Transport Assessment

Scenarios for Distribution of Housing Growth-
Stage 3 Report

June 2016

Waverley Borough Council

Waverley BOROUGH COUNCIL

Mott MacDonald

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Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
A	October 2015	S Finney	R Khakh	N Richardson	1st issue
B	November 2015	S Finney	R Khakh	N Richardson	2nd issue
C	June 2016	S Finney	R Khakh	N Richardson	3rd issue

Contents

1 Introduction

Mott MacDonald has been commissioned by Waverley Borough Council (WBC) to provide advice in relation to planning for new development as part of their Local Plan. This report covers Stage 3 of the work, following on from the Stage 1 and Stage 2 Reports (February 2016).

1.1 Background

WBC consulted on a new Local Plan from 3 September - 17 October 2014, through the 'Consultation on Potential Housing Scenarios and Other Issues for the Waverley Local Plan' document. Four scenarios to meet the predicted demand for new housing were presented:

"Each would deliver 8,450 homes over the period from 2013 to 2031, equivalent to just over 469 homes per year on average. This includes the 3,400 on sites within settlements. The distribution of the remaining 5,050 homes differs between the scenarios as follows:

- Scenario 1 – Around 4,450 on greenfield sites at the four larger settlements, some growth at villages (600) but no development at Dunsfold Aerodrome
- Scenario 2 – Around 2,650 on greenfield sites at the four larger settlements, some growth at the villages (600) plus 1,800 at Dunsfold Aerodrome
- Scenario 3 – Around 1,900 on greenfield sites at the four larger settlements, some growth at the villages (550) plus 2,600 at Dunsfold Aerodrome
- Scenario 4 – Around 1,200 on greenfield sites at the four larger settlements, some growth at the villages (450) plus 3,400 at Dunsfold Aerodrome."

Supporting evidence for this consultation included a Strategic Transport Assessment of scenarios undertaken by Surrey County Council (SCC) on behalf of WBC, as well as a 'Planning Position Statement from Promoters of Dunsfold Aerodrome: August 2014'. Within this report the scenarios modelled are referred to as the STA Scenarios, which are different to those consulted on by WBC.

1.2 Scope of Work

Stages 1 and 2 of the assessment have focused on the A281 corridor (Alfold to Guildford town centre gyratory).

Stage 3 of the work considers the potential impact of housing developments in and around Farnham and uses the Farnham Traffic Model that was developed by SCC. This report includes a review of the traffic model and details existing levels of congestion in and around Farnham. The impact of additional housing for Farnham is then considered for two development scenarios, based on predicted increases in traffic demand provided by SCC from their strategic traffic model that covers the whole county. Potential mitigation measures to address the predicted future congestion issues are also considered and their impact assessed.

2 Farnham Traffic Model

2.1 Details of Model

SCC has developed a micro-simulation traffic model covering Farnham and the roads immediately around the town, including the Wrecclesham, Rowledge, Hale and Badshot Lea areas, as shown in **Figure 2.1.**

The model uses S-Paramics software, which is an internationally recognised microsimulation traffic flow modelling program. It simulates the individual components of traffic flow and congestion, and presents its output as a real-time visual display for traffic management and road network design.

The model was originally built in 2004 to cover the PM peak period. In 2011, the model was reviewed and updated to a 2010 base year for both AM and PM peak periods, for the assessment of highway schemes within Farnham town centre. The model was further improved in 2012 but retained a 2010 base year, covering the following periods for an average weekday:

- AM peak hour 08:00-09:00; and
- PM peak hour 17:00-18:00.

Traffic is assigned to the road network through 83 zones which represent the origin/destination of vehicle trips, such as car parks, residential and employment areas and the radial routes at the edge of the model.

Modelled vehicles on the road network mimic real-life behaviour, such as giving way to each other at priority and roundabout junctions, using a range of 'desired' speeds and faster vehicles overtaking slower ones. At signalised junctions and pedestrian crossings, appropriate 'green times' are assigned to the different movements, including at the railway level crossing south of Hickley's Corner. Four of the junctions are controlled on site with MOVA to optimise signal timings to match the variation in traffic demand over the day and within the peak hours. This is replicated within the model at the following junctions:

- A287 Folly Hill junction with A3016 Upper Hale Road (J702);
- A31 Farnham Bypass junction with Shepherd & Flock Roundabout (J705);
- A31 Farnham Bypass junction with South Street and Station Hill (Hickley's Corner) (J721); and
- A31 Farnham Bypass junction with D5317 Weydon Lane (J748).

Different vehicle classes (and their different characteristics such as acceleration rates, vehicle length etc) are modelled as follows:

- car - petrol;
- car - diesel (to give air quality data);
- Light Goods Vehicle (LGV);
- Oversized Goods Vehicle 1 (OGV1);
- Oversized Goods Vehicle 2 (OGV2); and
- coach.

Scheduled bus services are included based on timetabled routes and frequencies.

Figure 2.1: Extent of Traffic Model

Source: Farnham Microsimulation Model, Local Model Validation Report, July 2013

2.2 Observed Traffic Demand

Although the model has a base year of 2010, traffic demand has been derived from traffic counts undertaken between 2004 and 2012 from a number of sources:

- Classified counts (traffic volumes on a single weekday, split into vehicle classes);
- Automatic traffic counts (giving average weekday volumes over one or more weeks); and
- Automatic Number Plate Recognition surveys (used to determine origin and destination of trips but also provide traffic volumes).

There is no apparent factoring applied to counts from earlier years to bring them in-line with later years and take into account possible growth. However, data from long term ATC sites (detailed in Section 3) show that there has generally been no traffic growth between 2009 and 2014. Counts are also available from 2009-2012 on the A31 and most of the main radial routes to/from Farnham town centre and within the centre itself. The modelled flows generally match these more recent counts adequately, therefore the validation is acceptable as representing 2010. The lack of traffic growth over recent years also means that the model can be taken as a proxy for 2014/15 traffic conditions.

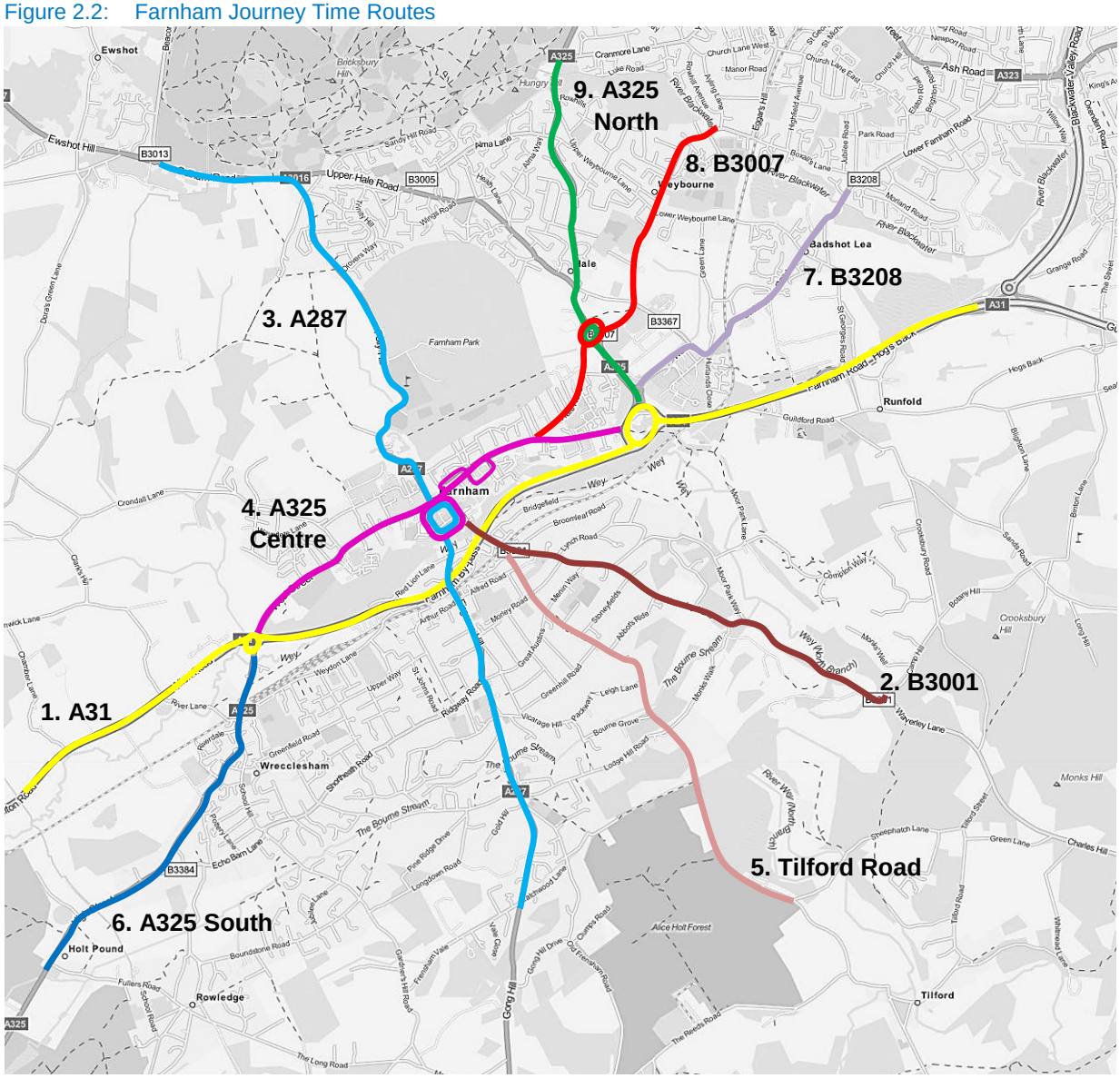
2.3 Observed Journey Times

Observed journey times were obtained from the Congestion and Journey-time Acquisition and Monitoring System (CJAMS). CJAMS is developed by Mott MacDonald and holds observed journey time information from in-vehicle global positioning systems. Tuesday to Thursday weekday data (excluding school holidays) was extracted for the school year 2010/11 (01/09/10 – 01/08/11). This was the most recent data available at the time of the 2012 model update, and was used to calibrate and verify model values of delay, speed and journey times. As such, the model is validated to congestion levels for an average schoolday over the whole year, rather than for a particular month (it is usual practice to build traffic models that represent a 'neutral' month i.e. in March, April, May, June, September, October or November[1]).

The main journey time routes that have been evaluated are shown in **Figure 2.2.**

1 Transport Analysis Guidance Unit M1.2, Data Sources and Surveys, Department for Transport, January 2014

Figure 2.2: Farnham Journey Time Routes



Source: Routes as in Local Model Validation Report, © OpenStreetMap contributors

Table 2.1 shows the observed average journey times on each of these routes for the AM hour, with the PM results in **Table 2.2.** Note that the length of route is different in each direction as the start and end points are not necessarily in exactly the same location and some routes involve one-way loops in the town centre.

Table 2.1: Journey Times – AM Peak Hour

			Length (m)	Modelled Time (mins)	Observed Time (mins)	Observed Delay (mins)	Ave Speed (kph)
1	A31	Westbound	6934	6.8	7.6	2.5	55
	A31	Eastbound	6613	11.7	10.9	5.7	36
2	B3001	Southbound	3187	5.0	5.6	1.3	34
	B3001	Northbound	3204	7.4	7.1	2.3	27
3	A287	Southbound	6881	14.0	14.0	5.6	29
	A287	Northbound	5728	13.8	12.1	4.9	28
4	A325 Centre	Eastbound	3118	8.2	6.8	2.4	27
	A325 Centre	Westbound	3645	7.8	8.2	2.8	27
5	Tilford Rd	Northbound	3355	4.8	6.0	1.8	33
	Tilford Rd	Southbound	3355	3.7	4.8	1.0	42
6	A325 South	Northbound	2808	8.3	7.3	4.2	23
	A325 South	Southbound	2816	3.1	3.8	0.9	45
7	B3208	Southbound	2124	4.2	4.0	1.1	32
	B3208	Northbound	2084	3.3	3.5	0.7	35
8	B3007	Southbound	2526	5.2	6.0	3.1	25
	B3007	Northbound	2683	6.4	6.4	3.2	25
9	A325 North	Southbound	2662	5.5	5.9	2.7	27
	A325 North	Northbound	2383	4.8	5.7	2.8	25

Table 2.2: Journey Times – PM Peak Hour

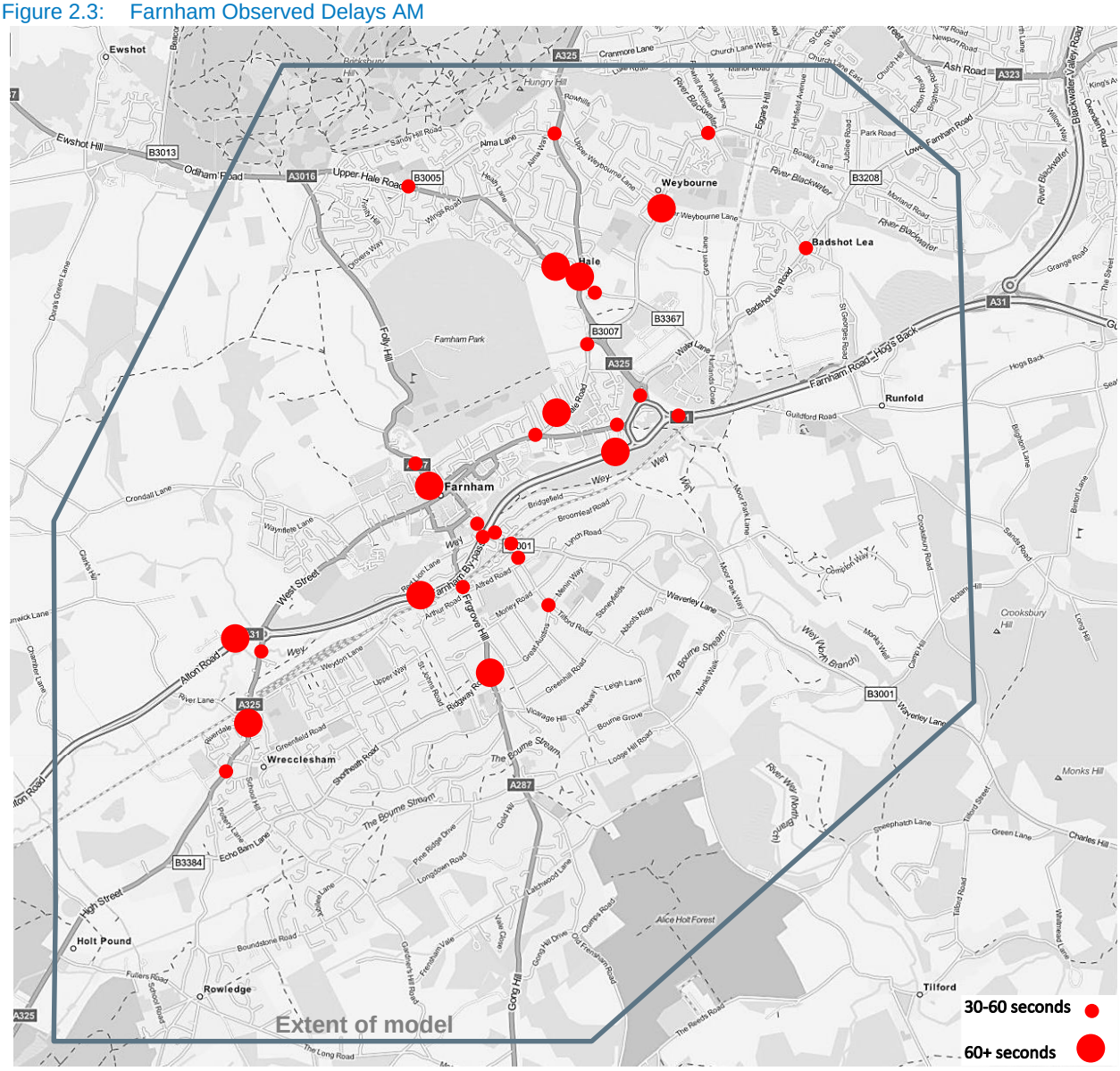
			Length (m)	Modelled Time (mins)	Observed Time (mins)	Observed Delay (mins)	Ave Speed (kph)
1	A31	Westbound	6934	13.0	12.5	7.4	33
	A31	Eastbound	6613	6.5	7.6	2.3	52
2	B3001	Southbound	3187	5.2	6.0	1.6	32
	B3001	Northbound	3204	7.0	7.3	2.6	26
3	A287	Southbound	6881	9.8	13.7	5.3	30
	A287	Northbound	5728	9.1	10.1	2.9	34
4	A325 Centre	Eastbound	3118	7.2	7.4	3.0	25
	A325 Centre	Westbound	3645	8.8	10.4	5.0	21
5	Tilford Rd	Northbound	3355	4.3	5.3	1.1	38
	Tilford Rd	Southbound	3355	3.5	4.1	0.4	49
6	A325 South	Northbound	2808	3.6	4.3	1.3	39
	A325 South	Southbound	2816	3.3	4.2	1.3	40
7	B3208	Southbound	2124	4.2	4.4	1.6	29
	B3208	Northbound	2084	3.5	4.2	1.4	30
8	B3007	Southbound	2526	4.8	4.3	1.4	35
	B3007	Northbound	2683	5.5	5.7	2.4	28
9	A325 North	Southbound	2662	6.0	5.4	2.2	30
	A325 North	Northbound	2383	4.5	4.9	2.0	29

Within CJAMS, delays at junctions for busier hours are estimated based on the observed journey times during off-peak periods and these are included in the table above. **Figure 2.3** shows the locations where delays of over 30 seconds were experienced on links in the AM peak hour on an average schoolday in 2010/11 (at the end of each link where it meets the junction).

Figure 2.4 shows a 'snapshot' from the AM traffic model in which yellow circles show the areas where there is queuing, with the size of the circle proportional to the number of queuing vehicles. It should be noted that this diagram only represents one instant within the peak hour, rather than average levels of queuing. Nevertheless, the diagram shows that queues generally occur in the model at the same locations where there were observed delays.

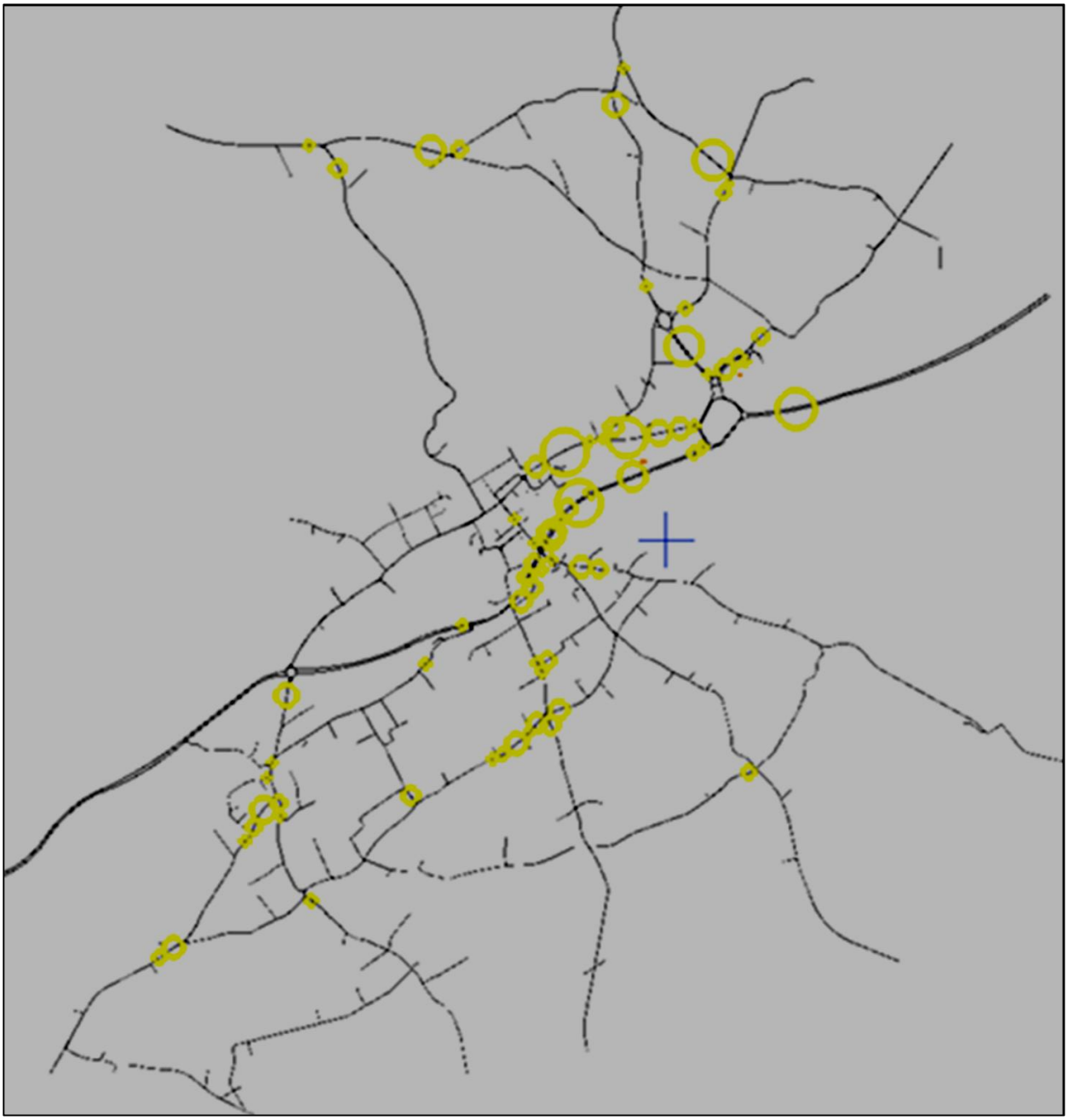
Similarly, the locations of delays/congestion in the PM peak hour are shown in **Figure 2.5** and **Figure 2.6**.

Figure 2.3: Farnham Observed Delays AM



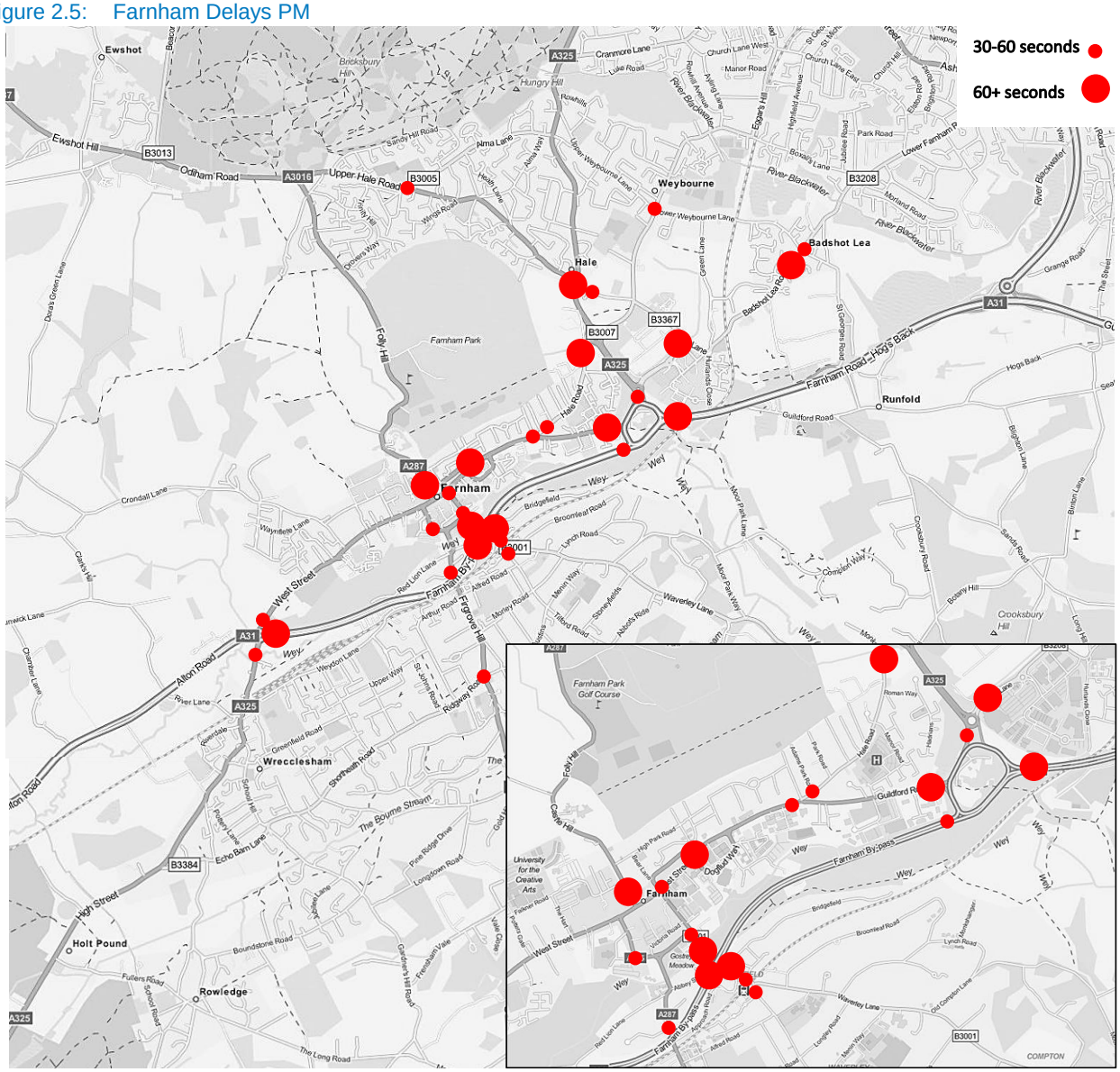
Source: CJAMS data, © OpenStreetMap contributors

Figure 2.4: Snapshot of Modelled Congestion Points AM



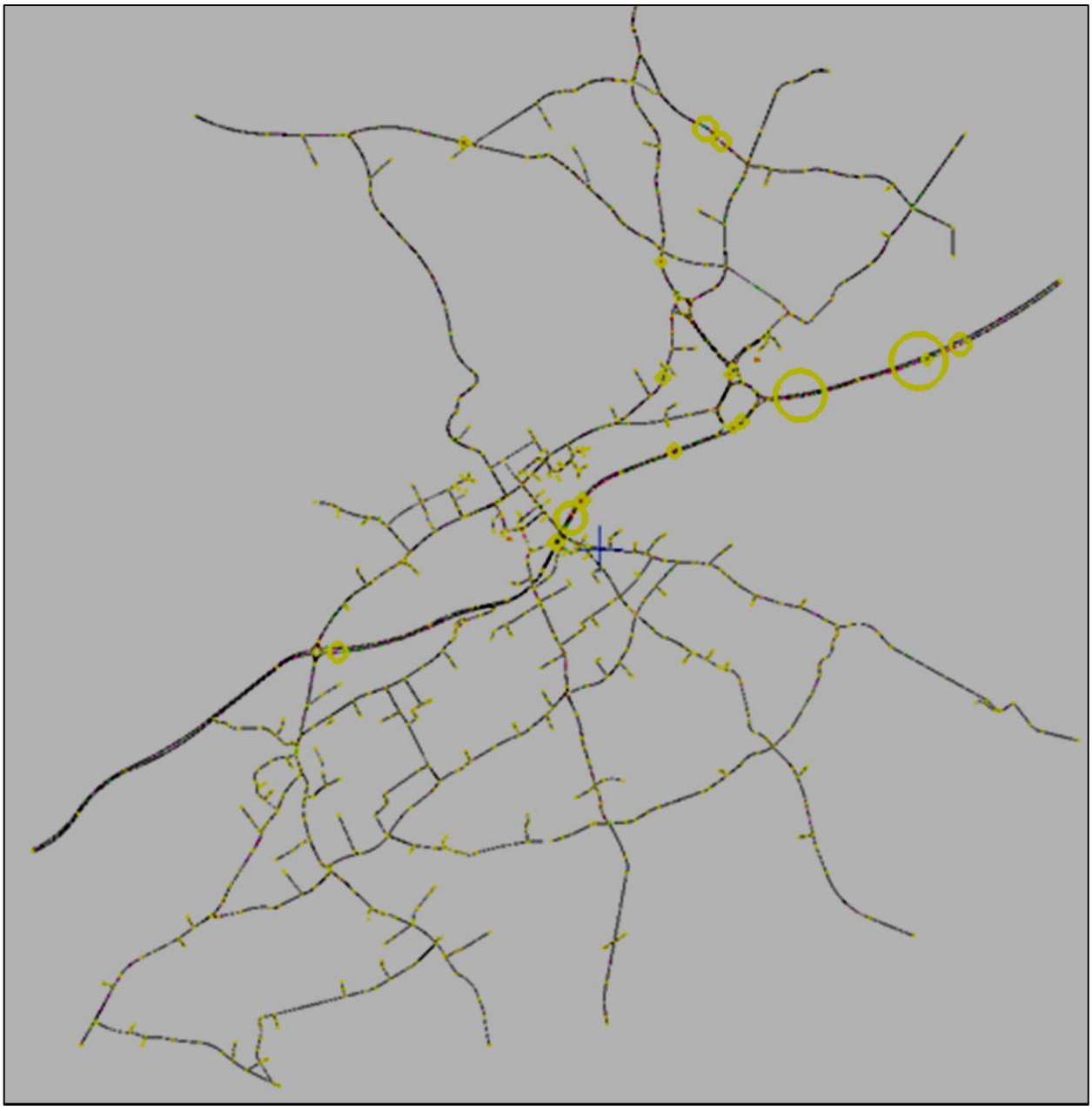
Source: Paramics Base Model

Figure 2.5: Farnham Delays PM



Source: CJAMS data, © OpenStreetMap contributors

Figure 2.6: Snapshot of Modelled Congestion Points PM



Source: Paramics Base Model

The main locations that experience delays are outlined below:

A31 Shepherd and Flock Roundabout

The capacity of the junction is constrained by the signals at the roundabout, with excess traffic demand leading to the eastbound delays in the AM peak. This leads to queuing back through Hickley's Corner, with delays shown on the links at this junction. In the PM peak there are westbound queues back from the roundabout signals towards the A331 junction.

Long queuing also forms on the A325 eastbound approach in the AM peak, blocking back into the town centre.

Queuing on the southbound approach blocks through the B3208 roundabout in the AM peak and reaches the Six Bells roundabout, in turn, causing queuing on approaches to this junction. Similarly, the constraint causes queuing on the westbound B3208 Water Lane.

A31 Hickley's Corner

In the PM peak this junction is the main constraint to throughput, with westbound queues extending back to the Shepherd and Flock Roundabout, but the junction also contributes to eastbound delays in the AM peak. In both peaks, queuing on northbound Station Hill extends past the rail station and level crossing and southbound queues can extend back into the town centre.

A31 / A325 Coxbridge Roundabout

The roundabout causes some congestion in both peak hours.

A325 Farnborough Road / A3016 Upper Hale Road Signals

The signal junction causes some delays in both peak hours.

A325 Wrecclesham Road

Some queuing and delays, mainly in the AM peak, due to the roundabout and numerous priority junctions as the A325 passes through Wrecclesham.

A287 Firgrove Hill / Ridgway Road Signals

The signalised crossroads cause some queuing, mainly in the AM peak.

A287 Folly Hill / A3106 Upper Hale Road Signals

The signals cause some queuing in the AM peak for A287 eastbound traffic due to right turning traffic blocking the ahead movement.

2.4 Model Validation

The adequacy of a traffic model is judged on how well it matches observed data or 'validates'. For traffic volumes, 85% of links should meet the validation criteria set out in the Department for Transport's guidelines (WebTAG). This is achieved for both peak hours in the Farnham model as detailed in **Table 2.3.** However, there is a slight concern with the model in that around two-thirds of the modelled flows are lower than the observed, even for counts from 2004-2009, whereas it may be expected that around half would be lower and half higher.

Table 2.3: Link Count Validation

		AM			PM		
Year	No. of counts	Validates	% Validate	Model flow less than observed	Validates	% Validate	Model flow less than observed
2004	67	63	94%	44	65	97%	44
2005	2	2	100%	2	2	100%	2
2006	18	16	89%	9	15	83%	7
2007	14	12	86%	10	11	79%	11
2008							
2009	9	8	89%	4	7	78%	2
2010	54	44	81%	32	48	89%	31
2011	6	6	100%	3	6	100%	2
2012	63	59	94%	37	60	95%	34
Total	233	210	90%	141	214	92%	133

In terms of journey times, the model also validates according to the WebTAG requirement that 85% of measurements should be within 15% of the observed value or within one minute if this is lower. 19 out of the 22 routes meet the validation criteria in both peaks equating to 86%. However, in both the AM and PM peaks, many modelled journey times are less than that observed, with the overall modelled journey time being 2% lower in the AM peak and 11% lower in the PM peak. Given that the modelled flows are generally lower than observed, it follows that the journey times are likely to be lower.

The conclusion of the model review is that the modelled flows and journey times are generally understated to some degree, compared to the observed data, but that the model validates successfully in terms of the published guidelines.

3 Historic Traffic Growth

3.1 Automatic Traffic Count Locations

Figure 3.1 shows the locations of long term automatic traffic counters (ATC), from which average weekday traffic volumes have been extracted for each year between 2009 and 2014 where available. Flows shown are generally for a neutral month (April, May, June or September) and, where possible, the month is the same for each year.

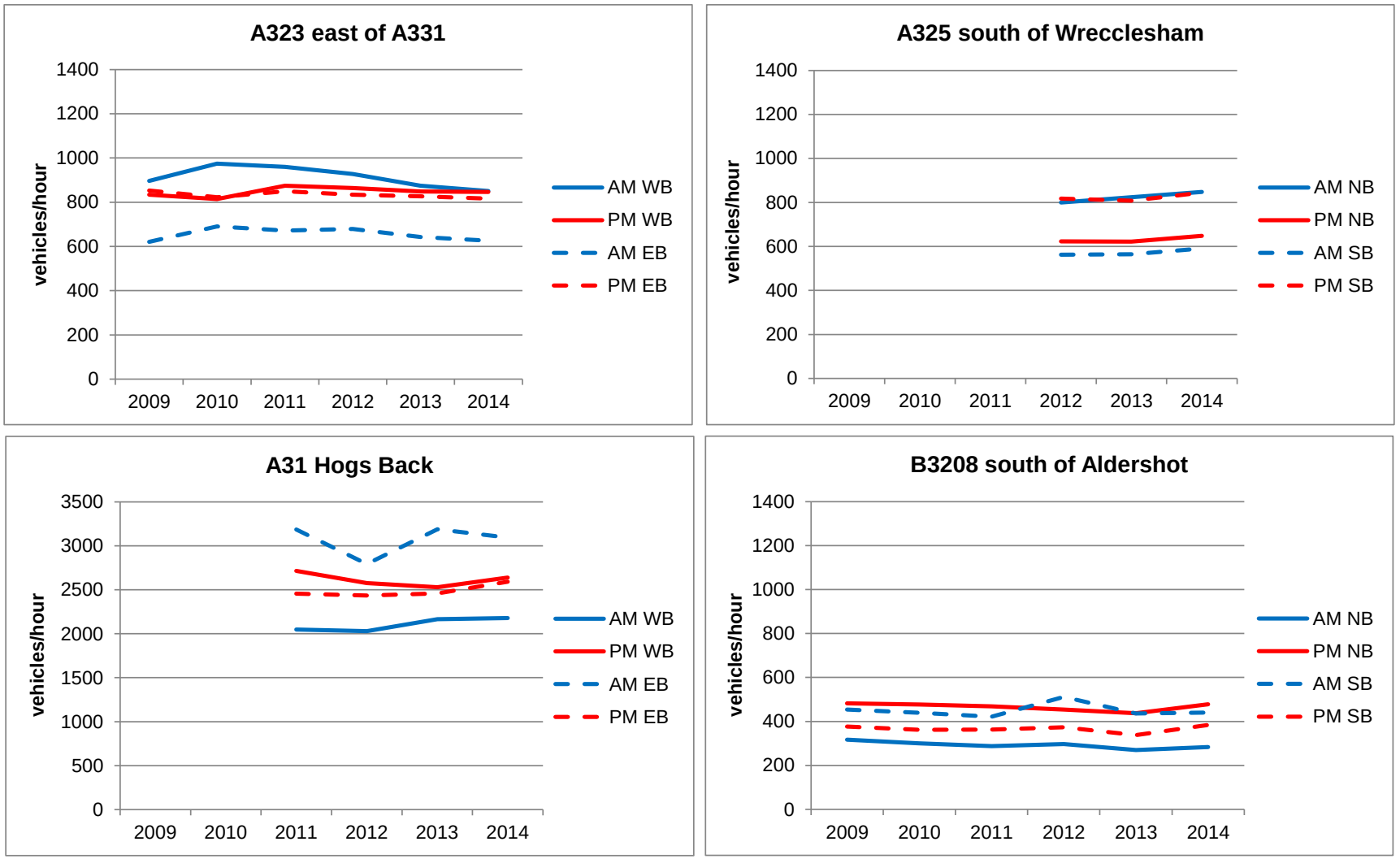
Figure 3.2 and **Figure 3.3** show the AM and PM peak hour volumes at each of the ATC sites, with daily volumes shown in **Figure 3.4** and **Figure 3.5**. The graphs show that there has generally been no growth in peak hour or daily flows over the past 5 years, although there has been some increase on the B3007 in the AM peak since 2012. On the A31, west of the A325 Coxbridge roundabout, the data shows a trend of reduced volumes year on year.

The conclusion from the ATC data is that the base model year of 2010/11 should still be representative of traffic demand in 2014.

Figure 3.1: ATC Location Plan

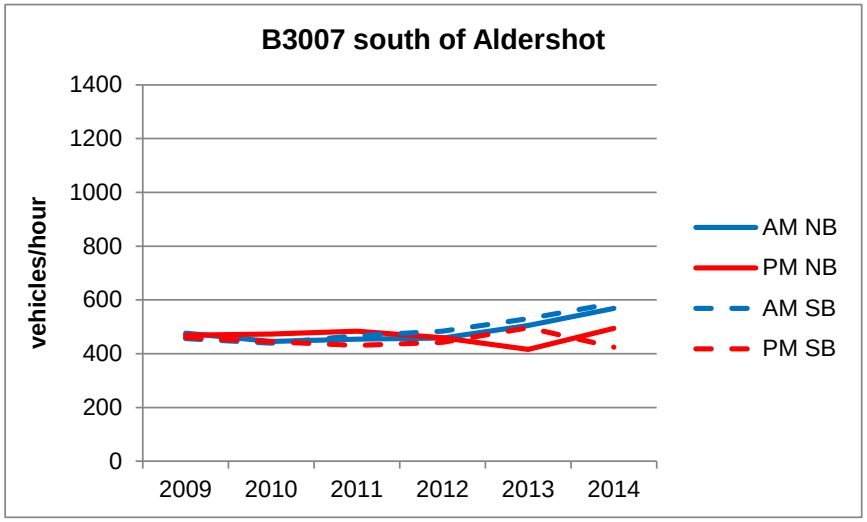
Source: © OpenStreetMap contributors

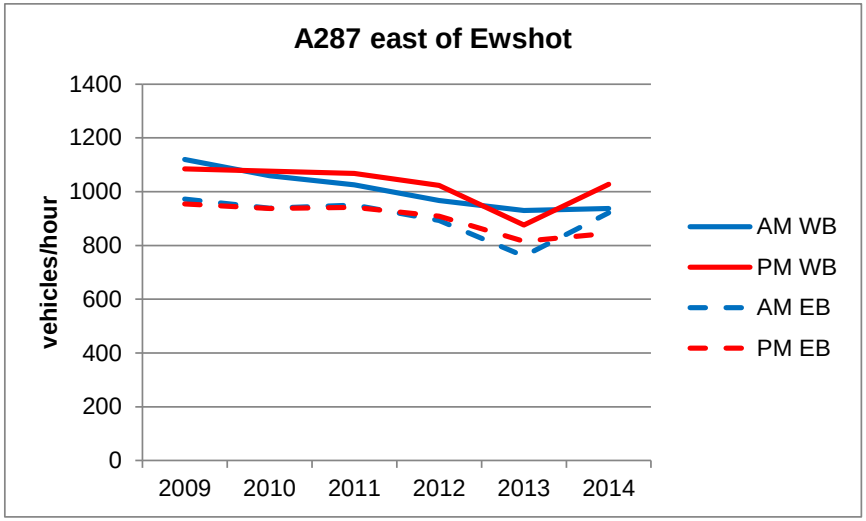
Figure 3.2: Peak Hour Volumes 1 of 2

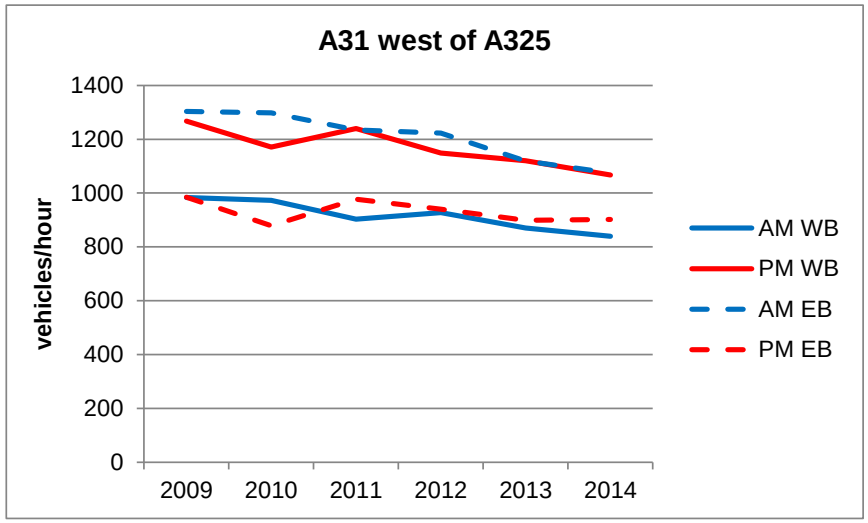


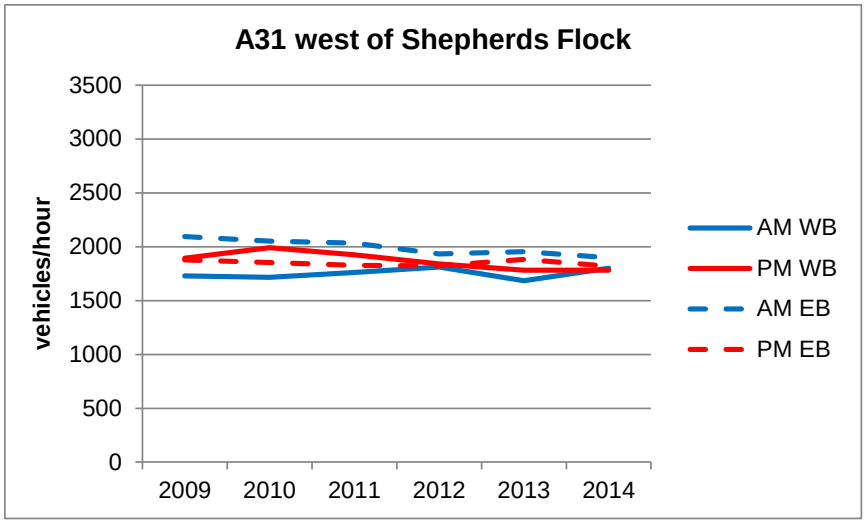
Source: SCC traffic counts

Figure 3.3: Peak Hour Volumes 2 of 2



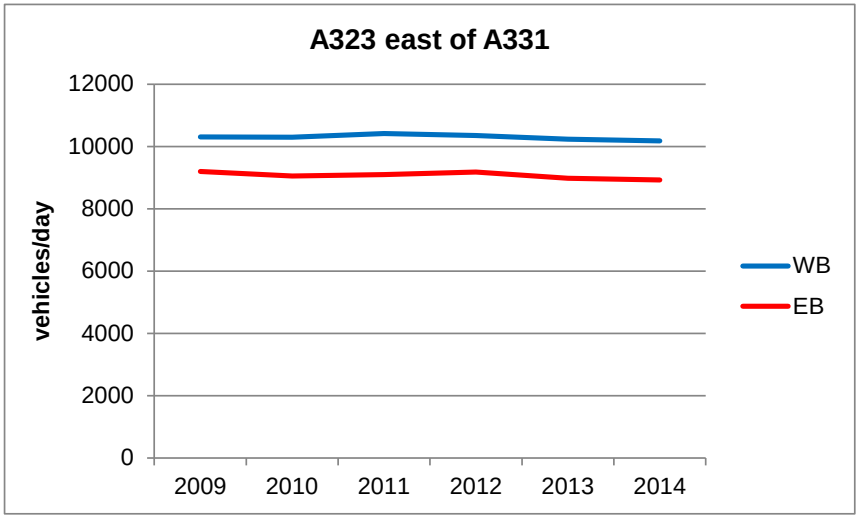


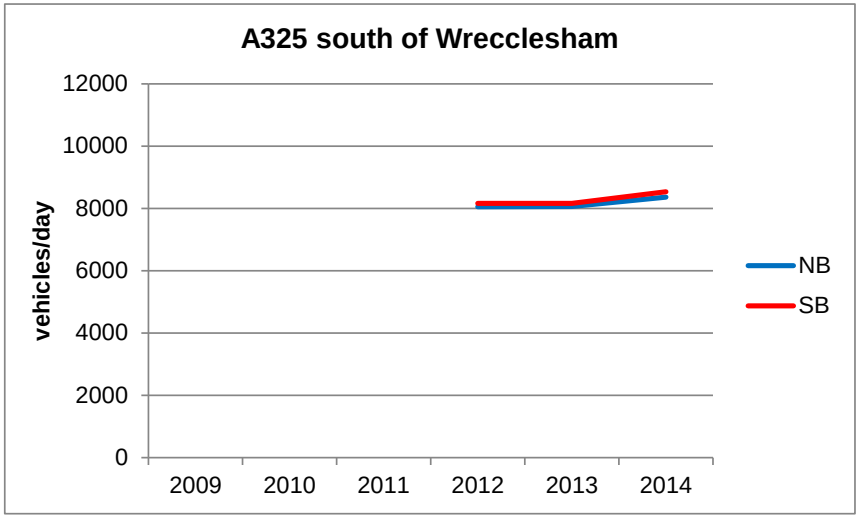


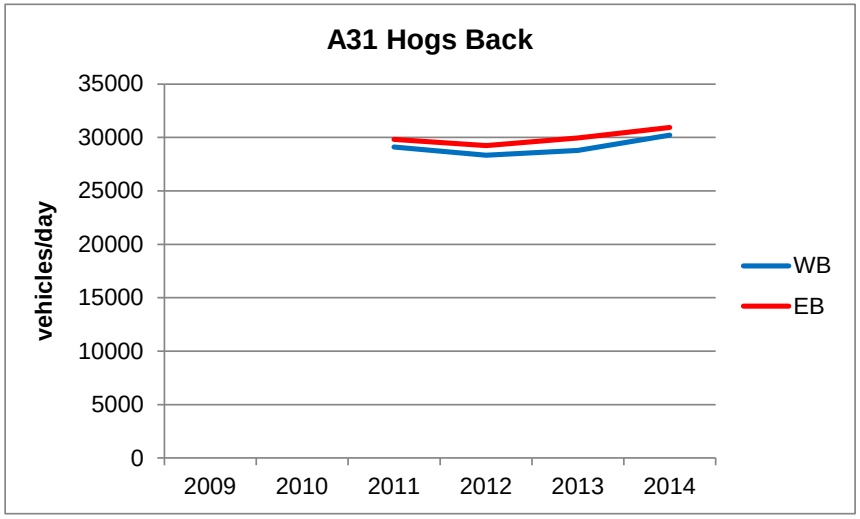


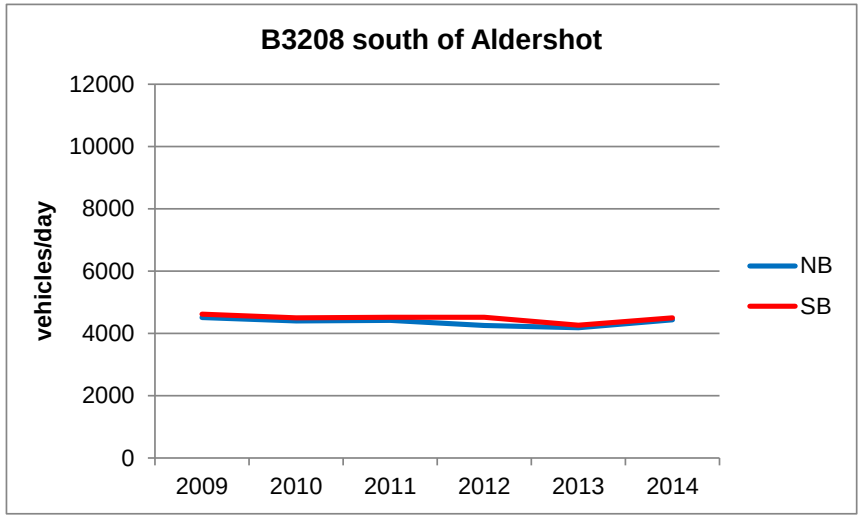
Source: SCC traffic counts

Figure 3.4: Daily Volumes 1 of 2



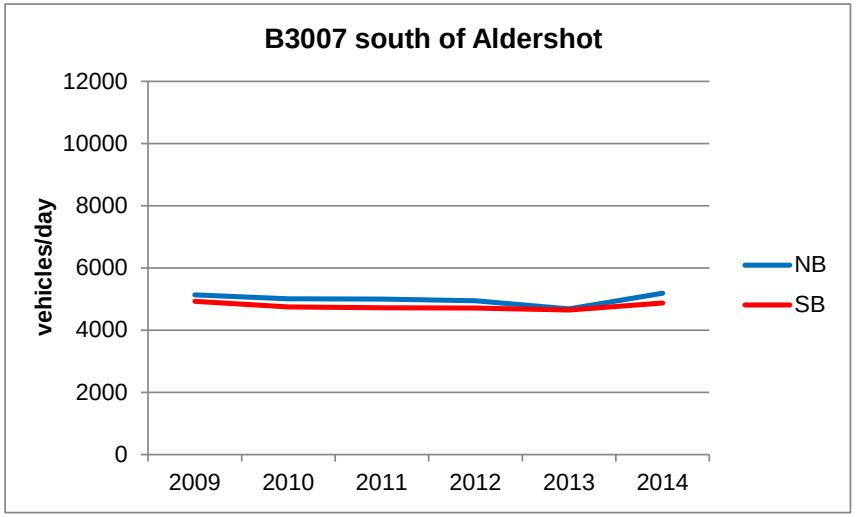


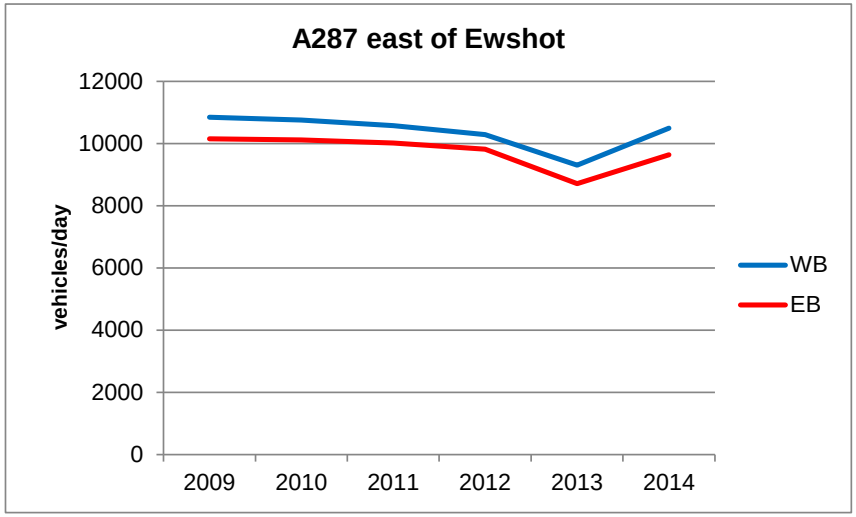


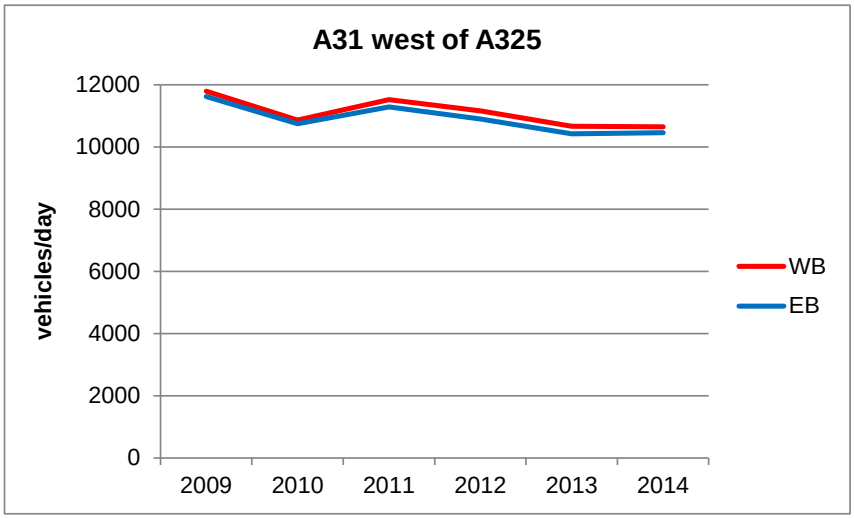


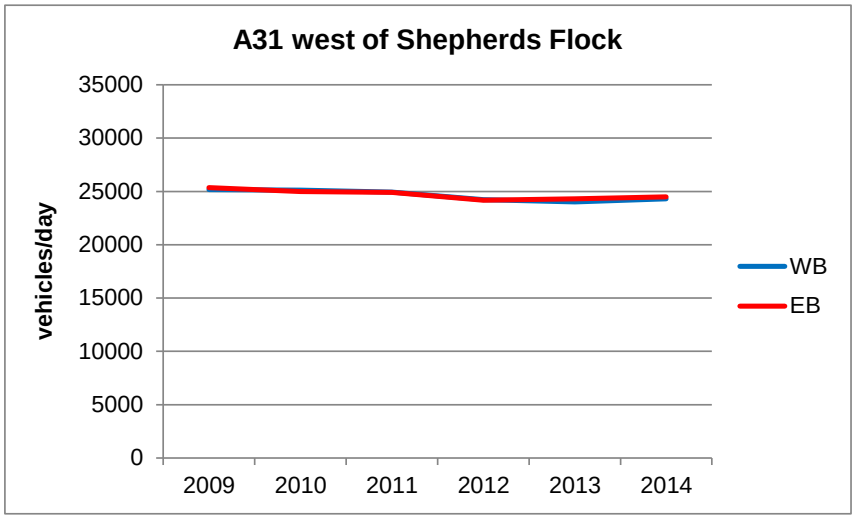
Source: SCC traffic counts

Figure 3.5: Daily Volumes 2 of 2









Source: SCC traffic counts

4 Future Year Congestion

4.1 Traffic Growth

Predicted traffic growth for the Farnham area has been estimated based on SCC's strategic traffic model (SINTRAM). For their Strategic Transport Assessment (reported in September 2014), SCC modelled four different development scenarios for Waverley in 2031, which were then compared to the 2009 base model. For this work, the increase in traffic demand for trips to, from, within and passing through the Farnham area has been extracted for two of the scenarios. Note that the STA scenarios are not the same as the development scenarios that were consulted on by WBC.

The numbers of additional homes in each of the main settlement areas with the two STA scenarios under consideration are detailed in **Table 4.1**:

Table 4.1: STA Modelled Scenarios for 2031

Scenario	Type	Farnham	Godalming	Cranleigh	Dunsfold	Total
STA Scenario 2	Brownfield	1140	882	383	1800	4205
	Greenfield	1139	210	774	0	2123
	Total	2279	1092	1157	1800	6328
STA Scenario 3	Brownfield	1140	882	383	0	2405
	Greenfield	2660	994	1649	0	5303
	Total	3800	1876	2032	0	7708

Source: Extracted from SCC Strategic Transport Assessment Appendix A

STA Scenario 3 had around 1,500 more homes in Farnham, compared to STA Scenario 2 which was focused on 1,800 new homes at Dunsfold Park. STA Scenario 3 also had significantly more homes in Godalming and Cranleigh but trips from these areas will have less of an impact in Farnham. A 'Do Minimum' scenario has also been considered which has no additional housing in Farnham and the rest of Waverley, other than completed schemes and those with planning permission between 2009-2013.

The total trips were extracted for the AM peak period of 07:00-10:00 only, as this period was used for the Strategic Transport Assessment, giving the levels of traffic growth in **Table 4.2**:

Table 4.2: Traffic Growth Levels 2009-2031

Development Scenario	Car	LGV	HGV
Do Minimum	18.0%	13.5%	3.0%
STA Scenario 2	30.3%	18.2%	3.7%
STA Scenario 3	35.2%	25.3%	9.6%

Source: SCC from SINTRAM

The above factors take into account trips from the new homes in Farnham, but also other developments away from Farnham which would result in some trips to or through the Farnham area, including longer

distance trips using the A31. General traffic growth, such as from increased car ownership and reduction in relative fuel costs, is also allowed for in SINTRAM.

The factors were applied to all of the trips in the relevant vehicle classes in both the AM and PM peak hour models for Farnham. The impact of the traffic growth on journey times and congestion in and around Farnham is detailed in the following sections.

4.2 Future Journey Times

Error! Reference source not found. details the predicted journey times on the 9 routes analysed in the AM peak, together with the increases compared to the base model and Do Minimum. **Figure 4.1 - Figure 4.18** show how the journey times increase over the length of each route with STA Scenarios 2 and 3, with steeper parts of the graph highlighting areas where delays are greatest. The process of extracting results from the runs follows the method used by Surrey CC and uses their spreadsheet as a template for the new results.

With STA Scenario 2, the largest increases in journey times are for northbound movements towards the town centre on the A325 northbound (18.3 minutes) and A287 northbound (13.6 minutes). Other routes that experience an increase of 6 minutes or more are the A31 in both directions and the radial routes towards the centre on the B3001 northbound, A287 southbound and B3007 southbound. In all cases it is clear that the increased delays are as a result of worsening of the existing congestion problems, with queues extending back and affecting a wider area.

With the higher levels of growth under STA Scenario 3 the journey times are higher, as would be expected, and similar routes to Scenario 2 experience increases in delays but the delays are around 3-5 minutes greater.

Results for the Do Minimum show that even with no additional housing in Farnham, some routes will experience significant increases in journey time, particularly the northbound A325 and A287 routes into the centre. However, the increased delay on these and other routes is a lot less than under STA Scenario 2 or 3.

The journey times in the PM peak (**Table 4.4)** show highest increases from the base year on the A325 passing through the town centre (both directions) and B3001 northbound for STA Scenario 2. Increases of 6 minutes or more also occur on the A287 (both directions), B3208 southbound, B3007 northbound and A325 southbound towards the centre.

With STA Scenario 3, the A325 routes through the town centre are around 3 minutes longer than STA Scenario 2; on other routes the difference is generally only around one minute or so. Again the increase in delay is generally due to existing problems getting worse but it is apparent that the town centre one-way system will also constrain north-south and south-north movements in the future, e.g. on the A287.

For the Do Minimum, there is a similar pattern to the STA Scenarios, with some routes experiencing increased delay but at a lower level, with increases of generally around 4 minutes at most.

The A31 Westbound route shows a slightly lower journey time in the PM peak with STA Scenario 3, compared to STA Scenario 2, which is not expected. The issue here is that there is a high level of congestion in both scenarios, which leads to queues extending back to the edge of the model and start of the journey time measurement route on the A31 Westbound, east of Farnham. Therefore, the journey time from the edge of the model is shown to be roughly the same as with STA Scenario 2, when in reality the queues and delays would be longer.

The reason that the STA Scenario 3 journey time is slightly lower is because there is variation in each model run that is carried out. All of the Paramics model runs have been run with a random seed. The random seed affects two variables – the vehicle release rate with their characteristics and the randomisation of vehicle interaction within the network. These together are used to represent normal day-to-day variability within the road network.

It is normal practice to run micro-simulation models numerous times and to take an average across the runs; this reduces the impact of any 'outliers' and creates more robust results. The number of runs required will vary depending on the network performance. The Farnham base model was initially run 40 times by Surrey County Council. Both STA Scenario 2 and 3 have been run 20 times for this analysis.

A number of junctions within the Farnham model are linked to PC MOVA software which takes adaptive control of the signal timings within Paramics to optimise junction capacity. The use of PC MOVA means that the signal timings for these junctions will vary between runs and, therefore, the demand assigned to each approach could vary between runs. This leads to a greater amount of reassignment, compared to fixed time signal operation, and adds to the level of variability between runs. It is this variability (which is an inherent part of the model to reflect normal day-to-day variations) that results in the journey time on the A31 being lower for Scenario 3; this difference is therefore not considered to be significant.

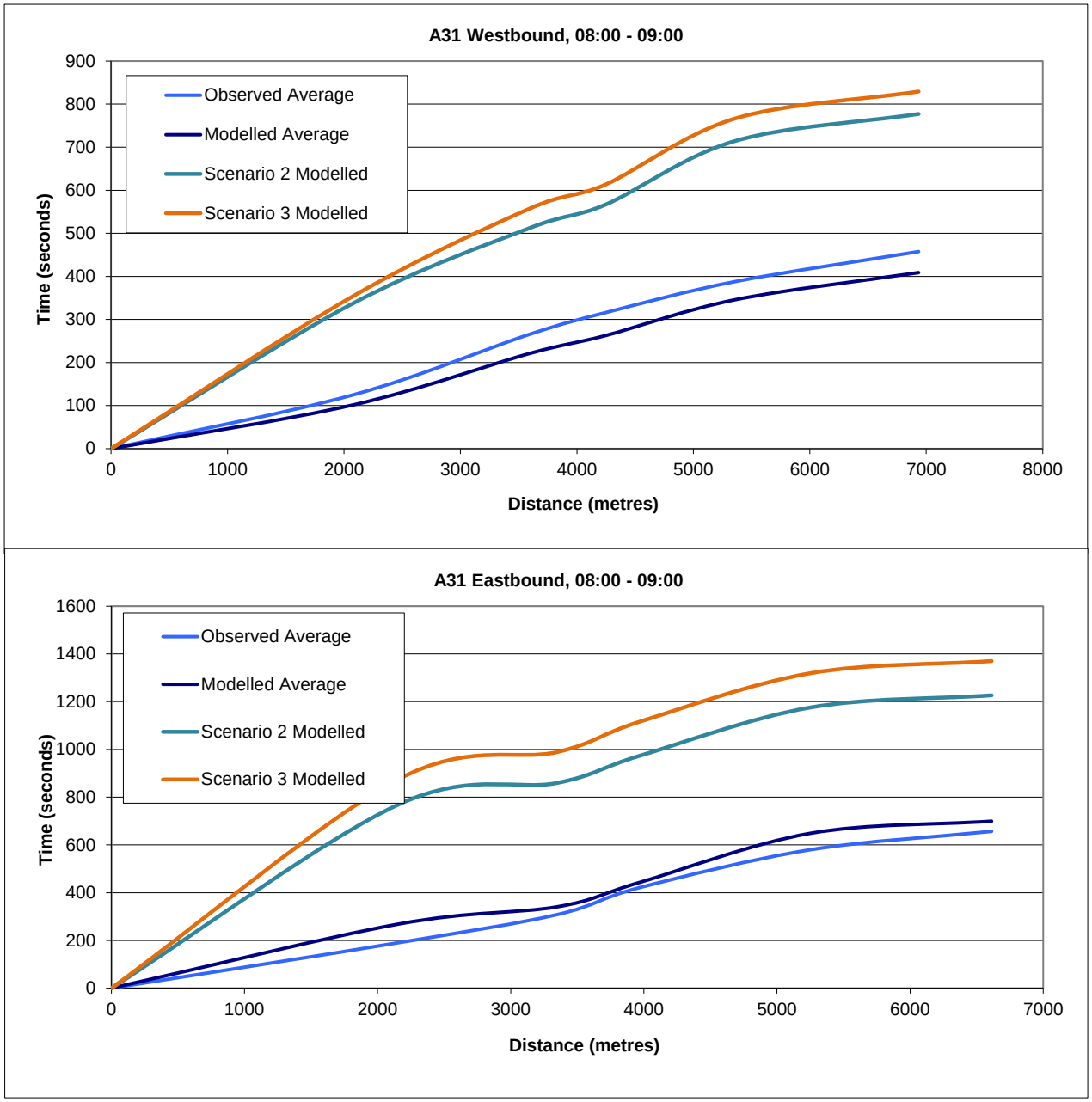
Table 4.3: Journey Times – AM Peak Hour

				Base Year	Future Do Minimum		STA Scenario 2			STA Scenario 3		
Ref	Route	Direction	Length (m)	Time (mins)	Time (mins)	Diff to Base (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)
1	A31	Westbound	6934	6.8	11.5	4.7	13.0	6.1	1.5	13.8	7.0	2.4
	A31	Eastbound	6613	11.7	17.6	5.9	20.4	8.8	2.9	22.8	11.2	5.3
2	B3001	Southbound	3187	5.0	5.5	0.5	6.0	1.0	0.5	6.5	1.5	1.0
	B3001	Northbound	3204	7.4	12.4	5.0	16.8	9.4	4.4	21.0	13.6	8.6
3	A287	Southbound	6881	14.0	17.5	3.5	20.6	6.5	3.1	21.7	7.7	4.2
	A287	Northbound	5728	13.8	22.2	8.4	27.5	13.6	5.2	29.9	16.1	7.7
4	A325 Centre	Eastbound	3118	6.8	8.2	1.4	10.0	3.2	1.8	11.5	4.7	3.3
	A325 Centre	Westbound	3645	7.8	11.0	3.2	11.8	4.0	0.8	14.2	6.5	3.2
5	Tilford Rd	Northbound	3355	4.8	6.5	1.7	7.9	3.1	1.4	8.2	3.4	1.7
	Tilford Rd	Southbound	3355	3.7	3.8	0.1	4.0	0.4	0.3	4.3	0.6	0.5
6	A325 South	Northbound	2808	8.3	16.8	8.5	26.6	18.3	9.8	27.3	19.0	10.5
	A325 South	Southbound	2816	3.1	3.3	0.2	3.4	0.3	0.1	3.4	0.3	0.1
7	B3208	Southbound	2124	4.2	6.4	2.2	9.2	4.9	2.7	10.0	5.7	3.5
	B3208	Northbound	2084	3.3	3.9	0.6	4.5	1.2	0.6	4.1	0.9	0.3
8	B3007	Southbound	2526	5.2	7.5	2.3	11.9	6.7	4.4	14.4	9.2	6.9
	B3007	Northbound	2683	6.4	8.7	2.3	10.4	3.9	1.6	10.5	4.1	1.8
9	A325 North	Southbound	2662	5.5	8.1	2.6	11.0	5.5	2.9	12.7	7.2	4.6
	A325 North	Northbound	2383	4.8	6.8	2.0	8.5	3.7	1.7	9.1	4.3	2.3

Table 4.4: Journey Times – PM Peak Hour

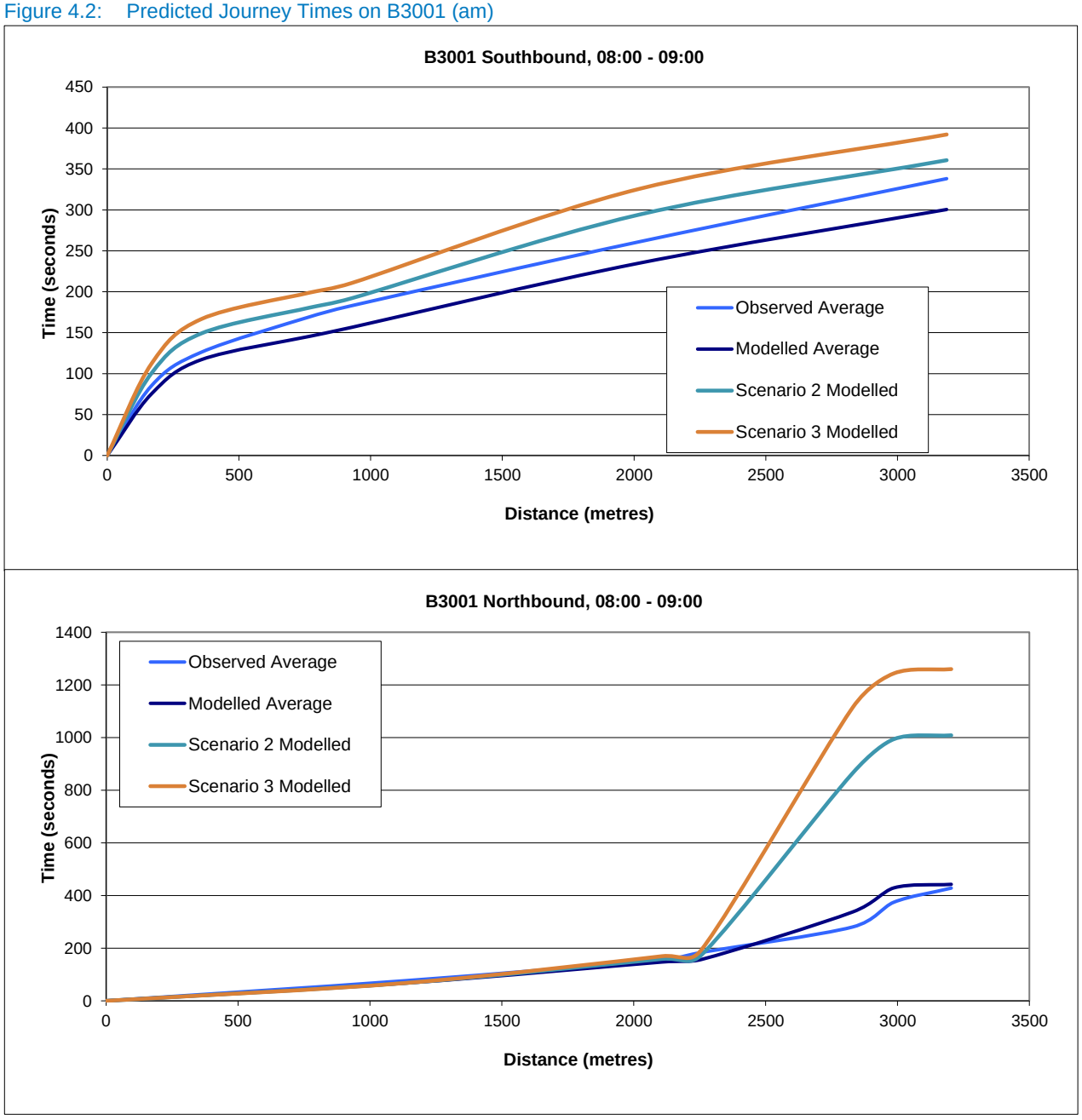
				Base Year	Future Do Minimum		STA Scenario 2			STA Scenario 3		
Ref	Route	Direction	Length (m)	Time (mins)	Time (mins)	Diff to Base (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)
1	A31	Westbound	6934	13.0	15.5	2.5	16.4	3.3	0.9	15.4	2.3	-0.1
	A31	Eastbound	6613	6.5	8.8	2.3	11.2	4.7	2.4	12.0	5.5	3.2
2	B3001	Southbound	3187	5.2	5.5	0.3	5.7	0.5	0.2	5.8	0.6	0.2
	B3001	Northbound	3204	7.0	11.3	4.3	20.5	13.5	9.2	21.5	14.5	10.2
3	A287	Southbound	6881	9.8	13.8	4.0	18.1	8.3	4.3	18.3	8.5	4.5
	A287	Northbound	5728	9.1	12.0	2.9	15.5	6.4	3.6	16.4	7.3	4.4
4	A325 Centre	Eastbound	3118	6.3	12.3	6.0	20.8	14.5	8.5	24.3	18.0	12.0
	A325 Centre	Westbound	3645	8.8	15.7	6.9	25.9	17.1	10.2	29.4	20.6	13.7
5	Tilford Rd	Northbound	3355	4.3	5.1	0.9	7.3	3.0	2.2	7.8	3.5	2.6
	Tilford Rd	Southbound	3355	3.5	3.6	0.0	3.6	0.0	0.0	3.6	0.0	0.0
6	A325 South	Northbound	2808	3.6	4.7	1.0	5.6	2.0	1.0	6.4	2.7	1.7
	A325 South	Southbound	2816	3.3	3.5	0.2	3.6	0.2	0.1	3.7	0.4	0.2
7	B3208	Southbound	2124	4.2	7.1	2.8	10.0	5.7	2.9	11.3	7.1	4.2
	B3208	Northbound	2084	3.5	4.0	0.5	4.2	0.7	0.3	4.1	0.5	0.1
8	B3007	Southbound	2526	4.8	5.5	0.8	8.2	3.4	2.7	8.5	3.7	3.0
	B3007	Northbound	2683	5.5	10.2	4.6	14.5	9.0	4.3	14.8	9.3	4.6
9	A325 North	Southbound	2662	6.0	8.4	2.4	11.8	5.8	3.4	12.3	6.3	3.9
	A325 North	Northbound	2383	4.5	5.4	0.9	6.0	1.5	0.6	6.4	1.9	1.0

Figure 4.1: Predicted Journey Times on A31 (am)



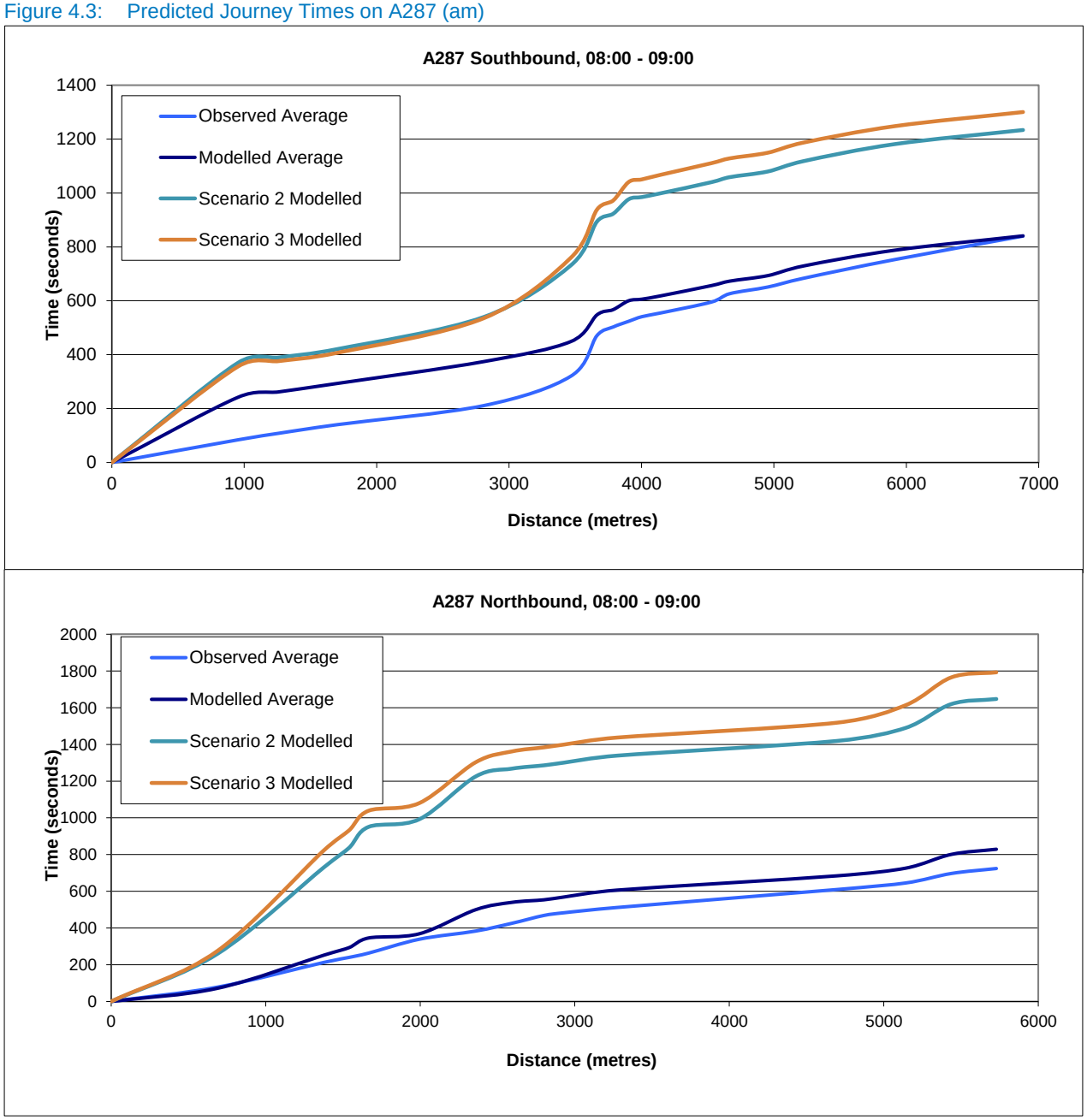
Source: Farnham Traffic Model

Figure 4.2: Predicted Journey Times on B3001 (am)



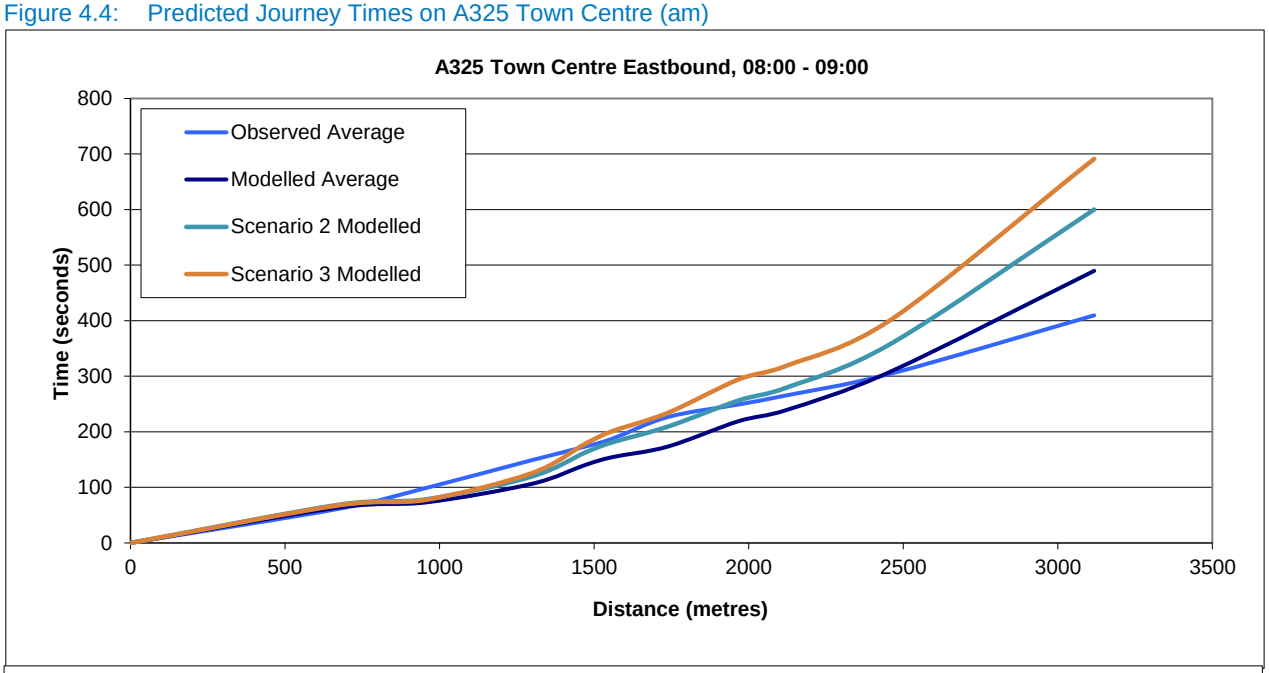
Source: Farnham Traffic Model

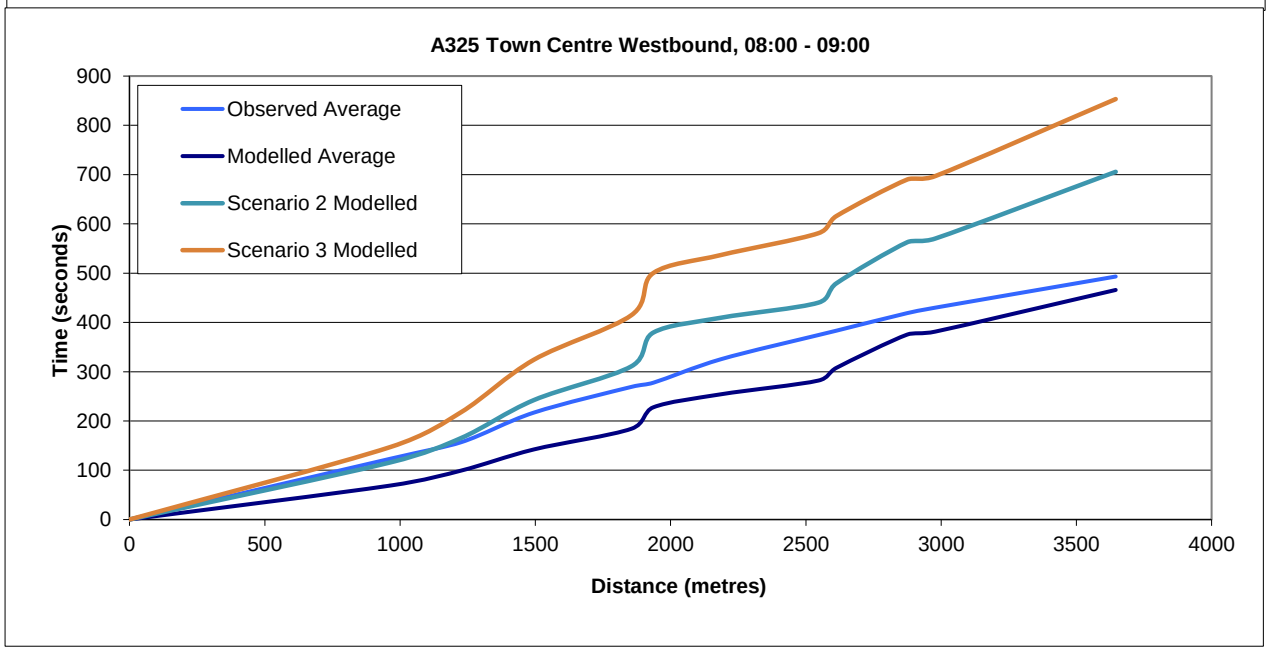
Figure 4.3: Predicted Journey Times on A287 (am)



Source: Farnham Traffic Model

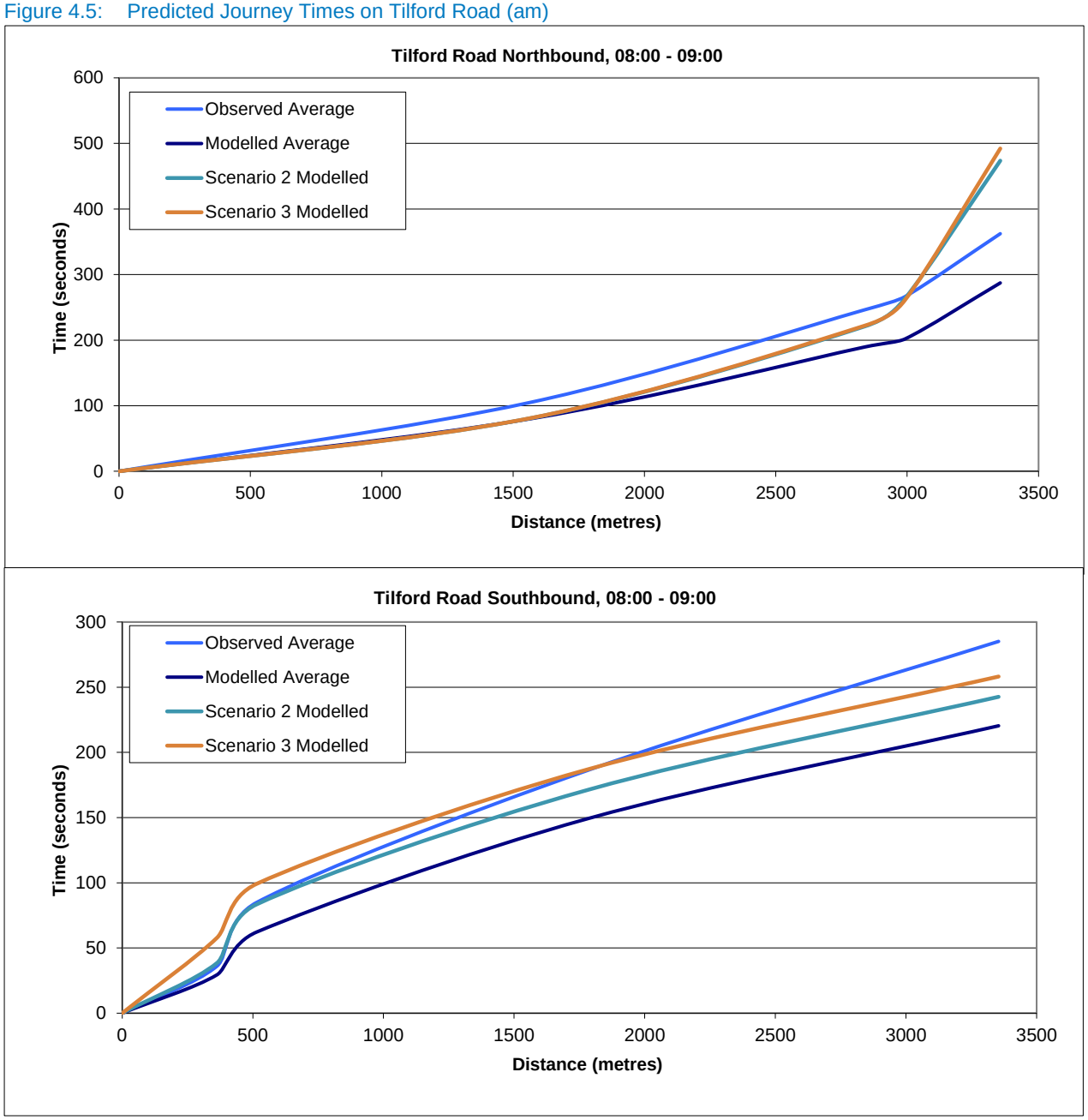
Figure 4.4: Predicted Journey Times on A325 Town Centre (am)





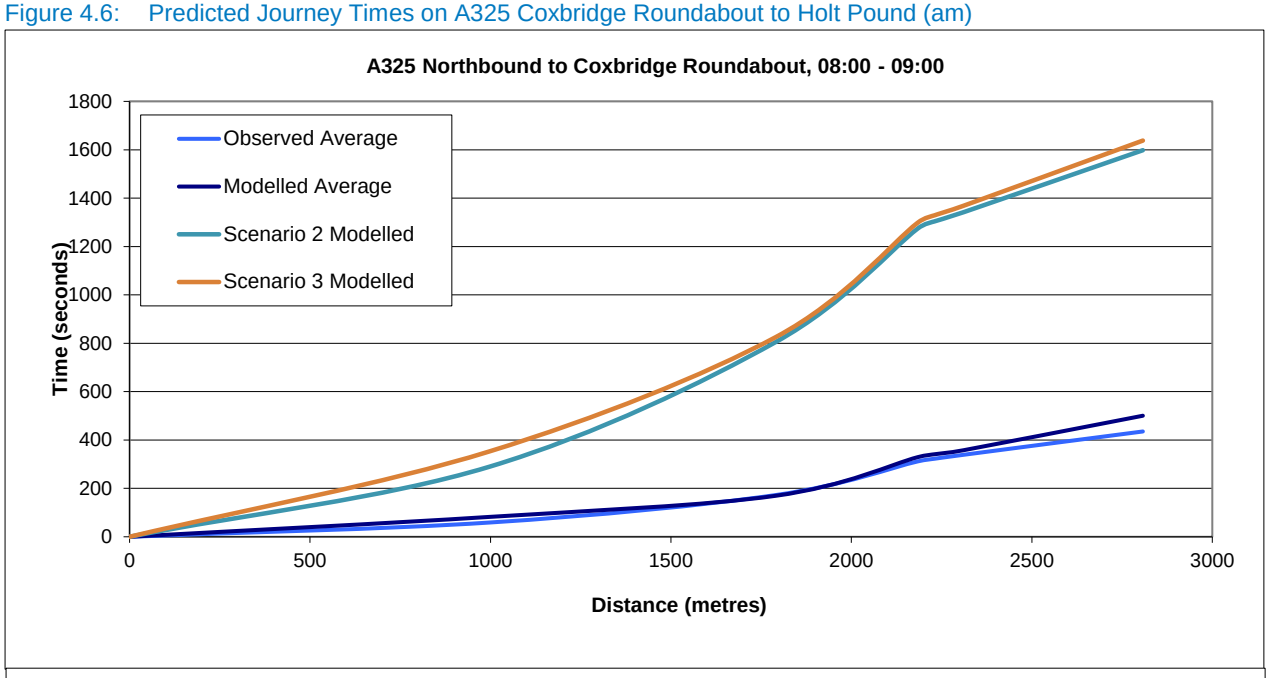
Source: Farnham Traffic Model

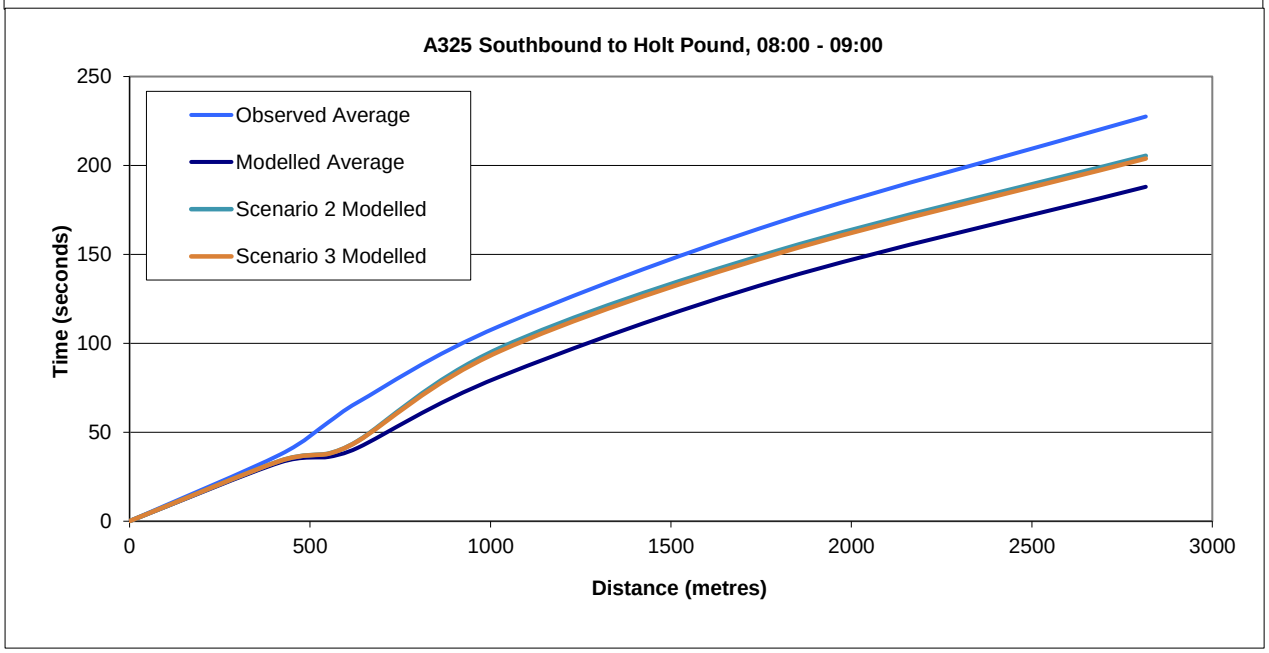
Figure 4.5: Predicted Journey Times on Tilford Road (am)



Source: Farnham Traffic Model

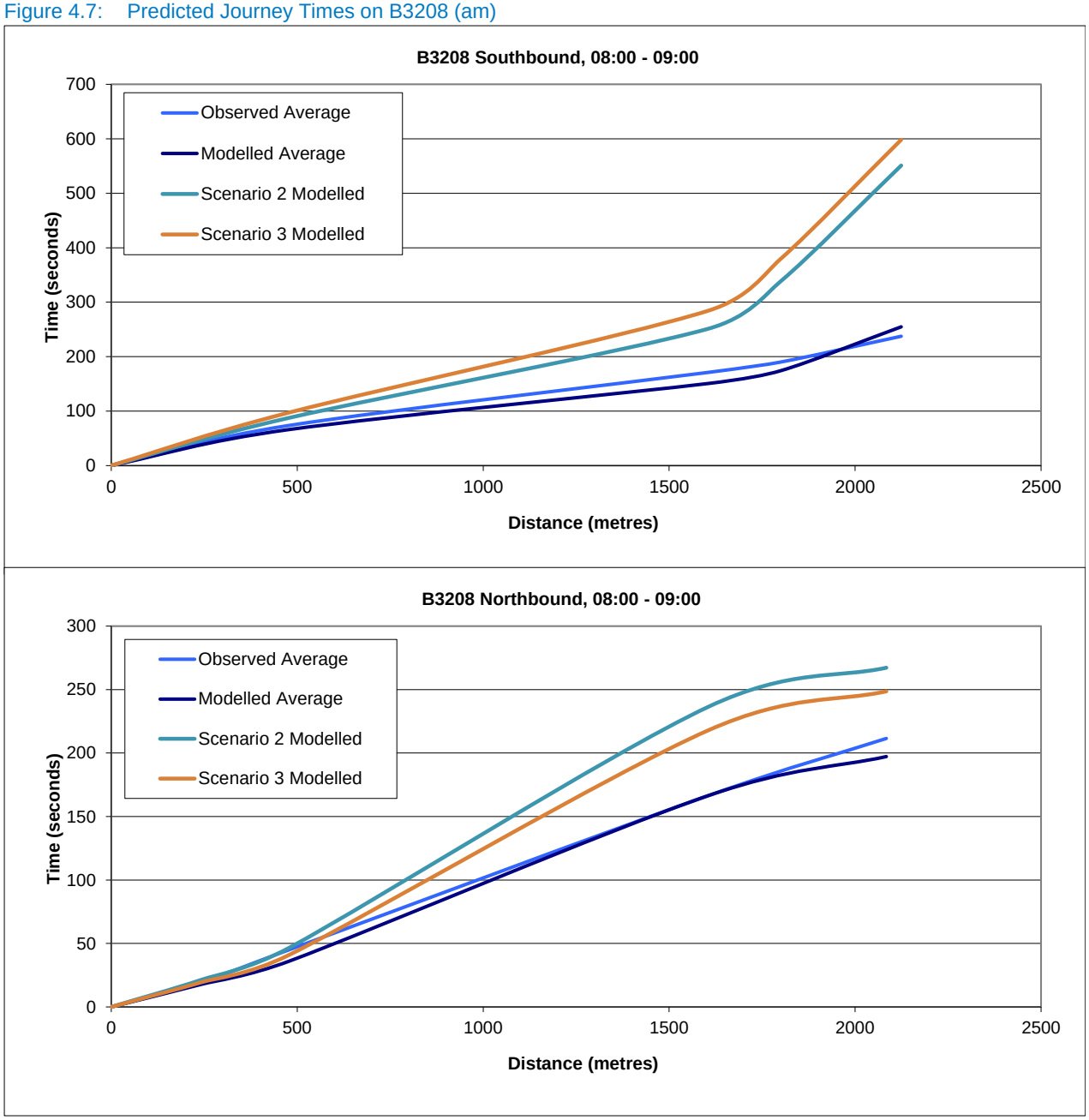
Figure 4.6: Predicted Journey Times on A325 Coxbridge Roundabout to Holt Pound (am)





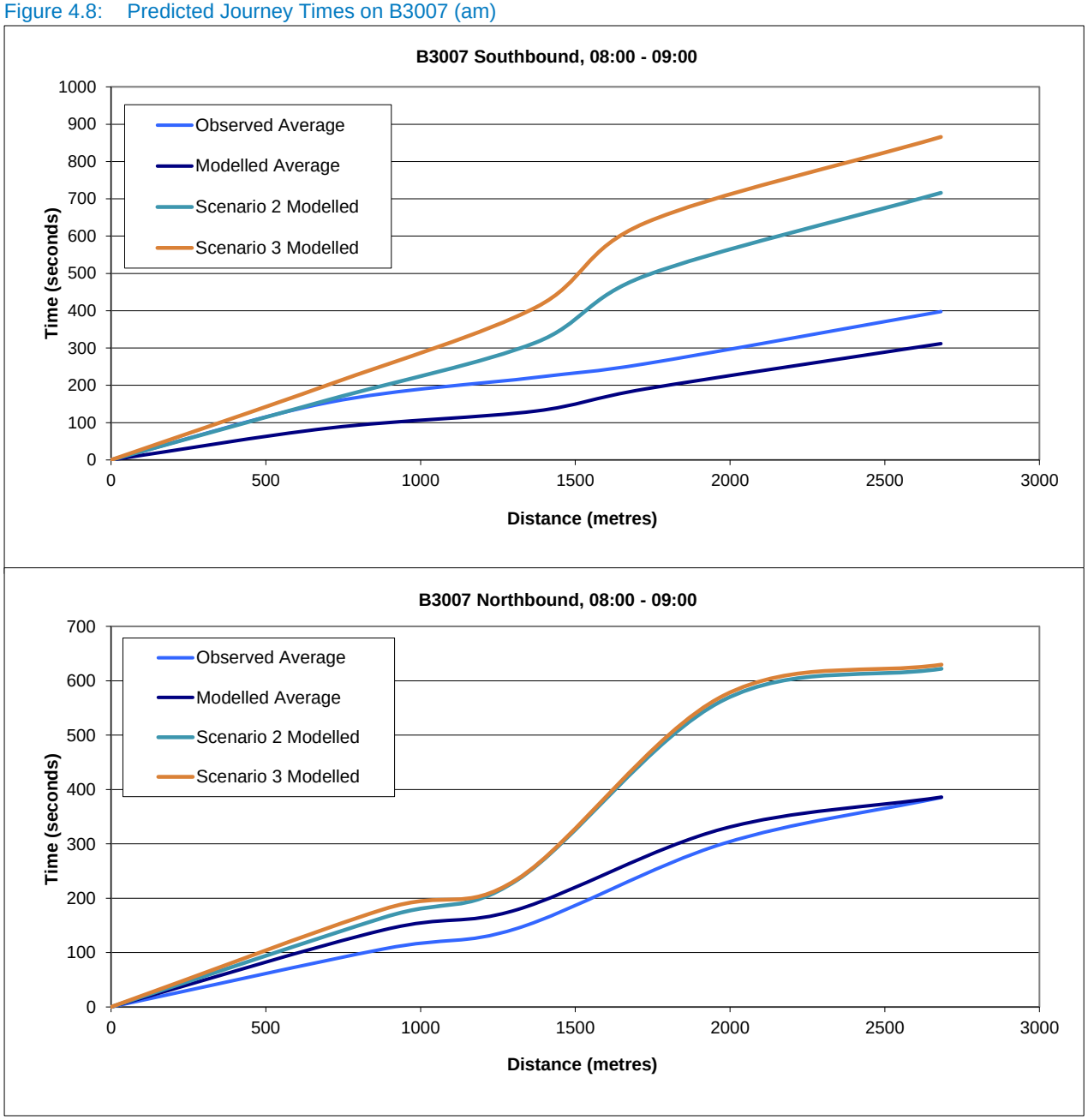
Source: Farnham Traffic Model

Figure 4.7: Predicted Journey Times on B3208 (am)



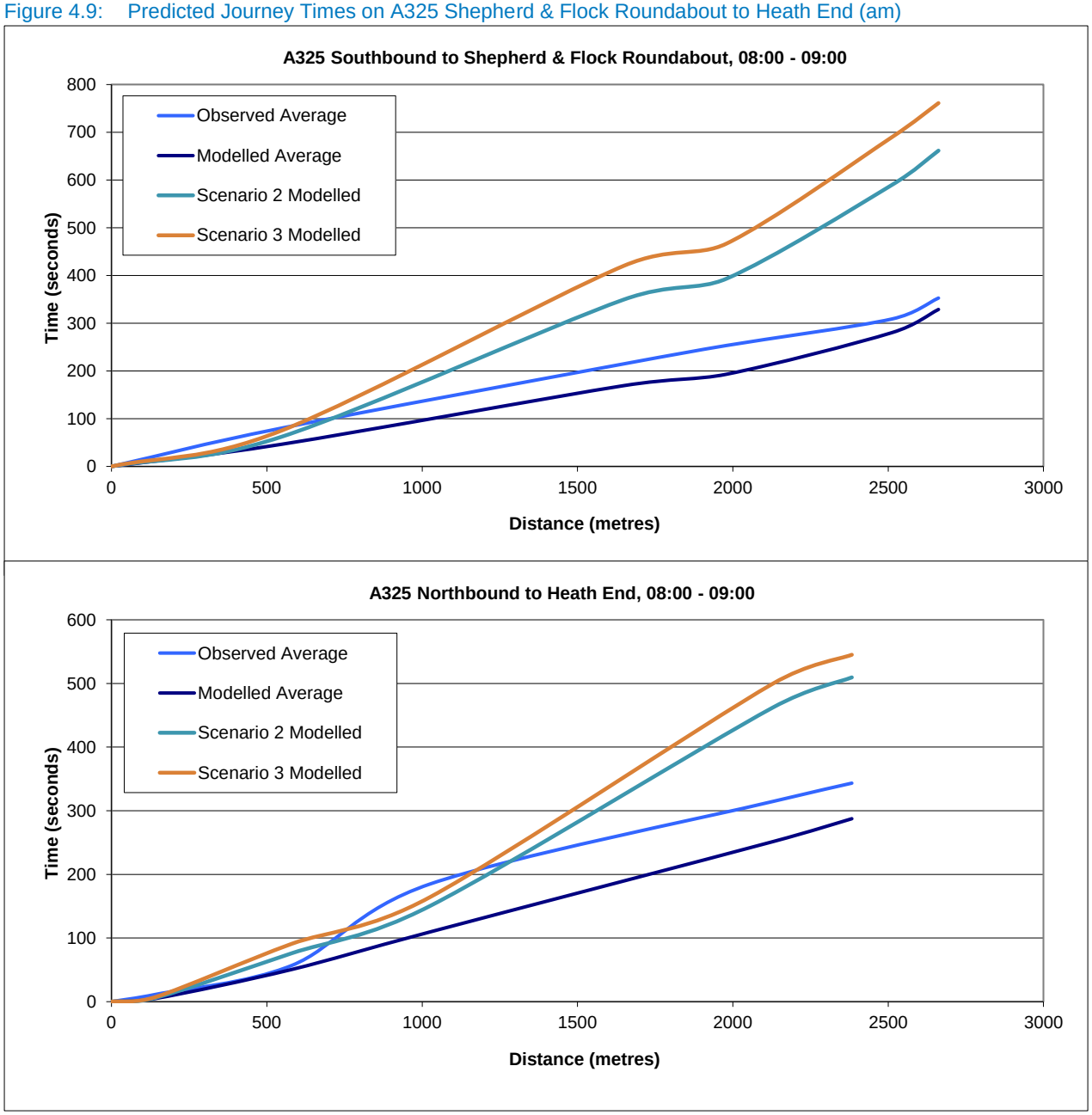
Source: Farnham Traffic Model

Figure 4.8: Predicted Journey Times on B3007 (am)



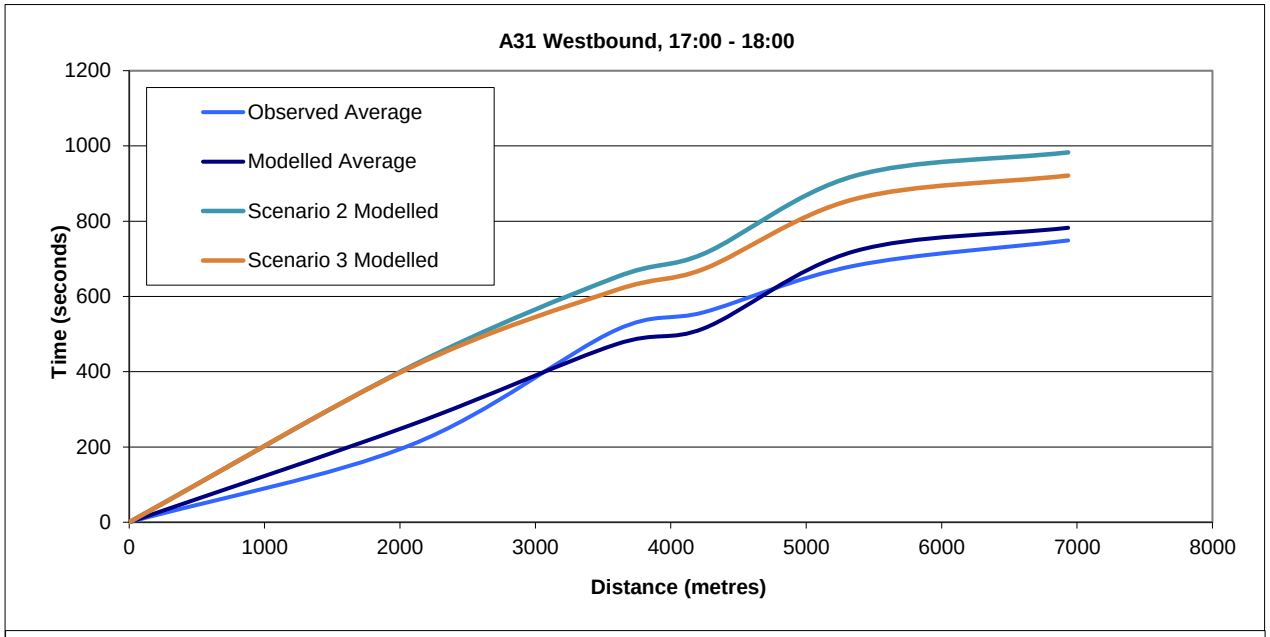
Source: Farnham Traffic Model

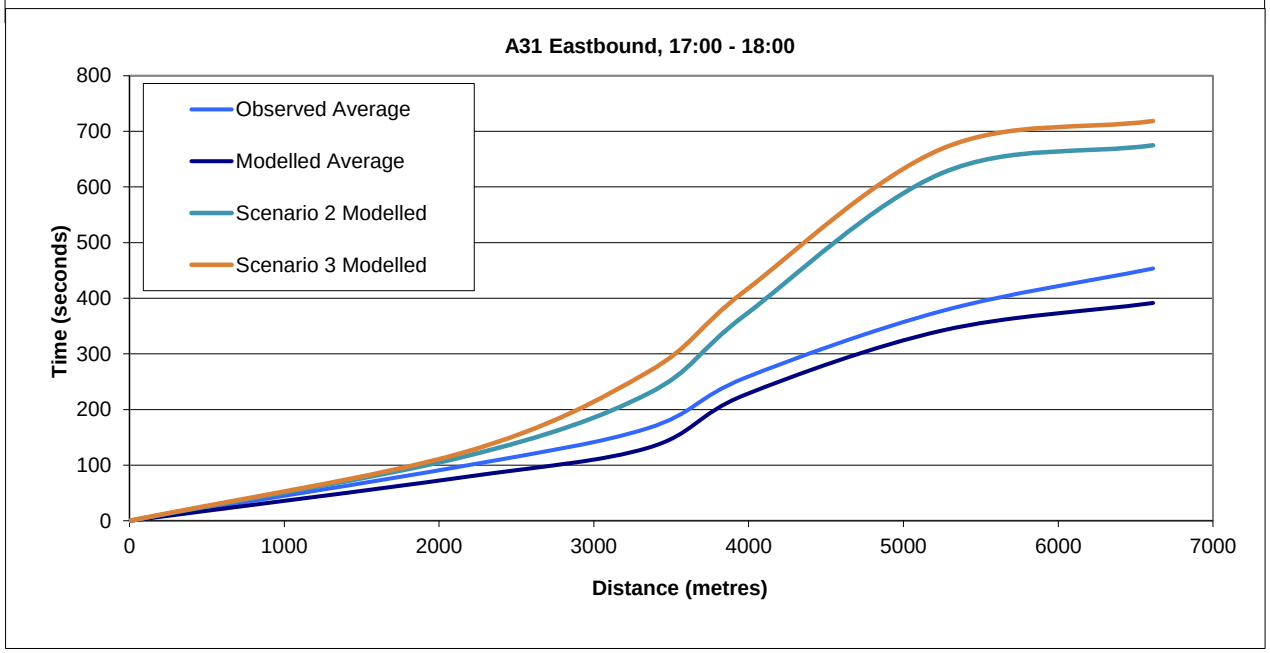
Figure 4.9: Predicted Journey Times on A325 Shepherd & Flock Roundabout to Heath End (am)



Source: Farnham Traffic Model

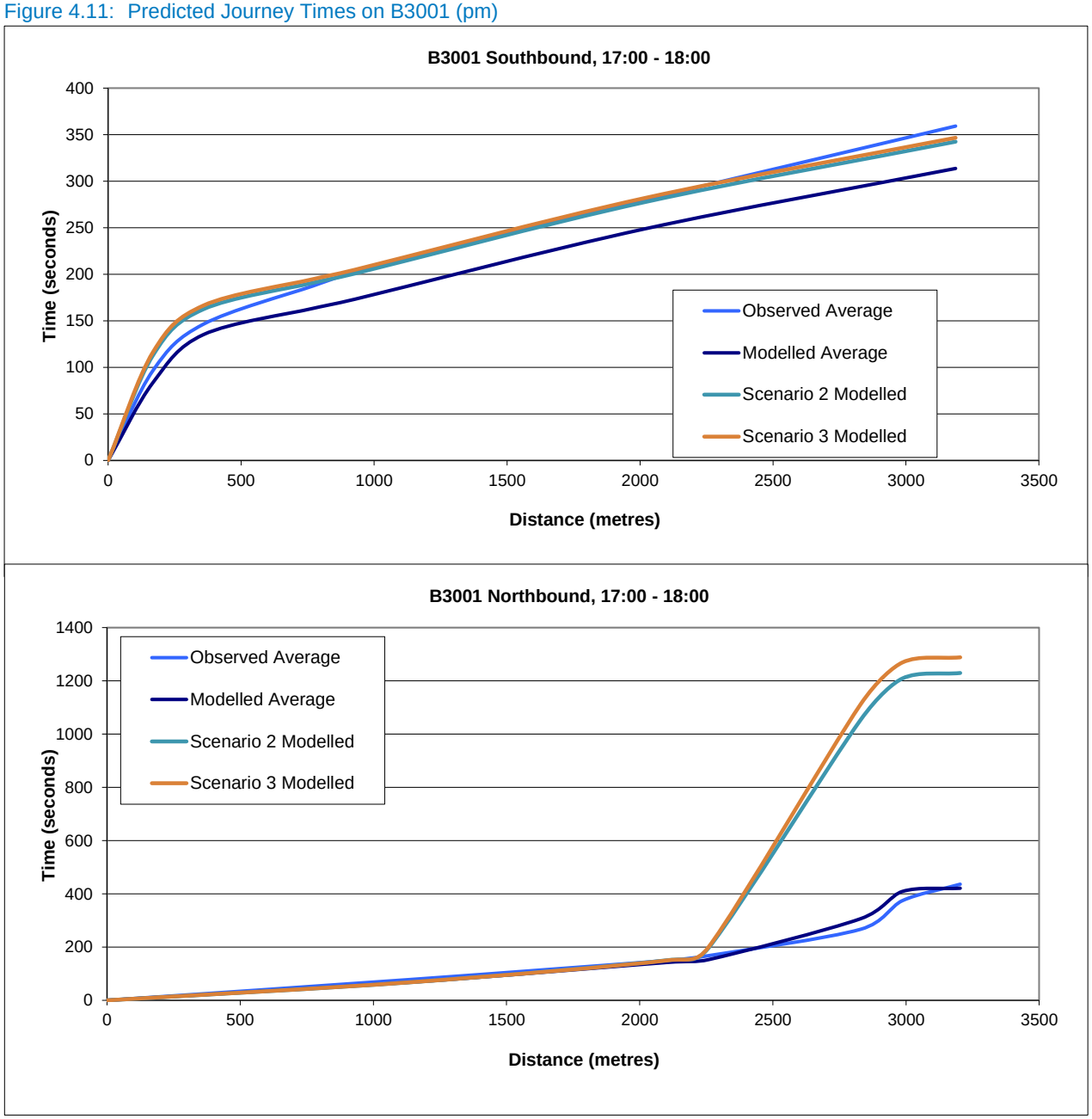
Figure 4.10: Predicted Journey Times on A31 (pm)





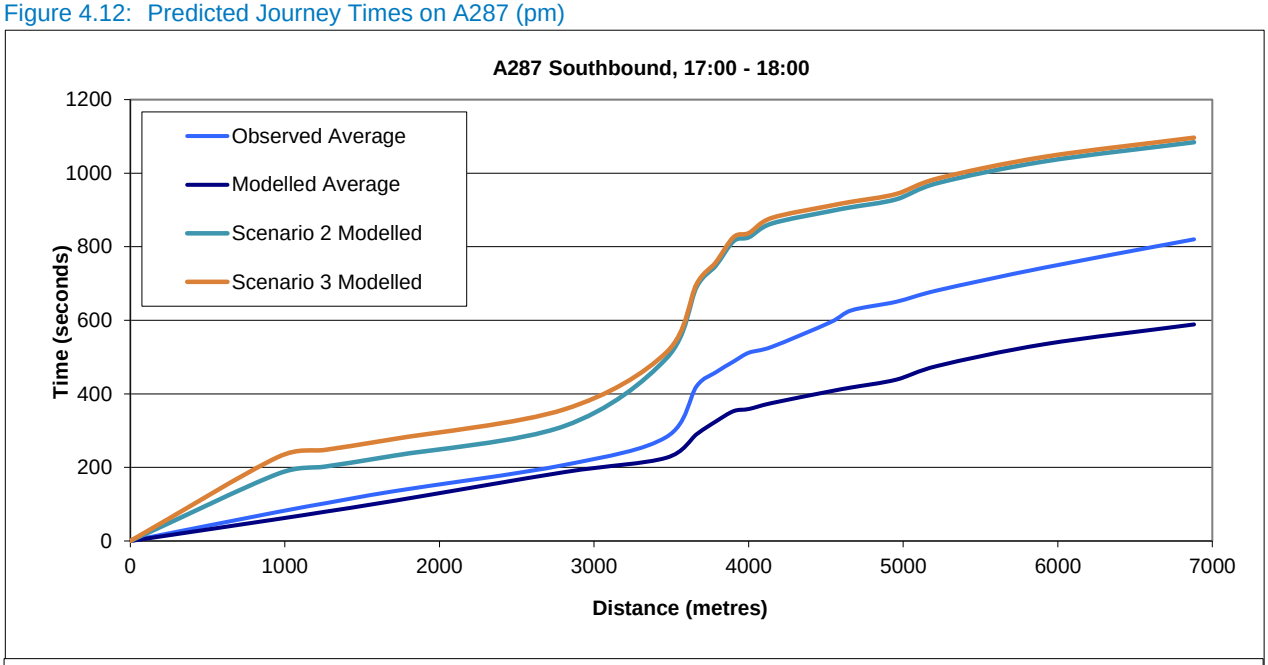
Source: Farnham Traffic Model

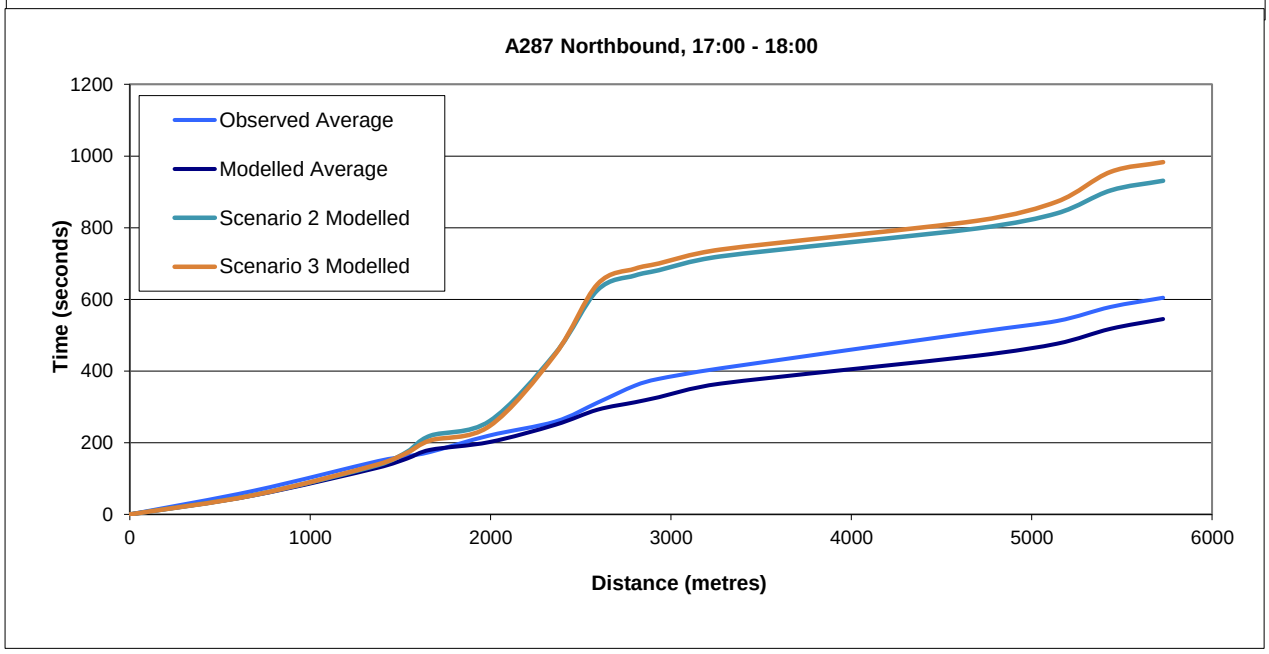
Figure 4.11: Predicted Journey Times on B3001 (pm)



Source: Farnham Traffic Model

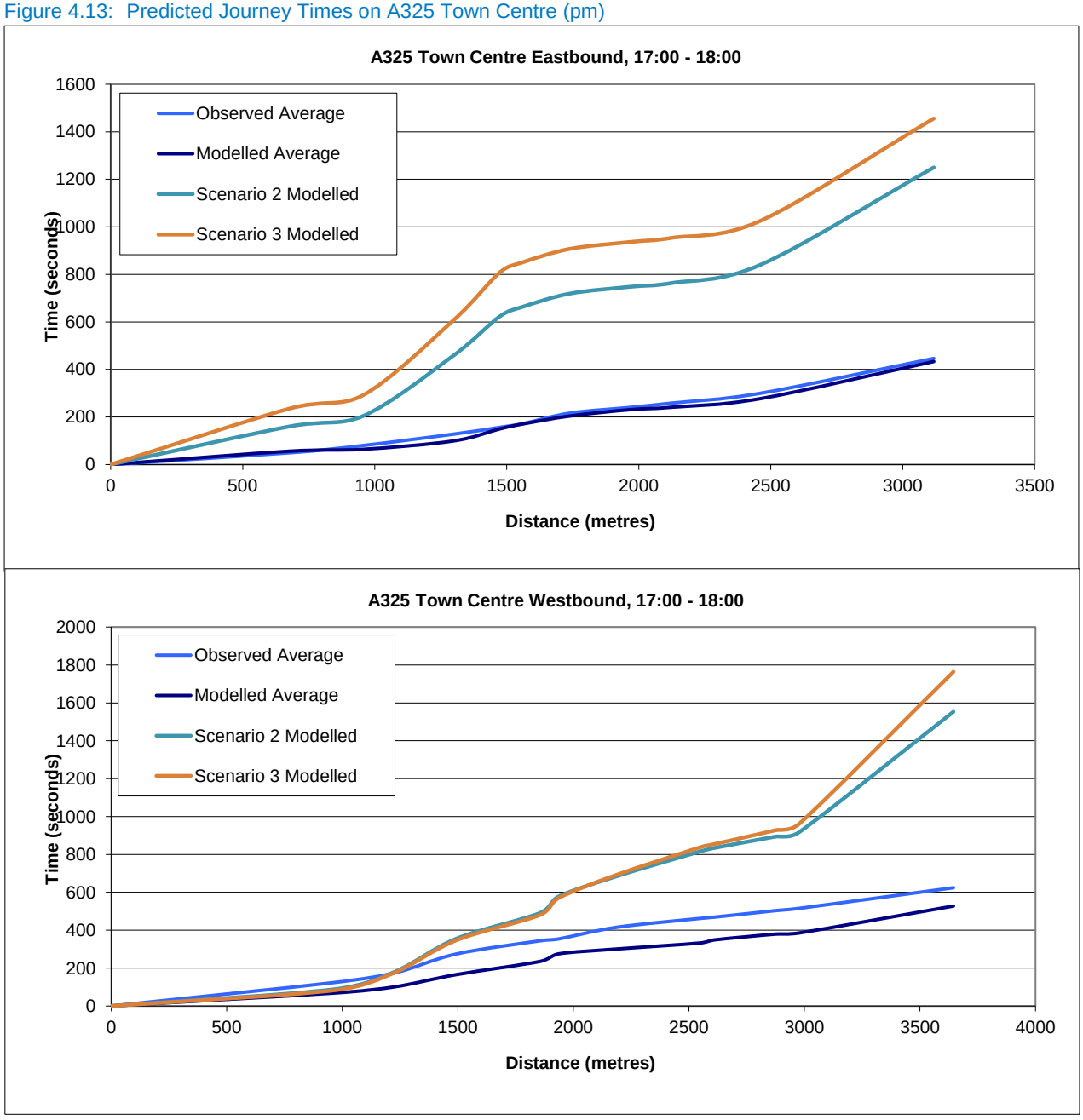
Figure 4.12: Predicted Journey Times on A287 (pm)





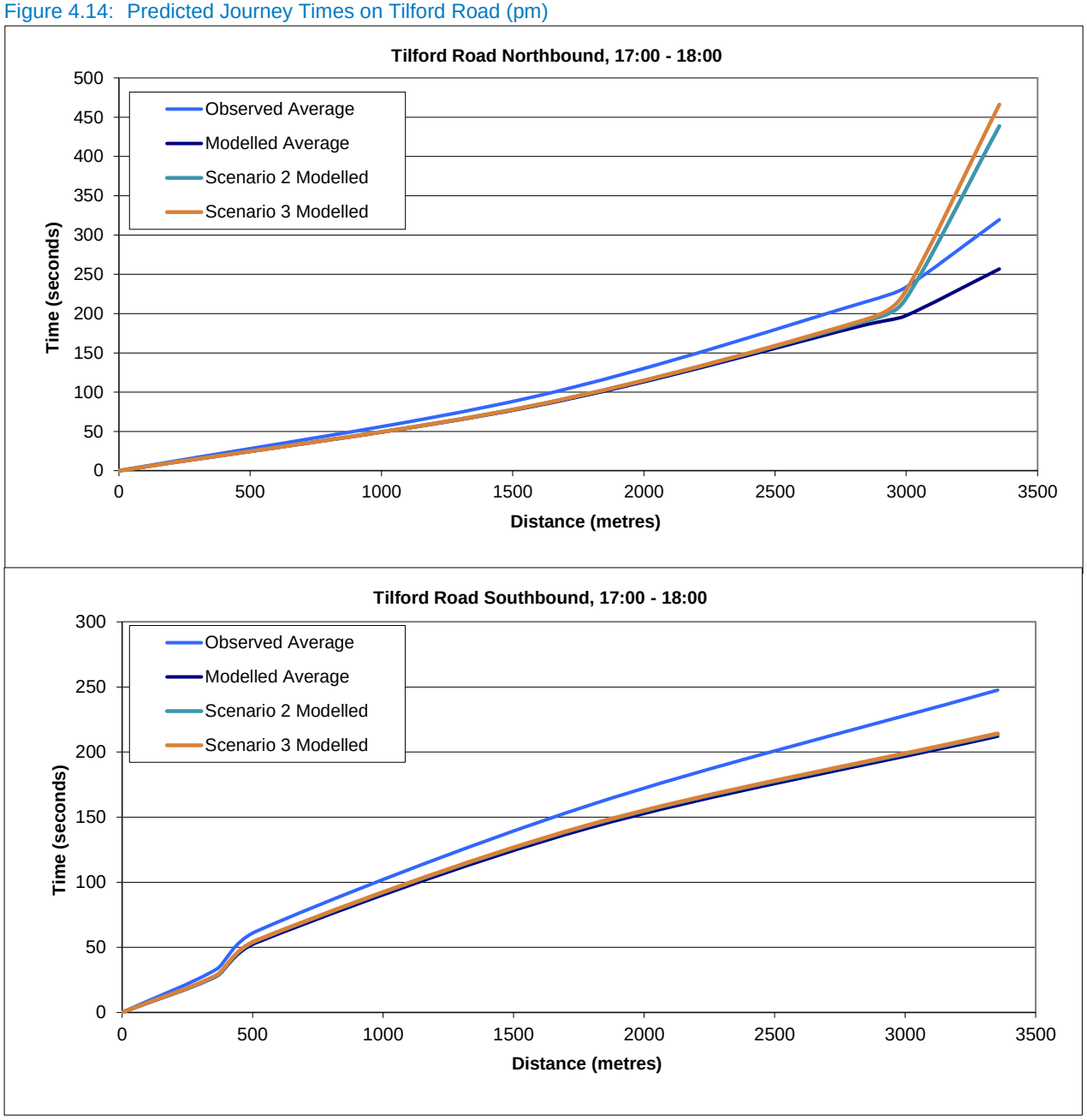
Source: Farnham Traffic Model

Figure 4.13: Predicted Journey Times on A325 Town Centre (pm)



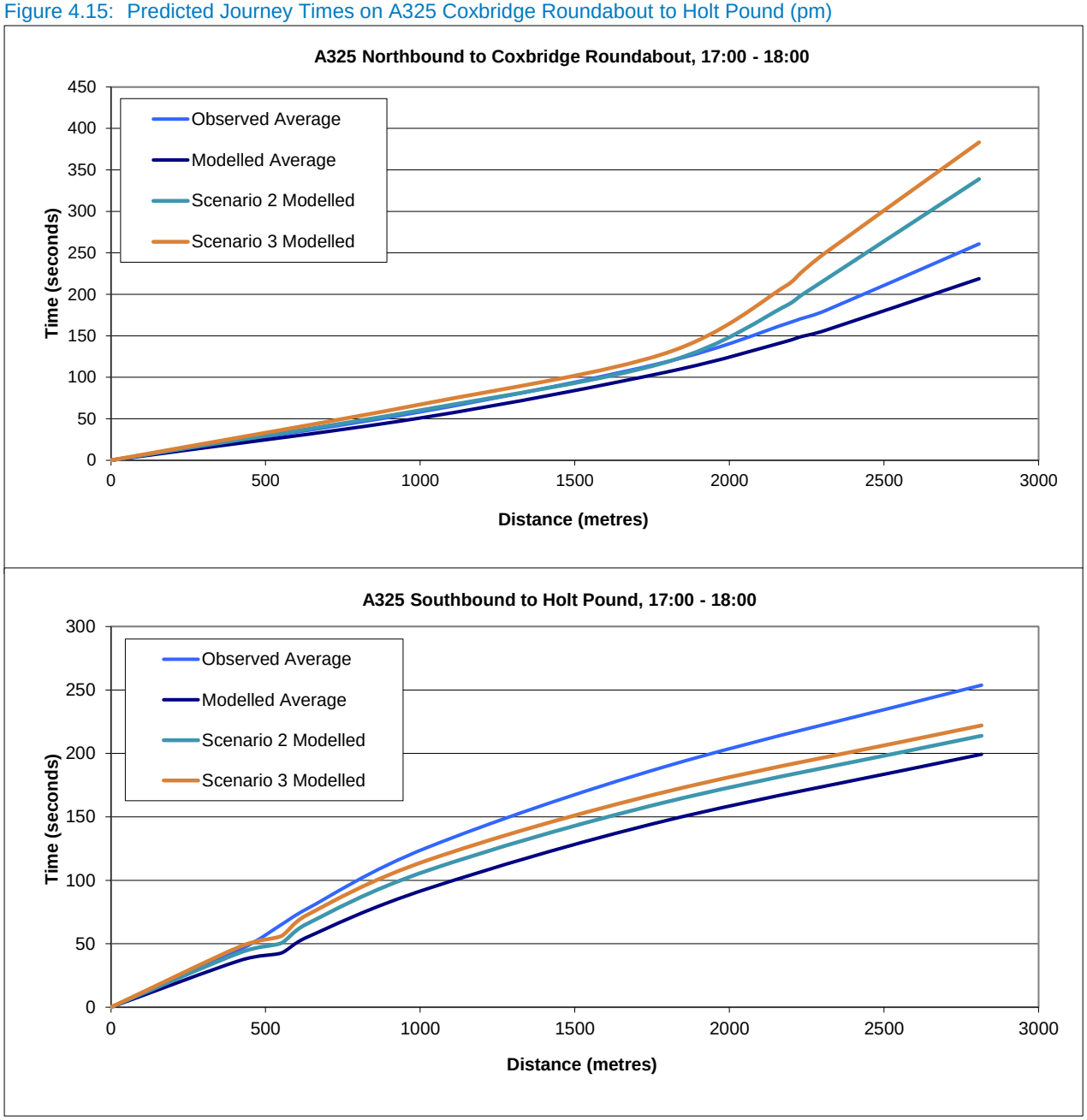
Source: Farnham Traffic Model

Figure 4.14: Predicted Journey Times on Tilford Road (pm)



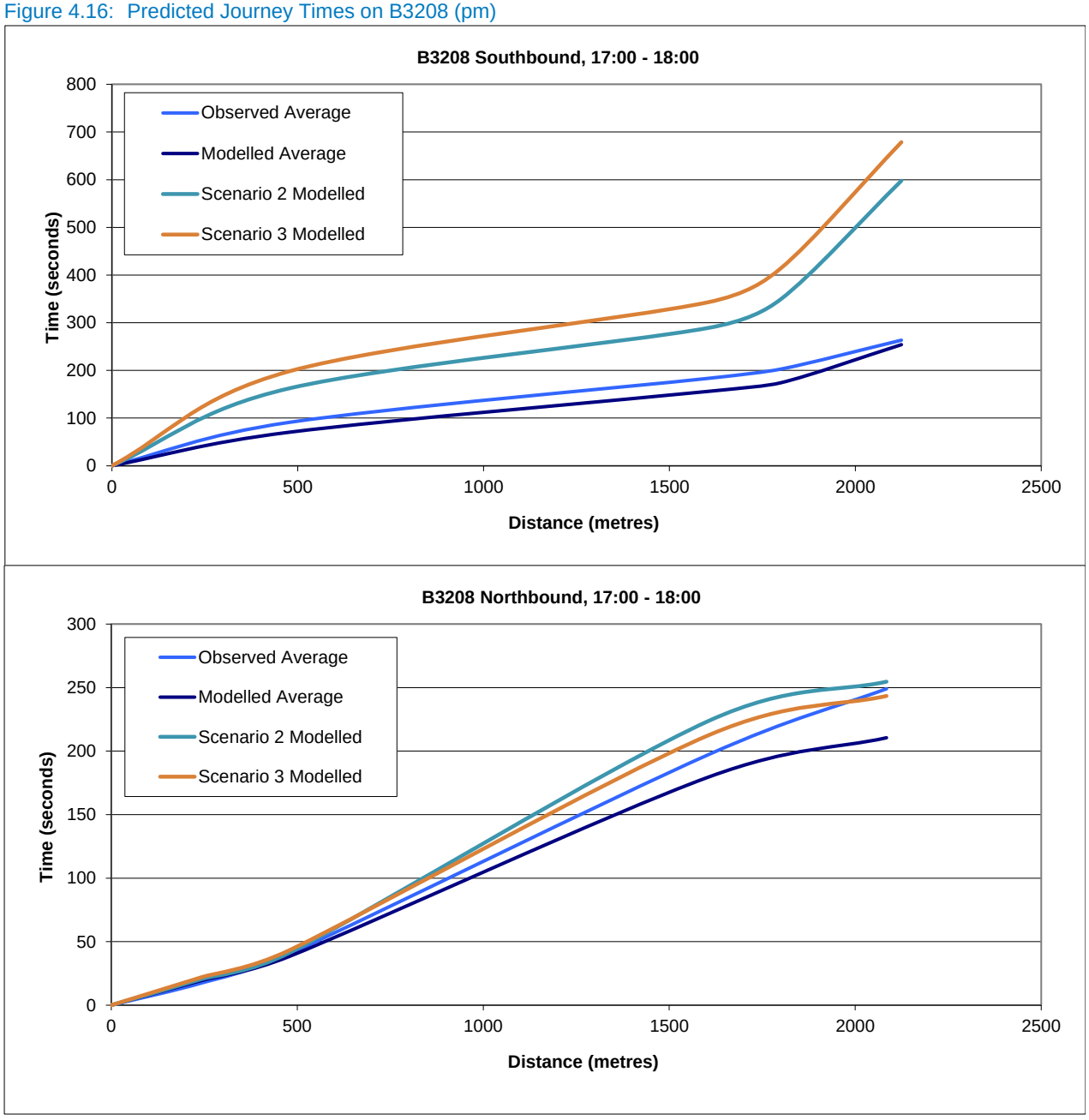
Source: Farnham Traffic Model

Figure 4.15: Predicted Journey Times on A325 Coxbridge Roundabout to Holt Pound (pm)



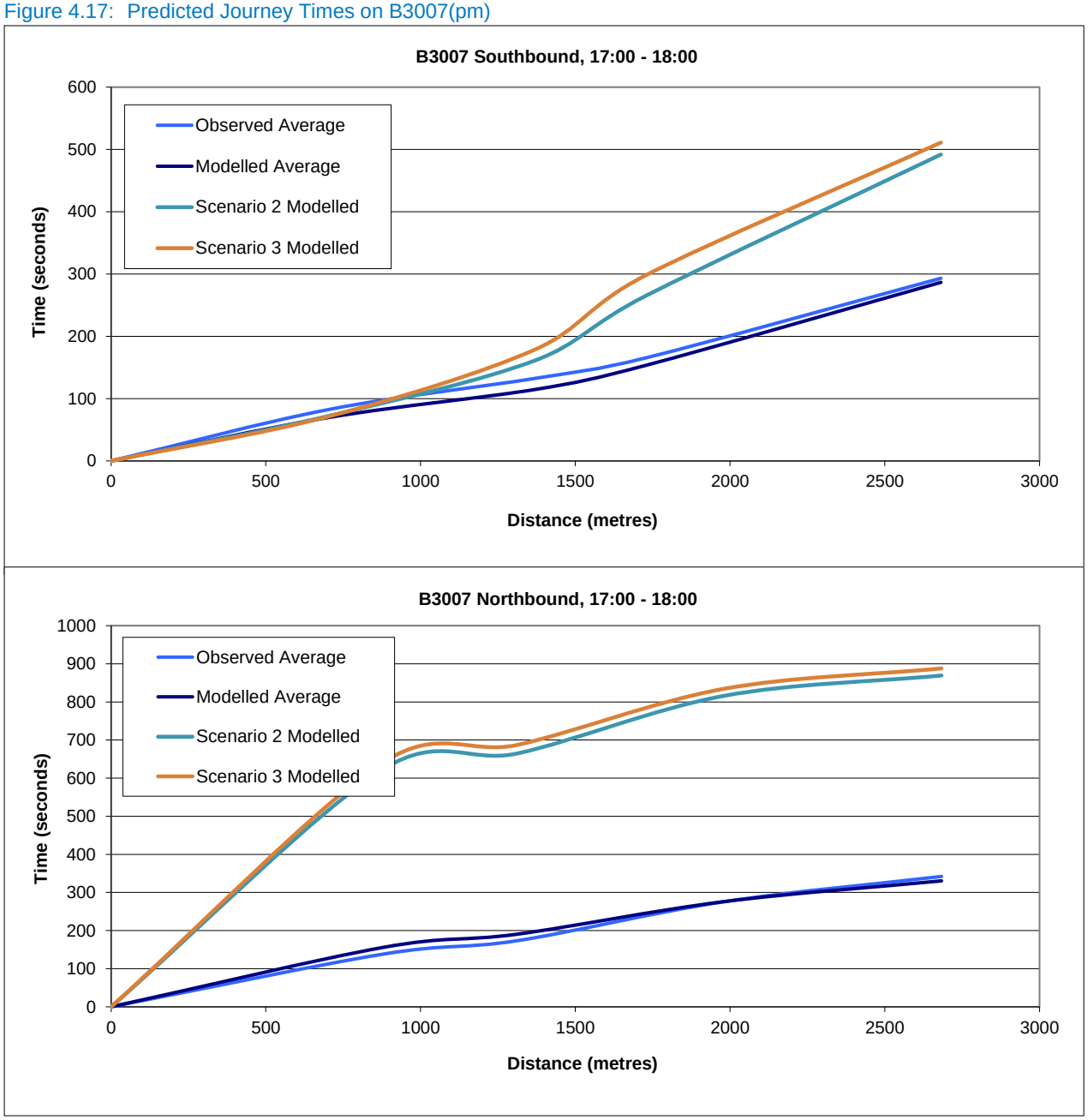
Source: Farnham Traffic Model

Figure 4.16: Predicted Journey Times on B3208 (pm)



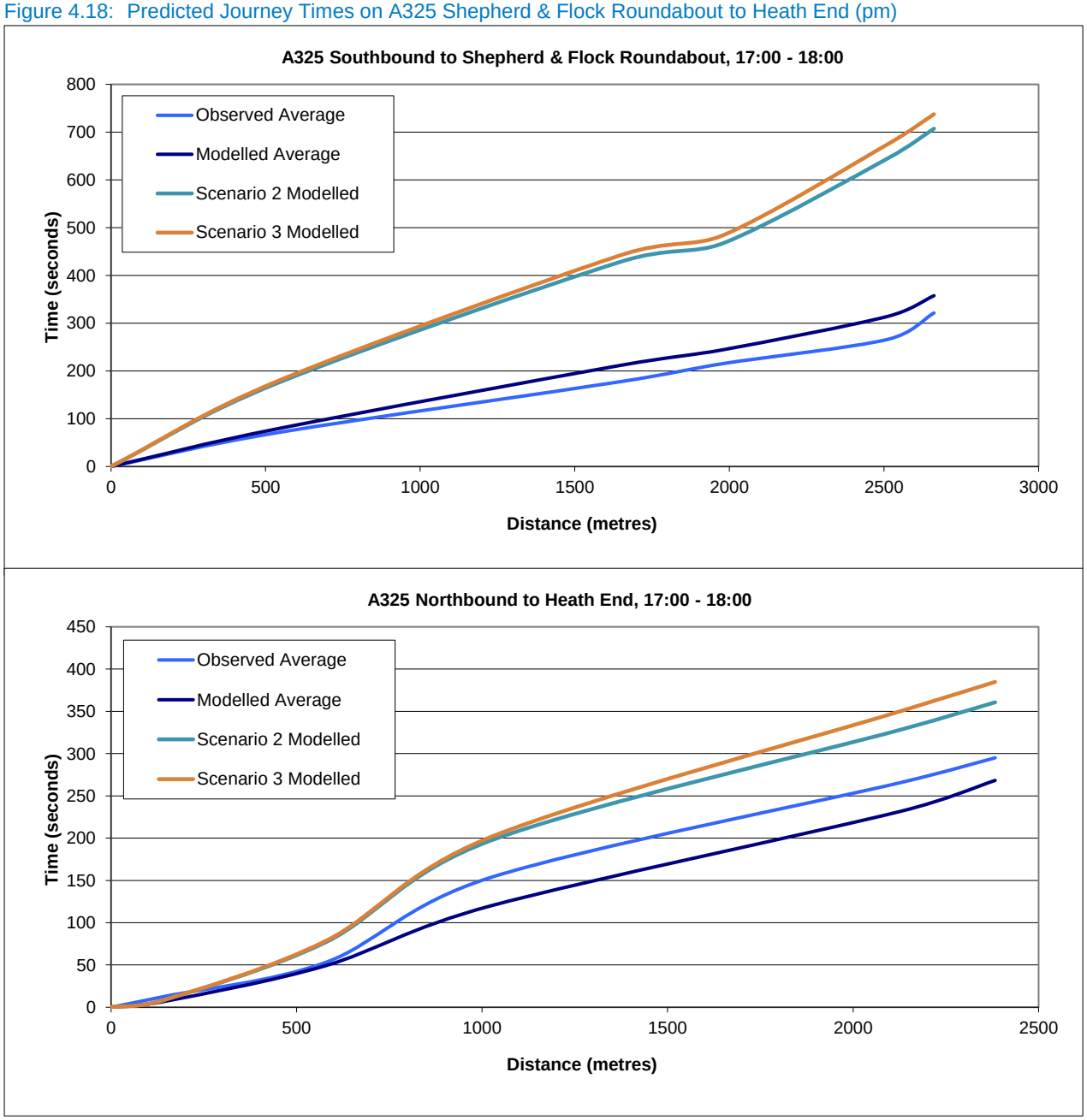
Source: Farnham Traffic Model

Figure 4.17: Predicted Journey Times on B3007(pm)



Source: Farnham Traffic Model

Figure 4.18: Predicted Journey Times on A325 Shepherd & Flock Roundabout to Heath End (pm)



Source: Farnham Traffic Model

5 Potential Mitigation Measures

5.1 Previous Core Strategy Supporting Documents

Potential mitigation measures have previously been considered in relation to the Core Strategy. SCC produced a report entitled "Transport Measures to Support Growth Identified in the Waverley Borough Core Strategy" (August 2012). This was an assessment of the highways and transport infrastructure which would be required to support the growth set out in the emerging Local Development Framework (LDF) Core Strategy at the time, for the period to 2028. This previous Core Strategy had a housing target of 3,614 new homes in total for 2012-2028, including 1,295 in Farnham.

The information presented on future highway conditions was based on the Waverley Borough-Wide Traffic Modelling 2009-2026: Core Strategy Transport Assessment Report (SCC, May 2012). The overall conclusion was that "major highway infrastructure is not required to support the planned development proposed within the emerging LDF Core Strategy. However, it is likely that some schemes in urban areas, such as Farnham, and at key junctions, will be required."

Schedules of improvement measures were produced to "show outline highways and transport schemes or packages of schemes. These generally do not provide additional network capacity but seek to manage the existing network and provide more sustainable transport choices." For Farnham the following schemes were proposed and included in the Infrastructure Delivery Plan produced by WBC in August 2012:

- Farnham town centre improvement scheme including revised traffic system (following review), pedestrian priority, streetscene enhancements and reallocation of street space; Measures to reduce emissions e.g. VMS to discourage idling; Upgrade bus stops and improve services; Improved cycle routes providing town centre access;
- A287 Firgrove Hill traffic management route improvement including a pedestrian crossing near Red Lion Lane;
- Farnham rail station forecourt improvement scheme including new bus shelter;
- A31 Hickley's Corner online junction improvement - following a study to identify an appropriate scheme to balance objectives to improve access for pedestrians and cyclists between the town centre and the station and residential areas to the south, improve air quality, and tackle traffic congestion, both in the town centre and at Hickley's Corner itself;
- Urban traffic control linking level crossing with Hickley's Corner signals;
- A31 Shepherd & Flock roundabout improvement scheme – including further signalisation of the junction and modification of traffic lights to allow crossing of A31 by cyclists;
- A325 Corridor, Wrecclesham - Traffic management and route improvements including A325 School Hill mini-roundabout replacement with traffic signals; and
- A31 Coxbridge Roundabout – pedestrian crossing to the east, make safer for cyclists and increase vehicle throughput.

5.2 Strategic Transport Assessment

The Strategic Transport Assessment (STA) Report produced by SCC in September 2014 re-visited the modelling of Core Strategy development scenarios. This showed that the A325 Coxbridge roundabout and A325 West Street / Crondall Lane priority junction would be among the junctions experiencing the highest increase in junction delay compared to the Do minimum, under all scenarios considered. However, the increase in delay was only between 8-19 seconds on average over the peak period of 07:00-10:00.

With STA Scenario 3, the links with the highest increase in flow from the Do Minimum included the A325 north of Shepherd and Flock (26%), the A287 through the town centre (42%) and B3208 Water Lane (97%).

Potential mitigation measures to address increased congestion in the future were not considered in the STA.

STA Scenarios 2 and 3 were based on 2,279 and 3,800 new homes in Farnham respectively: substantially more than the 1,295 considered for the previous Core Strategy work. From the previous reports only modest traffic capacity enhancement schemes were proposed at the A31 Shepherd and Flock roundabout, A31 Hickley's Corner signals and on the A325 at Wrecclesham. It is clear that with many more new houses being considered in Farnham, schemes to increase traffic capacity will be required if congestion and delays are not to increase greatly.

5.3 Schemes Associated with Whitehill/ Bordon

Potential schemes related to increased traffic as a result of the proposed White Hill/ Bordon development in Hampshire have been identified:

- A31 Hickley's Corner – local widening through removal of footways adjacent to the A31 to allow traffic on the A31 to pass through the junction in three lanes;
- A31 / A325 Coxbridge Roundabout - local widening to provide a separate left turn lane on each of the A31 approaches;
- A325 / School Hill mini-roundabout in Wrecclesham – conversion to signalised junction
- A325 / B3384 priority junction replaced with mini-roundabout.

All of the above schemes would be part funded by development at Whitehill/ Bordon, but would only be delivered if gap funding could be found.

5.4 Key Schemes

If the largest increases in journey times predicted for STA Scenarios 2 and 3 are to be addressed, significant increases in capacity will be required at Shepherd and Flock and Hickley's Corner. These junctions cause delays for A31 traffic but also generate queuing that blocks back to other junctions. This

causes delays on the A287, B3001, B3208, B3007 and A325 North radial routes towards Farnham, as well as the A325 through the town centre.

It is noted that the Waverley Borough Local Plan 2002 contains Policy M19: A31 Farnham By-Pass Improvements. These improvements comprised a grade-separated junction at Hickley's Corner and associated works including improvements to the station forecourt. The scheme was subsequently identified in the Draft South East Plan Implementation Plan (SEERA, March 2006) with an estimated cost of £87m but has since been considered 'unlikely to proceed'.

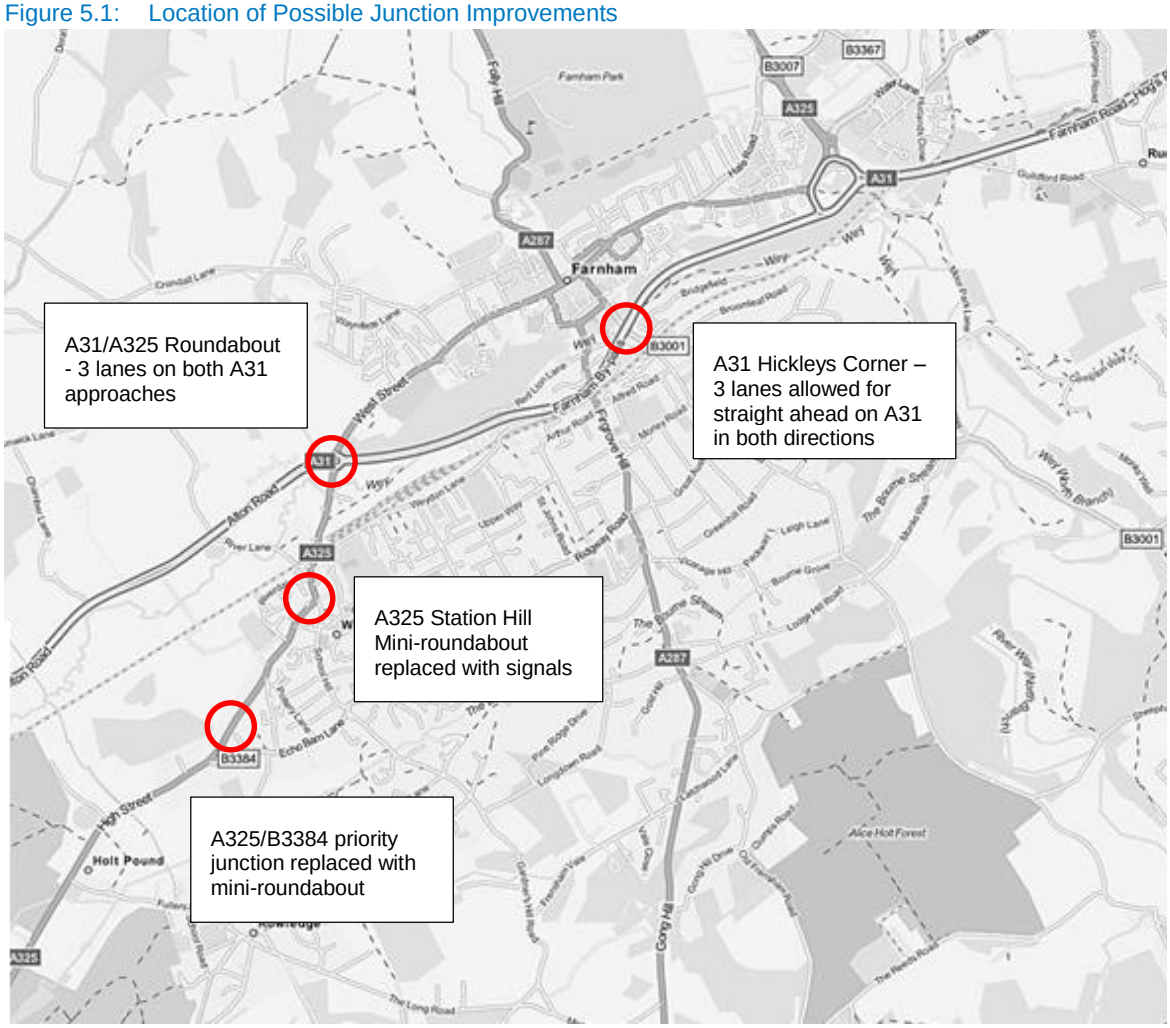
It is also noted that improving the A31 through Farnham is not currently seen as priority by the Enterprise M3 Local Enterprise Partnership (based on their report Working for a Smarter Future, the Enterprise M3 Strategic Economic Plan 2014-2020, March 2014), therefore they have not been seeking funding for schemes. Farnham was not identified as a Growth Town or Step-Up Town so is not considered a priority.

At Shepherd and Flock, some increases in capacity should be possible through further signalisation of the roundabout and localised widening to provide more lanes at the signal stop lines i.e. without the need for a major scheme.

5.5 Results of Modelling Improvements

Potential junction improvement schemes have been modelled with the STA Scenario 2 and 3 demands, at four locations as shown in **Figure 5.1**. These are the schemes that were developed as part of work to assess the potential impact of the proposed Whitehill Bordon development, as detailed above.

Figure 5.1: Location of Possible Junction Improvements



Source: © OpenStreetMap contributors

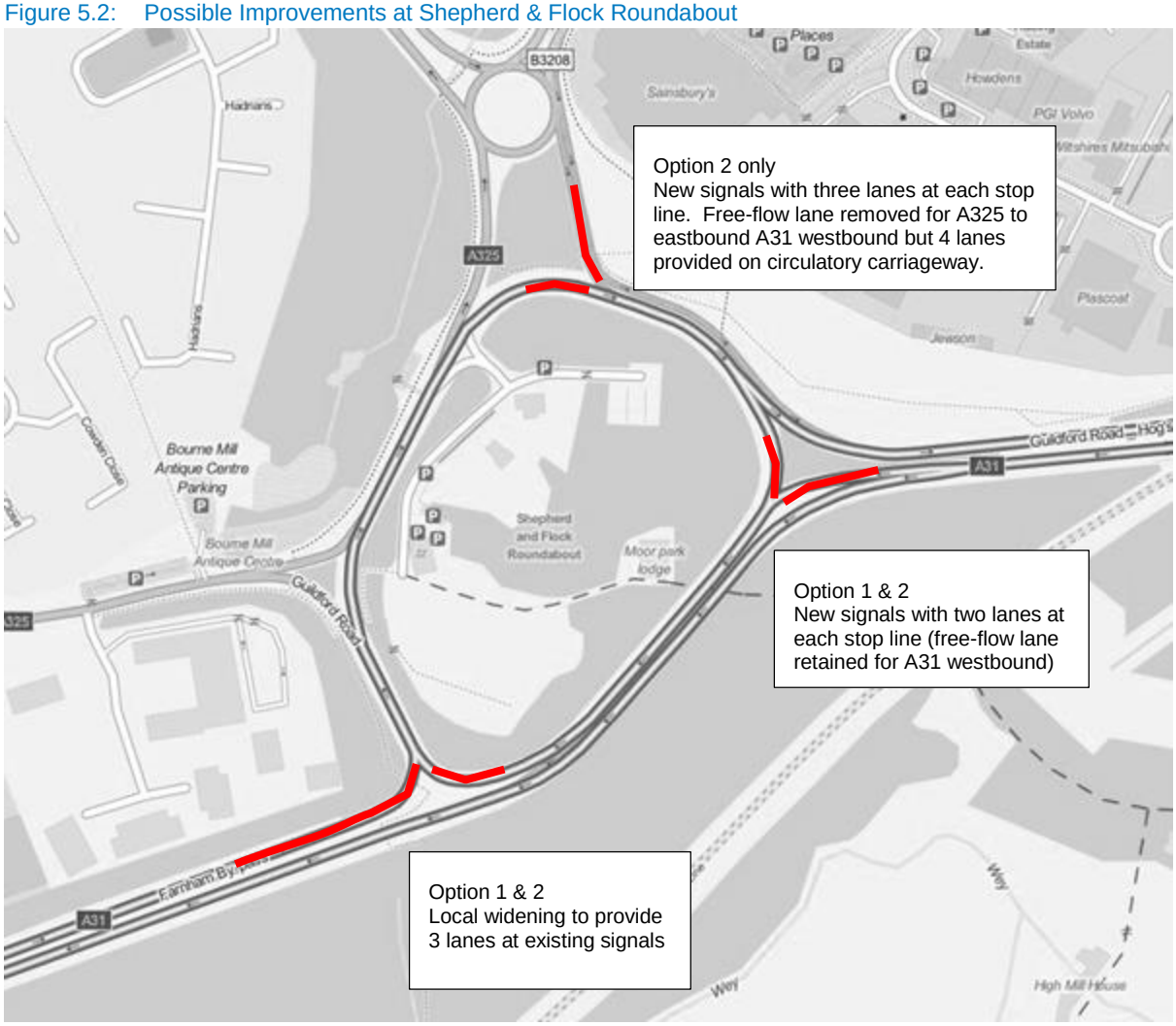
Modelling of the possible improvements to Hickley's Corner highlighted a problem in the PM peak. There is currently a separate lane on the westbound A31 for left-turning traffic onto the B3001 Station Hill. This movement receives more green time than the A31 straight ahead movement at the signals because it can run at the same time as the Station Hill arm. With the improvement, the current left turn lane would also be used for straight-ahead movements so could not run at the same time as the side road i.e. the capacity for left turners would reduce. In the PM peak, there is a high volume of left-turners so the scheme was shown to make congestion worse on the A31. Therefore, this part of the scheme was excluded and only changes to the eastbound layout were modelled.

No schemes have previously been proposed for the A31/A325 Shepherd and Flock roundabout, so potential improvements here have been developed, primarily to address the constraint to A31 movements.

Schemes were considered that stayed within the highway boundary and did not require major construction, such as a new flyover. **Figure 5.2** illustrates potential improvements. Option 1 has local widening on the approaches to the existing signalised part of the roundabout (south west corner), with new signals introduced where the westbound A31 joins the roundabout. The existing free-flow lane for westbound traffic staying on the A31 is retained.

Option 2 is the same as Option 1 but with the addition of new signals where the southbound A325 joins the roundabout, to try to address the problem of queuing on the A325 blocking back to upstream junctions. The free-flow lane from the A325 to the eastbound A31 is removed but replaced with 4 lanes between the two new sets of signals.

Figure 5.2: Possible Improvements at Shepherd & Flock Roundabout



Source: © OpenStreetMap contributors

Table 5.1 and **Table 5.2** show how the journey times change with the Option 1 improvements at Shepherd & Flock and all of the other schemes in place, for the AM and PM peak respectively.

In the future AM peak, the schemes are successful in reducing delays on the A31, particularly in the eastbound direction (which is busier in the AM peak) where journey times are actually less than in the Base Year. The schemes also reduce delays on some of the other routes, compared to Scenario 2 & 3 without improvements, particularly on the A325 northbound (south section) although long delays remain on the B3001 northbound and A287 northbound.

In the future PM peak, A31 westbound journey times are shown to be only slightly higher than the Base Year. However, the Option 1 scheme still has long queues (due to blocking back from Hickley's corner), but it provides more capacity and queuing past the edge of the model is greatly reduced. As a result more traffic is released onto the A325 northbound and through the town centre.

This extra traffic has the knock-on impact of increasing journey times on other routes, so that some routes are higher than the Scenario 2 & 3 base cases, particularly the B3007 northbound, B3001 northbound and A325 through the centre. With higher flows around the Shepherd & Flock roundabout, there are less gaps for traffic on the A325 from the town centre so queuing is much worse. This also results in traffic changing route, with more demand on the B3007 causing longer delays on this route.

Therefore, the Option 1 improvements on their own are not sufficient to have a significant impact on journey times with Scenarios 2 & 3, due to interaction of traffic at other junctions through and near to the town centre.

Table 5.3 and **Table 5.4** show how the Option 2 improvements change the journey time results.

In the AM peak, the new signals on the northern part of the Shepherd & Flock roundabout lead to increased delays to eastbound traffic, compared to Option 1. This is shown by the journey times for the eastbound A31 but the impact is much greater on the A325 through the town centre. The B3007 southbound is also worse due to congestion where it joins the A325 in the centre.

In the PM peak, there is a similar situation with more delays to A31 and A325 town centre eastbound traffic, compared to Option 1. However, the increase in delays in the centre is much greater, with knock-on effects on the westbound traffic and A287 in both directions.

5.6 Summary of Modelling of Possible Improvements

Modelling of possible improvements has shown:

1. Improvements on the A325 at the A31 junction and to the south are shown to reduce the northbound delays in the AM peak with STA Scenario 2 and 3 back to around Do Minimum levels;
2. Improvements on the A31 at Hickley's Corner and at Shepherd & Flock (Option 1) are shown to reduce eastbound delays in the AM peak to below existing levels;
3. In the AM peak, long delays remain on the B3001 northbound and A287 northbound;

4. Signalisation of the northern part of Shepherd & Flock (Option 2) does not provide sufficient capacity for eastbound traffic in both AM and PM peaks;
5. In the PM peak, Option 1 increases the capacity for A31 westbound traffic where it joins Shepherd & Flock. However, the westbound capacity at Hickley's Corner cannot easily be increased, resulting in similar delays to those currently experienced;
6. Option 1 in the PM peak does allow more A31 westbound traffic to reach the A325 to the north and A325 into the town centre. This causes longer delays on other routes due to the interaction of traffic at other junctions through and near to the town centre.

Based on the above results, it is clear that the capacity at the Shepherd & Flock roundabout can be increased but further work is required to assess improvements on other routes that would be needed to address the knock-on impacts. The overall conclusion is that it should be possible to largely mitigate for the impacts of additional traffic demand resulting from new housing allocations in Farnham, compared to the Do Minimum, but there will be additional delay due to background growth. This will be easier to achieve under STA Scenario 2 which has much less new housing compared to STA Scenario 3.

Table 5.1: AM Peak Hour, With Option 1 Junction Improvements

				Base Year	Future Do Minimum		STA Scenario 2			STA Scenario 3		
Ref	Route	Direction	Length (m)	Time (mins)	Time (mins)	Diff to Base (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)
1	A31	Westbound	6934	6.8	11.5	4.7	10.1	3.3	-1.4	11.2	4.3	-0.3
	A31	Eastbound	6613	11.7	17.6	5.9	8.4	-3.3	-9.2	9.0	-2.7	-8.6
2	B3001	Southbound	3187	5.0	5.5	0.5	6.2	1.2	0.7	6.5	1.5	1.0
	B3001	Northbound	3204	7.4	12.4	5.0	18.1	10.7	5.7	23.4	16.1	11.1
3	A287	Southbound	6881	14.0	17.5	3.5	20.4	6.4	2.9	22.0	8.0	4.5
	A287	Northbound	5728	13.8	22.2	8.4	23.9	10.1	1.7	27.0	13.2	4.8
4	A325 Centre	Eastbound	3118	6.8	8.2	1.4	9.8	3.0	1.6	11.3	4.5	3.1
	A325 Centre	Westbound	3645	7.8	11.0	3.2	12.8	5.0	1.8	15.8	8.0	4.8
5	Tilford Rd	Northbound	3355	4.8	6.5	1.7	7.7	3.0	1.2	8.3	3.5	1.8
	Tilford Rd	Southbound	3355	3.7	3.8	0.1	3.9	0.2	0.1	4.1	0.5	0.4
6	A325 South	Northbound	2808	8.3	16.8	8.5	15.2	6.9	-1.6	16.8	8.4	-0.1
	A325 South	Southbound	2816	3.1	3.3	0.2	4.4	1.2	1.0	4.5	1.4	1.2
7	B3208	Southbound	2124	4.2	6.4	2.2	10.1	5.8	3.6	12.7	8.5	6.3
	B3208	Northbound	2084	3.3	3.9	0.6	4.2	1.0	0.4	4.1	0.8	0.2
8	B3007	Southbound	2526	5.2	7.5	2.3	11.2	6.0	3.7	14.7	9.5	7.2
	B3007	Northbound	2683	6.4	8.7	2.3	11.7	5.3	3.0	13.9	7.5	5.2
9	A325 North	Southbound	2662	5.5	8.1	2.6	12.9	7.4	4.8	15.4	9.9	7.3
	A325 North	Northbound	2383	4.8	6.8	2.0	9.4	4.7	2.7	10.6	5.8	3.8

Table 5.2: PM Peak Hour, With Option 1 Junction Improvements

				Base Year	Future Do Minimum		STA Scenario 2			STA Scenario 3		
Ref	Route	Direction	Length (m)	Time (mins)	Time (mins)	Diff to Base (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)
1	A31	Westbound	6934	13.0	15.5	2.5	13.5	0.5	-2.0	14.4	1.3	-1.1
	A31	Eastbound	6613	6.5	8.8	2.3	10.0	3.5	1.2	11.1	4.6	2.3
2	B3001	Southbound	3187	5.2	5.5	0.3	6.0	0.8	0.5	5.9	0.7	0.4
	B3001	Northbound	3204	7.0	11.3	4.3	19.8	12.7	8.5	27.6	20.6	16.3
3	A287	Southbound	6881	9.8	13.8	4.0	22.0	12.2	8.2	21.1	11.3	7.3
	A287	Northbound	5728	9.1	12.0	2.9	16.2	7.2	4.3	17.8	8.7	5.8
4	A325 Centre	Eastbound	3118	6.3	12.3	6.0	27.3	21.0	15.0	31.9	25.6	19.6
	A325 Centre	Westbound	3645	8.8	15.7	6.9	29.9	21.1	14.2	31.7	22.9	16.0
5	Tilford Rd	Northbound	3355	4.3	5.1	0.9	7.0	2.7	1.8	7.7	3.4	2.6
	Tilford Rd	Southbound	3355	3.5	3.6	0.0	3.6	0.0	0.0	3.6	0.0	0.0
6	A325 South	Northbound	2808	3.6	4.7	1.0	4.5	0.9	-0.1	5.1	1.4	0.4
	A325 South	Southbound	2816	3.3	3.5	0.2	6.8	3.4	3.3	7.1	3.8	3.7
7	B3208	Southbound	2124	4.2	7.1	2.8	11.0	6.8	3.9	13.1	8.9	6.1
	B3208	Northbound	2084	3.5	4.0	0.5	4.2	0.7	0.2	4.1	0.6	0.1
8	B3007	Southbound	2526	4.8	5.5	0.8	12.0	7.3	6.5	10.9	6.2	5.4
	B3007	Northbound	2683	5.5	10.2	4.6	28.8	23.3	18.6	29.0	23.5	18.9
9	A325 North	Southbound	2662	6.0	8.4	2.4	13.7	7.8	5.3	14.8	8.9	6.5
	A325 North	Northbound	2383	4.5	5.4	0.9	6.9	2.4	1.5	6.7	2.2	1.3

Table 5.3: AM Peak Hour, With Option 2 Junction Improvements

				Base Year	Future Do Minimum		STA Scenario 2			STA Scenario 3		
Ref	Route	Direction	Length (m)	Time (mins)	Time (mins)	Diff to Base (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)
1	A31	Westbound	6934	6.8	11.5	4.7	10.4	3.6	-1.1	10.6	3.8	-0.9
	A31	Eastbound	6613	11.7	17.6	5.9	13.8	2.1	-3.8	14.6	3.0	-2.9
2	B3001	Southbound	3187	5.0	5.5	0.5	6.1	1.1	0.6	6.8	1.8	1.3
	B3001	Northbound	3204	7.4	12.4	5.0	20.0	12.6	7.6	21.8	14.4	9.4
3	A287	Southbound	6881	14.0	17.5	3.5	22.7	8.7	5.2	24.5	10.5	7.0
	A287	Northbound	5728	13.8	22.2	8.4	25.9	12.1	3.7	28.7	14.9	6.5
4	A325 Centre	Eastbound	3118	6.8	8.2	1.4	23.8	17.0	15.6	23.9	17.1	15.7
	A325 Centre	Westbound	3645	7.8	11.0	3.2	14.5	6.7	3.5	14.1	6.3	3.1
5	Tilford Rd	Northbound	3355	4.8	6.5	1.7	7.9	3.1	1.3	8.5	3.7	2.0
	Tilford Rd	Southbound	3355	3.7	3.8	0.1	3.9	0.2	0.1	4.0	0.3	0.2
6	A325 South	Northbound	2808	8.3	16.8	8.5	14.9	6.5	-2.0	16.2	7.8	-0.6
	A325 South	Southbound	2816	3.1	3.3	0.2	4.2	1.1	0.9	4.3	1.2	1.0
7	B3208	Southbound	2124	4.2	6.4	2.2	11.0	6.8	4.6	12.2	8.0	5.8
	B3208	Northbound	2084	3.3	3.9	0.6	3.9	0.6	0.0	3.7	0.4	-0.2
8	B3007	Southbound	2526	5.2	7.5	2.3	16.6	11.4	9.1	19.5	14.3	12.0
	B3007	Northbound	2683	6.4	8.7	2.3	12.5	6.0	3.8	12.7	6.2	3.9
9	A325 North	Southbound	2662	5.5	8.1	2.6	15.3	9.8	7.2	16.0	10.5	7.9
	A325 North	Northbound	2383	4.8	6.8	2.0	8.6	3.9	1.9	8.9	4.1	2.1

Table 5.4: PM Peak Hour, With Option 2 Junction Improvements

				Base Year	Future Do Minimum		STA Scenario 2			STA Scenario 3		
Ref	Route	Direction	Length (m)	Time (mins)	Time (mins)	Diff to Base (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)	Time (mins)	Diff to Base (mins)	Diff to Do Min (mins)
1	A31	Westbound	6934	13.0	15.5	2.5	13.8	0.8	-1.6	14.6	1.5	-0.9
	A31	Eastbound	6613	6.5	8.8	2.3	18.4	11.8	9.6	19.2	12.7	10.4
2	B3001	Southbound	3187	5.2	5.5	0.3	6.8	1.5	1.2	7.5	2.2	1.9
	B3001	Northbound	3204	7.0	11.3	4.3	18.0	11.0	6.7	24.4	17.3	13.1
3	A287	Southbound	6881	9.8	13.8	4.0	25.2	15.4	11.4	27.8	18.0	14.0
	A287	Northbound	5728	9.1	12.0	2.9	22.6	13.5	10.6	25.3	16.2	13.4
4	A325 Centre	Eastbound	3118	7.2	12.3	5.1	50.5	43.3	38.2	43.8	36.6	32.6
	A325 Centre	Westbound	3645	8.8	15.7	6.9	28.0	19.2	12.3	35.8	27.0	20.1
5	Tilford Rd	Northbound	3355	4.3	5.1	0.9	8.7	4.4	3.5	10.9	6.6	5.8
	Tilford Rd	Southbound	3355	3.5	3.6	0.0	3.6	0.0	0.0	3.6	0.0	0.0
6	A325 South	Northbound	2808	3.6	4.7	1.0	5.0	1.3	0.3	5.2	1.6	0.5
	A325 South	Southbound	2816	3.3	3.5	0.2	6.3	3.0	2.8	6.4	3.1	2.9
7	B3208	Southbound	2124	4.2	7.1	2.8	10.5	6.3	3.4	11.3	7.1	4.2
	B3208	Northbound	2084	3.5	4.0	0.5	3.6	0.1	-0.4	3.7	0.2	-0.3
8	B3007	Southbound	2526	4.8	5.5	0.8	10.6	5.8	5.1	14.1	9.3	8.5
	B3007	Northbound	2683	5.5	10.2	4.6	14.6	9.1	4.5	17.3	11.8	7.2
9	A325 North	Southbound	2662	6.0	8.4	2.4	17.6	11.7	9.3	18.0	12.0	9.6
	A325 North	Northbound	2383	4.5	5.4	0.9	6.3	1.8	0.9	5.8	1.3	0.4

6 Conclusions

- Congestion currently occurs on some of the roads in and around Farnham. The largest delays are due to the capacity of the A31 Shepherd and Flock and Hickley's Corner junctions that constrain throughput and lead to delays on the other routes feeding into these junctions.
- Other junctions on the A287 and A325 cause some delays due to capacity constraint but the impacts are localised.
- A micro-simulation model of Farnham has been developed by Surrey County Council representing a base year of 2010/11, covering the AM and PM peak hours. Although the model seems to underestimate traffic demand and journey times to some degree, it was successfully validated in line with Department for Transport guidelines. Therefore, the model is considered suitable for testing the impact of additional traffic in the future due to new housing and other developments in Farnham.
- Traffic growth between 2009 and 2031 has been estimated based on Surrey County Council's strategic traffic model which was used to test different development scenarios. STA Scenarios 2 and 3 include 2,279 and 3,800 new houses in Farnham respectively and are predicted to increase car traffic demand by 30% and 35%. This is compared to 18% with the 'Do Minimum' of no new housing in Farnham, other than that which currently has planning permission.
- This growth has been applied uniformly to the Farnham base year traffic model to represent conditions in 2031 with the two development scenarios and Do Minimum.
- Under both development scenarios, increases in journey time from the base year of over ten minutes are predicted on:
  - AM peak hour - the A325 and A287 northbound routes towards the town centre
  - PM peak hour - B3001 northbound and A325 through the town centre in both directions.
- Under Scenario 3, the following routes also experience increases in journey time of over ten minutes:
  - AM peak hour - the A31 eastbound, B3001 northbound and B3007 southbound
  - PM peak hour – no additional routes.
- The A31 junctions at Shepherd and Flock and Hickley's Corner cause delays for A31 traffic but also generate queuing that blocks back to other junctions. This causes delays on the A287, B3001, B3208, B3007 and A325 North radial routes towards Farnham, as well as the A325 through the town centre.
- Modelling has shown that it should be possible to increase the capacity of the A31 Shepherd and Flock junction through further signalisation of the roundabout and localised widening to provide more lanes at the signal stop lines. However, improving this junction to increase the A31 throughput has implications for other routes due to a combination of more queuing on some arms and increased traffic volumes reaching downstream junctions.
- Improvements at the A31 Hickley's Corner junction should be able to increase the capacity for eastbound traffic but westbound throughput would still be constrained.
- The overall conclusion is that it should be possible to largely mitigate for the impacts of additional traffic demand resulting from new housing allocations in Farnham, compared to the Do Minimum, but there will be additional delay due to background growth.
- This will be easier to achieve under STA Scenario 2 which has much less new housing compared to STA Scenario 3.