Amey

Transport Impact Study

Sturry and Broadoak Level Crossings

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RSK GENERAL NOTES

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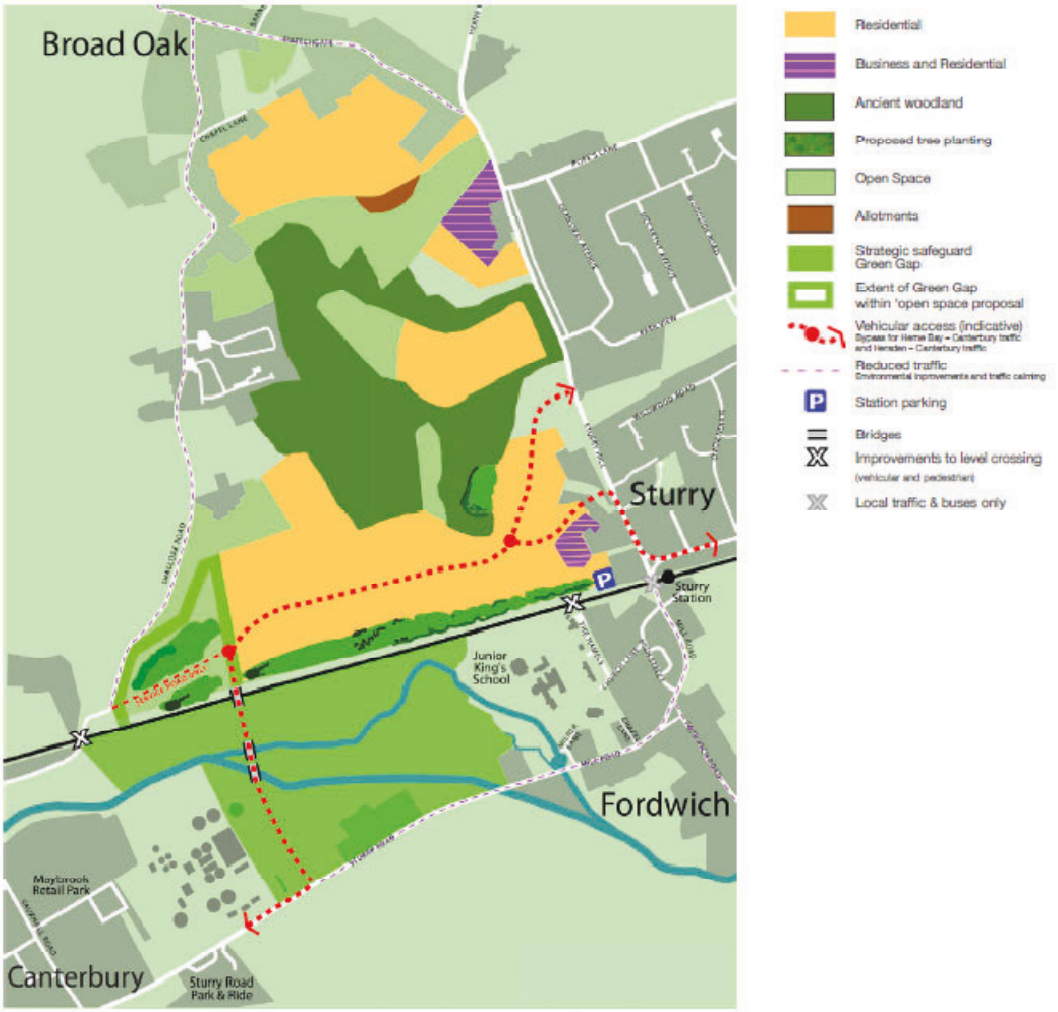
1 INTRODUCTION

RSK has been instructed by Amey to carry out a study into the potential impacts of a significant housing development on the operation of existing railway level crossings at Sturry, near Canterbury in Kent.

The development site is located to the west of Sturry on land between Broadoak village and the railway. The proposals comprise the construction of around 1,000 new dwellings with associated infrastructure. This would include a new road bridge over the railway, designed to alleviate existing level crossings to the east (Sturry) and west (Broadoak), and a revised junction adjacent to the Sturry level crossing to encourage traffic to use the new bridge. Figure 1.1 illustrates the indicative proposals for the link road in the context of the wider development.

Figure 1.1: Site location plan



Source: Somerlee Homes Public Exhibition

The proposed options for the Sturry junction are illustrated at Appendix 1, which have been prepared by Amey on behalf of Kent County Council. The options to be taken forward for further consideration are as follows:

- Option 1a: signal controlled, bus priority left turn across level crossing, banned left turn for all other A28 westbound traffic;
- Option 2b: priority junction with banned right turn for A28 northbound traffic and left turn only for A291 southbound traffic, except buses; and
- Option 4b: signal controlled with left turn only for A291 southbound traffic, except buses.

This report examines the proposals, primarily from a traffic perspective, to assess the likely impacts of the proposed housing on the future operation of the level crossings and consider the junction options available at Sturry in relation to their suitability.

The remainder of this report is divided into the following sections:

Chapter 2 reviews the existing context of each level crossing location;

Chapter 3 summarises the traffic flow changes as a result of the development proposals;

Chapter 4 details the assessment undertaken for highway capacity; and

Chapter 5 provides a summary and our conclusions.

2 EXISTING CONTEXT

2.1 Broadoak Level Crossing

The Broadoak level crossing is located to the west of Sturry, south of Broadoak village, where Broadoak Road crosses the railway. Broadoak Road is a semi rural road in the vicinity of the level crossing that connects to the B2248 near the edge of Canterbury city centre, predominantly serving industrial uses at its western end. Just north of the level crossing the road changes to Shalloak Road and leads north to Broadoak village.

In the vicinity of the level crossing, the road is a single carriageway and offers a footway on just the southern side of the road. It is subject to the national speed limit (60mph) and has no street lighting. The level crossing is automated and provides a half barrier across the road, yellow box markings and double white centre lines on the approaches along with appropriate warning signs. The crossing is pictured in Figure 2.1.

Figure 2.1: Broadoak level crossing pictured from south side

Just to the north of the crossing, an access to an industrial and landfill site generates heavy goods vehicle (HGV) traffic. Beyond this access there is a 7.5 tonne weight restriction on Shalloak Road and the carriageway narrows, removing the footway provision.

The layout of the level crossing in the context of the road is such that there is limited forward visibility as you approach from both directions. The alignment of the road from Broadoak also results in a double bend on the approach to the level crossing, which restricts forward visibility, particularly to see the back of a queue of vehicles. This is illustrated at Figure 2.2.

The level crossing barriers are lowered for each train passing, resulting in a total stoppage time for traffic of around 1 minute. On average there are two trains per hour in each direction.

Figure 2.2: Broadoak level crossing location plan

2.2 Sturry Level Crossing

The Sturry level crossing is located on the edge of Sturry where the A28 Sturry Hill crosses the railway. The A28 is a primary route between Margate and Canterbury and beyond to Ashford. Just north of the level crossing the A28 turns eastwards, changing to Island Road, and connects at a priority junction with the A291 which continues as Sturry Hill.

In the vicinity of the level crossing the road is a single carriageway and offers footways on both sides within an urban environment. It is subject to a 30mph speed limit and benefits from street lighting. The level crossing is manually operated with full width barriers across the road, yellow box markings and appropriate warning signs, as pictured in Figure 2.3.

Figure 2.3: Sturry level crossing pictured from north side

The alignment of the A28 approaching from the north results in restricted forward visibility, however the 30mph speed limit minimises risks with rear shunts.

Figure 2.4: Sturry level crossing location plan

Contains Ordnance Survey data © Crown copyright and database right 2017

Sturry station is located adjacent to the level crossing with each platform located downstream of the crossing. Therefore the barriers are lowered while a train is slowing down to enter the station and remain lowered if it is a long train that extends to the crossing. This results in varied stoppage times for traffic, as follows:

- Non-stopping trains (25 per day) = 2 minutes
- Stopping short trains (16 per day) = 3 minutes
- Stopping long trains (11 per day) = 5 minutes

On average there are two trains per hour in each direction.

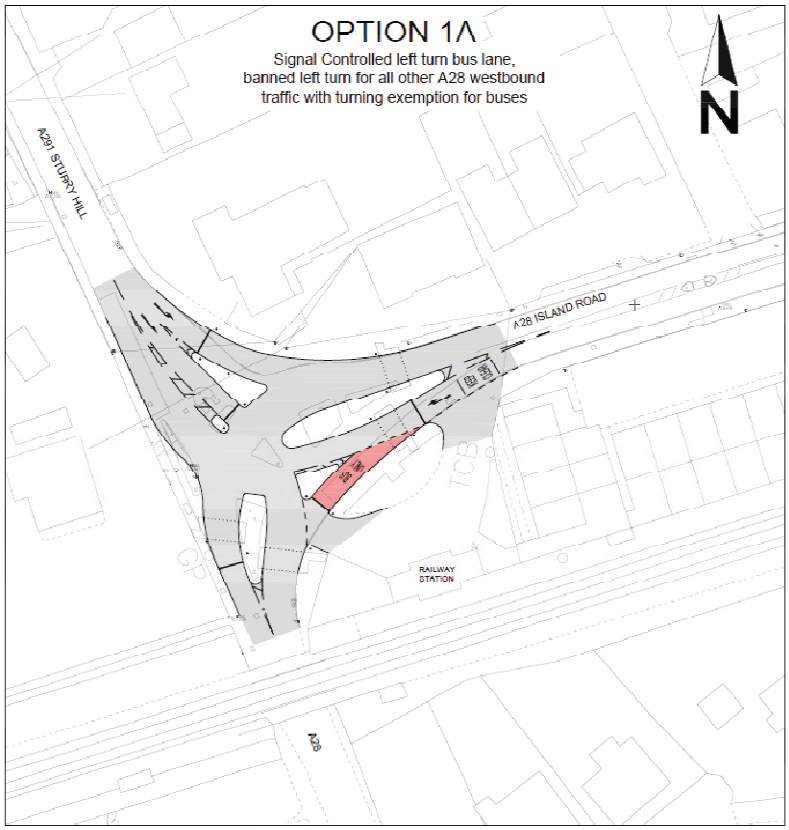
2.3 Sturry Junction Improvement Options

Amey, on behalf of Kent County Council, has prepared a series of improvement options for the junction immediately north of the Sturry level crossing. A number of factors have been taken into account, such as preventing certain turns to reduce traffic across the level crossing, introducing bus only movements to allow existing services to continue uninterrupted, and the ability to provide more formal pedestrian crossing facilities. The three options being considered for further investigation are set out below.

2.3.1 Option 1A

The proposed option 1A is a signalised option for A28 Island Road/ A291 Sturry Hill as shown on Figure 2.5 below. This is a fully signal controlled option with all movement allowed except the left turn from A28 (E) to A28 (S), which is restricted to buses only

Figure 2.5: Sturry level crossing Option 1A

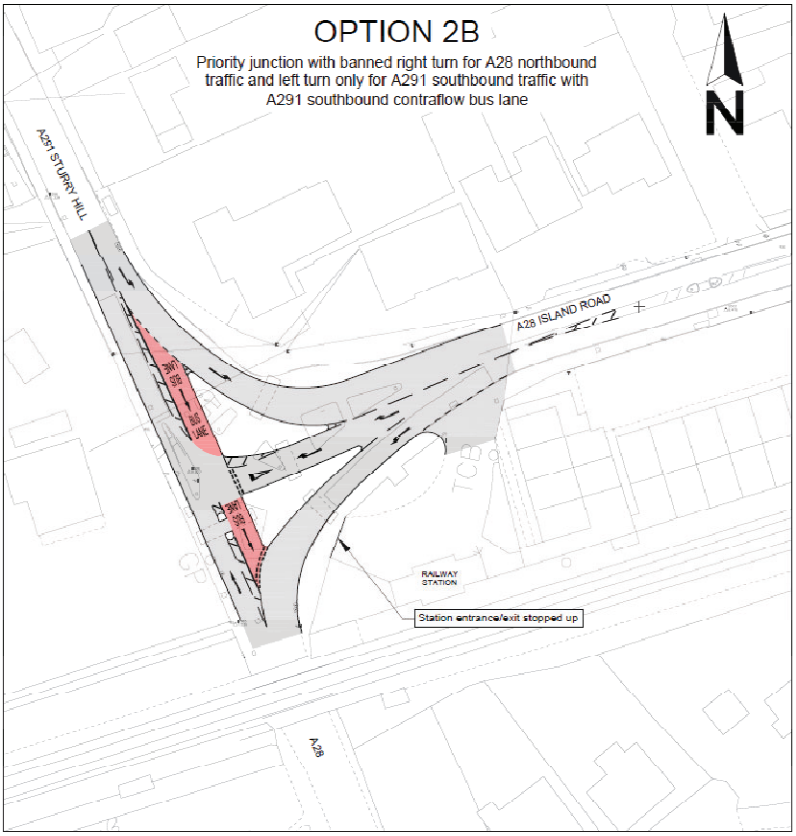


Source: Amey/KCC

2.3.2 Option 2B

The proposed option 2B takes the form of a priority junction between A28 Island Road/ and A291 Sturry Hill as shown on Figure 2.6 below. This is a priority controlled option, with right-turn from A28 (S) to A28 (E) banned; along with A291 to A28 (S) banned, except for buses.

Figure 2.6: Sturry level crossing Option 2B

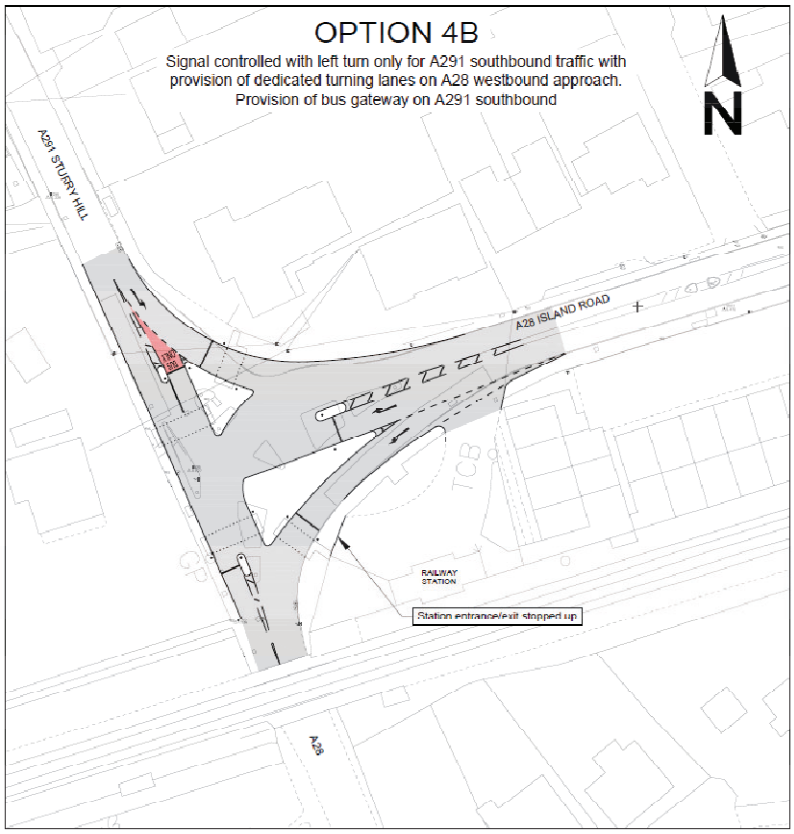


Source: Amey/KCC

2.3.3 Option 4B

Option 4B is a signalised option for A28 Island Road/ A291 Sturry Hill as shown on Figure 2.7 below. This is a signal controlled option, with right-turn from A28 (S) to A28 (E) banned; along with A291 to A28 (S) banned, except for buses.

Figure 2.7: Sturry level crossing Option 4B



Source: Amey/KCC

3 MOVEMENT ANALYSIS

3.1 Traffic Movements

Traffic flows across each level crossing have been calculated from the 9 day survey, undertaken in March 2017. Details of expected traffic flows across each level crossing have been provided by the consultant assessing the impacts of the housing development.

AM and PM peak hour assessments generally offer a robust analysis of the network as these are the busiest hours of the day and therefore lead to the longest queues and highest levels of congestion. It is noted that the road network in the vicinity of Sturry is constrained, particularly due to the junction arrangement and level crossing, and therefore traffic may reassign to other parts of the network. While this may artificially reduce the traffic demand at these times, these time periods will also represent a constrained network. During off-peak periods the network may operate unconstrained with no reassignment, but it is unlikely to encounter traffic flows any higher than those for peak hours.

Peak hour turning movements have been provided as traffic flow diagrams for the following scenarios:

- Existing network flows 2017 (no development)
- Existing network forecast flows 2031 (no development)
- Future network flows with development and A28/A291 Option 1a
- Future network flows with development and A28/A291 Option 2b
- Future network flows with development and A28/A291 Option 4b

These diagrams allow a calculation of traffic flow movements across each level crossing to be made during each peak hour and for each scenario. A summary of the results are set out in Tables 3.1 and 3.2, which include the results from the 9 day survey in 2017.

Table 3.1: Traffic flow summary – Broadoak Level Crossing

Scenario	AM Peak		PM Peak	
	Southbound	Northbound	Southbound	Northbound
Existing Flows (2017)	809	199	244	575
Existing Flows (2031)	848	151	200	583
Proposed Flows (Option 1a)	1051	522	355	625
Proposed Flows (Option 2b)	1038	590	223	772
Proposed Flows (Option 4b)	1088	476	283	625

Table 3.2: Traffic flow summary – Sturry Level Crossing

Scenario	AM Peak		PM Peak	
	Southbound	Northbound	Southbound	Northbound
Existing Flows (2017)	1008	657	708	969
Existing Flows (2031)	1081	794	748	1228
Proposed Flows (Option 1a)	52	88	63	449
Proposed Flows (Option 2b)	542	198	369	389
Proposed Flows (Option 4b)	659	295	355	460

Both tables indicate that current traffic flows are broadly in line with the data collected for the development proposals, although the 2017 northbound flow at Sturry during the PM peak is lower than anticipated when comparing the gap between 2017 and 2031 for other directions and times.

Table 3.1 clearly shows that the development proposals are predicted to result in a significant increase in traffic over the Broadoak level crossing during both peak hours and in both directions, particularly in a northbound direction during the AM peak and, to a lesser extent, southbound during the PM peak. In addition, the southbound AM peak flow with all three options are in excess of 1,000 vehicles an hour. This increase and absolute flow could have implications on road safety and capacity.

Table 3.2 indicates the Sturry level crossing will experience over a 50% reduction in traffic during both peak hours and directions, particularly for Option 1a. These significant reductions will alleviate the level crossing from a road safety and capacity perspective. The introduction of a signalised option for this junction will offer the opportunity to further improve safety as the stoplines and staging can be incorporated into the overall signal control of the level crossing.

3.2 Pedestrian Movements

The 9 day survey collected information about pedestrian movements across each level crossing. Although no information is available for the number of pedestrian movements that may be generated by the housing development, a judgement can be made to assess the likely implications of increased movement. Table 3.3 provides a summary of the pedestrian movements recorded during weekday peak hours.

Table 3.3: Pedestrian flow summary

Level Crossing	AM Peak		PM Peak	
	Southbound	Northbound	Southbound	Northbound
Broadoak	1	5	3	0
Sturry	53	21	24	25

The above table emphasises the semi-rural nature of the Broadoak level crossing compared to the urban environment that Sturry is located within.

Given the lack of suitable pedestrian facilities in the vicinity of the Broadoak level crossing, any increase in pedestrian movements are likely to pose a highway safety risk. However, based upon the good provision of footways around the Sturry level crossing, it is expected that a significant increase in pedestrian movements could be accommodated without affecting the level of risk to such users.

4 HIGHWAY CAPACITY ASSESSMENT

Each of the level crossings have been assessed in detail for their capacity based on the frequency and duration of barriers being lowered for trains passing. This has been carried out using Linsig computer software, which models signal controlled junctions, and can be modelled to simulate a level crossing. In addition, the Sturry level crossing has been modelled by C&A Consulting Engineers using a VISSIM model, which is a micro-simulation software package and is ideal where network constraints can lead to reassignment of traffic to other parts of the network.

4.1 Broadoak Level Crossing

The Broadoak level crossing has been modelled on the basis of two trains per hour in each direction, resulting in four stoppages per hour to traffic. Each stoppage has been modelled as being for a total of 60 seconds. No changes to the level crossing or approaches have been modelled.

The results of the Linsig modelling are summarised in Table 4.1, while detailed outputs are provided at Appendix 2.

Table 4.1: Linsig Results summary – Broadoak Level Crossing

Scenario	Southbound				Northbound			
	AM		PM		AM		PM	
	Max Q	Deg of Sat	Max Q	Deg of Sat	Max Q	Deg of Sat	Max Q	Deg of Sat
Existing 2017	30	44.0%	6.1	13.3%	4.9	10.8%	18	31.3%
Existing 2031	33	46.1%	4.9	10.9%	3.6	8.2%	18	31.7%
Option 1a 2031	49	57.2%	9.5	19.3%	16	28.4%	20	34.0%
Option 2b 2031	47	56.5%	5.5	12.1%	18	32.1%	28	42.0%
Option 4b 2031	52	59.2%	52	59.2%	7.2	15.4%	20	34.0%

The above results highlight that the level crossing is predicted to experience a significant increase in traffic as a result of the housing development. The degree of saturation remains within acceptable limits for a standard signal controlled junction, however the length of queue extends considerably on both approaches for the dominant tidal flow, i.e. from the north in the AM peak and from the south in the PM peak. An increased length of queue affects the clearance time and therefore the overall delay to drivers.

Research in Australia[1] found that drivers' decision making is affected by the amount of time that the driver needs to wait at the crossing. Excessive waiting times can lead to driver frustration and non-compliant behaviour by motorists including driving through flashing lights, driving around the barriers and stopping on the yellow box markings.

A substantial increase in delay therefore has the potential to increase the risk of driver violation and subsequent risk to highway safety. Other factors such as traffic congestion and the need to stay at the crossing for multiple activations of the crossing can also be factors that influence driver frustration.

4.2 Sturry Level Crossing

The Sturry level crossing has been modelled using VISSIM as a micro-simulation network by consultants reviewing each of the options. However, the model covers a number of junctions across the network and doesn't report on the impact of queues when the level crossing barriers are down.

Therefore, the operation of the level crossing has been modelled in LinSig for the existing arrangement and options 1a, 2b and 4b of the potential improvement scheme. The arrangement of each is illustrated on the drawing enclosed at Appendix 1. The existing 2017 scenario is unable to be modelled here due to traffic survey only covering movements across the crossing and not turning movements at the adjacent junction.

Table 4.2: Linsig Results summary – Sturry Level Crossing

Scenario	Southbound				Northbound			
	AM		PM		AM		PM	
	Max Q	Deg of Sat	Max Q	Deg of Sat	Max Q	Deg of Sat	Max Q	Deg of Sat
Existing 2031	117	67.3%	55	43.2%	19	19.9%	35	32.2%
Option 1a 2031	45	65.6%	50	72.9%	8.4	65.5%	40	72.7%
Option 2b 2031	106	66.3%	53	44.1%	11	12.3%	24	24.1%
Option 4b 2031	153	99.2%	74	87.0%	34	99.1%	45	86.7%

The above table indicates that in 2031 the level crossing, based on its current layout, already has the potential to generate queues over 100 vehicles in the AM peak along A28 Island Road and up to 35 on the A28 northbound approach.

The infrastructure proposals associated with the housing development will alleviate traffic passing through this junction and over the level crossing.

[1] https://www.acri.net.au/waiting-times-at-level-crossings-leading-to-motorists-risky-behaviours/

Option 1a will introduce additional signal control, however it offers virtually no change in queue length, except for the AM southbound approach where a significant reduction is predicted.

Option 2b retains a priority junction layout and would experience some reduction in queues all around the junction.

Option 4b will introduce additional signal control, and is predicted to increase queues. This is partly due to the additional staging required for bus priority.

Overall, the results would indicate that option 2b would deliver the best result for an improvement scheme, which is required in order to achieve a reduction in traffic while providing new pedestrian facilities.

4.3 Future Level Crossing Operation

There are current proposals to increase the line speed of this railway and increase the number of trains that may pass each hour. This could have two effects on the operation of the level crossing and subsequent effects on the traffic on the network.

Increased line speeds will potentially reduce the time that the barriers are closed for as the train will pass through quicker. This will reduce driver frustration on each occasion that the barrier is closed.

An increased frequency in the number of trains will inevitably increase the number of times the barrier is closed. A simple increase in the number of times a barrier is closed may have minimal effect on drivers as they will always be aware of the risk of being stopped by the barrier. The length of time being stopped will be the key factor in determining driver frustration.

However, should an increased frequency of trains result in the barrier being closed for a longer period of time to allow two trains to pass (one in each direction) then this would increase the length of stoppage time and increase driver frustration. The same effect could also be encountered if the crossing was activated shortly after the barriers lifted and therefore some drivers are waiting for a second time before reaching the level crossing. This would cancel out any benefits from a reduced stoppage time for a single train.

5 SUMMARY AND CONCLUSIONS

The proposed housing development is expected to deliver additional infrastructure that will alleviate existing roads, particularly the level crossings at Broadoak and Sturry. This is anticipated to be in the form of a new bridge over the railway combined with an altered junction adjacent to the Sturry level crossing.

5.1 Broadoak Level Crossing

The data provided indicates that the Broadoak level crossing will experience a significant increase in traffic flows. The modelling of this level crossing has indicated that, as a result of higher traffic flows, the predicted queues will extend significantly which may cause driver frustration and lead to a higher risk of driver violations.

5.2 Sturry Level Crossing

The traffic flows at Sturry are predicted to reduce, as expected. The proposed options for improvement at the adjoining junction will offer a number of benefits, including increased visibility to signal heads, new pedestrian crossing facilities and will force some traffic away from the level crossing. The modelling of this level crossing indicates that some queuing may increase from the baseline case. Option 2B would result in the smallest increase and would therefore suit an overall balance between capacity, queuing and pedestrian facilities.

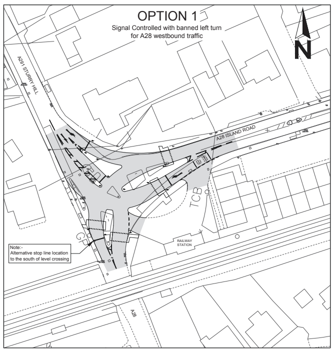
5.3 Pedestrian Movements

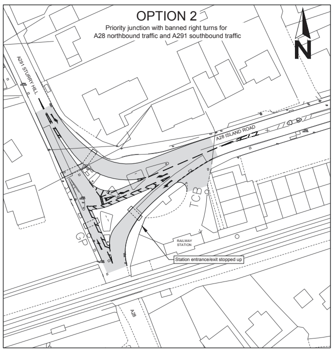
The pedestrian movements at each crossing are commensurate with their location, with Broadoak experiencing very low numbers while Sturry encounters reasonable numbers. Although the proposed housing development will inevitably increase the number of pedestrians on the local network, it is not expected that this will have a detrimental effect on the operation of the level crossings.

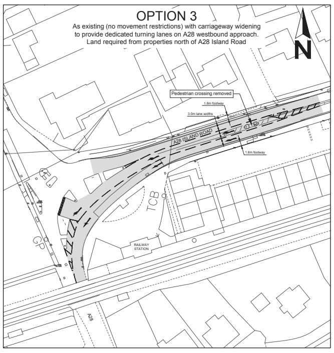
5.4 Overall

Overall, based upon the data supplied, it is recommended that further improvements are proposed to channel traffic away from the Broadoak level crossing. It is also recommended that Option 2B is considered further in terms of providing wider benefits to pedestrians and cyclists without compromising further on highway capacity.

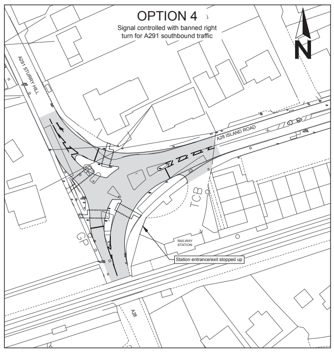
APPENDIX 1
STURRY JUNCTION OPTIONS

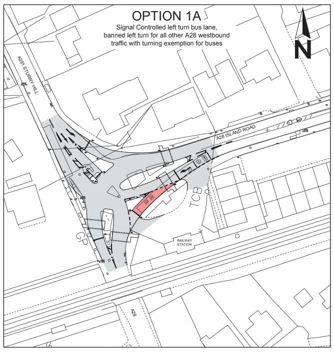


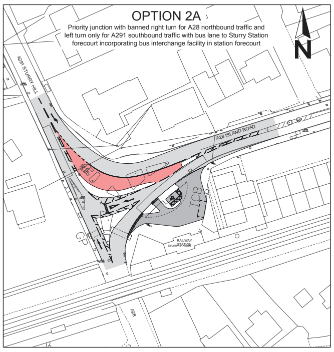




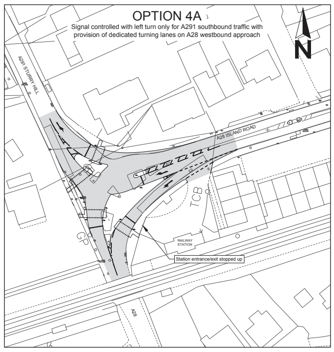
OPTION 3
As existing (no movement restrictions) with carriageway widening
to provide dedicated turning lanes on A28 westbound approach.
Land required from properties north of A28 Island Road
Pedestrian crossing removed
1.8m footway
3.0m lane widths
A28 ISLAND ROAD
1.8m footway
A28

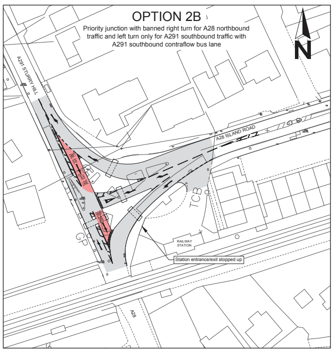


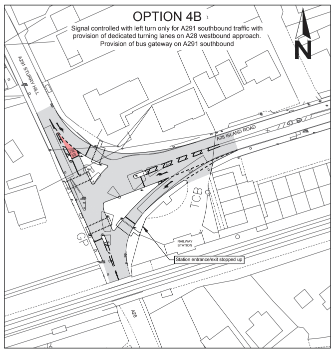




OPTION 2A
Priority junction with banned right turn for A28 northbound traffic and
left turn only for A291 southbound traffic with bus lane to Sturry Station
forecourt incorporating bus interchange facility in station forecourt
A291 STURRY HILL
A28 ISLAND ROAD
A28







OPTION 4B
Signal controlled with left turn only for A291 southbound traffic with
provision of dedicated turning lanes on A28 westbound approach.
Provision of bus gateway on A291 southbound
A291 STURRY HILL
A28 ISLAND ROAD
Station entrance/exit stopped up
A28

0 10 20 30 40 50 m
SCALE 1 : 500

File ref - p:\d - projects\co04300392 - a28 sturry link rd\102 drawings\01. working\000 non contract\4300392-000-42.dwg

Notes

Rev	Revision details	Chkd	Appd	Date

Drawn:	TMW	Preliminary	✓
Design:	.	For comment	
Chkd:	RJHF	For tender	
Appd:	MIM	For construction	
Date:	03 March 2017	As constructed	
		Other	

www.amey.co.uk

Client

Project Name
A28 Sturry Link Road, Canterbury

Drawing Title
A28 Island Road / A291 Sturry Hill Junction Options

Original Drawing Size : A0	Dimensions : m
Scale : 1:500	Copyright © Amey

Drawing No	Rev
4300392/000/42	0

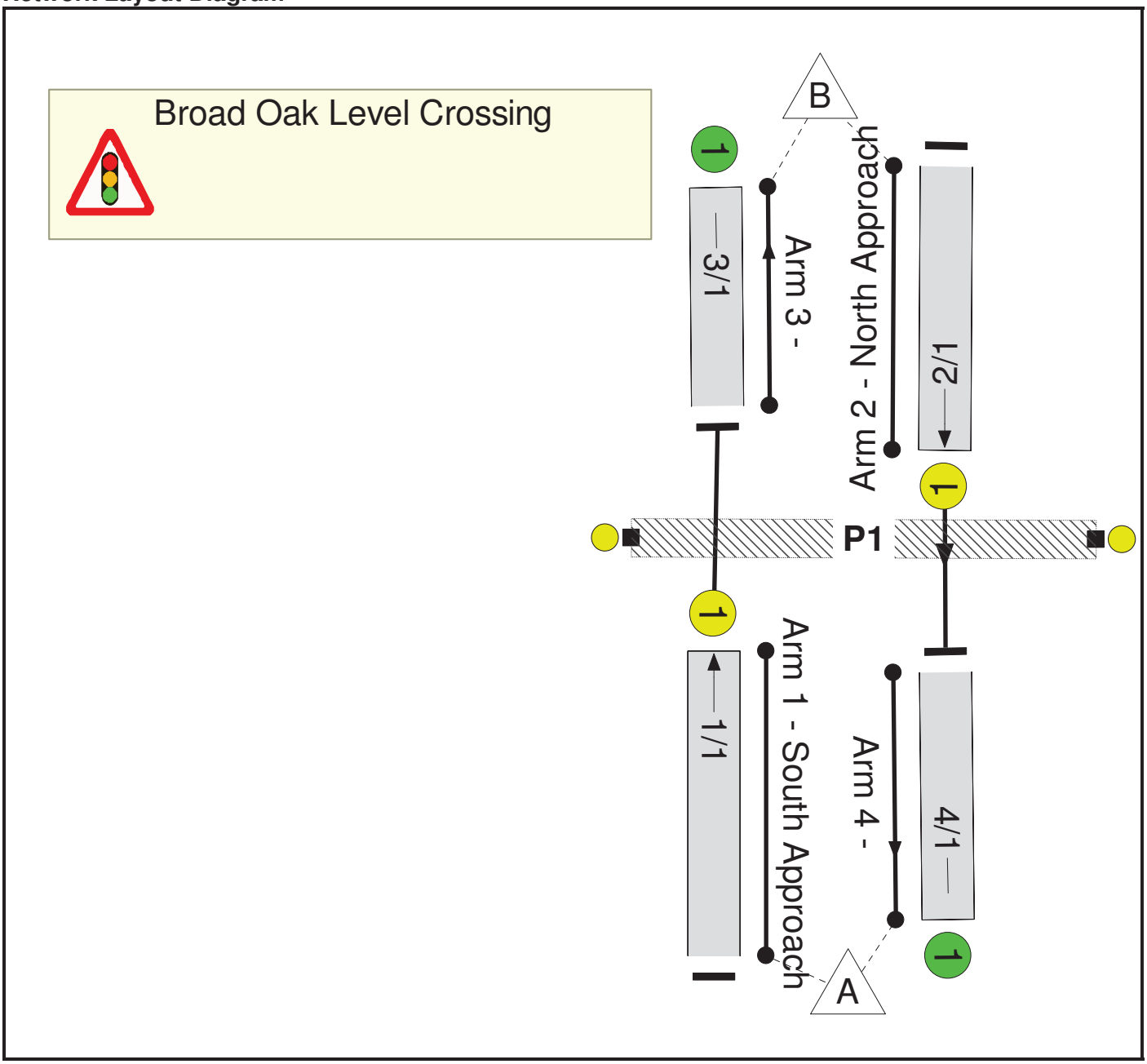
APPENDIX 2
LINSIG OUTPUTS – BROADOAK

LinSig V1 style report

User and Project Details

Project:	**Broad Oak Level Crossing**
Title:	
Location:	
Additional detail:	
File name:	Broad Oak.lsg3x
Author:	IW
Company:	RSK
Address:	

Network Layout Diagram



Phase Input Data

A	Traffic		7	7
B	Traffic		7	7
C	Pedestrian		60	60

Phase Intergreens Matrix

		Starting Phase		
			B	C
Terminating Phase	A			10
	B			10
	C	10	10	

Phase Delays

There are no Phase Delays defined

Prohibited Stage Change

		To Stage	
		1	2
From Stage	1		10
	2	10	

Phases in Stage

Stage No.	Phases in Stage
1	A B
2	C

Give-Way Lane Input Data

Junction: Broad Oak Level Crossing
There are no Opposed Lanes in this Junction

Lane Input Data

1/1 (South Approach)	U	A	2	3	60.0	Geom	-	4.00	0.00	Y	Arm 3 Ahead	Inf
2/1 (North Approach)	U	B	2	3	60.0	Geom	-	4.00	0.00	Y	Arm 4 Ahead	Inf
3/1	U		2	3	60.0	Inf	-	-	-	-	-	-
4/1	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

1: 'Existing 2017 AM'	07:45	08:45	01:00	
2: 'Existing 2017 PM'	16:45	17:45	01:00	
3: 'Existing 2031 AM'	07:45	08:45	01:00	
4: 'Existing 2031 PM'	16:45	17:45	01:00	
5: 'Proposed Option 1a 2031 AM'	07:45	08:45	01:00	
6: 'Proposed Option 1a 2031 PM'	16:45	17:45	01:00	
7: 'Proposed Option 2b 2031 AM'	07:45	08:45	01:00	
8: 'Proposed Option 2b 2031 PM'	16:45	17:45	01:00	
9: 'Proposed Option 4b 2031 AM'	07:45	08:45	01:00	
10: 'Proposed Option 4b 2031 PM'	16:45	17:45	01:00	

Traffic Flows, Desired

FG1: 'Existing 2017 AM'

Desired Flow :

	Destination			
Origin		A	B	Tot.
	A	0	199	199
	B	809	0	809
	Tot.	809	199	1008

FG2: 'Existing 2017 PM'
Desired Flow :

		Destination		
Origin		0	575	575
		244	0	244
		244	575	819

FG3: 'Existing 2031 AM'
Desired Flow :

		Destination		
Origin		0	151	151
		848	0	848
		848	151	999

FG4: 'Existing 2031 PM'
Desired Flow :

		Destination		
Origin		0	583	583
		200	0	200
		200	583	783

FG5: 'Proposed Option 1a 2031 AM'
Desired Flow :

		Destination		
Origin		0	522	522
		1051	0	1051
		1051	522	1573

FG6: 'Proposed Option 1a 2031 PM'
Desired Flow :

		Destination		
		A	B	Tot.
Origin	A	0	625	625
	B	355	0	355
	Tot.	355	625	980

FG7: 'Proposed Option 2b 2031 AM'
Desired Flow :

		Destination		
Origin		0	590	590
		1038	0	1038
		1038	590	1628

FG8: 'Proposed Option 2b 2031 PM'
Desired Flow :

		Destination		
Origin		0	772	772
		223	0	223
		223	772	995

FG9: 'Proposed Option 4b 2031 AM'
Desired Flow :

		Destination		
Origin		0	476	476
		1088	0	1088
		1088	476	1564

FG10: 'Proposed Option 4b 2031 PM'
Desired Flow :

		Destination		
		A	B	Tot.
Origin	A	0	625	625
	B	283	0	283
	Tot.	283	625	908

LinSig V1 style report

Network Results

Scenario 1: '2017 AM' (FG1: 'Existing 2017 AM', Plan 1: 'Network Control Plan 1')

	-	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**44.0%**	**0**	**0**	**0**	**2.0**	**-**	**-**	**-**	**-**
	Railway	-	C		1	60	-	0	-	0	0.0%	-	-	-	-	-	-	-	-
			C1		PRC for Signalled Lanes (%):		104.5		Total Delay for Signalled Lanes (pcuHr):			1.97	Cycle Time (s):	900					
					PRC Over All Lanes (%):		104.5		Total Delay Over All Lanes(pcuHr):			1.97							

LinSig V1 style report

Scenario 2: '2017 PM' (FG2: 'Existing 2017 PM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**31.3%**	**0**	**0**	**0**	**1.3**	-	-	-	-
Broad Oak Level Crossing	-	-	-		-	-	-	-	-	-	**31.3%**	**0**	**0**	**0**	**1.3**	-	-	-	-
1/1	South Approach Ahead	U	A		1	820	-	575	2015	1838	31.3%	-	-	-	1.0	6.3	17.6	17.8	12.3
2/1	North Approach Ahead	U	B		1	820	-	244	2015	1838	13.3%	-	-	-	0.3	5.1	6.0	6.1	5.2
3/1		U	-		-	-	-	575	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
4/1		U	-		-	-	-	244	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	60	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 187.7 Total Delay for Signalled Lanes (pcuHr): 1.35 Cycle Time (s): 900
PRC Over All Lanes (%): 187.7 Total Delay Over All Lanes(pcuHr): 1.35

LinSig V1 style report

Scenario 3: '2031 AM' (FG3: 'Existing 2031 AM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**46.1%**	**0**	**0**	**0**	**2.0**	-	-	-	-
Broad Oak Level Crossing	-	-	-		-	-	-	-	-	-	**46.1%**	**0**	**0**	**0**	**2.0**	-	-	-	-
1/1	South Approach Ahead	U	A		1	820	-	151	2015	1838	8.2%	-	-	-	0.2	4.8	3.6	3.6	3.2
2/1	North Approach Ahead	U	B		1	820	-	848	2015	1838	46.1%	-	-	-	1.8	7.8	32.0	32.5	18.1
3/1		U	-		-	-	-	151	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
4/1		U	-		-	-	-	848	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	60	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 95.1 Total Delay for Signalled Lanes (pcuHr): 2.04 Cycle Time (s): 900
PRC Over All Lanes (%): 95.1 Total Delay Over All Lanes(pcuHr): 2.04

Scenario 4: '2031 PM' (FG4: 'Existing 2031 PM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**31.7%**	**0**	**0**	**0**	**1.3**	-	-	-	-
Broad Oak Level Crossing	-	-	-		-	-	-	-	-	-	**31.7%**	**0**	**0**	**0**	**1.3**	-	-	-	-
1/1	South Approach Ahead	U	A		1	820	-	583	2015	1838	31.7%	-	-	-	1.0	6.3	18.0	18.2	12.5
2/1	North Approach Ahead	U	B		1	820	-	200	2015	1838	10.9%	-	-	-	0.3	4.9	4.8	4.9	4.3
3/1		U	-		-	-	-	583	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
4/1		U	-		-	-	-	200	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	60	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 183.8 Total Delay for Signalled Lanes (pcuHr): 1.30 Cycle Time (s): 900
PRC Over All Lanes (%): 183.8 Total Delay Over All Lanes(pcuHr): 1.30

Scenario 5: 'Option 1a AM' (FG5: 'Proposed Option 1a 2031 AM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**57.2%**	**0**	**0**	**0**	**3.7**	-	-	-	-
Broad Oak Level Crossing	-	-	-		-	-	-	-	-	-	**57.2%**	**0**	**0**	**0**	**3.7**	-	-	-	-
1/1	South Approach Ahead	U	A		1	820	-	522	2015	1838	28.4%	-	-	-	0.9	6.0	15.4	15.6	11.2
2/1	North Approach Ahead	U	B		1	820	-	1051	2015	1838	57.2%	-	-	-	2.8	9.5	48.2	48.8	22.5
3/1		U	-		-	-	-	522	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
4/1		U	-		-	-	-	1051	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	60	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 57.4 Total Delay for Signalled Lanes (pcuHr): 3.66 Cycle Time (s): 900
PRC Over All Lanes (%): 57.4 Total Delay Over All Lanes(pcuHr): 3.66

Scenario 6: 'Option 1a PM' (FG6: 'Proposed Option 1a 2031 PM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**34.0%**	**0**	**0**	**0**	**1.7**	-	-	-	-
Broad Oak Level Crossing	-	-	-		-	-	-	-	-	-	**34.0%**	**0**	**0**	**0**	**1.7**	-	-	-	-
1/1	South Approach Ahead	U	A		1	820	-	625	2015	1838	34.0%	-	-	-	1.1	6.5	19.8	20.0	13.4
2/1	North Approach Ahead	U	B		1	820	-	355	2015	1838	19.3%	-	-	-	0.5	5.4	9.4	9.5	7.6
3/1		U	-		-	-	-	625	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
4/1		U	-		-	-	-	355	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	60	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 164.7 Total Delay for Signalled Lanes (pcuHr): 1.66 Cycle Time (s): 900
PRC Over All Lanes (%): 164.7 Total Delay Over All Lanes(pcuHr): 1.66

Scenario 7: 'Option 2b AM' (FG7: 'Proposed Option 2b 2031 AM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**56.5%**	**0**	**0**	**0**	**3.7**	-	-	-	-
Broad Oak Level Crossing	-	-	-		-	-	-	-	-	-	**56.5%**	**0**	**0**	**0**	**3.7**	-	-	-	-
1/1	South Approach Ahead	U	A		1	820	-	590	2015	1838	32.1%	-	-	-	1.0	6.3	18.2	18.4	12.6
2/1	North Approach Ahead	U	B		1	820	-	1038	2015	1838	56.5%	-	-	-	2.7	9.4	46.7	47.4	22.2
3/1		U	-		-	-	-	590	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
4/1		U	-		-	-	-	1038	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	60	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 59.4 Total Delay for Signalled Lanes (pcuHr): 3.75 Cycle Time (s): 900
PRC Over All Lanes (%): 59.4 Total Delay Over All Lanes(pcuHr): 3.75

Scenario 8: 'Option 2b PM' (FG8: 'Proposed Option 2b 2031 PM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**42.0%**	**0**	**0**	**0**	**1.9**	-	-	-	-
Broad Oak Level Crossing	-	-	-		-	-	-	-	-	-	**42.0%**	**0**	**0**	**0**	**1.9**	-	-	-	-
1/1	South Approach Ahead	U	A		1	820	-	772	2015	1838	42.0%	-	-	-	1.6	7.3	27.4	27.8	16.5
2/1	North Approach Ahead	U	B		1	820	-	223	2015	1838	12.1%	-	-	-	0.3	5.0	5.5	5.5	4.8
3/1		U	-		-	-	-	772	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
4/1		U	-		-	-	-	223	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	60	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 114.3 Total Delay for Signalled Lanes (pcuHr): 1.88 Cycle Time (s): 900
PRC Over All Lanes (%): 114.3 Total Delay Over All Lanes(pcuHr): 1.88

Scenario 9: 'Option 4b AM' (FG9: 'Proposed Option 4b 2031 AM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**59.2%**	**0**	**0**	**0**	**3.8**	-	-	-	-
Broad Oak Level Crossing	-	-	-		-	-	-	-	-	-	**59.2%**	**0**	**0**	**0**	**3.8**	-	-	-	-
1/1	South Approach Ahead	U	A		1	820	-	476	2015	1838	25.9%	-	-	-	0.8	5.9	13.6	13.8	10.2
2/1	North Approach Ahead	U	B		1	820	-	1088	2015	1838	59.2%	-	-	-	3.0	9.9	51.7	52.4	23.3
3/1		U	-		-	-	-	476	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
4/1		U	-		-	-	-	1088	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	60	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 52.1 Total Delay for Signalled Lanes (pcuHr): 3.78 Cycle Time (s): 900
PRC Over All Lanes (%): 52.1 Total Delay Over All Lanes(pcuHr): 3.78

Scenario 10: 'Option 4b PM' (FG10: 'Proposed Option 4b 2031 PM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**34.0%**	**0**	**0**	**0**	**1.5**	-	-	-	-
Broad Oak Level Crossing	-	-	-		-	-	-	-	-	-	**34.0%**	**0**	**0**	**0**	**1.5**	-	-	-	-
1/1	South Approach Ahead	U	A		1	820	-	625	2015	1838	34.0%	-	-	-	1.1	6.5	19.8	20.0	13.4
2/1	North Approach Ahead	U	B		1	820	-	283	2015	1838	15.4%	-	-	-	0.4	5.2	7.2	7.2	6.1
3/1		U	-		-	-	-	625	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
4/1		U	-		-	-	-	283	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	60	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 164.7 Total Delay for Signalled Lanes (pcuHr): 1.54 Cycle Time (s): 900
PRC Over All Lanes (%): 164.7 Total Delay Over All Lanes(pcuHr): 1.54

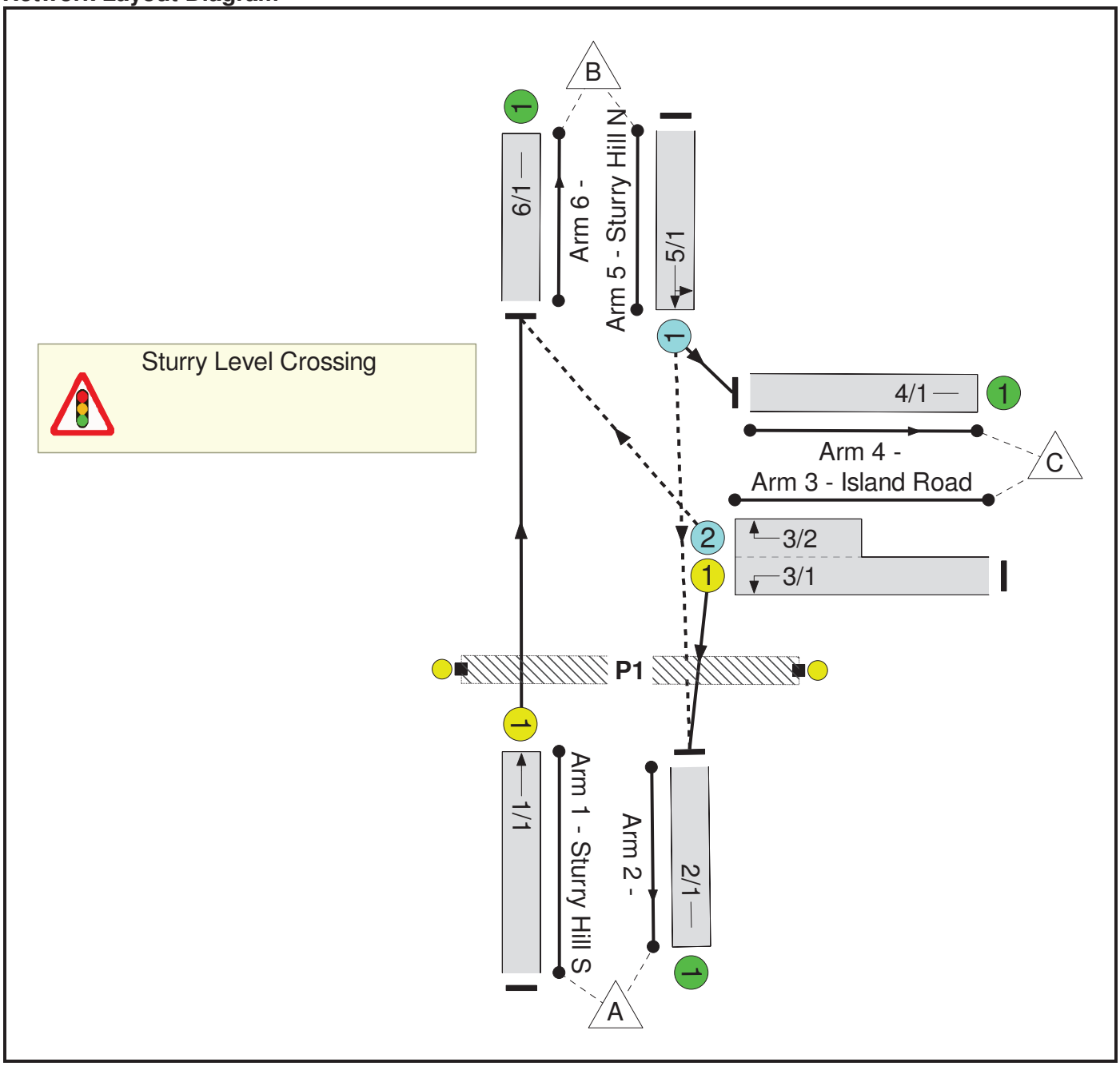
APPENDIX 3
LINSIG OUTPUTS – STURRY

LinSig V1 style report

User and Project Details

Project:	**Sturry Level Crossing**
Title:	
Location:	
File name:	Sturry - Existing.lsg3x
Author:	IW
Company:	RSK
Address:	Manchester M1 2EJ
Notes:	

Network Layout Diagram



Phase Input Data

A	Traffic		7	7
B	Traffic		7	7
C	Pedestrian		100	100

Phase Intergreens Matrix

		Starting Phase		
			B	C
Terminating Phase	A			40
	B			40
	C	40	40	

Phase Delays

There are no Phase Delays defined

Prohibited Stage Change

		To Stage	
		1	2
From Stage	1		40
	2	40	

Phases in Stage

Stage No.	Phases in Stage
1	A B
2	C

Give-Way Lane Input Data

Junction: Sturry Level Crossing

Lane	Movement	Max Flow when Giving Way (PCU/Hr)	Min Flow when Giving Way (PCU/Hr)	Opposing Lane	Opp. Lane Coeff.	Opp. Mvmnts.	Right Turn Storage (PCU)	Non-Blocking Storage (PCU)	RTF	Right Turn Move up (s)	Max Turns in Intergreen (PCU)
3/2 (Island Road)	6/1 (Right)	1439	0	1/1	1.09	All	-	-	-	-	-
5/1 (Sturry Hill N)	2/1 (Ahead)	1439	0	3/1	1.09	All	-	-	-	-	-
				3/2	1.09	All					

Lane Input Data

1/1 (Sturry Hill S)	U	A	2	3	60.0	Geom	-	4.00	0.00	Y	Arm 6 Ahead	Inf
2/1	U		2	3	60.0	Inf	-	-	-	-	-	-
3/1 (Island Road)	U	B	2	3	60.0	Geom	-	4.25	0.00	Y	Arm 2 Left	Inf
3/2 (Island Road)	O		2	3	5.0	Geom	-	3.25	0.00	Y	Arm 6 Right	Inf
4/1	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (Sturry Hill N)	O		2	3	60.0	Geom	-	4.00	0.00	Y	Arm 2 Ahead	Inf
											Arm 4 Left	Inf
6/1	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

1: 'Existing 2017 AM'	07:45	08:45	01:00	
2: 'Existing 2017 PM'	16:45	17:45	01:00	
3: 'Existing 2031 AM'	07:45	08:45	01:00	
4: 'Existing 2031 PM'	16:45	17:45	01:00	

Traffic Flows, Desired

FG1: 'Existing 2017 AM'

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	322	472	794
	B	147	0	36	183
	C	934	159	0	1093
	Tot.	1081	481	508	2070

FG2: 'Existing 2017 PM'
Desired Flow :

	Destination				
Origin		0	520	708	1228
		201	0	94	295
		547	135	0	682
		748	655	802	2205

FG3: 'Existing 2031 AM'
Desired Flow :

	Destination				
Origin		0	322	472	794
		147	0	36	183
		934	159	0	1093
		1081	481	508	2070

FG4: 'Existing 2031 PM'
Desired Flow :

	Destination				
		A	B	C	Tot.
Origin	A	0	520	708	1228
	B	201	0	94	295
	C	547	135	0	682
	Tot.	748	655	802	2205

LinSig V1 style report

Network Results

Scenario 1: 'Existing 2031' (FG3: 'Existing 2031 AM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**67.3%**	**303**	**3**	**0**	**17.9**	-	-	-	-
Sturry Level Crossing	-	-	-		-	-	-	-	-	-	**67.3%**	**303**	**3**	**0**	**17.9**	-	-	-	-
1/1	Sturry Hill S Ahead	U	A		1	720	-	322	2015	1614	19.9%	-	-	-	2.0	22.6	19.1	19.2	15.8
2/1		U	-		-	-	-	1081	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
3/1+3/2	Island Road Left Right	U+O	B -		1	720	-	1093	2040:1940	1389+236	67.3 : 67.3%	156	3	0	12.5	41.1	116.1	117.1	53.0
4/1		U	-		-	-	-	36	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
5/1	Sturry Hill N Ahead Left	O	-		-	-	-	183	2015	471	38.9%	147	0	0	3.4	67.5	27.1	27.4	-
6/1		U	-		-	-	-	481	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	100	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 33.8 Total Delay for Signalled Lanes (pcuHr): 14.49 Cycle Time (s): 900
PRC Over All Lanes (%): 33.8 Total Delay Over All Lanes(pcuHr): 17.92

Scenario 2: 'Existing 2031' (FG4: 'Existing 2031 PM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**43.2%**	**331**	**5**	**0**	**10.1**	-	-	-	-
Sturry Level Crossing	-	-	-		-	-	-	-	-	-	**43.2%**	**331**	**5**	**0**	**10.1**	-	-	-	-
1/1	Sturry Hill S Ahead	U	A		1	720	-	520	2015	1614	32.2%	-	-	-	3.7	25.6	34.8	35.0	25.6
2/1		U	-		-	-	-	748	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
3/1+3/2	Island Road Left Right	U+O	B -		1	720	-	682	2040:1940	1267+313	43.2 : 43.2%	130	5	0	5.8	30.9	54.8	55.2	32.5
4/1		U	-		-	-	-	94	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
5/1	Sturry Hill N Ahead Left	O	-		-	-	-	295	2015	924	31.9%	201	0	0	0.5	6.6	11.4	11.6	-
6/1		U	-		-	-	-	655	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	100	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1

PRC for Signalled Lanes (%): 108.5
PRC Over All Lanes (%): 108.5

Total Delay for Signalled Lanes (pcuHr): 9.55
Total Delay Over All Lanes(pcuHr): 10.09

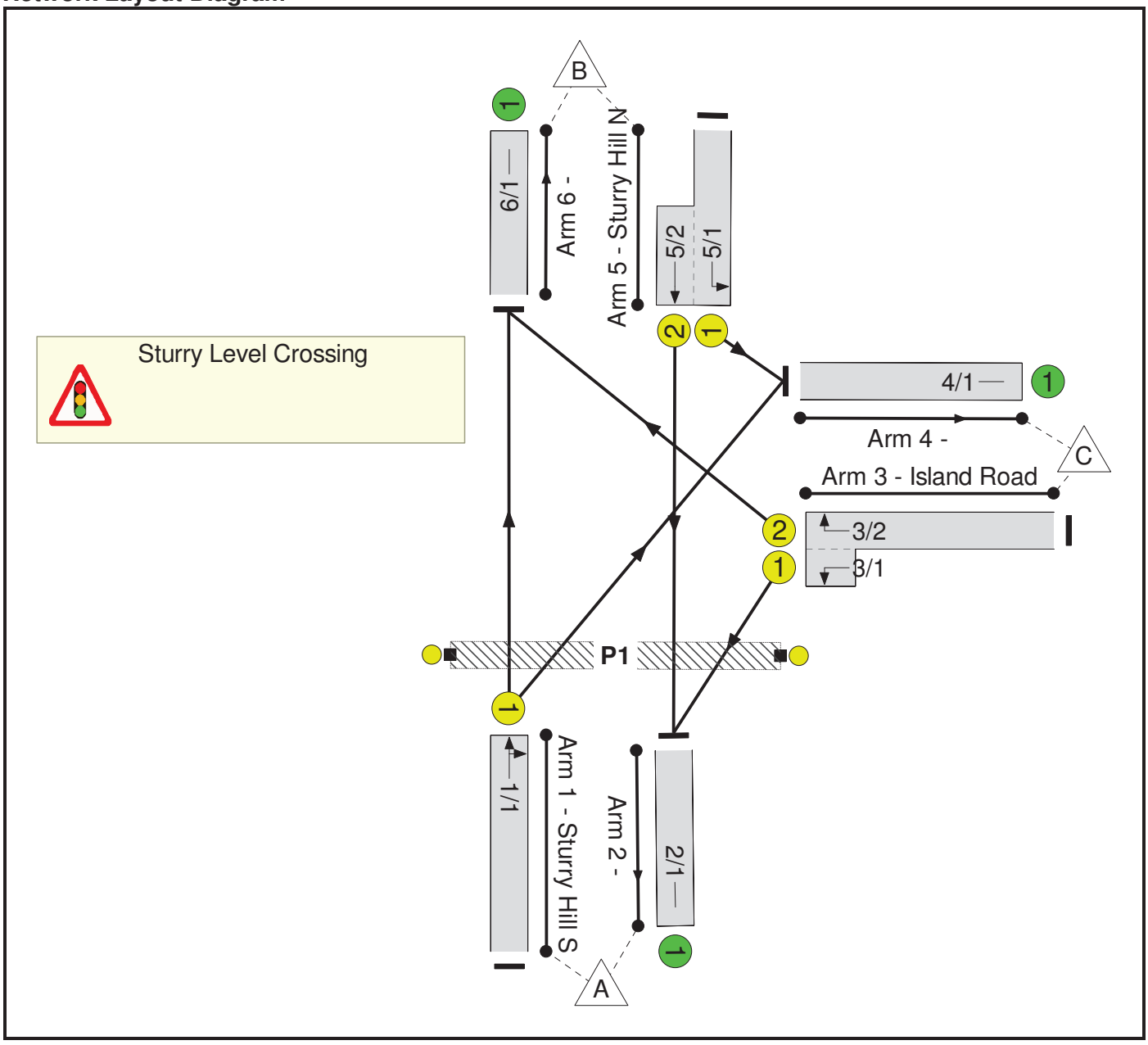
Cycle Time (s): 900

LinSig V1 style report

User and Project Details

Project:	**Sturry Level Crossing**
Title:	**Option 1a**
Location:	
File name:	Sturry - Option 1a.lsg3x
Author:	IW
Company:	RSK
Address:	Manchester M1 2EJ
Notes:	

Network Layout Diagram



Phase Input Data

A	Traffic		7	7
B	Traffic		7	7
C	Pedestrian		100	100
D	Traffic		7	7
E	Traffic		7	7
F	Bus		7	7

Phase Intergreens Matrix

		Starting Phase					
		A	B	C	D	E	F
Terminating Phase	A		7	40	7	7	-
	B	7					
	C	40					40
	D	7					
	E	7	7	40			7
	F	-					

Phase Delays

There are no Phase Delays defined					

Prohibited Stage Change

		To Stage			
		1	2	3	4
From Stage	1		7	7	40
	2	7		7	40
	3	7	7		40
	4	40	40	40	

Phases in Stage

Stage No.	Phases in Stage
1	A
2	D E
3	B D F
4	B C D

Give-Way Lane Input Data

Junction: Sturry Level Crossing
There are no Opposed Lanes in this Junction

Lane Input Data

1/1 (Sturry Hill S)	U	A	2	3	60.0	Geom	-	4.00	0.00	Y	Arm 4 Right	Inf
											Arm 6 Ahead	Inf
2/1	U		2	3	60.0	Inf	-	-	-	-	-	-
3/1 (Island Road)	U	F	2	3	2.0	Geom	-	3.25	0.00	Y	Arm 2 Left	Inf
3/2 (Island Road)	U	B	2	3	60.0	Geom	-	4.25	0.00	Y	Arm 6 Right	Inf
4/1	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (Sturry Hill N)	U	D	2	3	60.0	Geom	-	4.00	0.00	Y	Arm 4 Left	Inf
5/2 (Sturry Hill N)	U	E	2	3	4.0	Geom	-	3.25	0.00	Y	Arm 2 Ahead	Inf
6/1	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

1: 'Proposed Option 1a 2031 AM'	07:45	08:45	01:00	
2: 'Proposed Option 1a 2031 PM'	16:45	17:45	01:00	

Traffic Flows, Desired

FG1: 'Proposed Option 1a 2031 AM'

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	12	76	88
	B	45	0	488	533
	C	7	916	0	923
	Tot.	52	928	564	1544

FG2: 'Proposed Option 1a 2031 PM'
Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	91	358	449
	B	56	0	354	410
	C	7	686	0	693
	Tot.	63	777	712	1552

LinSig V1 style report

Network Results

Scenario 1: 'Option 1a AM' (FG1: 'Proposed Option 1a 2031 AM', Plan 1: 'Network Control Plan 1')

		-	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**65.6%**	**0**	**0**	**0**	**15.0**	**-**	**-**	**-**	**-**
		U	A		3	57	-	88	2015	134	65.5%	-	-	-	4.3	174.2	7.5	8.4	7.1
		U	B F		3	619:479	-	923	2040:1940	1396+11	65.6 : 65.6%	-	-	-	7.8	30.3	43.6	44.5	23.3
		-	C		1	100	-	0	-	0	0.0%	-	-	-	-	-	-	-	-
			C1		PRC for Signalled Lanes (%):		37.1		Total Delay for Signalled Lanes (pcuHr):			14.99		Cycle Time (s):	900				
					PRC Over All Lanes (%):		37.1		Total Delay Over All Lanes(pcuHr):			14.99							

Scenario 2: 'Option 1a PM' (FG2: 'Proposed Option 1a 2031 PM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network: Option 1a	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**72.9%**	**0**	**0**	**0**	**32.7**	**-**	**-**	**-**	**-**
Sturry Level Crossing	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**72.9%**	**0**	**0**	**0**	**32.7**	**-**	**-**	**-**	**-**
1/1	Sturry Hill S Right Ahead	U	A		3	273	-	449	2015	618	72.7%	-	-	-	12.9	103.7	36.5	37.9	28.2
2/1		U	-		-	-	-	63	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
3/2+3/1	Island Road Left Right	U	B F		3	418:278	-	693	2040:1940	941+10	72.9 : 72.9%	-	-	-	13.9	72.4	47.5	48.9	31.0
4/1		U	-		-	-	-	712	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
5/1+5/2	Sturry Hill N Ahead Left	U	D E		3	552:113	-	410	2015:1940	486+77	72.8 : 72.8%	-	-	-	5.9	51.5	16.1	17.4	12.7
6/1		U	-		-	-	-	777	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	100	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1

PRC for Signalled Lanes (%): 23.5 Total Delay for Signalled Lanes (pcuHr): 32.74 Cycle Time (s): 900

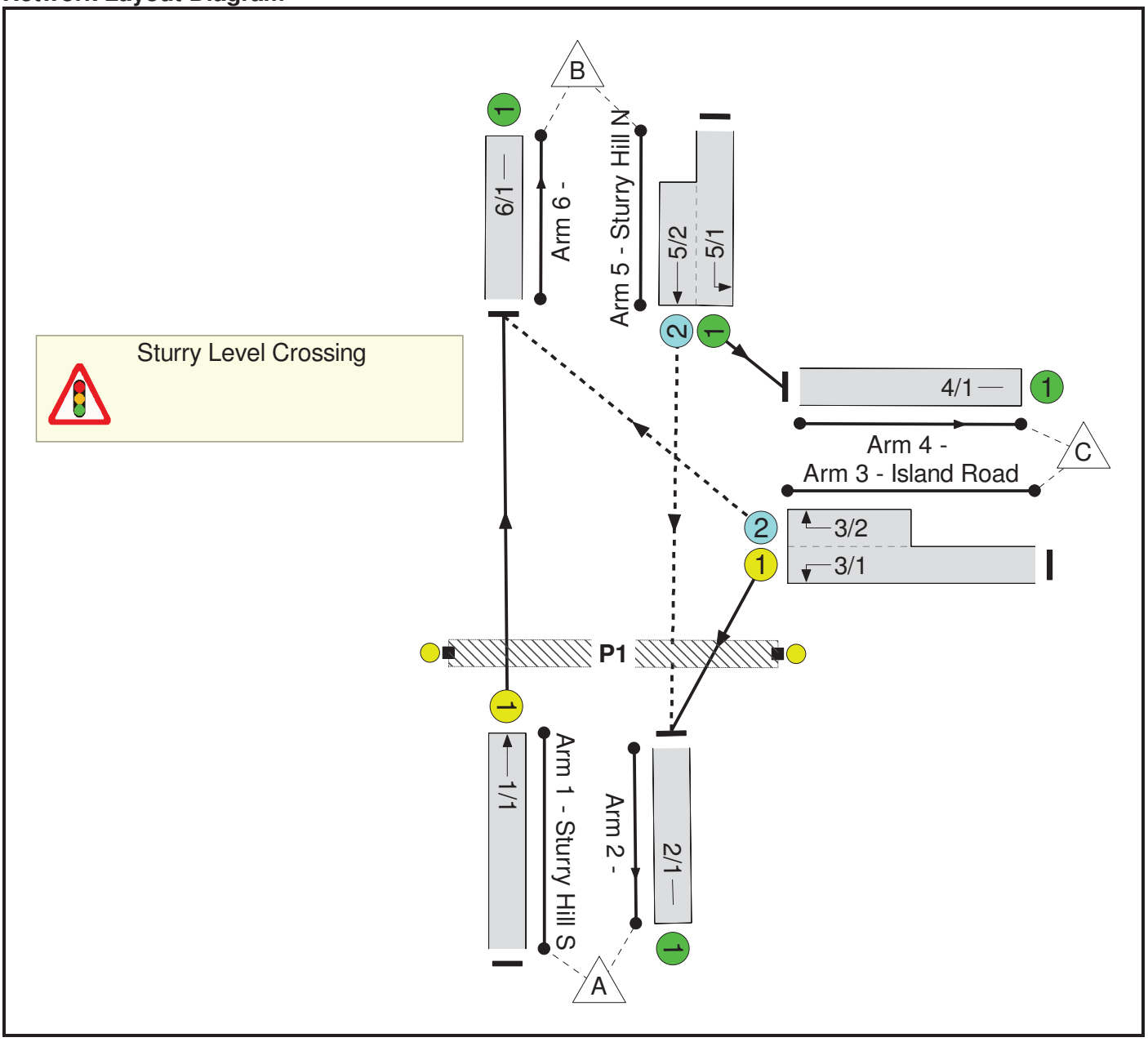
PRC Over All Lanes (%): 23.5 Total Delay Over All Lanes(pcuHr): 32.74

LinSig V1 style report

User and Project Details

Project:	**Sturry Level Crossing**
Title:	**Option 2b**
Location:	
Additional detail:	
File name:	Sturry - Option 2.lsg3x
Author:	IW
Company:	RSK
Address:	Manchester M1 2EJ

Network Layout Diagram



Phase Input Data

A	Traffic		7	7
B	Traffic		7	7
C	Pedestrian		100	100

Phase Intergreens Matrix

	Starting Phase			
			B	C
Terminating Phase	A			40
	B			40
	C	40	40	

Phase Delays

There are no Phase Delays defined

Prohibited Stage Change

	To Stage		
		1	2
From Stage	1		40
	2	40	

Phases in Stage

Stage No.	Phases in Stage
1	A B
2	C

Give-Way Lane Input Data

Junction: Sturry Level Crossing

Lane	Movement	Max Flow when Giving Way (PCU/Hr)	Min Flow when Giving Way (PCU/Hr)	Opposing Lane	Opp. Lane Coeff.	Opp. Mvmnts.	Right Turn Storage (PCU)	Non-Blocking Storage (PCU)	RTF	Right Turn Move up (s)	Max Turns in Intergreen (PCU)
3/2 (Island Road)	6/1 (Right)	1439	0	1/1	1.09	All	-	-	-	-	-
5/2 (Sturry Hill N)	2/1 (Ahead)	1439	0	3/1	1.09	All	-	-	-	-	-

Lane Input Data

1/1 (Sturry Hill S)	U	A	2	3	60.0	Geom	-	4.00	0.00	Y	Arm 6 Ahead	Inf
2/1	U		2	3	60.0	Inf	-	-	-	-	-	-
3/1 (Island Road)	U	B	2	3	60.0	Geom	-	4.25	0.00	Y	Arm 2 Left	Inf
3/2 (Island Road)	O		2	3	5.0	Geom	-	3.25	0.00	Y	Arm 6 Right	Inf
4/1	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (Sturry Hill N)	U		2	3	60.0	Geom	-	4.00	0.00	Y	Arm 4 Left	Inf
5/2 (Sturry Hill N)	O		2	3	5.0	Geom	-	3.25	0.00	Y	Arm 2 Ahead	Inf
6/1	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

1: 'Proposed Option 2b 2031 AM'	07:45	08:45	01:00	
2: 'Proposed Option 2b 2031 PM'	16:45	17:45	01:00	

Traffic Flows, Desired

FG1: 'Proposed Option 2b 2031 AM'

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	198	0	198
	B	4	0	632	636
	C	538	527	0	1065
	Tot.	542	725	632	1899

FG2: 'Proposed Option 2b 2031 PM'
Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	389	0	389
	B	4	0	759	763
	C	365	322	0	687
	Tot.	369	711	759	1839

LinSig V1 style report

Network Results

Scenario 1: 'Option 2b AM' (FG1: 'Proposed Option 2b 2031 AM', Plan 1: 'Network Control Plan 1')

	-	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**66.3%**	**512**	**19**	**0**	**12.1**	**-**	**-**	**-**	**-**
	Sturry Hill S Ahead	U	A		1	720	-	198	2015	1614	12.3%	-	-	-	1.2	21.0	10.9	11.0	9.7
	Island Road Left Right	U+O	B -		1	720	-	1065	2040:1940	812+795	66.3 : 66.3%	509	18	0	10.7	36.2	105.0	106.0	47.6
	Railway	-	C		1	100	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 35.8 Total Delay for Signalled Lanes (pcuHr): 11.87 Cycle Time (s): 900
PRC Over All Lanes (%): 35.8 Total Delay Over All Lanes(pcuHr): 12.10

Scenario 2: 'Option 2b PM' (FG2: 'Proposed Option 2b 2031 PM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network: Option 2b	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**44.1%**	**308**	**18**	**0**	**8.5**	**-**	**-**	**-**	**-**
Sturry Level Crossing	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**44.1%**	**308**	**18**	**0**	**8.5**	**-**	**-**	**-**	**-**
1/1	Sturry Hill S Ahead	U	A		1	720	-	389	2015	1614	24.1%	-	-	-	2.5	23.5	23.9	24.0	19.1
2/1		U	-		-	-	-	369	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
3/1+3/2	Island Road Left Right	U+O	B -		1	720	-	687	2040:1940	827+730	44.1 : 44.1%	305	17	0	5.7	29.7	52.9	53.3	29.4
4/1		U	-		-	-	-	759	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
5/1+5/2	Sturry Hill N Ahead Left	U+O	-		-	-	-	763	2015:1940	2004+11	37.9 : 37.9%	3	1	0	0.3	1.4	0.0	0.3	-
6/1		U	-		-	-	-	711	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	100	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

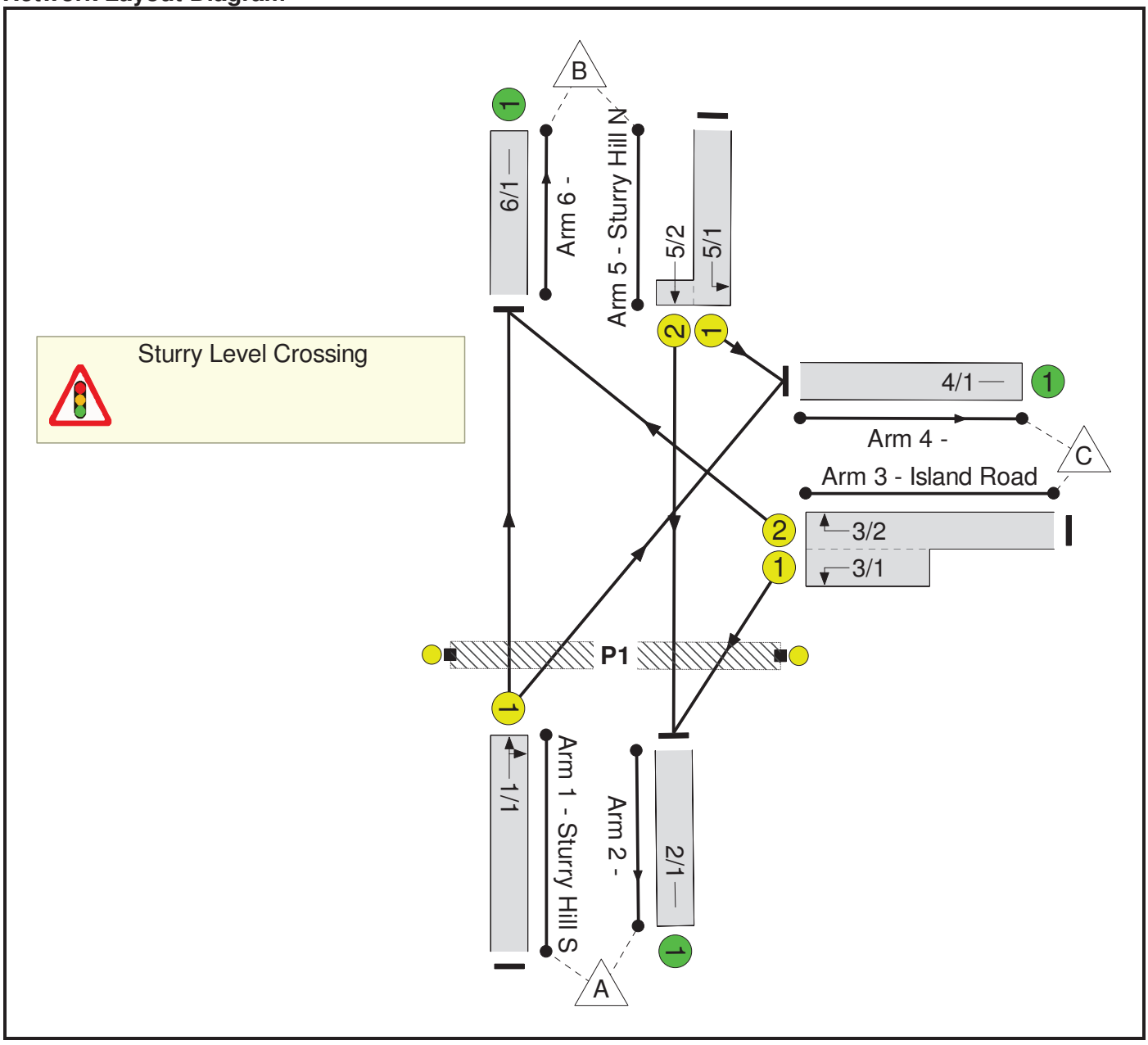
C1 PRC for Signalled Lanes (%): 103.9 Total Delay for Signalled Lanes (pcuHr): 8.20 Cycle Time (s): 900
PRC Over All Lanes (%): 103.9 Total Delay Over All Lanes(pcuHr): 8.51

LinSig V1 style report

User and Project Details

Project:	**Sturry Level Crossing**
Title:	
Location:	
File name:	Sturry - Option 4.lsg3x
Author:	IW
Company:	RSK
Address:	Manchester M1 2EJ
Notes:	

Network Layout Diagram



Phase Input Data

A	Traffic		7	7
B	Traffic		7	7
C	Pedestrian		100	100
D	Traffic		7	7
E	Traffic		7	7
F	Bus		7	7

Phase Intergreens Matrix

		Starting Phase					
			B	C	D	E	F
Terminating Phase	A		7	40	7		7
	B	7					7
	C	40					40
	D	7					
	E				-		7
	F	7	7	40			

Phase Delays

There are no Phase Delays defined					

Prohibited Stage Change

		To Stage			
		1	2	3	4
From Stage	1		7	7	40
	2	7		7	40
	3	7	7		40
	4	40	40	40	

Phases in Stage

Stage No.	Phases in Stage
1	A E
2	B E
3	D F
4	B C D

Give-Way Lane Input Data

Junction: Sturry Level Crossing
There are no Opposed Lanes in this Junction

Lane Input Data

1/1 (Sturry Hill S)	U	A	2	3	60.0	Geom	-	4.00	0.00	Y	Arm 4 Right	Inf
											Arm 6 Ahead	Inf
2/1	U		2	3	60.0	Inf	-	-	-	-	-	-
3/1 (Island Road)	U	E	2	3	5.0	Geom	-	3.25	0.00	Y	Arm 2 Left	Inf
3/2 (Island Road)	U	B	2	3	60.0	Geom	-	4.25	0.00	Y	Arm 6 Right	Inf
4/1	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (Sturry Hill N)	U	D	2	3	60.0	Geom	-	4.00	0.00	Y	Arm 4 Left	Inf
5/2 (Sturry Hill N)	U	F	2	3	1.0	Geom	-	3.25	0.00	Y	Arm 2 Ahead	Inf
6/1	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

1: 'Proposed Option 4b 2031 AM'	07:45	08:45	01:00	
2: 'Proposed Option 4b 2031 PM'	16:45	17:45	01:00	

Traffic Flows, Desired

FG1: 'Proposed Option 4b 2031 AM'

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	119	176	295
	B	4	0	450	454
	C	655	527	0	1182
	Tot.	659	646	626	1931

FG2: 'Proposed Option 4b 2031 PM'
Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	204	256	460
	B	4	0	530	534
	C	351	343	0	694
	Tot.	355	547	786	1688

LinSig V1 style report

Network Results

Scenario 1: 'Option 4b AM' (FG1: 'Proposed Option 4b 2031 AM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**99.3%**	**0**	**0**	**0**	**106.2**	-	-	-	-
Sturry Level Crossing	-	-	-		-	-	-	-	-	-	**99.3%**	**0**	**0**	**0**	**106.2**	-	-	-	-
1/1	Sturry Hill S Right Ahead	U	A		3	130	-	295	2015	298	99.1%	-	-	-	18.8	229.0	26.3	34.2	22.5
2/1		U	-		-	-	-	659	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
3/2+3/1	Island Road Left Right	U	B E		4:3	620:638	-	1182	2040:1940	531+660	99.2 : 99.2%	-	-	-	44.8	136.3	137.5	152.6	75.4
4/1		U	-		-	-	-	626	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
5/1+5/2	Sturry Hill N Ahead Left	U	D F		3	202:47	-	454	2015:1940	453+4	99.3 : 99.3%	-	-	-	42.7	338.6	84.4	94.3	65.1
6/1		U	-		-	-	-	646	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	100	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1

PRC for Signalled Lanes (%): -10.3
PRC Over All Lanes (%): -10.3

Total Delay for Signalled Lanes (pcuHr): 106.22
Total Delay Over All Lanes(pcuHr): 106.22

Cycle Time (s): 900

LinSig V1 style report

Scenario 2: 'Option 4b PM' (FG2: 'Proposed Option 4b 2031 PM', Plan 1: 'Network Control Plan 1')

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)	Back of Uniform Q At End of Red(pcu)
Network	-	-	-		-	-	-	-	-	-	**87.0%**	**0**	**0**	**0**	**58.5**	-	-	-	-
Sturry Level Crossing	-	-	-		-	-	-	-	-	-	**87.0%**	**0**	**0**	**0**	**58.5**	-	-	-	-
1/1	Sturry Hill S Right Ahead	U	A		3	234	-	460	2015	531	86.7%	-	-	-	16.9	132.4	41.7	44.7	31.9
2/1		U	-		-	-	-	355	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
3/2+3/1	Island Road Left Right	U	B E		4:3	446:568	-	694	2040:1940	395+404	86.8 : 86.8%	-	-	-	18.0	93.4	70.5	73.6	49.1
4/1		U	-		-	-	-	786	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
5/1+5/2	Sturry Hill N Ahead Left	U	D F		3	272:117	-	534	2015:1940	609+5	87.0 : 87.0%	-	-	-	23.6	159.0	58.3	61.4	42.6
6/1		U	-		-	-	-	547	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0	0.0	-
Ped Link: P1	Railway	-	C		1	100	-	0	-	0	0.0%	-	-	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 3.5 Total Delay for Signalled Lanes (pcuHr): 58.51 Cycle Time (s): 900
PRC Over All Lanes (%): 3.5 Total Delay Over All Lanes(pcuHr): 58.51