Junction Modelling Summary Report

A26 London Road/Yew Tree Road/Speldhurst Road Junction

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Contents

1 Introduction

1.1.1 Amey have been commissioned by Kent County Council (KCC) to investigate and assess schemes for potential improvements to the A26 London Road/Yew Tree Road/Speldhurst Road signalised junction in Tunbridge Wells.

1.1.2 It is understood that the existing junction arrangement is sensitive in capacity terms, particularly during highway peak hours. As stated within the project brief, the impact of implementing a double mini-roundabout arrangement or making alterations to the existing traffic signal timings and pedestrian crossing arrangements will be assessed in relation to junction operations.

1.1.3 It should be noted that the assessment examines the operation of the junction in isolation and does not consider its interaction with the surrounding road network. It was observed during site visits that queues on the A26 regularly queue back into the junction (particularly northbound in the AM peak period) causing exit blocking.

1.1.4 The assessment of the junction for the existing and proposed scenarios is to be undertaken using LinSig and ARCADY traffic signal junction modelling software, produced by the JCT Consultancy and TRL, respectively.

1.1.5 This report represents a deliverable identified in the project brief setting out the findings of the modelling work and traffic models for the existing and proposed scenarios.

2 Assessment Objective

2.1.1 During the concept design process, the following options for capacity improvements at the junction were identified:

2.1.2 Option 1 – Alterations to the existing pedestrian crossings to provide staggered crossing arrangements and appropriate revisions to the current signal arrangements, as shown at Appendix A.

2.1.3 Option 2 - As Option 1 with a non-staggered pedestrian crossing arrangement on the Speldhurst Road arm of the junction, as shown at Appendix B

2.1.4 Option 3 - Replace the existing traffic signal control with a double mini–roundabout arrangement, as shown at Appendix C.

2.1.5 The aim of this assessment is to establish the forecast operation of the proposed junction options in terms of highway capacity and to aid KCC in identifying a preferred option for the junction.

2.1.6 The assessment considers a 2026 Do-minimum scenario – existing junction arrangements with 2026 forecast traffic flows and, a 2026 Do-something scenario – proposed improvements with forecast traffic flows.

3 Existing Site

3.1 Introduction

3.1.1 The A26 represents one of the main arterial routes into Tunbridge Wells town centre and provides a link to the strategic road network, the A21, and the town of Tonbridge to the north.

3.1.2 It is understood that continuing severe traffic congestion on the A26 London Road corridor is inhibiting existing business and preventing further economic growth in Tunbridge Wells. Development over the years in Tunbridge Wells has created demand on the local road network, particularly on the arterial routes (A26 London Road, A264 Pembury Road and Longfield Road) connecting Royal Tunbridge Wells to the A21.

3.1.3 A key element of the Transport Strategy for Tunbridge Wells is to reduce congestion and improve traffic flow on the three arterial routes.

3.1.4 The A26 London Road/Yew Tree Road/Speldhurst Road junction has been identified as one of the most critical junctions along the corridor. However, to realise the full benefits of any capacity improvements at the junctions, downstream constraints must also be addressed.

3.1.5 The existing junction arrangements have been modelled in order to provide a robust base for forecasting and to provide a benchmark for comparative purposes between the existing situation and the proposed junction arrangements.

3.2 Traffic Count Data

3.2.1 Manual Classified Counts (MCC) surveys at 15 minute intervals were carried out in December 2014 at the A26 London Road/Speldhurst Road and A26 London Road/Yew Tree Road junctions between the hours of 08:00 – 10:00 and 15:00 – 19:00 to provide the basis for the assessments and determine the network peak hours on a typical weekday and the peak shopping period on weekends.

3.2.2 Queue length surveys (counts at 5 minutes intervals), for the purpose of traffic model calibration, were undertaken on all approaches to the two junctions during the same time period.

3.2.3 Analysis of the traffic survey data determined the weekday AM peak hour to be 08:00-09:00 and the PM peak hour to be 17:00-18:00. The Saturday peak hour was determined to be 12:30-13:30.

3.2.4 A copy of the MCC survey counts are attached as Appendix D to this report.

3.3 Site Observations

3.3.1 A site visit was undertaken on 21st and 22nd January 2015 to measure average signal timings, note the frequency of buses on the A26 and observe general traffic conditions and operation at the junction.

3.4 Existing Junction Assessment (Base 2014 Traffic Signals)

3.4.1 The A26 London Road/Speldhurst Road junction and A26 London Road/Yew Tree Rd junction have been modelled, using industry standard LinSig 3 software, as a staggered crossroads junction.

3.4.2 The junction currently has four formal controlled pedestrian crossing facilities, one across each side road and two across the A26. Site observations indicate that there is significant pedestrian footfall using these crossings, in particular as there is a school in close proximity to the south of the junction.

3.4.3 It is understood that the junction currently operates under Vehicle Actuation (VA) control. Due to the fact that the junction operates under VA, the cycle time of the signals is constantly variable based on vehicle demand. The junction is, however, heavily used due to its location with the maximum timings being demanded on the majority of cycles.

3.4.4 Signals controller information for the junction was provided by KCC and is attached as Appendix E to this report.

3.4.5 An average cycle time of 178 seconds was calculated based upon site observations to reflect the situation on ground.

3.4.6 The existing phases, stage sequence and intergreen matrix used within the assessment are shown within Figure 3.1 and Figure 3.2 and Figure 3.3 respectively below:

Figure 3.1: Phases

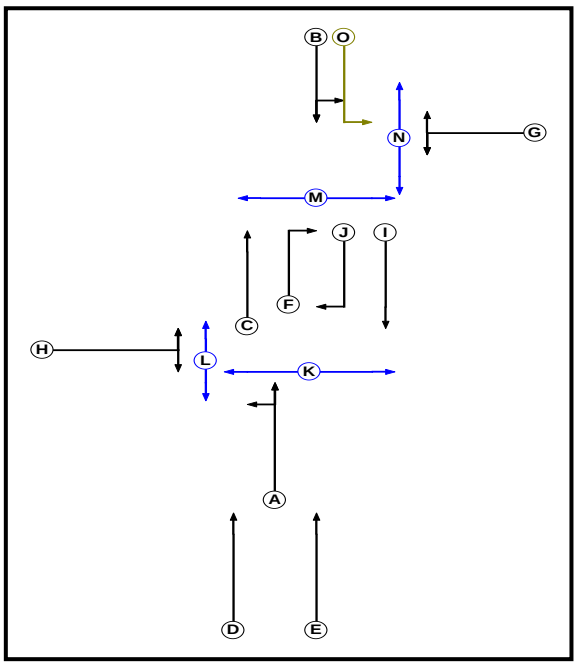
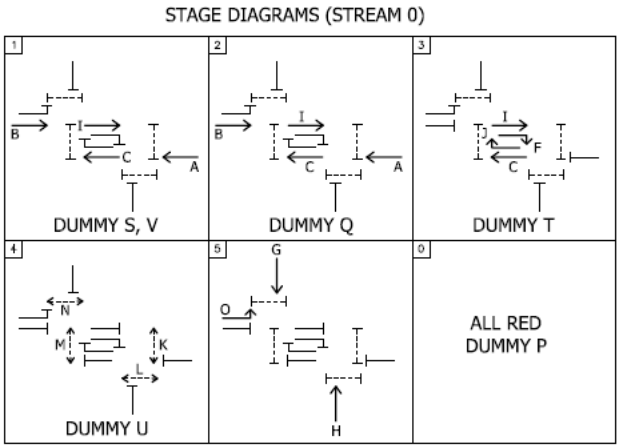


Figure 3.2: Existing Method of Control (from the controller information sheet and site observations)



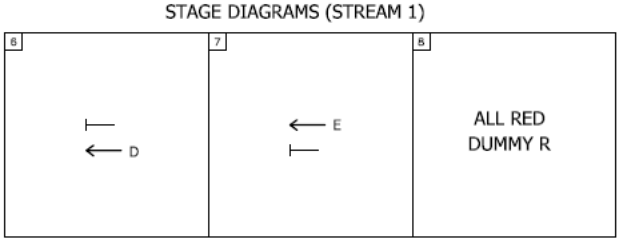


Figure 3.3: Intergreen Matrix

		Starting Phase														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Terminating Phase	A		-	-	-	-	-	-	9	-	4	5	7	-	-	-
	B	-		-	-	-	4	9	-	-	-	-	-	7	7	-
	C	-	-		-	-	-	5	-	-	-	-	-	5	7	-
	D	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	E	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	F	-	5	-	-	-		5	-	-	-	-	-	5	7	5
	G	-	5	5	-	-	5		-	-	-	-	-	6	5	-
	H	5	-	-	-	-	-	-		5	5	7	5	-	-	-
	I	-	-	-	-	-	-	-	5		-	6	7	-	-	-
	J	5	-	-	-	-	-	-	5	-		6	7	-	-	-
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3.5 Existing Junction Modelling Results

3.5.1 The 2014 baseline assessments undertaken to model the existing junction operations and traffic situation were carried out using LinSig v3 and made use of traffic count data from surveys undertaken in December 2014. Traffic flow diagrams showing the survey flows at the junction are shown at Appendix F.

3.5.2 As the junction assessments have been based upon junction turning counts which represent traffic flows which have discharged through the junction during the peak period, , in theory, given that this junction is known to be operating over capacity during peak periods, the Degree of Saturation (DoS) should be near to 100% on the main approaches.

3.5.3 The degree of saturation (DoS) is the measurement of demand that a junction is experiencing when compared to its total capacity and it is expressed as a ratio of demand to capacity on each approach to the junction. A value of 100% means that demand and capacity are equal and no further traffic is able to progress through the junction. Generally, values over 85% are regarded as suffering from capacity issues and vehicle queuing.

3.5.4 The tables below indicate that the existing junction is currently operating near to or over capacity during the busier AM and PM peak highway periods. During the AM peak period all links within the junction are operating below the saturation point of 100%, however, a number of links have a degree of saturation of over 90%. The situation during the PM peak is worse with two links of the junction having a degree of saturation of over 100%. Full modelling outputs are attached as Appendix G to this report.

Table 3.1: Existing Junction - AM Peak Period Modelling Results

Junction	Arm	DoS %	Delay (sec/PCU)	MMQ (PCU's)
St. John's Rd/London Rd/Speldhurst Rd	St. John's Rd Left Ahead	57.1	6.3	24.4
	Speldhurst Rd Right Left	106	255.3	29.3
	London Rd S/B Ahead	48.2	3.1	0.9
	London Rd S/B Right	47.8	83.6	4.8
	Ahead from Central Reserve	53.7	26.3	19.2
	Bus Lane	2.6	36.1	0.6
London Rd/Yew Tree Rd	London Rd S/B Left Ahead	84.4	38.1	39.2
	London Rd N/B Ahead	44.7	9.8	16.9
	London Rd N/B Right	55.4	102	5.6
	Yew Tree Rd Left Right	98.8	178	20.1

***Cycle Time – 178 Seconds**

Table 3.2: Existing Junction - PM Peak Period Modelling Results

Junction	Arm	DoS %	Delay (sec/PCU)	MMQ (PCU's)
St. John's Rd/London Rd/Speldhurst Rd	St. John's Rd Left Ahead	63.4	6.8	28.4
	Speldhurst Rd Right Left	106.7	264.4	29.3
	London Rd S/B Ahead	49.5	5.8	10.6
	London Rd S/B Right	80.3	118.3	9.1
	Ahead from Central Reserve	60.4	28.2	23
	Bus Lane	1.7	33.5	0.4
London Rd/Yew Tree Rd	London Rd S/B Left Ahead	81.6	35.9	36.5
	London Rd N/B Ahead	57.3	12.6	27.7
	London Rd N/B Right	39.7	91.6	3.9
	Yew Tree Rd Left Right	107.4	282.8	31.5

Table 3.3: Existing Junction - Saturday Peak Period Modelling Results

Junction	Arm	DoS %	Delay (sec/PCU)	MMQ (PCU's)
St. John's Rd/London Rd/Speldhurst Rd	St. John's Rd Left Ahead	60.4	6.4	26.4
	Speldhurst Rd Right Left	77.4	96.8	8.7
	London Rd S/B Ahead	45	3.3	1.5
	London Rd S/B Right	44.2	86.5	4.4
	Ahead from Central Reserve	57.3	27.3	21.2
	Bus Lane	1.9	33.5	0.5
London Rd/Yew Tree Rd	London Rd S/B Left Ahead	72.5	30.6	28.7
	London Rd N/B Ahead	52.7	10.2	24.1
	London Rd N/B Right	35.2	88.3	3.4
	Yew Tree Rd Left Right	119.5	460.6	49.6

***Cycle Time – 178 Seconds**

3.5.5 The results of the Base 2014 scenario indicate that in the AM peak period Speldhurst Rd (DoS 106%) and Yew Tree Rd (DoS 98.8%) are operating at full capacity. During the PM peak period the DoS percentage values are 106.7% and 107.4%, respectively. Similarly, the DoS for the Saturday peak period exceed 85% on only one lane, Yew Tree Road – DoS 119.5%.

3.5.6 The above results suggest that the junction is currently sensitive during the busier highway peak periods and any major changes to the junction will have a significant impact on its operation.

4 Proposals

4.1 2026 Do Nothing Future Year Scenario Assessment

4.1.1 The phases and stage sequence and intergreen matrix used for the future assessment are shown within Figure 4.1 and Figure 4.2 and Figure 4.3 respectively, below.

Figure 4.1: Phases

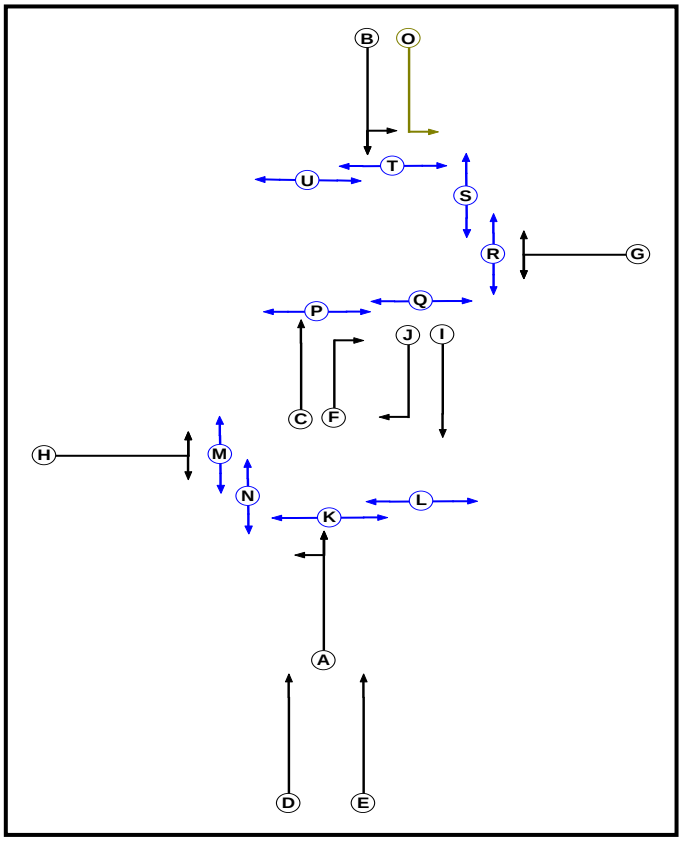

Figure 4.2: Stages

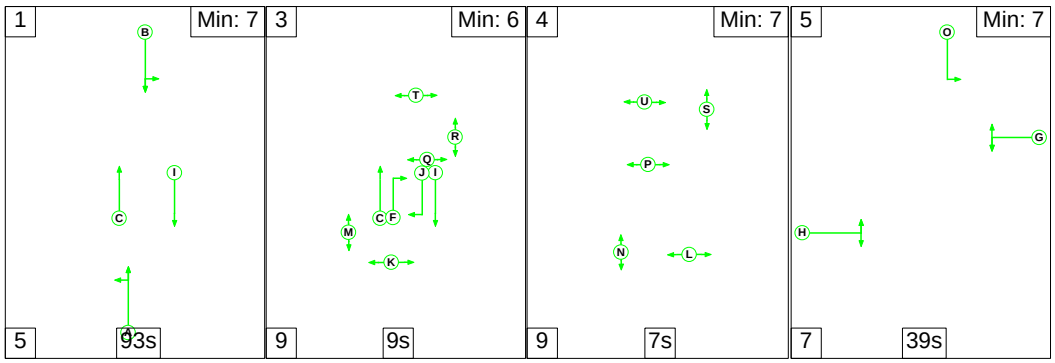

Figure 4.3: Intergreen Matrix

		Starting Phase																				
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Terminating Phase	A		-	-	-	-	-	-	9	-	4	5	-	-	5	-	-	-	-	-	-	-
	B	-		-	-	-	4	9	-	-	-	-	-	-	-	-	-	9	-	-	5	-
	C	-	-		-	-	-	5	-	-	-	-	-	-	-	-	5	-	-	-	-	9
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4.1.2 Modelling was undertaken with existing junction arrangements with 2026 forecast traffic flows. The base survey flows (2014) have been "growthed" using NTM growth factors obtained from TEMPRO v6.2, in accordance with WebTAG unit 3.15 for Tunbridge Wells, Kent. TEMPRO software has been used to derive the local adjustment factors to modify NTM growth.

4.1.3 The traffic impacts have been assessed for the future year of 2026. The table below indicates the growth factors used for this assessment:

Table 4.1: 2026 Growth Factors

NTM Growth Factors adjusted by local TEMPRO			
2014-2026	**Weekday AM**	**Weekday PM**	**Saturday**
Growth factor for Tunbridge Wells	1.1694	1.1743	1.1783

4.1.4 The results of the 2026 Do Nothing modelling scenario indicated that operational capacity has decreased in proportion to natural growth in traffic, as would be expected and summarised in the table below. Full modelling outputs are attached as Appendix H to this report.

Table 4.2: 2026 Do Nothing Future Scenario Modelling Results

		2026 AM Peak			2026 PM Peak			2026 Saturday Peak		
Junction	**Arm**	**DoS %**	**Delay (sec/PCU)**	**MMQ (PCU's)**	**DoS %**	**Delay (sec/PCU)**	**MMQ (PCU's)**	**DoS %**	**Delay (sec/PCU)**	**MMQ (PCU's)**
St. John's Rd/London Rd/Speldhurst Rd	St. John's Rd Left Ahead	77.7	10.3	39.2	81.4	11.1	43	78.5	9.9	40.1
	Speldhurst Rd Right Left	127.4	561.1	65.7	111	329.9	38.5	84.8	105.2	10.6
	London Rd S/B Ahead	55.6	4.6	8.2	56	7.1	15.2	51.2	5.2	10.6
	London Rd S/B Right	50.5	84.1	5	37.9	84.5	3.7	48.4	88.9	4.8
	Ahead from Central Reserve	73.7	33.4	32.1	78.4	36.6	35.9	75.3	34.9	33.3
	Bus Lane	2.4	33.5	0.6	1.9	32.9	0.5	2.3	32.9	0.6
London Rd/Yew Tree Rd	London Rd S/B Left Ahead	91.8	48.4	49	84.2	37.6	39	79.2	34.2	34.1
	London Rd N/B Ahead	55.4	6.9	12.6	69	11.6	32.1	66.6	10.7	29.5
	London Rd N/B Right	67.3	100.5	7.1	49.4	88.1	4.9	44	85.5	4.3
	Yew Tree Rd Left Right	102.2	212.8	23.6	117.4	428.3	49.1	130.2	598.4	70.6

***Cycle Time – 178 Seconds**

4.2 2026 Do Something Future Year Scenario Assessment – Revised Signals Arrangement

4.2.1 This scenario involved alterations to the pedestrian phases to provide staggered crossing facilities and the associated intergreen times. By providing staggered pedestrian crossing this enables the phasing and staging of the junction to be configured more efficiently and reduces the intergreen times for the crossings as it takes pedestrians less time to cross. The signal timings and overall cycle times in the model were then optimised to suit the revised arrangement and 2026 predicted traffic flows.

4.2.2 The modelling results, as shown in the tables below, indicate that the junction would operate with spare capacity in all peak hour periods. The DoS percentage values for all lanes at the junction are below 85%. Full modelling outputs are attached as Appendix H to this report.

Table 4.3: 2026 Do Something Future Scenario Modelling Results

2026 AM Peak					2026 PM Peak			2026 Saturday Peak		
Junction	**Arm**	**DoS %**	**Delay (sec/PCU)**	**MMQ (PCU's)**	**DoS %**	**Delay (sec/PCU)**	**MMQ (PCU's)**	**DoS %**	**Delay (sec/PCU)**	**MMQ (PCU's)**
St. John's Rd/London Rd/Speldhurst Rd	St. John's Rd Left Ahead	84.1	29.7	37.4	82.3	29.5	37.9	82.5	29.2	37
	Speldhurst Rd Right Left	83.7	86.4	17	81.3	85.7	14.5	57.5	67.1	7.3
	London Rd S/B Ahead	61.2	6.6	23.3	60.8	12.4	27.6	57.7	9.6	24.7
	London Rd S/B Right	60.7	94.6	5.3	58.3	109.7	4.2	74.2	124.7	5.8
	Ahead from Central Reserve	61.7	18.2	23.3	59.4	12.7	20.4	60	15.5	21.6
	Bus Lane	3.6	50.7	0.7	3.8	60.9	0.7	3.8	54.8	0.7
London Rd/Yew Tree Rd	London Rd S/B Left	22.3	6.8	4.2	20.1	5.9	3.5	16.9	5.7	2.9
	London Rd S/B Ahead	71	37.7	28.6	60.4	29.8	22.8	61.6	32.1	23
	London Rd N/B Ahead	63.1	12.7	22	74.7	18.6	38.6	73.2	16.6	35.5
	London Rd N/B Right	83.1	130.5	8.3	75.8	129.5	6	65.9	109.2	4.9
	Yew Tree Rd Left Right	63.8	72.3	12.5	82	88.5	16.6	82.2	85.4	18.2

***Cycle Time – 178 Seconds**

4.2.3 An alternative scenario involving a non-staggered crossing on the Speldhurst Road arm has also been assessed. The revised option indicates that the overall junction would still operate with some spare capacity in 2026.

4.2.4 The overall operation of the junction is marginally worse than the scenario with a staggered crossing facility on Speldhurst Rd as summarised in the table below.

4.2.5 The phases, stage sequence and intergreen matrix used for the alternative future scenario assessment are shown within Figure 4.4 and Figure 4.5 and Figure 4.6, respectively.

Figure 4.4: Phases

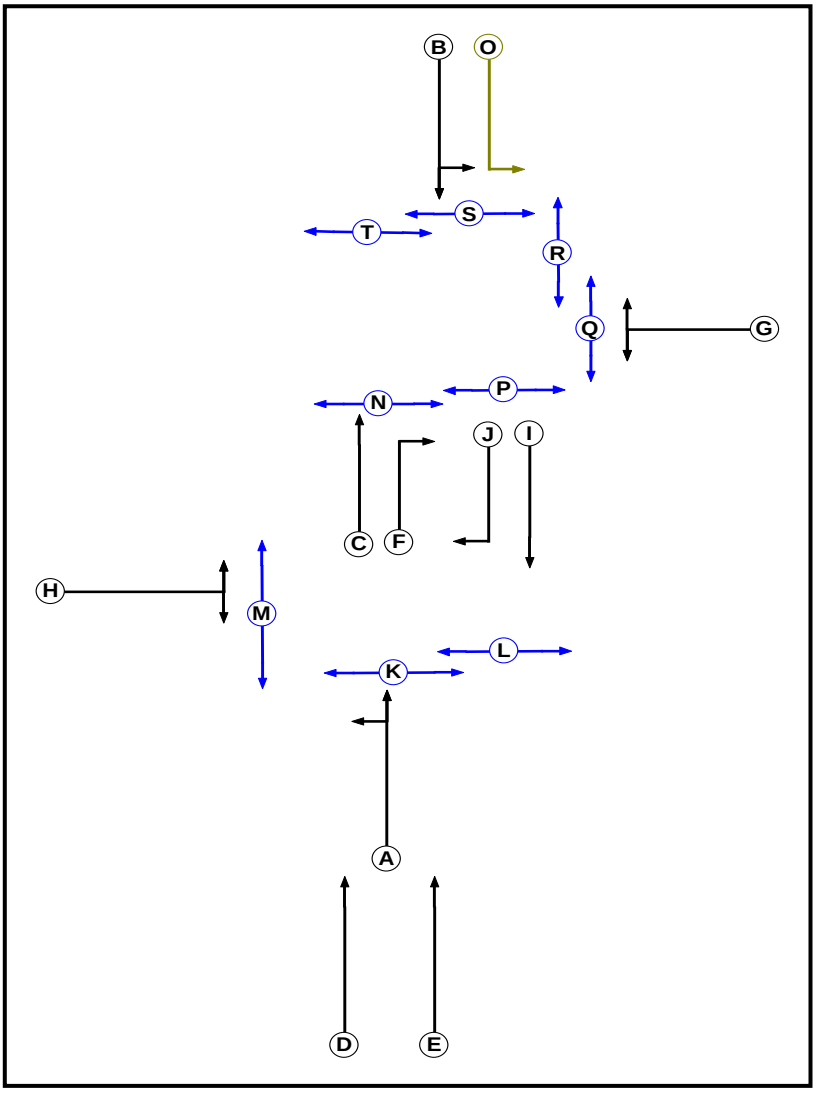

Figure 4.5: Stages

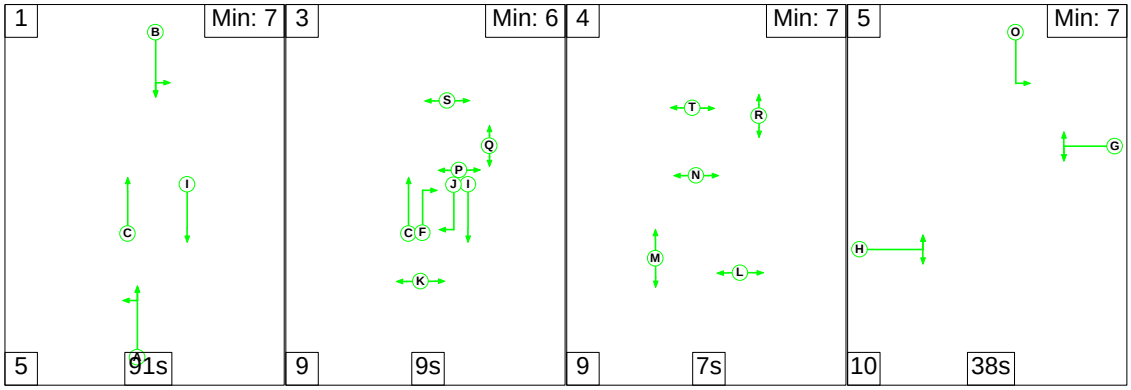

Figure 4.6: Intergreen matrix

	Starting Phase																			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
A		-	-	-	-	-	-	9	-	4	5	-	7	-	-	-	-	-	-	-
B	-		-	-	-	4	9	-	-	-	-	-	-	-	-	9	-	-	5	-
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Table 4.4: Alternative 2026 Do Something Future Scenario Modelling Results

2026 AM Peak					2026 PM Peak			2026 Saturday Peak		
Junction	Arm	DoS %	Delay (sec/PCU)	MMQ (PCU's)	DoS %	Delay (sec/PCU)	MMQ (PCU's)	DoS %	Delay (sec/PCU)	MMQ (PCU's)
St. John's Rd/London Rd/Speldhurst Rd	St. John's Rd Left Ahead	85.9	32.8	38.7	83.9	32.1	39.2	82.5	29.2	37
	Speldhurst Rd Right Left	85.5	90.4	17.4	83.1	89	14.9	61.1	71.1	7.7
	London Rd S/B Ahead	62.3	6.9	23.3	61.8	13	28.1	57.7	9.6	24.7
	London Rd S/B Right	60.7	93.1	5.3	58.3	108.5	4.2	74.2	124.7	5.8
	Ahead from Central Reserve	61.7	18.2	23.3	59.4	12.7	20.4	60	15.5	21.6
	Bus Lane	3.6	50.7	0.7	3.8	60.9	0.7	3.8	54.8	0.7
London Rd/Yew Tree Rd	London Rd S/B Left	22.3	6.8	4.2	20.1	5.9	3.5	16.9	5.7	2.9
	London Rd S/B Ahead	72.6	39.6	29.4	61.6	31.3	23.4	61.6	32.1	23
	London Rd N/B Ahead	64.3	12.8	22.4	76	18.9	39.2	73.2	16.2	35.5
	London Rd N/B Right	83.1	128.7	8.3	75.8	127.7	6	65.9	108.9	4.9
	Yew Tree Rd Left Right	60.9	69.2	12.2	78.3	82.3	16	82.2	85.4	18.2

***Cycle Time – 178 Seconds**

4.3 2026 Do Something Future Year Scenario Assessment – Double Mini-Roundabouts

4.3.1 ARCADY 7 software has been used to model the proposed double mini-roundabout option with 2026 traffic flows.

4.3.2 The modelling results, as shown in table below, indicate that the proposed double mini-roundabout would over capacity in all the modelled scenarios. Full modelling outputs are attached as Appendix H to this report.

4.3.3 The A26, St. Johns Rd (NB) approach and the NB centre arm of the junction are predicted to operate with a Ratio of Flow/Capacity (RFC) of over 1.0 which indicates that the approach is over capacity during these peak time periods.

Table 4.5: 2026 Do Something Future Scenario ARCADY Modelling Results

2026 AM Peak				2026 PM Peak		2026 Saturday Peak	
Mini-RAB	Arm	RFC	Max Q (PCU)	RFC	Max Q (PCU)	RFC	Max Q (PCU)
St. John's Rd/London Rd/Speldhurst Rd	St. John's Rd	0.90	8	0.90	8	1.03	20
	Speldhurst Rd	0.73	3	0.77	3	0.87	4
	London Rd	0.56	1	0.56	1	0.52	1
London Rd/Yew Tree Rd	London Rd (S)	0.80	4	1.03	28	0.98	13
	London Rd (N)	0.82	4	0.76	3	0.69	2
	Yew Tree Road	0.52	1	0.61	2	0.62	2

5 Conclusions and Recommendations

5.1.1 The existing junction is already sensitive in terms of its operational capacity; particularly during the busier AM and PM peak hour periods with significant queuing occurring.

5.1.2 The assessments indicate that, of the proposed options, the revised signal arrangement would provide more additional theoretical capacity at the junction when compared with the double mini-roundabout option.

5.1.3 The proposed option with the staggered crossing on Speldhurst Rd would be the optimum in terms of capacity if the pedestrian refuge can be physically accommodated; however, either crossing arrangement does not have too detrimental an impact on junction capacity.

5.1.4 It is important to note that the assessments have been undertaken from the perspective of operational capacity at the junction only.

5.1.5 The assessment does not take into account or consider other operational factors, such as, vehicle/pedestrian safety, design or cost practicalities.

5.1.6 The assessments do not include the operation of existing stand-alone pelican crossing to the north of the junction as the potential is considered equal to either proposed scenario.