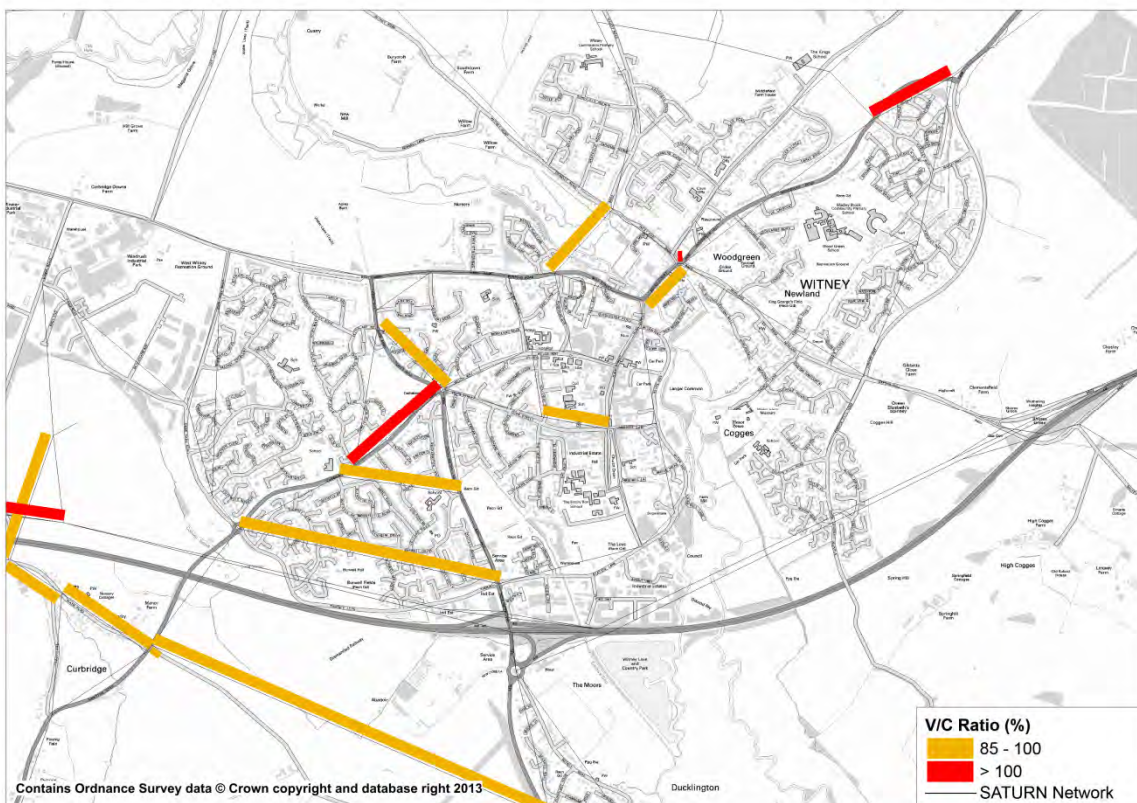
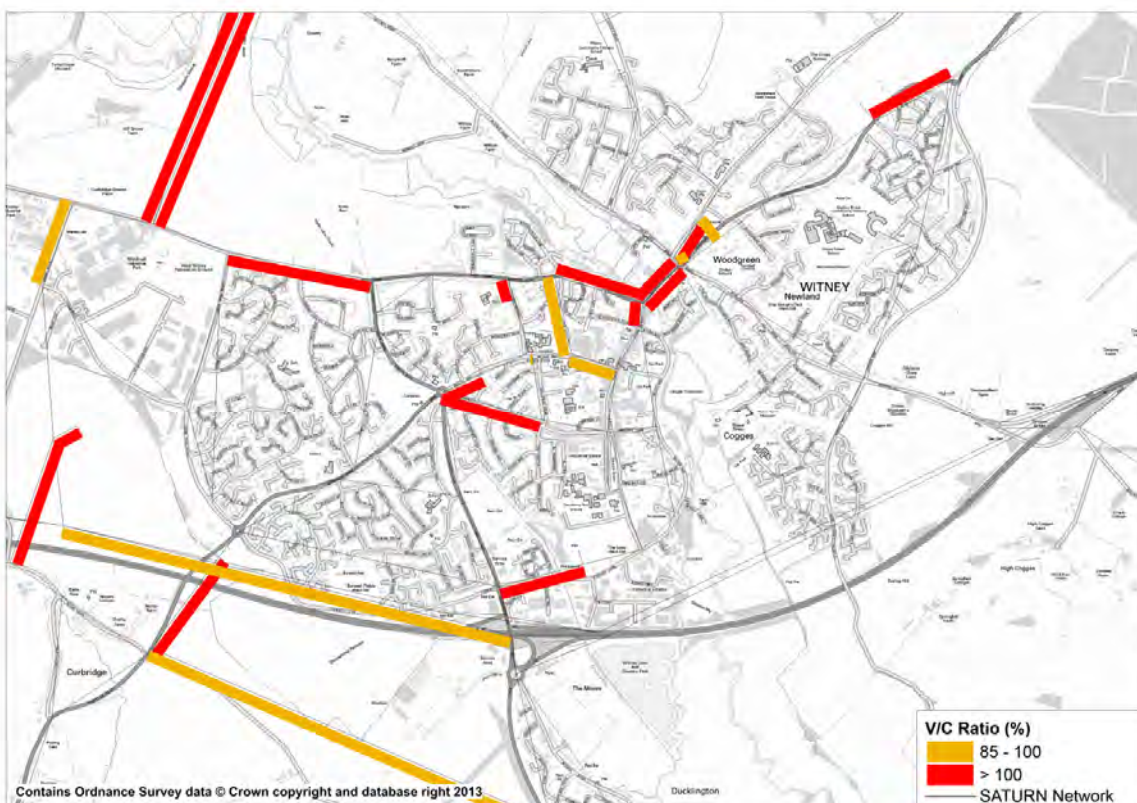


Figure 47. 2030 PM Scenario 1 Do Nothing – Volume / Capacity (%)



# Technical Note

Figure 48. 2030 PM Scenario 1 Option A – Volume / Capacity (%)

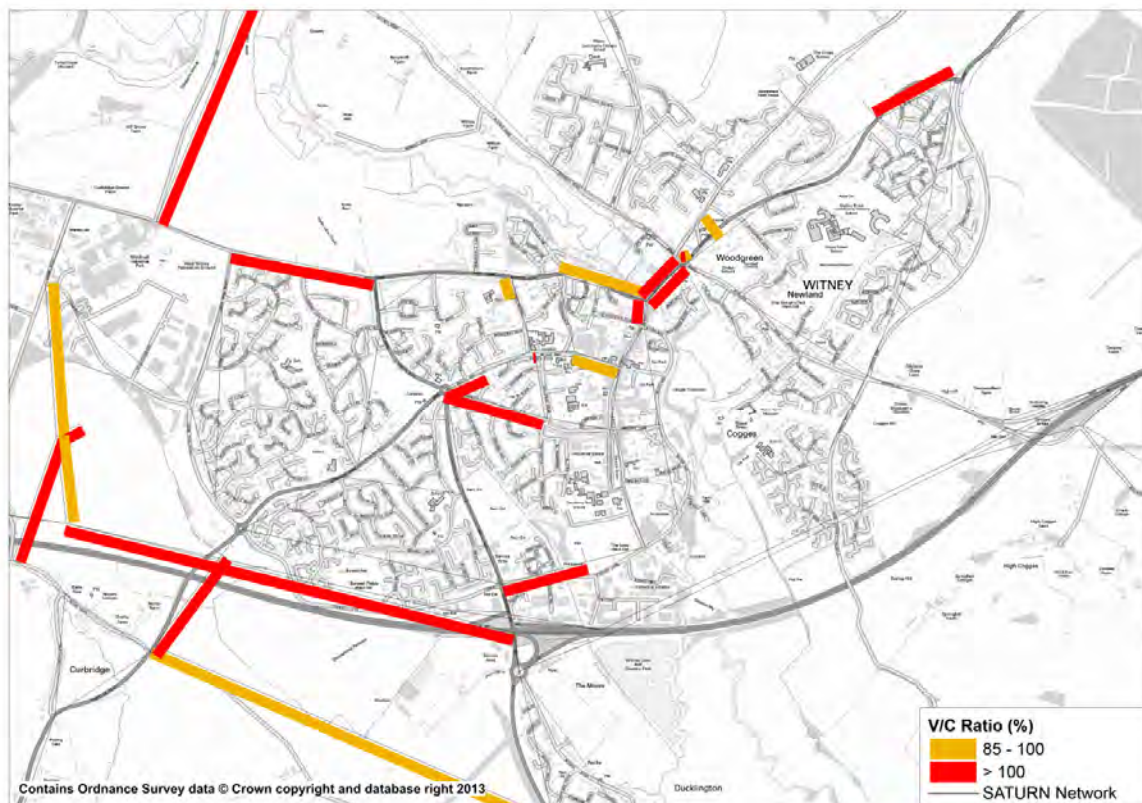
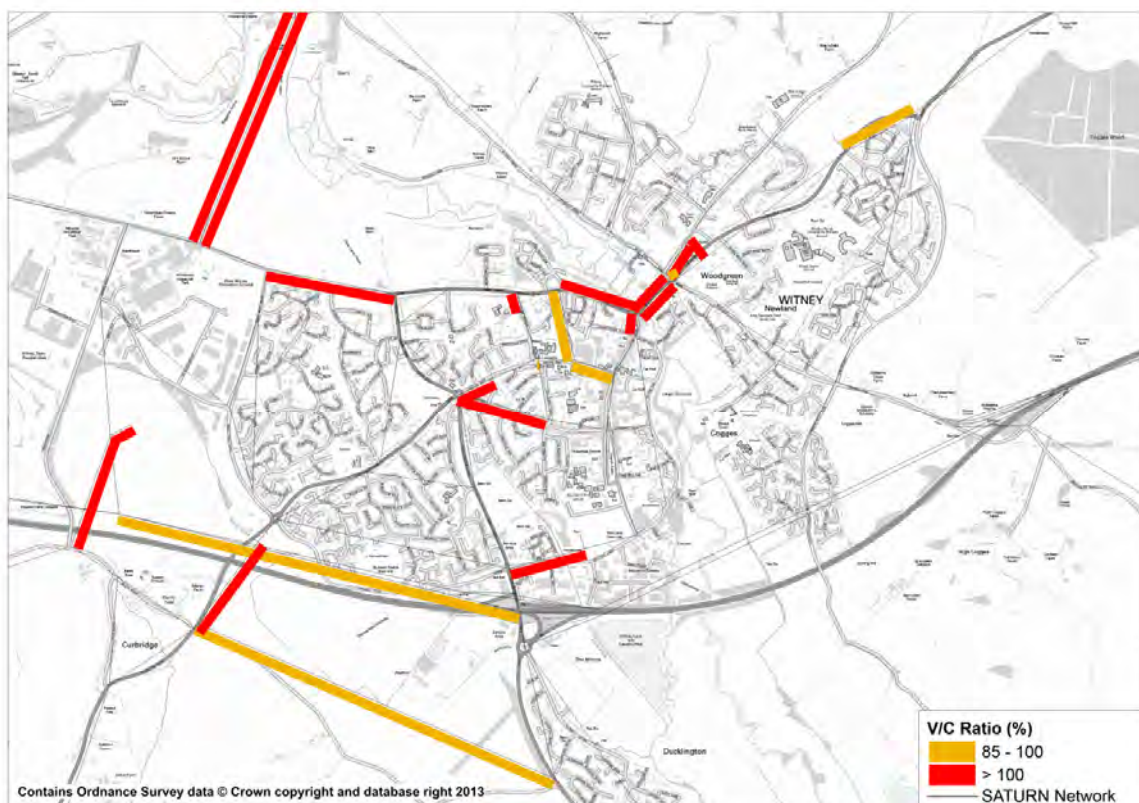


Figure 49. 2030 PM Scenario 2 Do Nothing – Volume / Capacity (%)



# Technical Note

Figure 50. 2030 PM Scenario 2 Option A – Volume / Capacity (%)

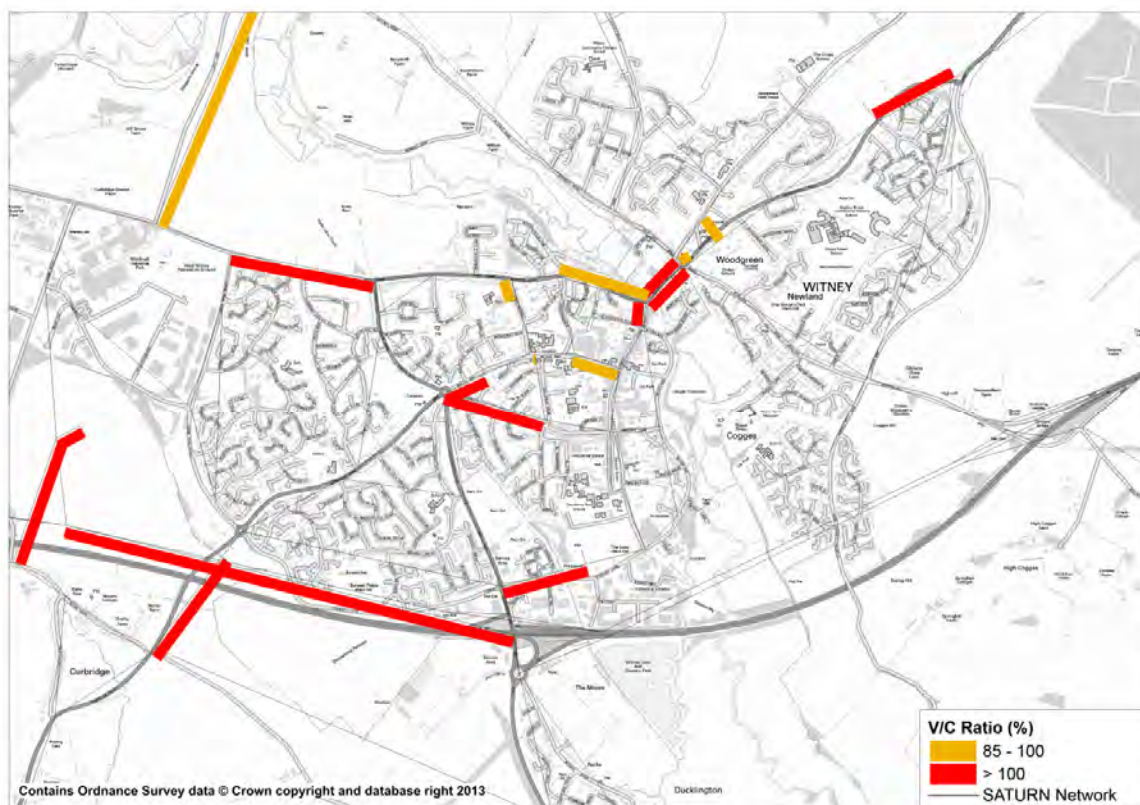
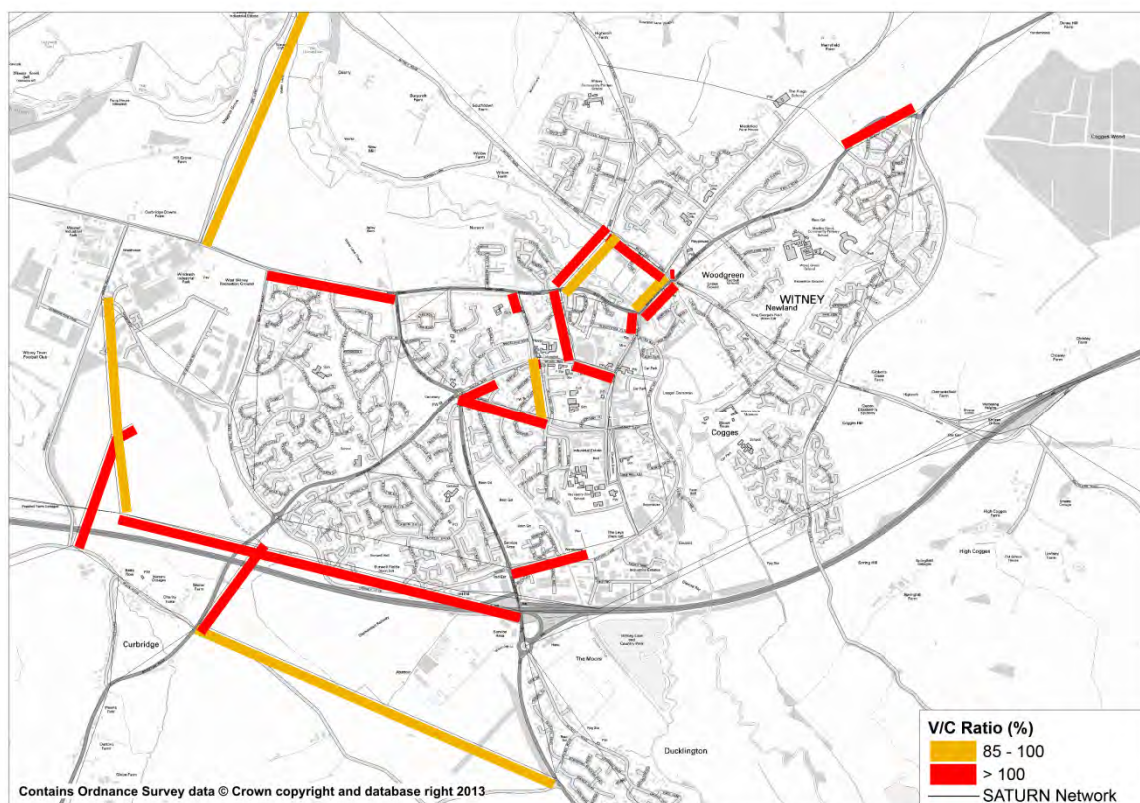


Figure 51. 2030 PM Scenario 3a Option C – Volume / Capacity (%)



# Technical Note

Figure 52. 2030 PM Scenario 3b Option C – Volume / Capacity (%)

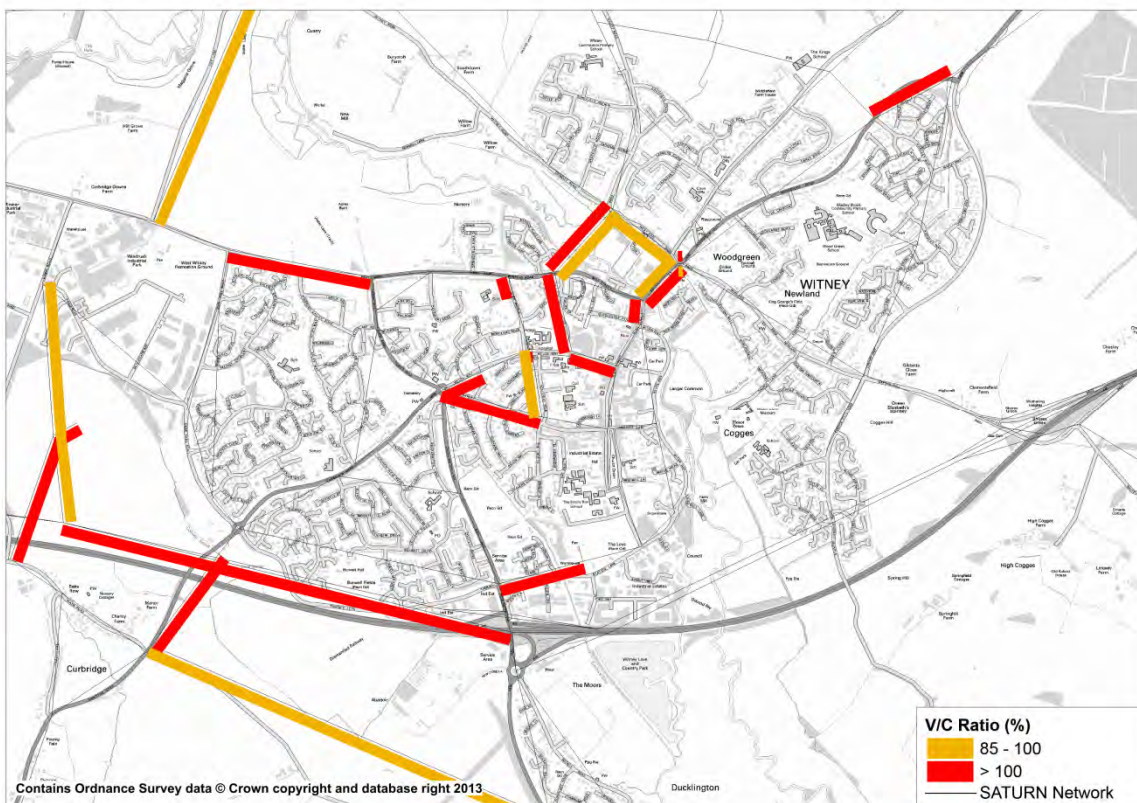
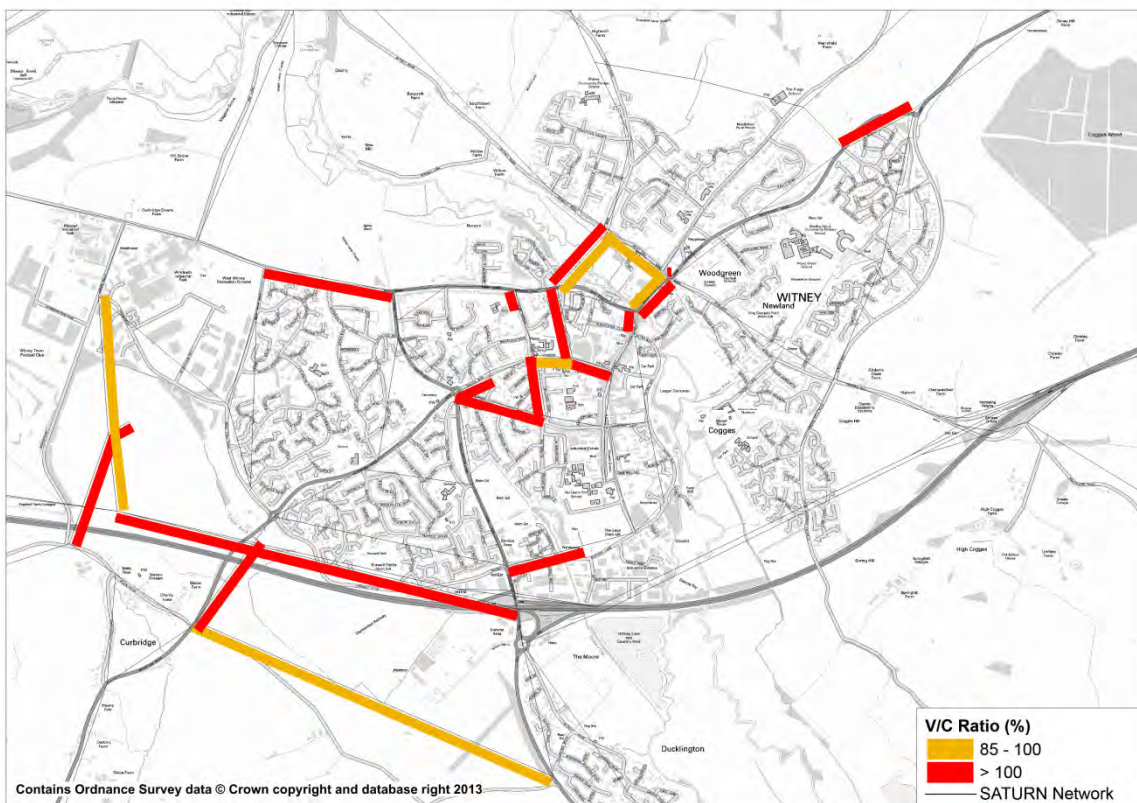


Figure 53. 2030 PM Scenario 3c Option C – Volume / Capacity (%)



# Technical Note

## Appendix E. Average Jct Delay Plots (Witney)

Figure 54. 2030 AM Scenario 1 Do Nothing – Average Junction Delay (s)

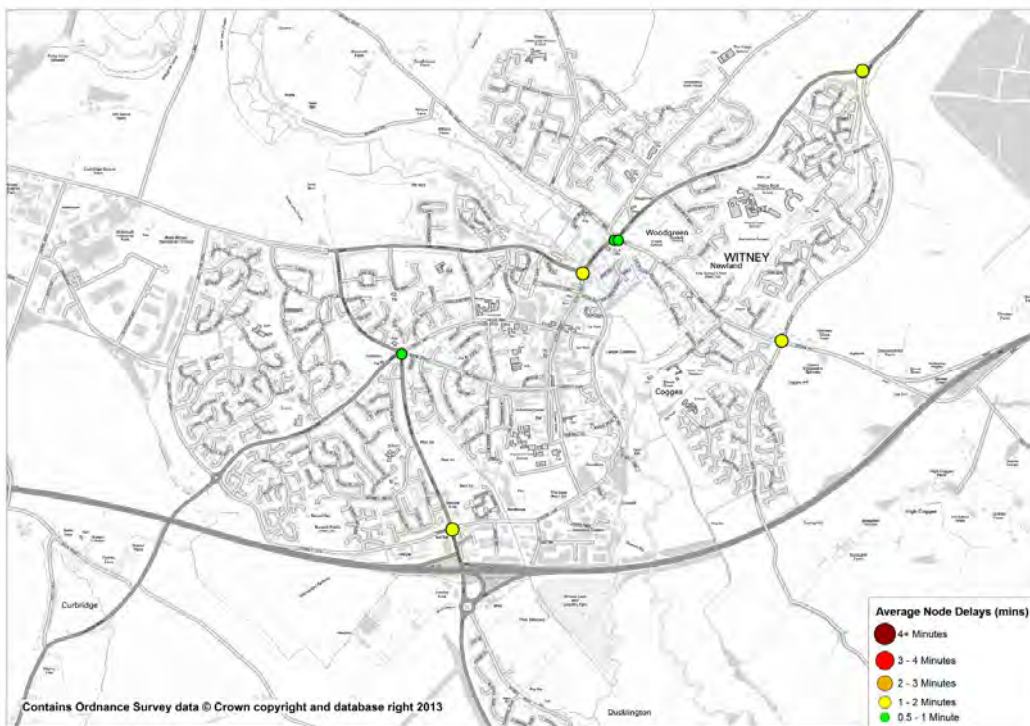
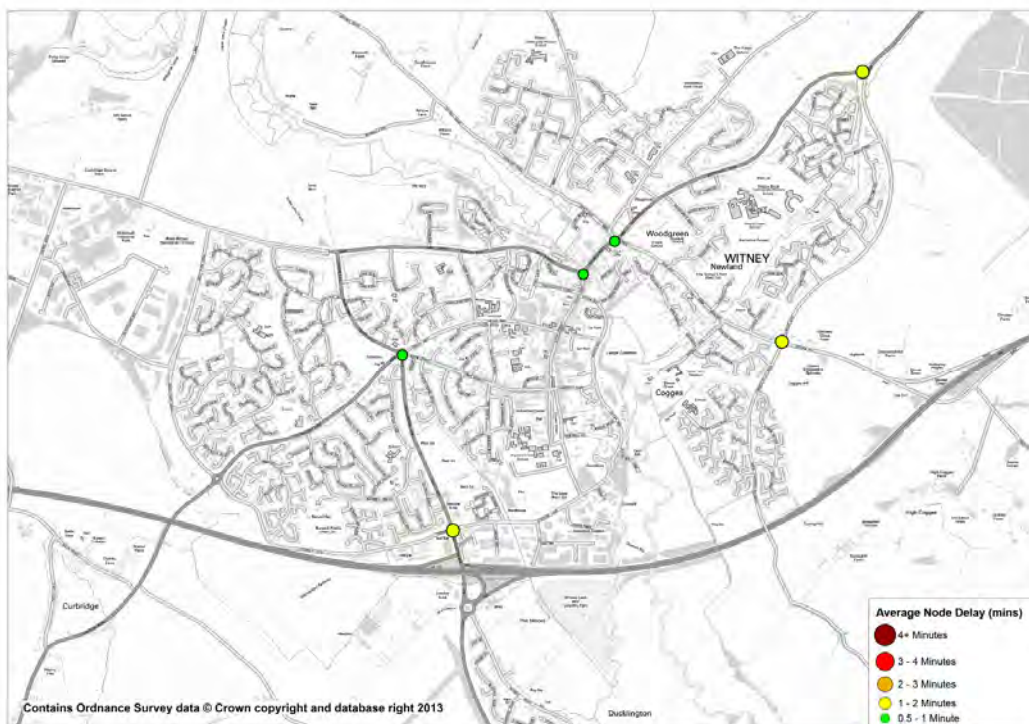


Figure 55. 2030 AM Scenario 1 Option A – Average Junction Delay (s)



# Technical Note

Figure 56. 2030 AM Scenario 2 Do Nothing – Average Junction Delay (s)

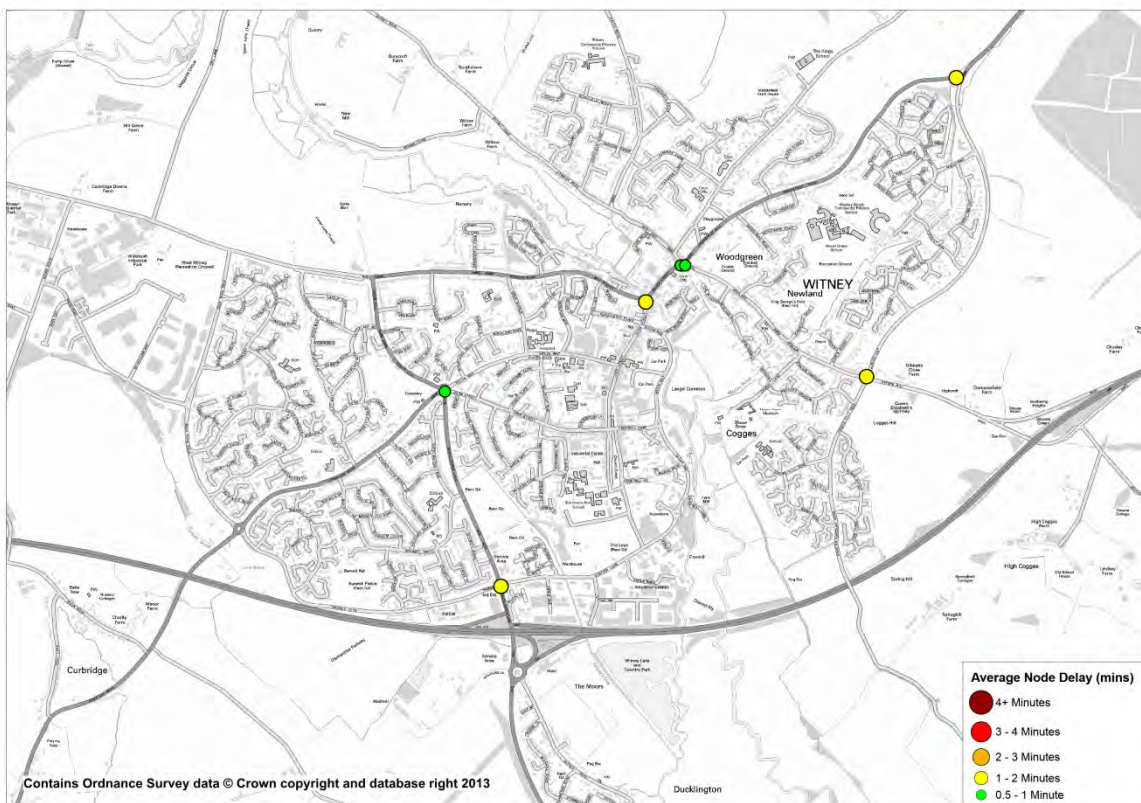
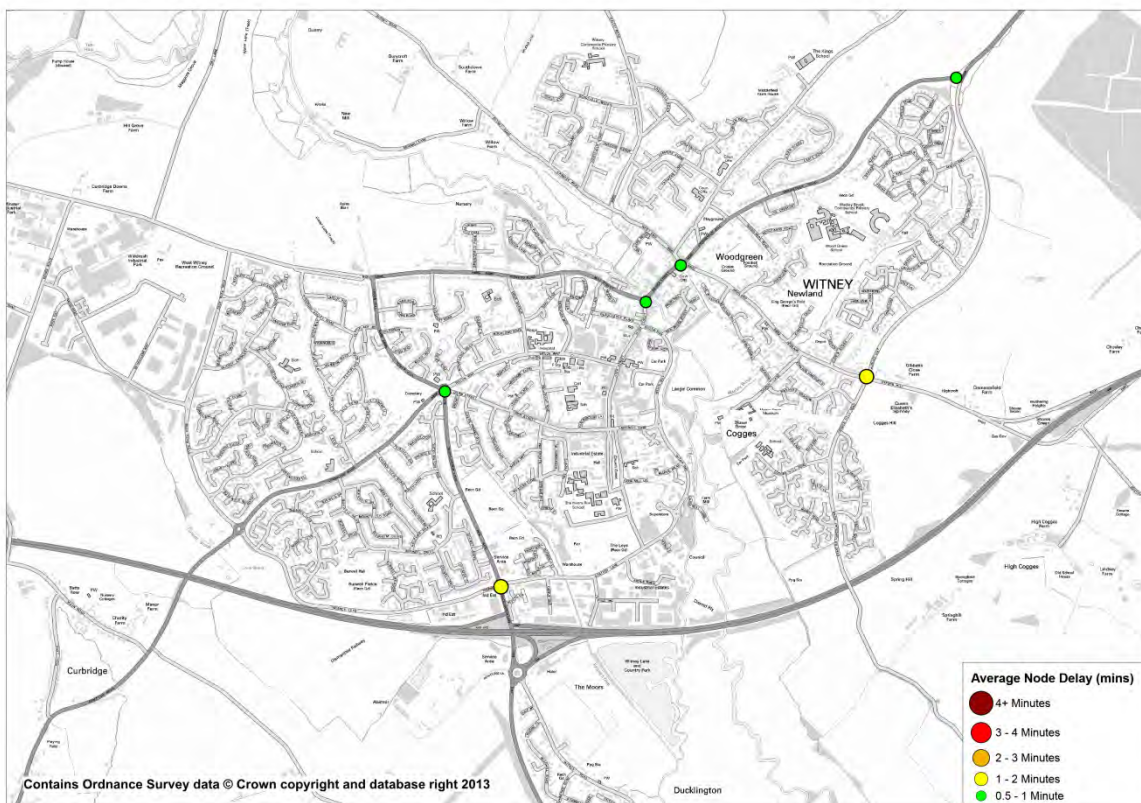


Figure 57. 2030 AM Scenario 2 Option A – Average Junction Delay (s)



# Technical Note

Figure 58. 2030 AM Scenario 3a Option C – Average Junction Delay (s)

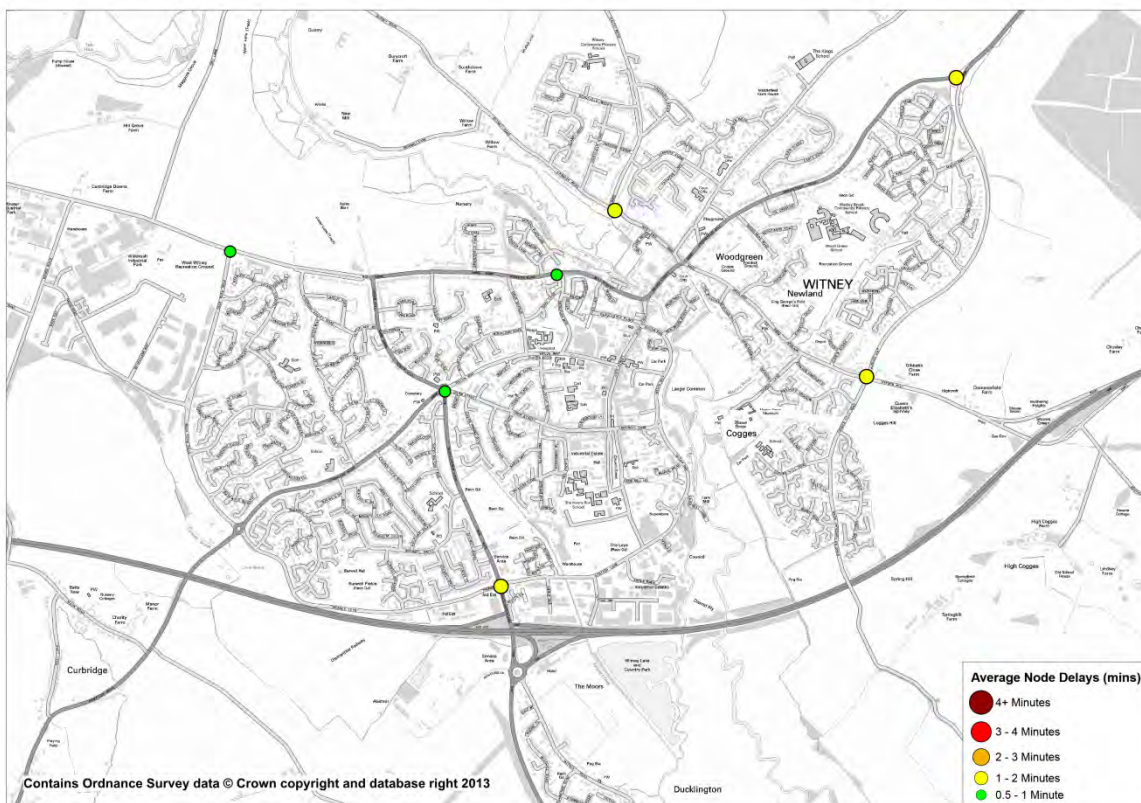
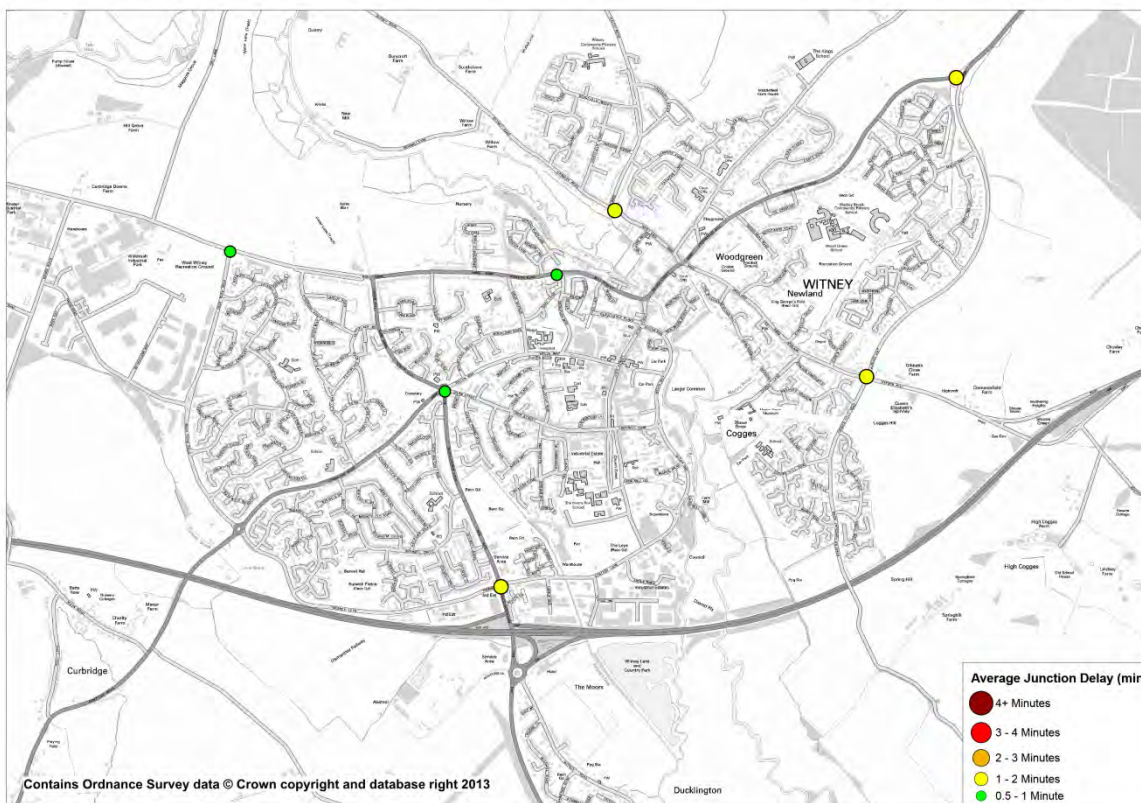


Figure 59. 2030 AM Scenario 3b Option C – Average Junction Delay (s)





# Technical Note

Figure 60. 2030 AM Scenario 3c Option C – Average Junction Delay (s)

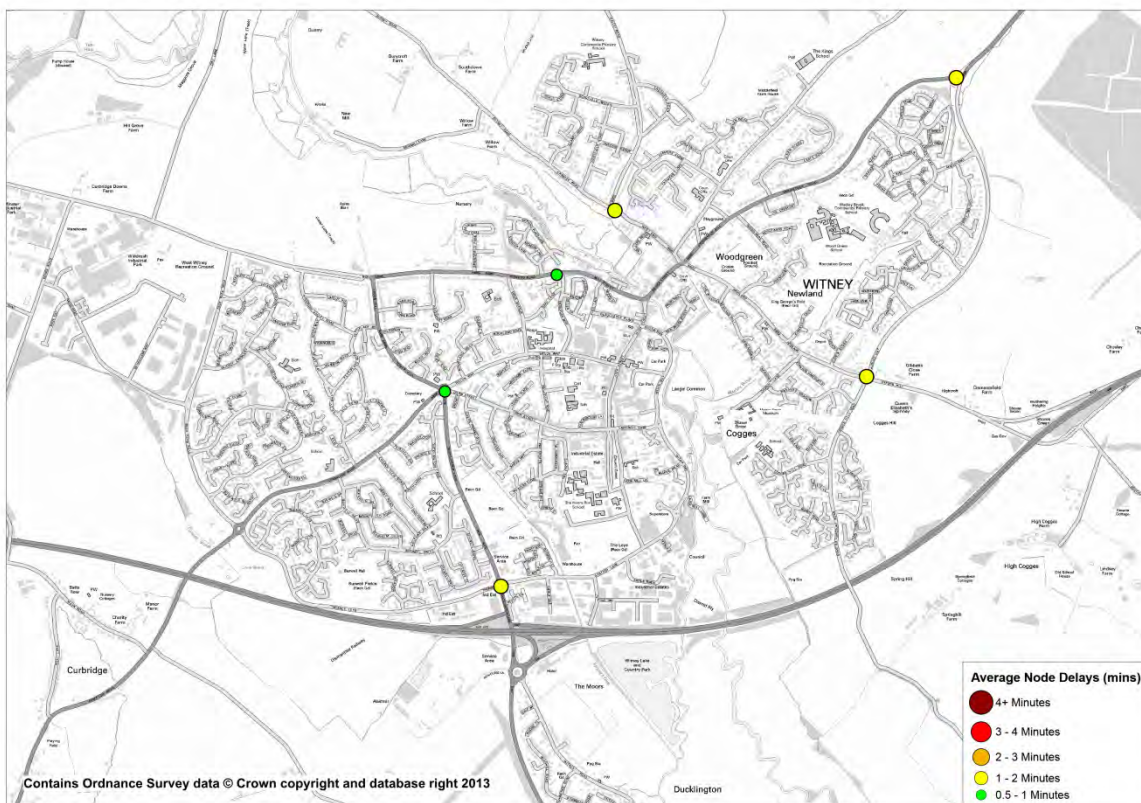


Figure 61. 2030 PM Scenario 1 Do Nothing – Average Junction Delay (s)



# Technical Note

Figure 62. 2030 PM Scenario 1 Option A – Average Junction Delay (s)



Figure 63. 2030 PM Scenario 2 Do Nothing – Average Junction Delay (s)



# Technical Note

Figure 64. 2030 PM Scenario 2 Option A – Average Junction Delay (s)

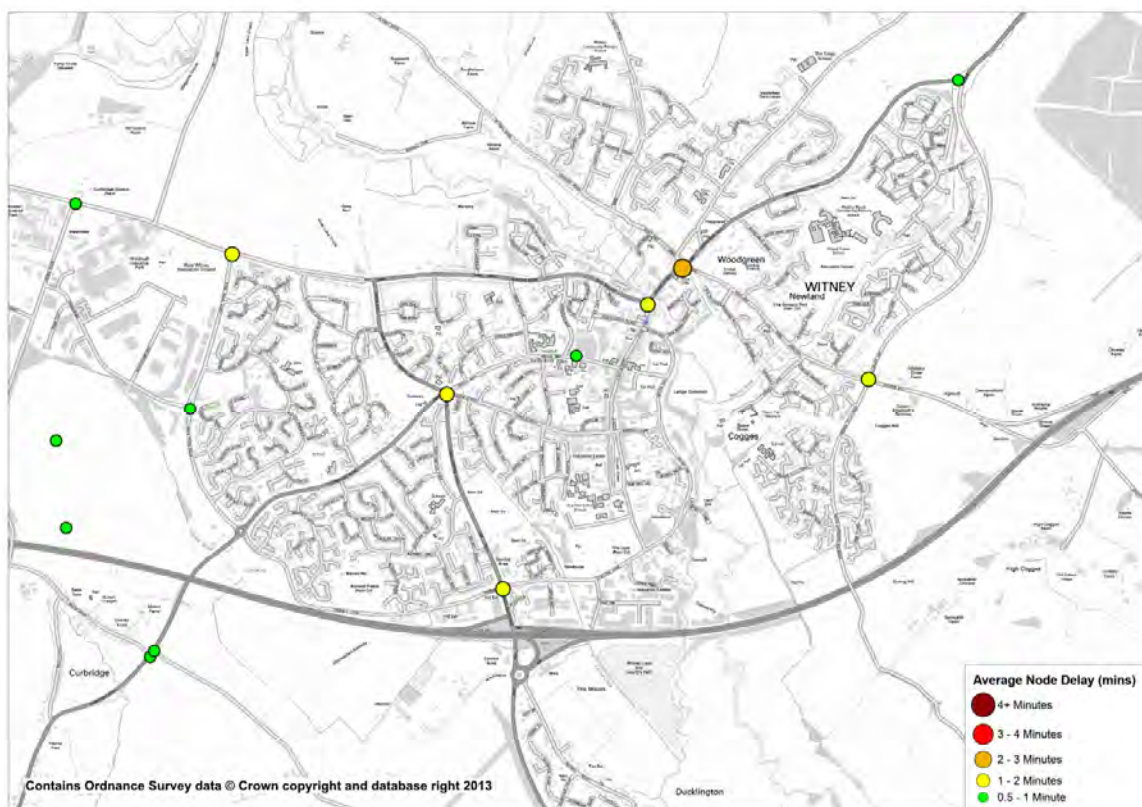


Figure 65. 2030 PM Scenario 3a Option C – Average Junction Delay (s)



# Technical Note

Figure 66. 2030 PM Scenario 3b Option C – Average Junction Delay (s)

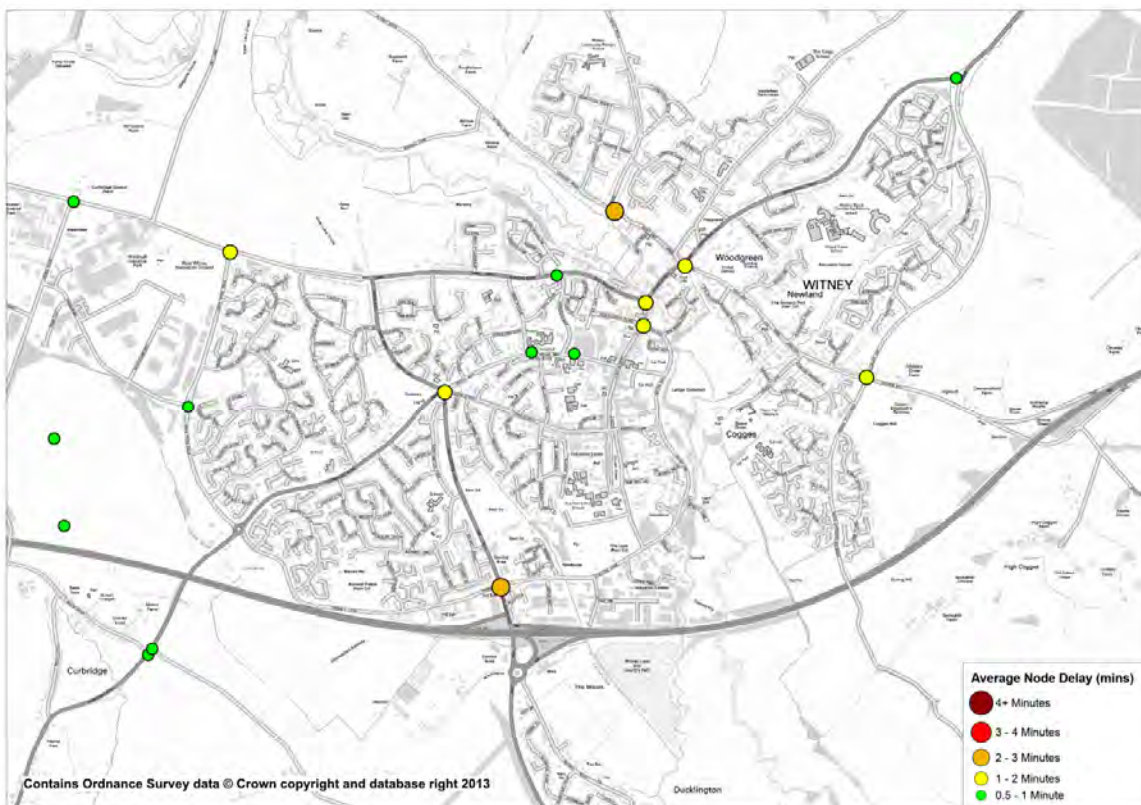


Figure 67. 2030 PM Scenario 3c Option C – Average Junction Delay (s)

