



# Tyburn Roundabout ±Option Development and Appraisal Report



Final Report

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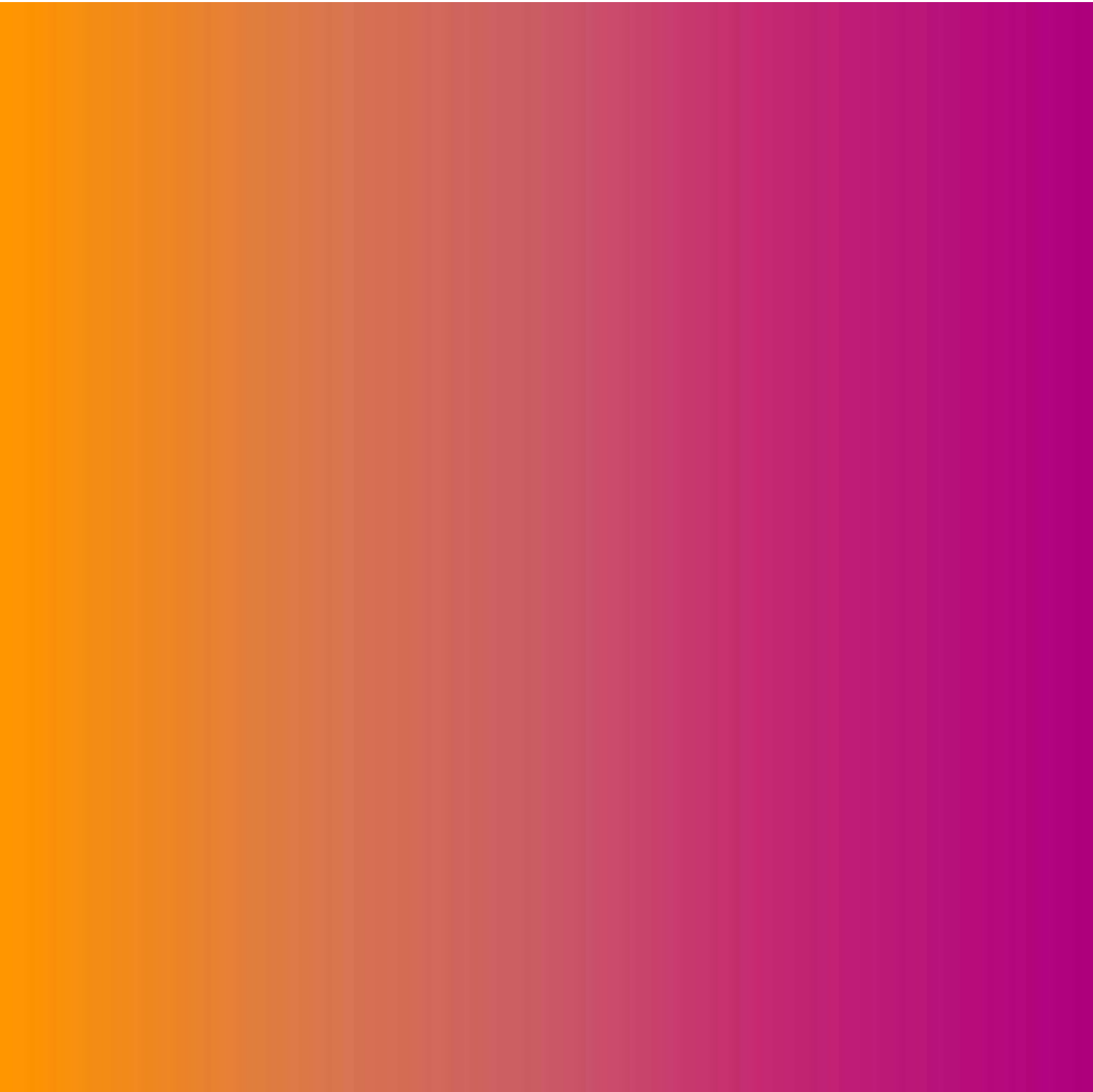
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### Construction (Design and Management) Notes

There are numerous statutory undertakers in this location that are affected by the proposed mitigation measures. These are detailed in the report and also in risk register.

# 1 Introduction



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### 1.1 Overview

This report details options tested for the A38/A452 Tyburn House roundabout in Birmingham to accommodate the growth projected by strategic modelling of a 2031 future year scenario.

### 1.2 Background

The Birmingham Development Plan (BDP) sets out the sta



## 2 Observed Conditions

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### 2.3 Site observations

AECOM undertook a PM peak site visit on 6<sup>th</sup> March 2014 and an AM peak site visit on the 25<sup>th</sup> of the same month. The general observations during the site visits were:

The A452 Chester Road north approach operates over capacity in both peaks and queues extend back to the B4148/A452 roundabout, which is 550m north of the junction.

The A38 Kingsbury Road East approach operated with long queues (~500m) during the AM peak but with shorter queues in PM peak.

On the A452 Chester Road south approach, long queues (~600m) were observed only in the PM peak which extended back to the A47/A452 roundabout but did not appear to affect its operation.

The A38 Kingsbury Road west approach had short queues in the AM peak but long queues (750m) in the PM peak.

The approaches are shown in Figures 2.1-2.4, below, during the site visit.



Figure 2.1: A38 East Approach Queues in AM peak



Figure 2.2: A38 West Approach Queues in PM peak



Figure 2.3: A452 North Approach Queues in PM peak



Figure 2.4: A452 South Approach Queues in AM peak



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maximum values)

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Company Name	Apparatus at location ?	Date Received	Comments	Status
Vodafone	Yes	10/03/2014	Ex-cable&Wireless UK Network cable runs through and across the A452 Chester Road. Ex-Energis Network (now Vodafone) cable runs across the A38 Kingsbury Road.	C3 enquires will be required
Western Power Distribution	Yes	04/03/2014	High voltage 33kV cable runs along the left edge of the A452 Chester Road South and through the junction to the A452 Chester Road North. A 33kV cable also runs around the east edge of the junction and under the A38 east approach. Low voltage cables run through the junction and also around the edges of the junction. There are also overhead cables of 11 kV within the junction enquiry area.	C3 enquires will be required
AWE Pipeline	No	04/03/2014	A response has been received from LinesearchbeforeUdig that they do not have any equipment within the site area.	No 0 0 1 476.38 550.

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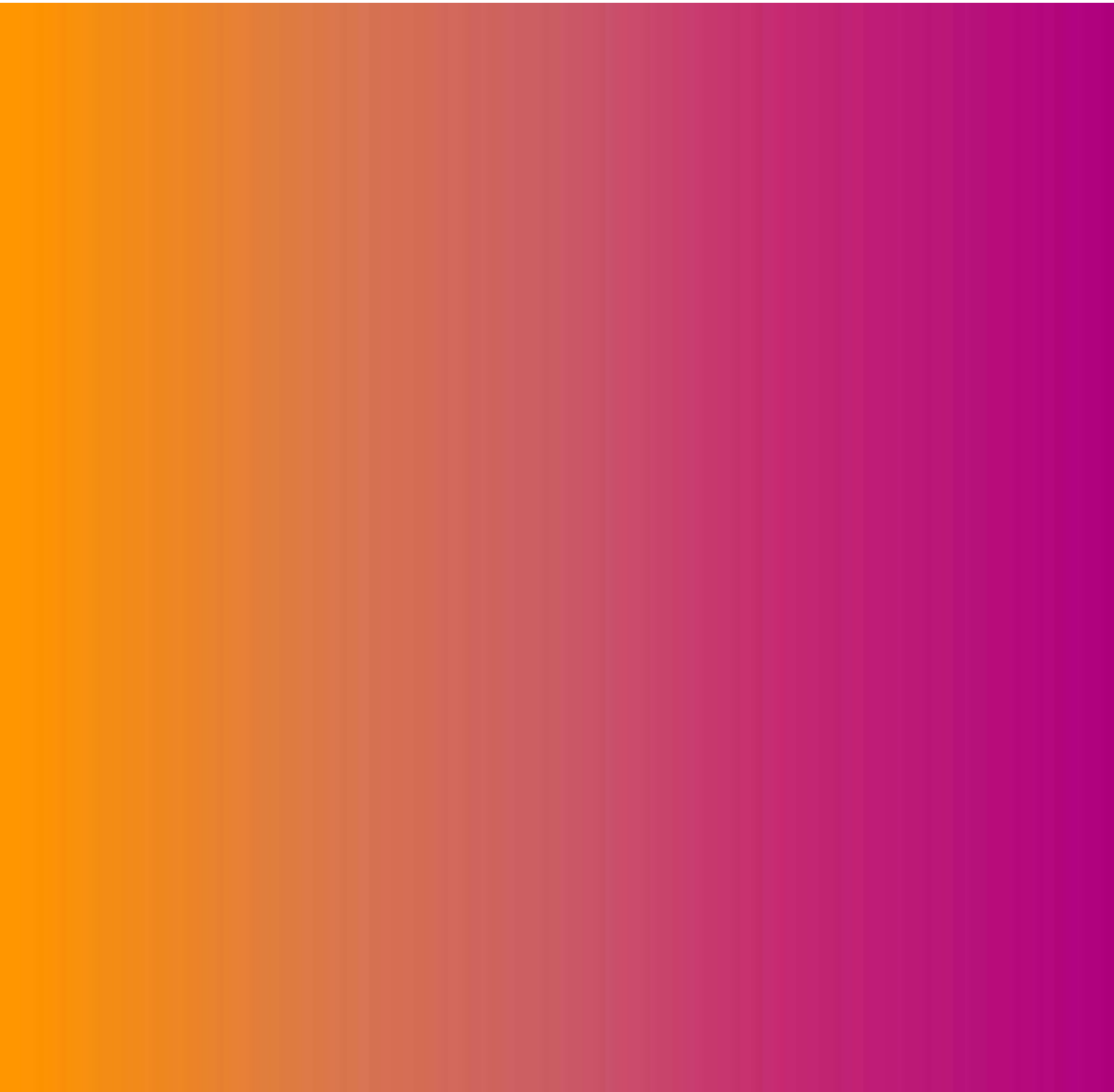
Company Name	Apparatus at location ?	Date Received	Comments	Status
Perenco UK Limited	No	04/03/2014	A response has been received from LinesearchbeforeUdig that they do not have any equipment within the site area.	No further action anticipated.
Phillips 66	No	04/03/2014	A response has been received from LinesearchbeforeUdig that they do not have any equipment within the site area.	No further action anticipated.
Premier Transmission Ltd	No	04/03/2014	A response has been received from LinesearchbeforeUdig that they do not have any equipment within the site area.	No further action anticipated.
RWEpower	No	04/03/2014	A response has been received from LinesearchbeforeUdig that they do not have any equipment within the site area.	No further action anticipated.
SABIC UK Petrochemicals	No	04/03/2014	A response has been received from LinesearchbeforeUdig that they do not have any equipment within the site area.	No further action anticipated.
Scottish Power Generation	No	04/03/2014	A response has been received from LinesearchbeforeUdig that they do not have any equipment within the site area.	No further action anticipated.
Seabank Power Ltd	No	04/03/2014	A response has been received from LinesearchbeforeUdig that they do not have any equipment within the site area.	No further action anticipated.
Shell Pieplines	No	04/03/2014		

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Company Name	Apparatus at location ?	Date Received	Comments	Status
Utilicom Limited	No	06/03/2014	A reply has been received from the company that they do not know of their equipment within the area.	No further action anticipated .
Verizon Limited	No	05/03/2014	A response has been received that they do not have any equipment within the site area.	No further action anticipated.
Wingas Storage UK Ltd	No	04/03/2014	A response has been received from LinesearchbeforeUdig that they do not have any equipment within the site area.	No further action anticipated.
York Potash	No	04/03/2014	A response has been received from LinesearchbeforeUdig that they do not have any equipment within the site area.	No further action anticipated.
Vtesse Networks	Unclear	-	No data provided	A further enquiry should bBT /F1 9 Tf



### 3 Base Model



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### 3.1 Modelling Approach Overview

A 2009 base model has been built with ARCADY 6 software using 2009 flows and subsequently validated against the 2009 queue survey data. This has enabled impr

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Results		2009 AM - Site Intercept correction		2009 PM - Site Intercept correction	
Arm	Approach	RFC	Queue	RFC	Queue
A	Chester Rd N	0.972	18	1.021	34
B	Kingsbury E	1.072	42	0.405	1
C	Chester Rd S	0.816	4	0.978	21
D	Kingsbury W	0.436	1	1.229	77

Note: RFC is Ratio of Flow to Capacity; Queues are in PCUs

Table 8: 2009 AM and PM Peak - Base Model Results

The queue results from the validated models have been compared to the 2009 survey data and as shown in Tables 9 and 10 below for the AM and PM peaks respectively.

Time



## 4 Future Year Model

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#### 4.1 Introduction

This section describes the modelling for the 2031 future year flow test for the Tyburn roundabout for the existing network. The do nothing models include the Chester Road Improvements as these are considered as committed.

#### 4.2 2031 Future Year Flows

Mott MacDonald on behalf of BCC have provided 2031 future year flows based on the strategic PRSIM model which was developed in support of the BDP. Mott MacDonald have advised that the flows are based on the μ' H Y H O R S P H Q W & PRISM forecasts (i.e. including the greenbelt development). Actual Vehicle Flows have been provided for the AM and PM average hour models. AECOM have not checked the PRISM model flows and have used them as provided by Mott Mac Donald.

DMRB (Volume 12, Section 1, Part 1, TAM) discusses the







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Table 18: 2031 Overall Delay at the junction

The results from the model indicate that the junction would operate with severe queues on the Kingsbury Road

## 5 Option Development

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## 5.1 Introduction

This section describes the various options considered for the A38/A452 Tyburn roundabout as mitigation measures.

In order to maintain deliverability of any improvement works, by avoiding high cost items; the following constraints were identified;

There are both gas and electricity substations on the southern corner of the A38(E) approach, these will be too costly to move, therefore any widening is limited to widening

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Initial testing has been undertaken in LINSIG v 3.2.12. The results from the model are in Table 19.

Results		2031 AM		2031 PM	
Arm	Approach	DOS (%)	MMQ	DOS (%)	MMQ
A	Chester Rd N	158	140	134	91
B	Kingsbury Rd E	158	183	164	216
C	Chester Rd S	154	149	163	154
D	Kingsbury Rd W	94	12	128	105
Total Junction Delay (pcu hr)		787.82		1155.71	

Note: DoS is Degree of Saturation. MMQ is Mean Maximum Queue expressed in PCUs

Table 19: 2031 Future Year Model Results for Option 1

The results suggest that this option operates better than the do nothing option. However, the junction still does not operate effectively and severe queues are shown on the A38 Kingsbury Road east, Chester Road north and south approaches in the AM peak and in the PM peak severe queues are shown on all approaches, to the junction. The additional lanes required to make this junction work as a crossroads cannot be accommodated within the constraints of the available land. Due to the limited improvement, for a substantial scheme, and the difficulty of implementation this option has been discounted.

### 5.2.2

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Figure 5.2: Draft sketch - Option 2 .

Testing in TRANSYT v14.1.2.315 indicated that there would be severe queues on the A38 Kingsbury Road east in both peaks but the remaining approaches appear to operate reasonably. The results from the model are tabulated in Table 20.

Results		2031 AM		2031 PM	
Arm	Approach	DOS (%)	MMQ	DOS (%)	MMQ
A	Chester Rd N	76	3	81	5
B	Kingsbury Rd E	113	115	119	160
C	Chester Rd S	85	7	85	18
D	Kingsbury Rd W	68	7	90	10
Total Junction Delay (pcu -hr/hr)		170.06		236.44	

Note: DoS is Degree of Saturation. MMQ is Mean Maximum Queue expressed in PCUs

Table 20: 2031 Future Year Model Results for Option 2

Table 20 indicates that to improve the operation of the roundabout further modifications are necessary along the A38 Kingsbury Road East as queues exceed 115PCUs in both peak periods. Therefore this option has been refined with widening to create OpBT 10 g 1 G .

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Proposed toucan crossings on the A38 Kingsbury Road west approach and the existing pedestrian crossing on the A38 Kingsbury Road east is moved in front of the stop line.

A drawing of Option 3 is included in Appendix G. The option has been assessed in TRANSYT 15 V15.0.1.2976 using the 2031 future year flows.

Flows in the model have been balanced using the lane balancing option in TRANSYT. Queue limits have been applied on the circulatory stop lines and delay and stop weightings have been used on the paths at the circulatory to give priority for these movements so that queues are predominantly held on the entries.

The 72 second cycle time used in the model results in better operation than a 60 second cycle time based on cycle time optimisation (CYOP) analysis. Phase minimums used for the signals are seven seconds for traffic and five seconds for pedestrians.

#### *Flow Test 1*

The model has been run with flow test 1 and the results indicate that with the doubling of demand to 2031, the roundabout operates above capacity where the highest degree of saturation, of 114%, occurs on the Chester Rd North in the AM peak and 129% on the Kingsbury Road West in the PM peak. Full model outputs for this option are in Appendix H.

The results from the Option 3 TRANSYT model have been compared with the 2031 Future Year Existing Layout ARCADY model in Table

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internal queues should be revisited as part of the detailed design stage. If required, modelling using software capable of assessing the impact of blocking back should also be undertaken.

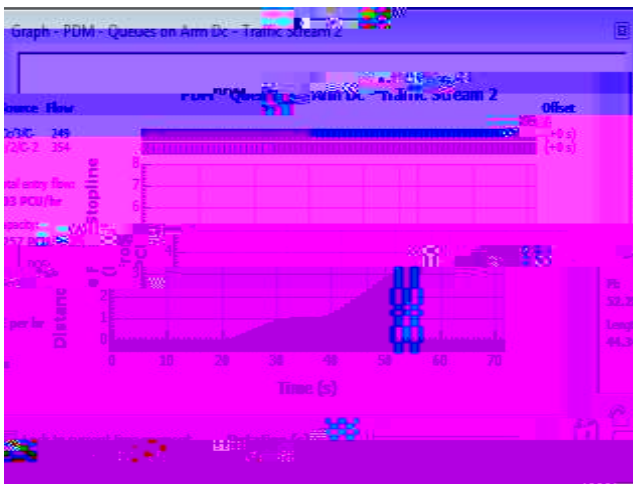


Figure 5.1 A452 Chester Road N Circulatory AM peak

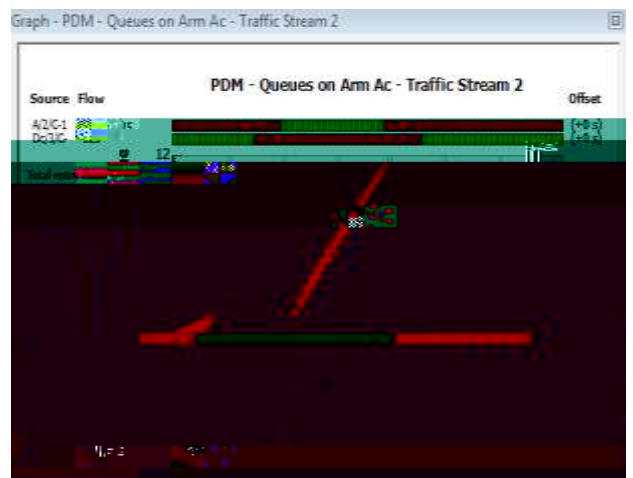


Figure 5.2 A38 Kingsbury Road E Circulatory AM peak



Figure 5.3 A452 Chester Road S Circulatory AM peak



Figure 5.4 A38 Kingsbury Road W Circulatory AM peak





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Comparison of delay for the Do Nothing and Proposed Option 3 is shown in Table 22 which shows that overall delay at the junction is reduced significantly as a result.

Junction Delay	2031 AM		2031 PM	
	Do Nothing (min /veh)	Option 3 Model (min/pcu)	Do Nothing (min /veh)	Option 3 Model (min/pcu)
A38/A452 Tyburn rounda bout	2.33	0.21	7.62	0.39

Table 22: Comparison of 2031 Future Year Model Delay between Do Nothing and Proposed Option 3 layout

It should be noted that the high levels of delay in the base model are primarily a result of queues on the Chester Road north and Kingsbury Road east approaches in the AM peak and the Kingsbury Road west approach in the PM peak. The proposed Option 3 results in improvement over the do nothing scenario as the signals better manage the traffic demand and therefore distribute delays more effectively at the junction.

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Results			2031 AM				2031 PM			
			Do Nothing		Option 3 Model		Do Nothing		Option 3 Model	
Arm	Approach	RFC	Queue	DoS (%)	MMQ	RFC	Queue	DoS (%)	MMQ	
A	Chester Rd N	1.253	147	130	93	0.809	4	160	137	
B	Kingsbury Rd E	1.282	208	100	25	0.813	4	98	22	
C	Chester Rd S	0.874	6	110	57	0.930	11	114	70	
D	Kingsbury Rd W	0.542	1	62	7	2.613	802	172	127	
Total Junction Delay (pcu-hr/hr)				251.58				689.86		

Note: RFC is Ratio of Flow to Capacity and DoS is Degree of Saturation. MMQ is Mean Maximum Queue expressed in PCUs  
Table 24: C

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Providing an east-west cut through would require acquisition and demolition of property to the north-west and north east of the junction as well as relocation of statutory undertakers equipment (including possible relocation of gas and electrical sub-stations) to the north-west and north east of the junction.





## 7 Summary & Recommendation

