Sawston Transport Modelling
January 2014

Technical note

Project:	Sawston Junction Assessment	**To:**	Cambridgeshire County Council
Subject:	Junctions Assessments	**From:**	Atkins
Date:	29 Jan 2014	**cc:**	South Cambridgeshire District Council

1. Introduction

1.1. Background

Atkins has been commissioned to undertake a traffic capacity assessment on four key junctions in Sawston, Cambridgeshire, which would be most directly affected by the full build out of the Local Plan allocations within Sawston. The Local Plan allocations considered are situated off Babraham Road, Sawston.

The four junctions include:

- A1301 / Mill Lane staggered crossroads (Junction 1);
- A1301 / Cambridge Road priority T junction (Junction 2);
- Babraham Road / Cambridge Road Signalised crossroads (Junction 3); and
- High Street / A1307 Cambridge Road crossroads (Junction 4).

The junctions have been tested for the following scenarios:

- *Base* Scenario - which considers the operation of the junctions in current traffic conditions;
- *Do Minimum Scenario* - which considers the operation of the junctions in a future year without the build out of Local Plan allocated sites off Babraham Road, but accounts for general growth in background traffic; and
- *Do Something Scenario* – which includes growth in background traffic and accounts for the full build out of sites off Babraham Road.

1.2. Purpose of Note

The junctions have been modelled using industry standard software, with the priority junctions (1, 2 and 4) being modelled in Junctions 8 (formerly known as PICADY) and the signalised junction (3) being modelled using LinSig V3. The purpose of this note is to summarise the assessment of these junctions outlining the key assumptions and model results.

2. Traffic Flows

2.1. Base Scenario

Manual Classified Counts (MCCs) were undertaken at each of the junctions on 4th December 2013. The counts captured a full 12 hour day broken down into 15 minute periods, covering 07:00 hours to 19:00 hours. From this it was determined that the AM and PM peak hours were 08:00 to 09:00 hours and 17:00 to 18:00 hours respectively.

To understand the extent of daily variation Automatic Traffic Counters (ATCs) were placed on two of the approach arms to the signalised junction. The ATCs indicated the flows captured by the MCCs were representative of a typical day, and therefore no correction factors have been applied.

For modelling purposes the traffic flows were converted into Passenger Car Units (PCUs), using the following conversion factors:

- Car and LGV = 1 PCU;
- OGV1 = 1.5 PCUs;
- OGV2 and Bus = 2 PCUs; and
- Motorbike = 0.4 PCUs.

The Base Scenario traffic flow matrices are available if required.

2.2. Do Minimum Scenario

The Do Minimum scenario accounts for growth in background traffic but assumes no development will take place off Babraham Road. Local and regional growth rates have been obtained from TEMPRO, and applied to the relevant turning movements depending on whether they are local turning movements or external turning movements (un-associated with Sawston).

The Do Minimum Scenario traffic matrices are available on request.

2.3. Do Something Scenario

The Do Something Scenario includes the background growth applied in the Do Minimum Scenario, but also includes traffic associated with the full build out of the Local Plan allocated sites. A generic two-way housing vehicular trip rate of 0.65 has been used for the development traffic, and has been distributed across the local road network, taking account of the vehicle mix observed in the MCCs. This trip rate is consistent with that listed in the “Dales Manor Residential Project Note” from WSP, dated 14th October 2013.

The Do Something Scenario traffic matrices are available on request

3. Modelling

The three priority controlled junctions have been modelled, using 15 minute time segments and have been input to the model as direct flow profiles, to accurately assess the operation of the junction over the course of the peak hours.

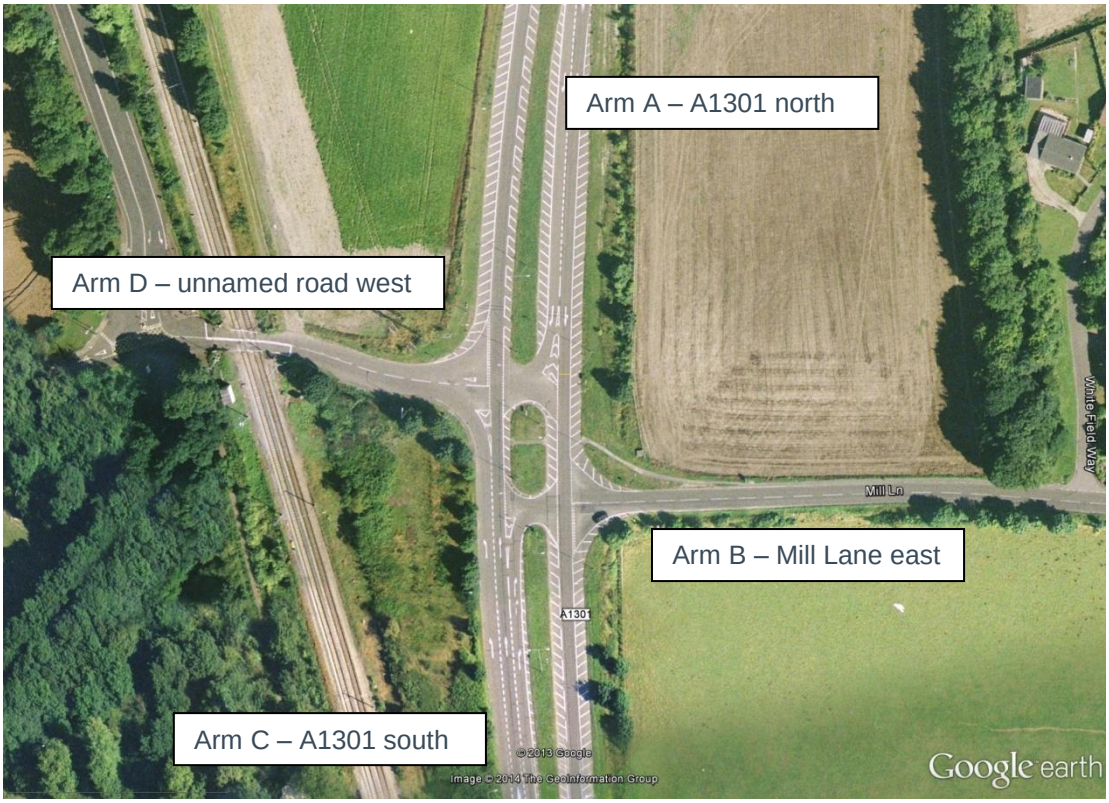
The signalised junction (junction 3) has been modelled within LinSig assuming a flat flow profile based on hourly flow data.

Results presented for the priority junctions assessed through Junctions 8 include the Ratio of Flow to Capacity (RFC) which indicates the degree of junction saturation. Values above 85% on any one approach in the critical 15 minute time period are generally viewed as a concern, since it is indicative that the relevant approach is approaching its capacity threshold.

3.1. Junction 1 – A1301 / Mill Lane / unnamed road

Junction 1 takes the form of a staggered crossroads connecting the A1301, a single-lane dual carriageway, with Mill Lane to the east and an unnamed road to the west. The junction is displayed in Figure 1.

Figure 1. Junction 1 A1301 / Mill Lane satellite image



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The northbound carriageway provides a single lane for traffic continuing northwards along the A1301, a right turn lane for traffic accessing Mill Lane and a dedicated left-turn lane for traffic accessing the unnamed road to the west.

To ensure a robust assessment two configurations (A and B) of the northbound carriageway have been tested. Configuration A accounts for the full carriageway width, including the left turn lane. As a worst case sensitivity test, Configuration B accounts for a restricted northbound carriageway to single width, omitting the dedicated left turn lane whilst continuing to include the left turn traffic.

The southbound carriageway also includes a right turn lane, and this has been modelled as a standard right turn bay.

The junction also provides right-turning vehicles exiting the minor arms with waiting space in the central reserve area; as indicated in Figure 2.

Figure 2. Central reserve queuing space at Junction 1

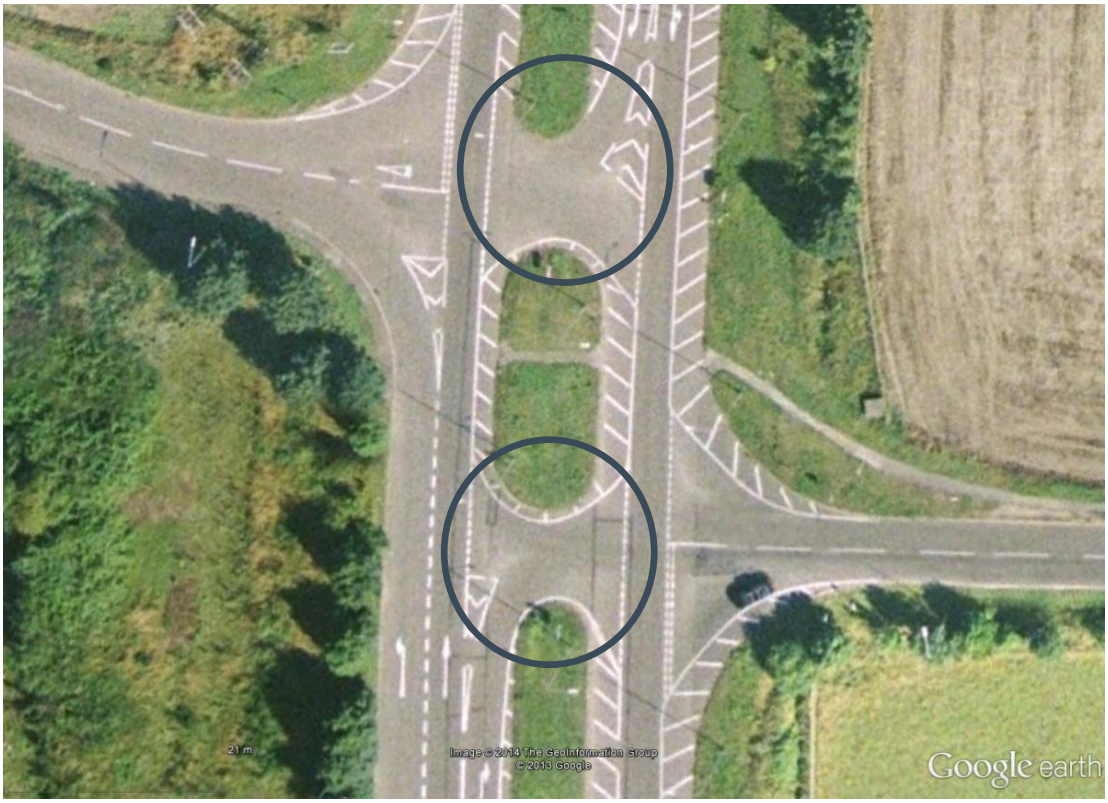


Image © 2014 Infoterra Ltd and Bluesky.

To ensure that there would be no blocking back of traffic across the main carriageway sensitivity tests have been undertaken, treating these as separate priority T-Junctions.

3.1.1. Base Scenario

The full results are available on request, and the worst case results (Configuration B) are summarised in Table 1 and Table 2.

Table 1. Base Scenario AM modelling results - Junction 1

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1301 north	Right turn onto unnamed road west	0.01	6	0
Arm B – Mille Lane East	Right turn onto A1301 north / straight on onto unnamed road west	0.23	7	0
	Left turn onto A1301 south	0.19	7	0
Arm C – A1301 south	Right turn onto Mill Lane east	0.21	7	0
Arm D – unnamed road west	Left turn onto A1301 north	0.01	5	0
	Right turn onto A1301 south / straight on onto Mill Lane east	0.04	7	0

Table 2. Base Scenario PM modelling results - Junction 1

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1301 north	Right turn onto unnamed road west	0.01	5	0
Arm B – Mille Lane East	Right turn onto A1301 north / straight on onto unnamed road west	0.12	8	0
	Left turn onto A1301 south	0.17	7	0
Arm C – A1301 south	Right turn onto Mill Lane east	0.08	6	0
Arm D – unnamed road west	Left turn onto A1301 north	0.01	6	0
	Right turn onto A1301 south / straight on onto Mill Lane east	0.08	6	0

Based on desktop analysis, the tables indicate that the junction is operating well within capacity and there are no instances of queuing noted from the capacity model.

The sensitivity tests at the central reserve stop lines are provided in Appendix B, and indicate that there is no issue of queuing onto the main carriageway.

3.1.2. Do Minimum Scenario

The full Do Minimum results are available on request and are summarised in Table 3 and Table 4.

Table 3. Do Minimum Scenario AM modelling results - Junction 1

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1301 north	Right turn onto unnamed road west	0.01	6	0
Arm B – Mille Lane East	Right turn onto A1301 north / straight on onto unnamed road west	0.28	10	0
	Left turn onto A1301 south	0.23	8	0
Arm C – A1301 south	Right turn onto Mill Lane east	0.25	7	0
Arm D – unnamed road west	Left turn onto A1301 north	0.01	5	0
	Right turn onto A1301 south / straight on onto Mill Lane east	0.05	7	0

Table 4. Do Minimum Scenario PM modelling results - Junction 1

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1301 north	Right turn onto unnamed road west	0.02	6	0
Arm B – Mille Lane East	Right turn onto A1301 north / straight on onto unnamed road west	0.14	9	0
	Left turn onto A1301 south	0.20	8	0
Arm C – A1301 south	Right turn onto Mill Lane east	0.10	6	0
Arm D – unnamed road west	Left turn onto A1301 north	0.02	6	0
	Right turn onto A1301 south / straight on onto Mill Lane east	0.04	7	0

The results demonstrate that the junction is anticipated to continue to operate within capacity. Queuing remains minimal and there is only a marginal increase in delay.

3.1.3. Do Something Scenario

The full Do Something results are available on request and are summarised in Table 5 and Table 6.

Table 5. Do Something Scenario AM modelling results - Junction 1

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1301 north	Right turn onto unnamed road west	0.01	6	0
Arm B – Mille Lane East	Right turn onto A1301 north / straight on onto unnamed road west	0.36	12	1
	Left turn onto A1301 south	0.29	9	0
Arm C – A1301 south	Right turn onto Mill Lane east	0.29	8	0
Arm D – unnamed road west	Left turn onto A1301 north	0.01	5	0
	Right turn onto A1301 south / straight on onto Mill Lane east	0.06	7	0

Table 6. Do Something Scenario PM modelling results - Junction 1

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1301 north	Right turn onto unnamed road west	0.02	6	0
Arm B – Mille Lane East	Right turn onto A1301 north / straight on onto unnamed road west	0.15	9	0
	Left turn onto A1301 south	0.24	8	0
Arm C – A1301 south	Right turn onto Mill Lane east	0.13	7	0
Arm D – unnamed road west	Left turn onto A1301 north	0.02	6	0
	Right turn onto A1301 south / straight on onto Mill Lane east	0.04	7	0

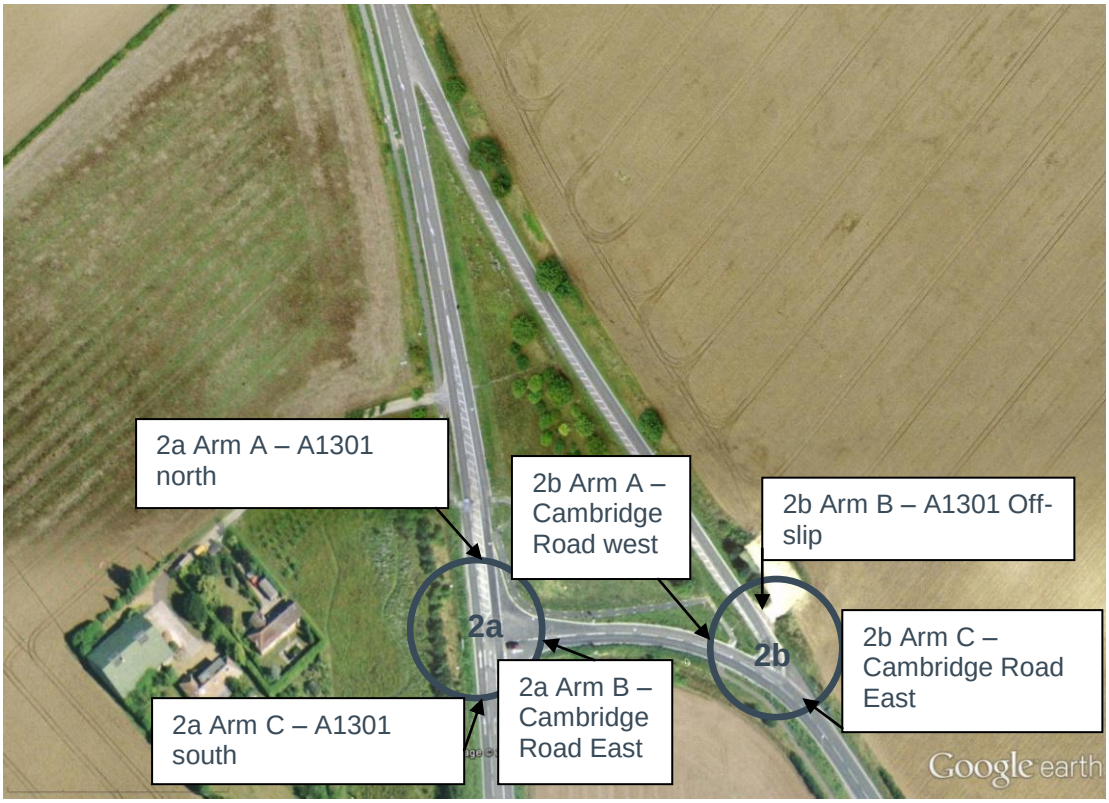
The results show that the junction is anticipated to continue to operate well within capacity in the Do Something Scenario, with limited queuing and only minor increases in delay predicted.

The sensitivity tests at the central reserve stop lines are provided in Appendix B, and indicate that the junction would continue to operate without queuing back onto the main carriageway.

3.2. Junction 2 – A1301 / Cambridge Road

Junction 2 takes the form of a priority T-junction, with an associated off-slip (left turn filter lane) that effectively creates a separate entry-only T-junction. The junction is presented in Figure 3.

Figure 3. Junction 2 A1301 / Cambridge Road



The junction has been modelled as two separate priority T-junctions (2a and 2b), and it has been assumed that all vehicles accessing Cambridge Road from the north would use the southbound only off-slip (junction 2b). At junction 2a there is a right turn lane for vehicle turning right onto Cambridge Road, providing queuing space for approximately eight PCUs.

3.2.1. Base Scenario

The full results are available on request and are summarised in Table 7 and Table 8.

Table 7. Base Scenario AM modelling results – Junction 2

Junction	Arm	Movement	RFC	Delay (s)	Queue (PCU)
2a	Arm B – Cambridge Road east	Left turn onto A1301 south	0.02	9	0
		Right turn onto A1301 north	0.73	25	2
	Arm C – A1301 south	Right turn onto Cambridge Road east / straight on onto A1301 north	0.01	6	0
2b	Arm B – A1301 Off-slip	Right turn onto Cambridge Road west / straight on onto Cambridge Road east	0.41	8	1
	Arm C – Cambridge Road east	Right turn onto A1301 Off-slip	Banned movement		

Table 8. Base Scenario PM modelling results – Junction 2

Junction	Arm	Movement	RFC	Delay (s)	Queue (PCU)
2a	Arm B – Cambridge Road east	Left turn onto A1301 south	0.01	7	0
		Right turn onto A1301 north	0.61	18	2
	Arm C – A1301 south	Right turn onto Cambridge Road east / straight on onto A1301 north	0.02	6	0
2b	Arm B – A1301 Off-slip	Right turn onto Cambridge Road west / straight on onto Cambridge Road east	0.66	14	2
	Arm C – Cambridge Road east	Right turn onto A1301 Off-slip	Banned movement		

Based on desktop analysis indicates that the junction currently operates within capacity and that there are no notable queuing issues predicted noted from the capacity model. There is a minor delay of 25 seconds in the AM peak and 18 seconds in the PM peak, for traffic manoeuvring from Cambridge Road (Arm B) onto the A1301 north.

The A1301 off-slip also operates within capacity; however there is a minor delay of up to 15 seconds in the PM peak for traffic manoeuvring onto Cambridge Road from the off-slip.

3.2.2. Do Minimum Scenario

The full results are available on request and summarised in Table 9 and Table 10.

Table 9. Do Minimum Scenario AM modelling results – Junction 2

Junction	Arm	Movement	RFC	Delay (s)	Queue (PCU)
2a	Arm B – Cambridge Road east	Left turn onto A1301 south	0.00	0	0
		Right turn onto A1301 north	0.80	33	4
	Arm C – A1301 south	Right turn onto Cambridge Road east / straight on onto A1301 north	0.00	0	0
2b	Arm B – A1301 Off-slip	Right turn onto Cambridge Road west / straight on onto Cambridge Road east	0.46	9	1
	Arm C – Cambridge Road east	Right turn onto A1301 Off-slip	Banned movement		

Table 10. Do Minimum Scenario PM modelling results – Junction 2

Junction	Arm	Movement	RFC	Delay (s)	Queue (PCU)
2a	Arm B – Cambridge Road east	Left turn onto A1301 south	0.00	0	0
		Right turn onto A1301 north	0.72	25	2
	Arm C – A1301 south	Right turn onto Cambridge Road east / straight on onto A1301 north	0.00	0	0
2b	Arm B – A1301 Off-slip	Right turn onto Cambridge Road west / straight on onto Cambridge Road east	0.75	19	3
	Arm C – Cambridge Road east	Right turn onto A1301 Off-slip	Banned movement		

The tables indicate that whilst the junctions are anticipated to continue to operate within capacity and with little queuing, there are increases in delay for certain movements predicted. Delay for vehicles exiting Cambridge Road onto the A1301 increases notably up to 33 seconds in the AM peak and up to 25 seconds in the PM peak, although the queues remain below four PCUs.

Delay also increases for vehicles exiting the A1301 off-slip onto Cambridge Road, up to nearly 19 seconds in the PM peak, however the forecast queue level is not anticipated to extend beyond the length of the slip.

3.2.3. Do Something Scenario

The full results are available on request and are summarised in Table 11 and Table 12.

Table 11. Do Minimum Scenario AM modelling results – Junction 2

Junction	Arm	Movement	RFC	Delay (s)	Queue (PCU)
2a	Arm B – Cambridge Road east	Left turn onto A1301 south	0.00	0	0
		Right turn onto A1301 north	0.96	82	10
	Arm C – A1301 south	Right turn onto Cambridge Road east / straight on onto A1301 north	0.00	0	0
2b	Arm B – A1301 Off-slip	Right turn onto Cambridge Road west / straight on onto Cambridge Road east	0.49	10	1
	Arm C – Cambridge Road east	Right turn onto A1301 Off-slip	Banned movement		

Table 12. Do Minimum Scenario PM modelling results – Junction 2

Junction	Arm	Movement	RFC	Delay (s)	Queue (PCU)
2a	Arm B – Cambridge Road east	Left turn onto A1301 south	0.00	0	0
		Right turn onto A1301 north	0.81	36	4
	Arm C – A1301 south	Right turn onto Cambridge Road east / straight on onto A1301 north	0.00	0	0
2b	Arm B – A1301 Off-slip	Right turn onto Cambridge Road west / straight on onto Cambridge Road east	0.84	28	5
	Arm C – Cambridge Road east	Right turn onto A1301 Off-slip	Banned movement		

The tables indicate that the increase in traffic from the build out of the Local Plan allocation puts further pressure on the arms associated with Cambridge Road (2a Arm B). In the AM peak, the Cambridge Road arm of junction 2a exceeds practical capacity, with an RFC of 0.96. Whilst the arm remains within its theoretical capacity, there is evidence of queuing (up to 10 PCUS), and significant delay of up to 82 seconds. This is primarily associated with the increase in demand at this movement from development traffic, coupled with the increase in traffic on the A1301 from background traffic growth limiting the number of available gaps in traffic flow. Right turn movements are anticipated to increase by approximately 100 PCUs and the two way flows on in the A1301 are anticipated to increase by approximately 140 PCUs per hour in the AM peak. It is noted that the assessment has not considered potential reassignment options and that the junction immediately south on the A1307 (junction 4) is able to offer scope to accommodate additional traffic, to the potential relief of this junction. In the PM peak the arm is within capacity at 0.81 RFC however delay does increase up to 36 seconds.

There is also a notable increase in delay for traffic accessing Cambridge Road from the A1301 off-slip in the PM peak, where delay is observed to be up to 28 seconds; however the forecast queue level is still not anticipated to extend beyond the length of the slip.

3.3. Junction 3 – Babraham Road / Cambridge Road Signalised crossroads

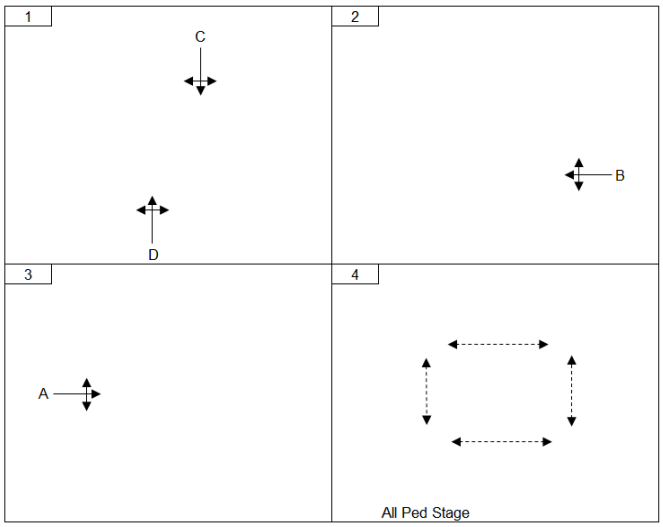
Junction 3 takes the form of a crossroad junction connecting Cambridge Road with the main road into Sawston, Babraham Road. The junction is shown in Figure 4 below. As this is a signalised junction, it has been modelled within LINSIG. The surveyed traffic flows were converted into PCUs for entry into the LINSIG model.

Figure 4. Junction 3 Babraham Road / Cambridge Rd

All entries to the junction are single lane approaches, with the exception of Hillside, which provides a short additional flare for right turning traffic into Babraham Road, although these vehicles are required to give way to oncoming traffic from Cambridge Road. Formal pedestrian facilities are provided at the junction and operate on demand.

The signal installation specification supplied by CCC identifies that the junction operates on vehicle actuation (VA) using detectors on the road surface to detect vehicles within a certain gap time and extend the green time up to a maximum green time, thus varying the cycle time as required. LINSIG can only model fixed time cycles, but during the AM and PM peak periods, it is more likely that vehicles would extend the green times to the maximums. Therefore, the maximum green time for each stage (as per the specification) has been utilised to obtain the most likely full cycle time. Analysis of the traffic survey footage from the AM peak hour indicates that the pedestrian facilities were called with a frequency most consistent with being called every cycle. Therefore to ensure a robust assessment, the pedestrian stage has been included in the staging to replicate it being called every cycle. Figure 5 show the staging used within the LINSIG model where phases C and D represent Cambridge Road and Hillside respectively.

Figure 5. Junction 3 Babraham Road / Cambridge Rd



The Do Minimum (DM) and Development flows (DS) were placed into the LINSIG model using the same signal staging and timings. A sensitivity test was also undertaken on the DS scenario by removing the pedestrian stage, thus decreasing the cycle time. The subsequent results are shown below.

3.3.1. LINSIG Comparison Results

Table 13 shows the overall results for each peak in terms of cycle time, Practical Reserve Capacity (PRC) and delay in pcu hours.

Table 13. LINSIG Comparison Results

	Cambridge Rd / Babraham Rd Junction - Sawston											
Measure	**Cycle Time**				**PRC (%)**				**Delay (pcu/hr)**			
Peak	**Base**	**2031 DM**	**2031 DS**	**2031 DS No Peds**	**Base**	**2031 DM**	**2031 DS**	**2031 DS No Peds**	**Base**	**2031 DM**	**2031 DS**	**2031 DS No Peds**
AM	94	94	94	80	24.5	11.1	-31.9	2.8	13.6	17.0	74.2	16.3
PM	83	83	83	69	6.2	-6.0	-125.4	6.5	13.3	20.8	156.0	15.0

Table 13 shows that by adding the development traffic with no mitigating measures in place, the PRC is predicted to significantly reduce, thus significantly increasing delays, especially in the PM peak as a result of additional traffic wishing to make a right turn into Babraham Road. If the pedestrian stage is removed, the PRC is increased and delays reduced back to Base levels, although the AM peak the PRC is much lower.

Table 14 shows the results in terms of Degree of Saturation (DoS) and delay in seconds per pcu for each approach at the junction for the AM peak.

Table 14. AM Peak Comparison of LinSig Results per Approach

	DoS (%)				Delay (s/pcu)			
Approach	**Base**	**2031 DM**	**2031 DS**	**2031 DS No Peds**	**Base**	**2031 DM**	**2031 DS**	**2031 DS No Peds**
Cambridge Rd	66.3%	75.0%	80.6%	65.6%	44.7	49.5	53.9	34.8
Babraham Rd	72.3%	81.0%	118.7%	87.5%	43.2	49.5	356.5	42.6
Hillside	48.4%	64.9%	89.7%	54.6%	38.0	40.4	50.2	30.9
New Rd	64.5%	72.7%	79.8%	67.9%	57.6	63.5	71.5	49.7

Table 14 shows that the DoS for all approaches is predicted to increase as a result of increasing the traffic demand, with Babraham Road experiencing the longest delays with the development traffic.

Table 15 shows the results in terms of DoS and delay in seconds per pcu for approach at the junction for the PM peak.

Table 15. PM Peak Comparison of LinSig Results per Approach

	DoS (%)				Delay (s/pcu)			
Approach	Base	2031 DM	2031 DS	2031 DS No Peds	Base	2031 DM	2031 DS	2031 DS No Peds
Cambridge Rd	74.4%	84.1%	98.9%	75.9%	39.0	46.8	96.2	28.8
Babraham Rd	84.8%	95.4%	125.1%	84.5%	70.6	108.1	442.7	50.4
Hillside	58.9%	84.4%	202.9%	80.4%	37.3	59.4	988.0	42.7
New Rd	37.9%	42.8%	48.8%	40.5%	41.4	42.4	44.0	33.2

Table 15 shows that the Hillside approach is predicted to be significantly impacted by the development flows as access to Babraham Road from the south is on give way and therefore, vehicles are unable to turn in gaps in traffic, as demand from the north has also increased. Delays are predicted to be in excess of 15 minutes per pcu for this approach. By removing the pedestrian stage, delays are significantly reduced, but capacity is still predicted to be a problem for this approach.

Therefore, it is recommended that further work is undertaken to assess possible improvement schemes to help alleviate the potential issues with the proposed development along Babraham Road. This may include;

- Optimisation of the existing signal times to make best use of the existing highway provision;
- Examining pedestrian desire lines across the junction and determining if intermediate crossing facilities could reduce junction loss time due to pedestrian demands; or
- Potential road widening to increase flare lengths on certain approaches.

3.4. Junction 4 – High Street / A1307 Cambridge Road

Junction 4 is a standard crossroads junction, connecting the dual carriageway A1307 to High Street and an unnamed road. The A3107 is primarily a single-lane dual carriageway, although the south-eastbound carriageway increases to two lanes approximately 150 metres north of Junction 4.

Junction 4 is presented in Figure 6

Figure 6. Junction 4 A1307 / High Street / unnamed road

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There is a right-turn lane on the south-eastbound carriageway, providing queuing space for approximately eight PCUs turning right onto High Street. There is no dedicated right turn provision for traffic turning right from the north-westbound carriageway on the unnamed road; however there is only the presence of white line hatching preventing vehicles from making use of the space created by the end of the central reserve and one vehicle was observed making this movement in each peak hour. It has therefore been assumed that there is sufficient room for one right turning PCU to wait before blocking of the main carriageway occurs.

3.4.1. Base Scenario

The full results are presented are available on request and are summarised Table 16 and Table 17.

Table 16. Base Scenario AM modelling results - Junction 4

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1307 north west	All movements	0.18	12	0
Arm B – unnamed road east	Right turn onto A1307 north / straight on onto High Street	0.02	11	0
	Left turn onto A1307 south / straight on onto High Street	0.02	7	0
Arm C – A1307 south east	All movements	0.01	7	0
Arm D – High Street west	Left turn onto A1307 north / straight on onto High Street	0.20	11	0
	Right turn onto A1307 south / straight on onto unnamed road	0.26	21	0

Table 17. Base Scenario PM modelling results - Junction 4

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1307 north west	All movements	0.18	8	0
Arm B – unnamed road east	Right turn onto A1307 north / straight on onto High Street	0.02	13	0
	Left turn onto A1307 south / straight on onto High Street	0.01	13	0
Arm C – A1307 south east	All movements	0.01	10	0
Arm D – High Street west	Left turn onto A1307 north / straight on onto High Street	0.14	8	0
	Right turn onto A1307 south / straight on onto unnamed road	0.29	16	0

Based on desktop analysis the tables indicate that the junction is operating well within capacity and there are no instances of queuing predicted noted from the capacity model. The largest delay is observed at the High Street arm of the junction, with vehicles delayed by up to 21 seconds in the AM peak and up to 16 seconds in the PM peak.

3.4.2. Do Minimum Scenario

The full Do Minimum results are available on request and are summarised in Table 18 and Table 19.

Table 18. Do Minimum Scenario AM modelling results - Junction 4

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1307 north west	All movements	0.12	13	0
Arm B – unnamed road east	Right turn onto A1307 north / straight on onto High Street	0.05	16	0
	Left turn onto A1307 south / straight on onto High Street	0.03	8	0
Arm C – A1307 south east	All movements	0.00	8	0
Arm D – High Street west	Left turn onto A1307 north / straight on onto High Street	0.21	14	0
	Right turn onto A1307 south / straight on onto unnamed road	0.44	35	1

Table 19. Do Minimum Scenario PM modelling results - Junction 4

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1307 north west	All movements	0.22	10	0
Arm B – unnamed road east	Right turn onto A1307 north / straight on onto High Street	0.03	20	0
	Left turn onto A1307 south / straight on onto High Street	0.01	20	0
Arm C – A1307 south east	All movements	0.01	12	0
Arm D – High Street west	Left turn onto A1307 north / straight on onto High Street	0.18	9	0
	Right turn onto A1307 south / straight on onto unnamed road	0.47	31	1

The results demonstrate that the junction is predicted to continue to operate within capacity. Queuing is anticipated to remain minimal and there is an increase in delay on the minor arms of the junction predicted. Traffic exiting from High Street is delayed by up to 35 seconds in the AM peak and 31 seconds in the PM peak. This increase in delay is mirrored on the opposite minor arm, with traffic exiting the unnamed road delayed by up to 16 seconds in the AM peak and 20 seconds in the PM peak.

3.4.3. Do Something Scenario

The full Do Something results are available on request and are summarised in Table 20 and Table 21.

Table 20. Do Something Scenario AM modelling results - Junction 4

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1307 north west	All movements	0.33	21	0
Arm B – unnamed road east	Right turn onto A1307 north / straight on onto High Street	0.05	17	0
	Left turn onto A1307 south / straight on onto High Street	0.03	8	0
Arm C – A1307 south east	All movements	0.01	8	0
Arm D – High Street west	Left turn onto A1307 north / straight on onto unnamed road	0.74	57	2
	Right turn onto A1307 south / straight on onto unnamed road	0.76	159	2

Table 21. Do Something Scenario PM modelling results - Junction 4

Arm	Movement	RFC	Delay (s)	Queue (PCU)
Arm A – A1307 north west	All movements	0.31	11	0
Arm B – unnamed road east	Right turn onto A1307 north / straight on onto High Street	0.04	22	0
	Left turn onto A1307 south / straight on onto High Street	0.01	21	0
Arm C – A1307 south east	All movements	0.01	13	0
Arm D – High Street west	Left turn onto A1307 north / straight on onto unnamed road	0.27	13	0
	Right turn onto A1307 south / straight on onto unnamed road	0.65	47	2

The tables indicate that the delay observed in the Do Minimum Scenario is exacerbated by the marginal increase in traffic from the Local Plan land allocation traffic. Whilst the junction remains within capacity there is a noticeable increase in delay up to 159 seconds in the AM peak for traffic exiting High Street onto the A1307, and up to 47 seconds in the PM peak. However, queues are anticipated to remain at minimal levels.

Traffic flows on the High Street minor arm are anticipated to increase by just between 60 – 70 PCUs within each peak hour – a 60% increase in the AM peak hour and 50% increase in the PM peak hour. However, two-way traffic flows are anticipated to increase by more than 600 PCUs in each peak hour on the A1307, which limits the number of available gaps for minor road traffic to utilise.

There is only a marginal increase in delay for traffic exiting the unnamed road, with no anticipated increase in queuing.

4. Summary

4.1. Background

Atkins has been commissioned to undertake an assessment on four key junctions in Sawston, Cambridgeshire, which would be most directly affected by the full build out of Local Plan allocations within Sawston. The Local Plan allocations tested in this desktop study are situated off Babraham Road, Sawston.

The four junctions assessed include:

- A1301 / Mill Lane staggered crossroads (Junction 1);
- A1301 / Cambridge Road priority T junction (Junction 2);
- Babraham Road / Cambridge Road Signalised crossroads (Junction 3); and
- High Street / A1307 Cambridge Road crossroads (Junction 4).

The junctions have been tested for the following scenarios:

- *Base* Scenario - which considers the operation of the junctions in current traffic conditions;
- *Do Minimum Scenario* - which considers the operation of the junctions in a future year without the build out of Local Plan allocated sites off Babraham Road, but accounts for general growth in background traffic; and
- *Do Something Scenario* – which includes growth in background traffic and accounts for the full build out of sites off Babraham Road.

The junctions have been modelled using industry standard software, with the priority junctions (1, 2 and 4) being modelled in Junctions 8 and the signalised junction (3) being modelled using LinSig V3. The purpose of this note is to summarise the assessment of these junctions outlining the key assumptions and model results.

4.2. Traffic Flows

Base Scenario

Manual Classified Counts (MCCs) were undertaken at each of the junctions on 4th December 2013. The counts captured a full 12 hour day broken down into 15 minute periods, covering 07:00 hours to 19:00 hours. From this it was determined that the AM and PM peak hours were 08:00 to 09:00 hours and 17:00 to 18:00 hours respectively.

To understand the extent of daily variation Automatic Traffic Counters (ATCs) were placed on two of the approach arms to the signalised junction. The ATCs indicated the flows captured by the MCCs were representative of a typical day, and therefore no correction factors have been applied.

Do Minimum Scenario

The Do Minimum scenario accounts for growth in background traffic but assumes no development will take place off Babraham Road. Local and regional growth rates have been obtained from TEMPRO, and applied to the relevant turning movements depending on whether they are local turning movements or external turning movements (un-associated with Sawston).

Do Something Scenario

The Do Something Scenario includes the background growth applied in the Do Minimum Scenario, but also includes traffic associated with the full build out of the Local Plan allocated sites. A generic two-way housing vehicular trip rate of 0.65 has been used for the development traffic, and has been distributed across the local road network, taking account of the vehicle mix observed in the MCCs.

4.3. Results

This note summarises an assessment on the impact of the full build out of Local Plan allocations on four key junctions in Sawston, Cambridgeshire.

The assessment indicates that the key priority junctions on the network around Babraham Road are currently operating well within capacity, while the signalised junction operates close to capacity on the Babraham Road arm in the PM peak.

An assessment of the Do Minimum Scenario accounts for growth in background traffic without the build out of the land allocations. The assessment indicates that whilst the network becomes busier, it continues to operate within capacity in the AM peak, while junction 3 begins to operate close to capacity in the PM peak.

In the Do Something Scenario the increase in general background traffic also includes for the full build out of Local Plan land allocations. Whilst on the whole the network continues to operate within capacity there are isolated instances were specific junction approaches are anticipated to operate close to capacity, and subsequently an element of queuing is observed. There is also a notable increase in delay for vehicles manoeuvring from the minor arms onto the main carriageway resulting from the increase in main line traffic flow. The specific movements which are approaching capacity in the Do Something Scenario are as follows:

Table 22. Movements Operating Close to Capacity

Movement	Time Period	Scale of Delay
Right turning traffic from Cambridge Road onto A1301 north	AM peak	High
Left turning traffic from High Street onto A1307 north	AM Peak	Medium
Right turning traffic from High Street onto A1307 south	AM and PM peaks	High / Medium
Right turning traffic from Hillside to Babraham Road	PM peak	High
Traffic exiting Babraham Road	AM peak	High

It should be noted that consideration has not been given to potential traffic reassignment in the forecast years within this desktop assessment. Traffic may choose a different route to avoid potential bottlenecks in capacity, therefore making more use of other routes that are less congested. This may mitigate the impact of increased delay on right turning traffic from Cambridge Road onto A1301 north in particular, as well as the operation of the signalised junction between Cambridge Road, Babraham Road, Hillside and New Road.

4.4. Conclusions and Recommendations

The level of delay that is predicted at the A1301/Mill Lane junction both without and with the proposed development traffic does not greatly increase from current day predictions in either the AM or PM peaks.

Delays at the A1301/Cambridge Road junction are not forecast to significantly increase from current day predictions, with the exception of traffic turning right from Cambridge Road to the A1301 in the AM peak. While without the development traffic, the junction shows a slight increase in delay from current day levels, the level of delay continues to increase from 33 seconds to 82 seconds with the addition of the development traffic. This level of delay may not become apparent in the future given that the junction with the A1301 to the south (A1301 / Mill Lane) is operating within capacity, meaning that traffic is able to change route to use this less congested junction as an alternative. It is recommended that future evaluation of the potential re-routing of traffic should be considered prior to the scale of any mitigation measures being considered.

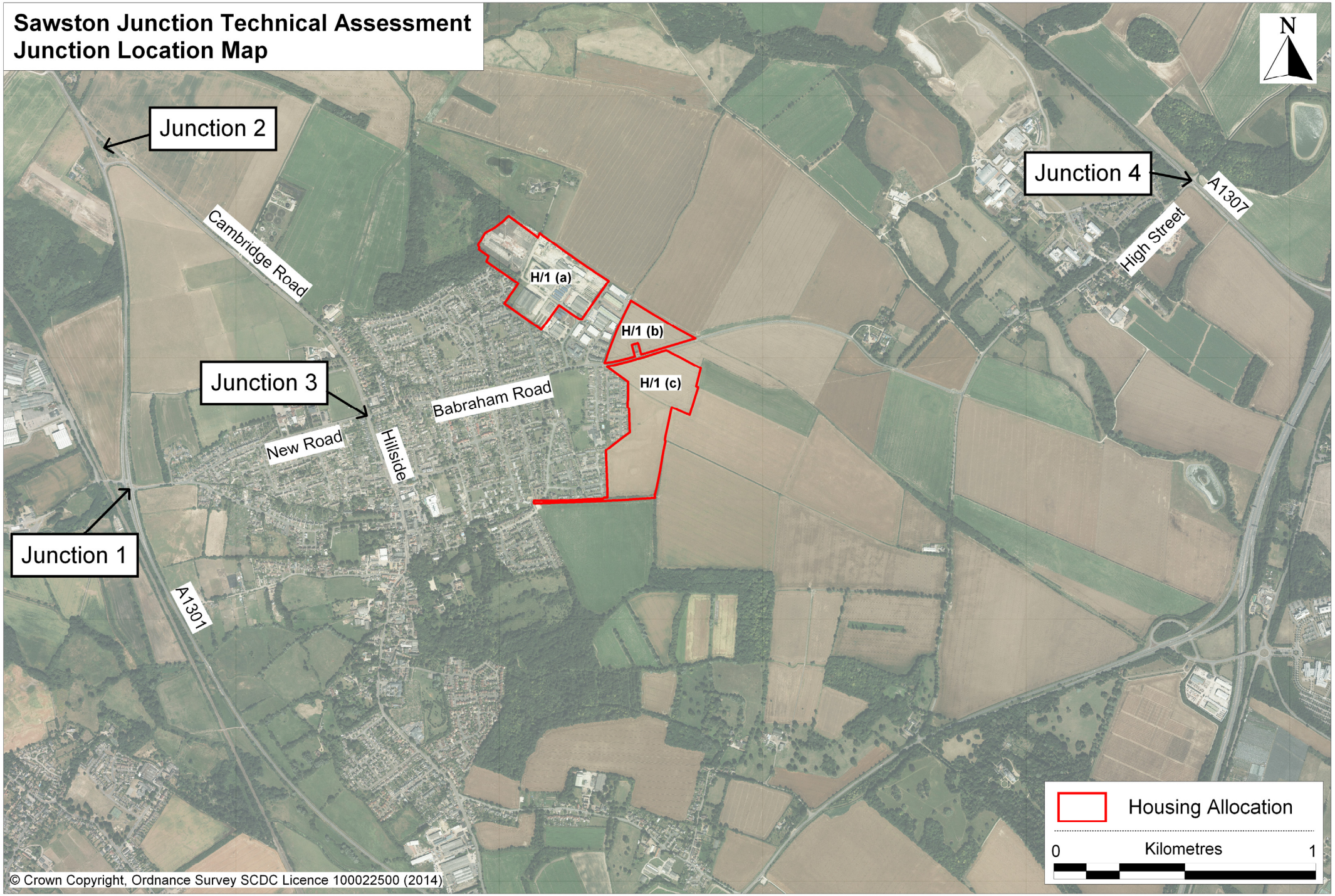
The level of delay forecast at the Cambridge Road/Babraham Road/Hillside/New Road signalised junction is likely to be significant for the Babraham Road arm in both AM and PM peaks, as well as Hillside in the PM peak with the addition of the development traffic. The additional modelling test that has been undertaken which removed the pedestrian crossing phase from the signal phasing demonstrates that there is scope for utilising the current road layout with revisions made to the signal timings and phasing to optimise the operation of the junction. This indicates that while mitigation will be necessary should the development go ahead, there are potential measures available that would provide relief to the traffic movements.

Consideration would however have to be given to how pedestrian requirements could best be combined with traffic flow optimisation.

The junction between High Street and the A1307 does exhibit some additional delay in the future without the addition of the development traffic, although this is not significant. However, once the development traffic has also been added, this junction does show some significant further increases in delay, particularly from High Street turning on to the A1307 in both the AM and PM peaks. While there are increases in delay, the relatively low flow levels at this junction mean that the length of queue forecast does not significantly increase.

A number of potential mitigation measures may be feasible to help reduce the potential impacts that have been highlighted in this desktop study, and would need to be further investigated to determine the most optimal solution. Particular attention will need to be paid to the signal controlled junction at Babraham Road/Cambridge Road to effectively provide capacity for both vehicular and pedestrian movements. It should be noted that the trip rate used in this desktop study are considered to be median values with no particular emphasis towards sustainable travel modes. Developers should be encouraged to promote sustainable travel from the development site to help reduce highway trip generation.

It is considered that the scale of mitigation is likely to be within the affordable limits of developers contributions.


Sawston Junction Technical Assessment
Junction Location Map
N
Junction 2
Junction 4
Junction 3
Junction 1
Cambridge Road
A1307
High Street
H/1 (a)
H/1 (b)
H/1 (c)
Babraham Road
New Road
Hillside
A1301
Housing Allocation
0
Kilometres
1
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