SKANSKA

Cromwell Road

Wisbech Access Study

August 2017

Wisbech Access Study

Cromwell Road

Cambridgeshire County Council / Fenland District Council

August 2017

This document and its contents have been prepared and are intended solely for Cambridgeshire County Council / Fenland District Council's information and use in relation to the Wisbech Access Study.

Document history

Job number: 5040201.001			**Document ref:** WAS_01_Cromwell Road			
Revision	**Purpose description**	**Originated**	**Checked**	**Reviewed**	**Authorised**	**Date**
V1	Initial Draft	HT	RMJ	JB	RMJ	
V2 / v3	Draft	HT	RMJ	JB	RMJ	
V4	Final Draft	HT	RMJ	JB	RMJ	04.08.2017

Client sign off

Client	
Project	
Document title	
Job no.	
Copy no.	
Document reference	

SKANSKA

Contents

Figures

Tables

1 Introduction

Wisbech Access Study

This assessment forms part of the first phase of the Wisbech Access Study. The Wisbech Access Study consists of two distinct phases. The first phase is a series of individual scheme assessments, and the second phase of the study consists of a packaging assessment, as shown in Figure 1.1 beneath. Note that this assessment is highlighted in green to demonstrate its relationship to the wider study.

Figure 1.1: Wisbech Access Study Components

Operation of Cromwell Road

The B198 Cromwell Road (Cromwell Road) is one of the nine scheme areas included within the wider Wisbech Access Study. Cromwell Road is the key corridor into Wisbech from the A47 and the southwest, and runs adjacent to the River Nene along the western side of the town. This study focuses on improving the operation of Cromwell Road to accommodate proposed development traffic, through a series of junction and / or carriageway improvements.

The inclusion of Cromwell Road within the Wisbech Access Study is primarily to address existing capacity restraints and peak hour congestion, and to mitigate the impact of future development traffic, which is anticipated to have a significant impact on the lower portion of Cromwell Road between Weasenham Lane and the A47.

Existing issues on the approach to Freedom Bridge Roundabout are discussed within this report, when considering the potential impact on Cromwell Road. However, options to address issues for the roundabout are reported within the Freedom Bridge Roundabout Report (see Figure 1.1), which informs this element of the study.

Scheme Location

Cromwell Road is located to the west of Wisbech, between Freedom Bridge Roundabout in the north and the A47 / Cromwell Road roundabout in the south. Figure 1.2 on the following page shows the location of road in relation to the rest of Wisbech.

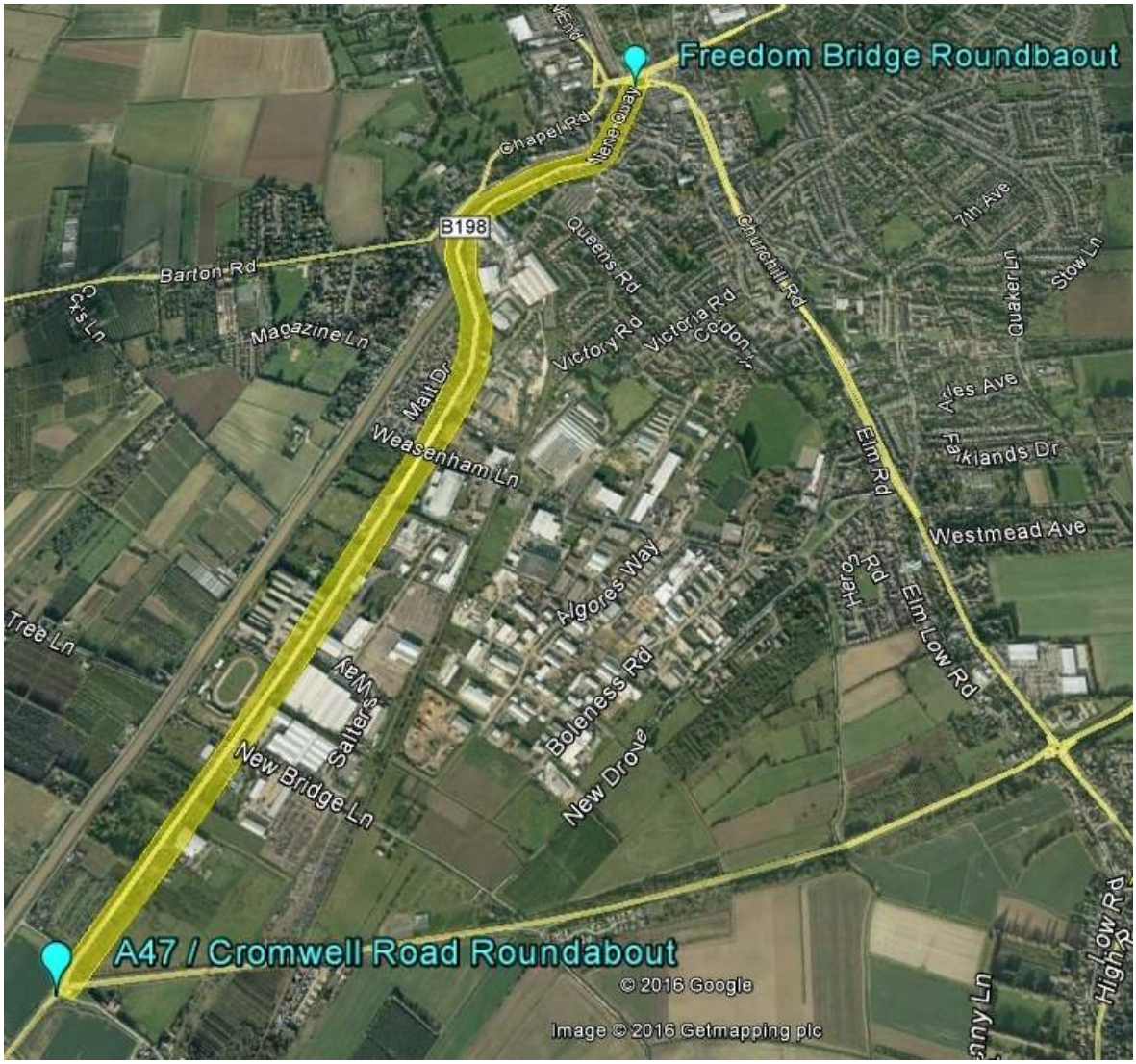


Figure 1.2: Scheme Location In Relation to Wisbech

Cromwell Road is a single carriageway road and is approximately 1.9 miles long. Along the corridor there are four signalised junctions, which provide access to residential, commercial and industrial areas. These junctions include (south to north):

- Traffic lights at the Tesco store / cinema site;
- Traffic lights at the Lidl / retail park;
- Traffic lights at the Reason Homes Development and Weasenham Lane; and,
- Junction with Town Bridge / Market Place Area.

2 Existing Conditions

Introduction

Existing conditions along the corridor for key junctions such as Freedom Bridge Roundabout, Town Bridge, Weasenham Lane, New Bridge Lane and the A47 / Cromwell Road Roundabout are considered within this chapter.

Additional conditions reported within this chapter, which correspond to the entire length of Cromwell Road corridor include:

- Accident Data;
- Land Ownership;
- Flood Risk; and,
- Environmental Considerations.

Each of the junctions mentioned above will be discussed in turn (north to south), with regards to traffic flow, queue lengths (with the exception of Town Bridge), journey times, delay and average speeds.

New Bridge Lane is discussed in regards to traffic flows only, due to the availability of data.

Freedom Bridge Roundabout

Traffic Flows

Turning counts were undertaken at Freedom Bridge Roundabout on the 14th January 2016. The survey recorded vehicle turning movements at the junction over a 12-hour period, between 07:00 -19:00. The day of the survey was considered typical, with no incidents reported that might affect the observed turning movements.

The results from the survey are shown beneath in Figures 2.1 to 2.3 for the 12-hour period, AM peak hour (08:00 – 09:00) and PM peak hour (17:00 – 18:00). The survey data shows the number of vehicles entering the corridor from the north via Freedom Bridge Roundabout. This analysis focused on the Nene Quay approach which forms part of the Cromwell Road Corridor. Further analysis of the other approaches is included within the Freedom Bridge Roundabout Scheme Report.

Survey results for the 12 hour period are shown on the following page:

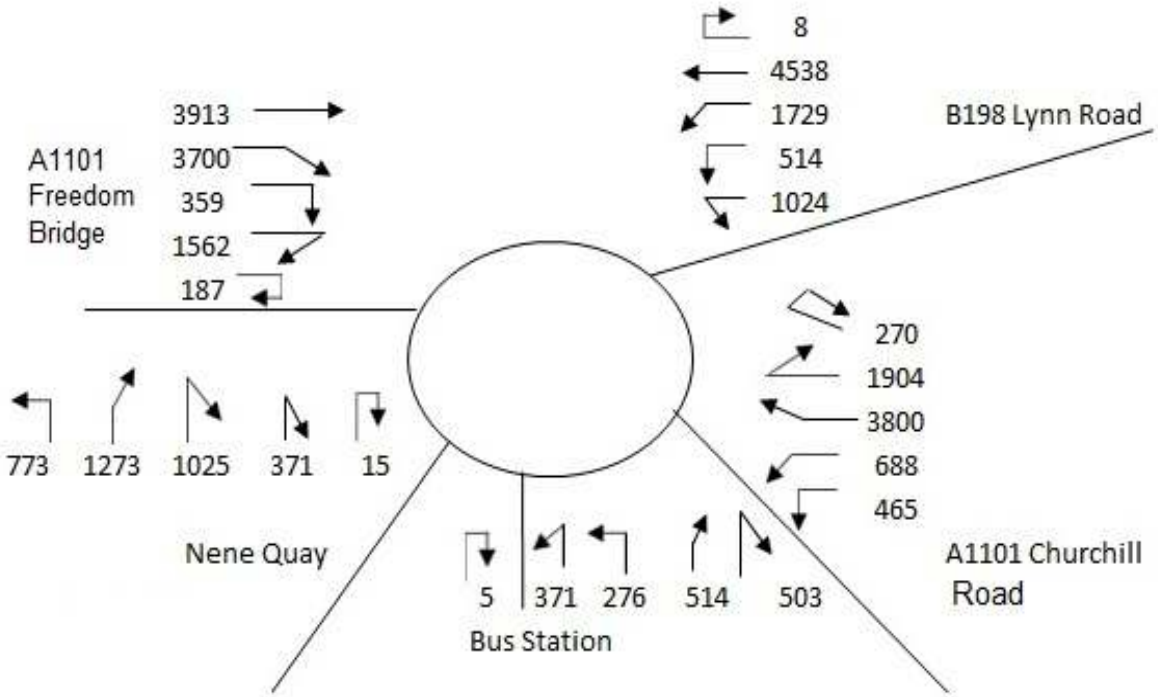


Figure 2.1: Freedom Bridge Roundabout 12 Hour Traffic Count (07:00 - 19:00)

Figure 2.1 shows that 3,457 vehicles originated from Nene Quay, and 4,365 vehicles were destined for Nene Quay, over the 12 hour period.

The dominant turning movement for both northbound (originating from Nene Quay) and southbound (arriving at Nene Quay) traffic is the B198 Lynn Road. However, there are also a significant number of trips travelling between Nene Quay and A1101 North End and A1101 Churchill Road.

The results for the AM peak hour are shown in Figure 2.2 beneath.

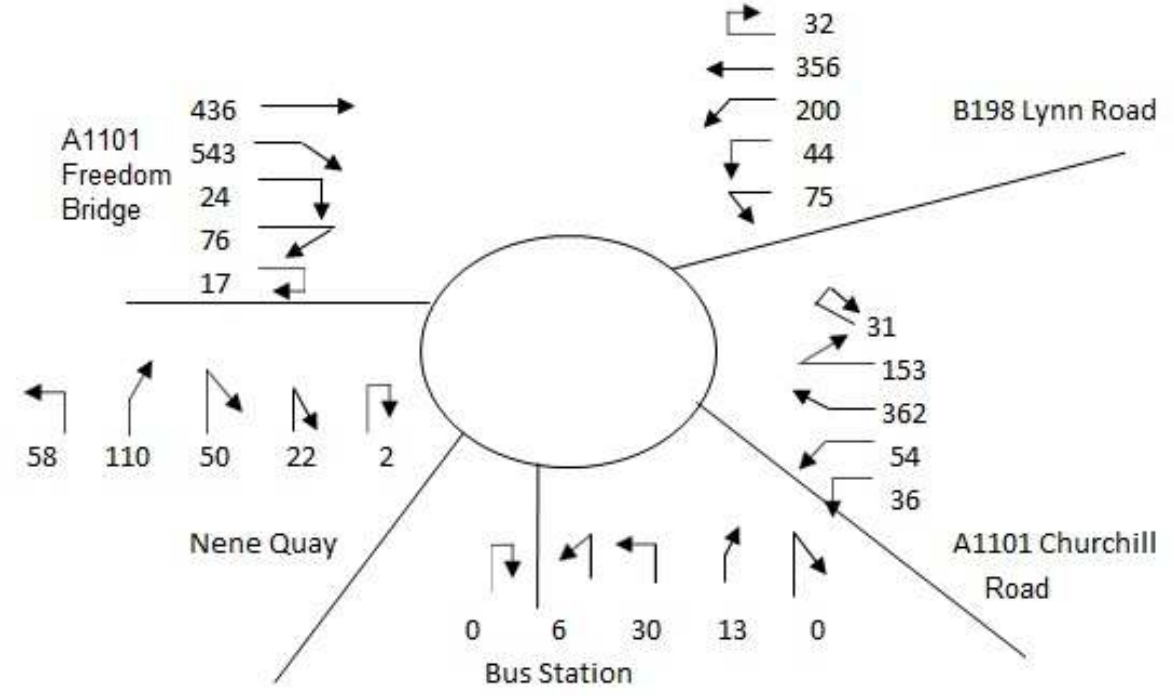


Figure 2.2: Freedom Bridge Roundabout AM Peak Hour Turning Count (08:00 - 09:00)

During the AM peak hour a total of 242 vehicles were recorded originating from the Nene Quay approach, whilst 338 vehicles were destined for Nene Quay. Similarly to the pattern shown across the 12 hour count, the highest turning movement in both directions was to / from the B198 Lynn Road.

Results from the PM peak hour are shown in Figure 2.3 beneath.

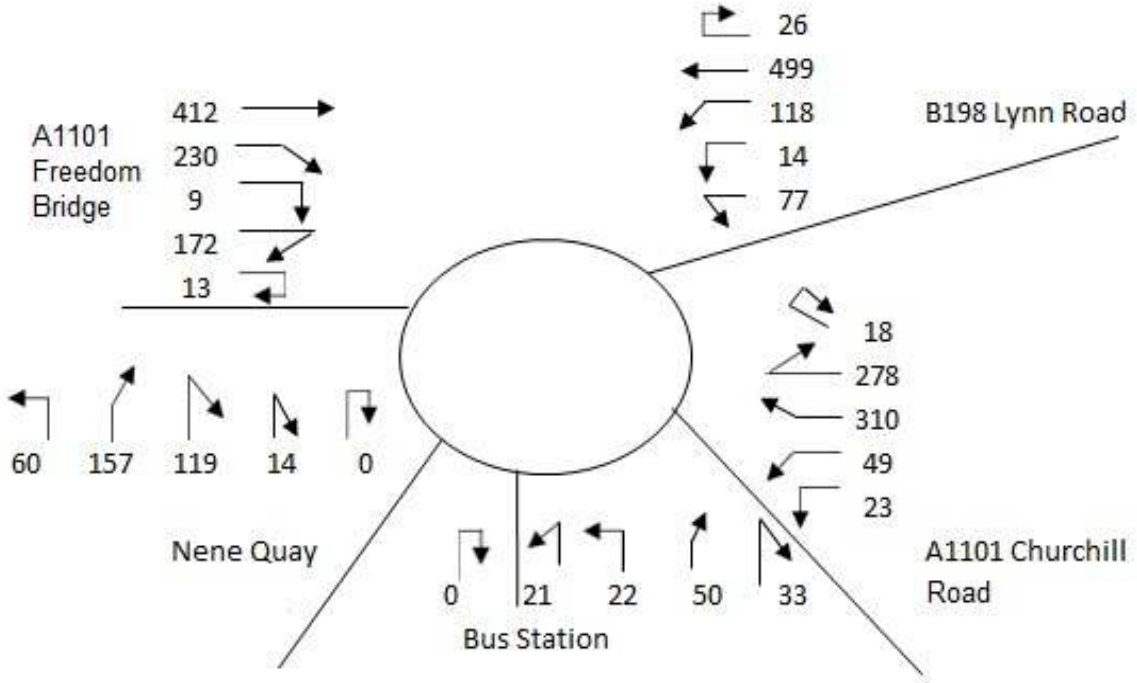


Figure 2.3: Freedom Bridge Roundabout PM Peak Hour Turning Count (17:00 - 18:00)

During the PM peak hour 350 vehicles originated from Nene Quay, whilst 260 vehicles were recorded entering Nene Quay from the roundabout. A comparison of the AM and PM peak hour traffic flows on the Nene Quay approach / exit to Freedom Bridge Roundabout show that there is a tidal flow, with a greater volume of traffic travelling southbound during the AM peak hour and northbound during the PM peak hour.

Queue Lengths

Queue length surveys were undertaken at Freedom Bridge Roundabout on the 14th January 2016, over a 12 hour period (07:00 -19:00). Only queue length data for the Nene Quay approach has been reported beneath, full details of queue lengths on each of the approaches to Freedom Bridge Roundabout are included within the Freedom Bridge Roundabout Scheme Report.

Please note, for these surveys a queue is defined as vehicles at a junction which are stationary or which have slowed to walking speed or less.

Table 2.1 and Figure 2.4 / 2.5 on the following pages show the maximum and average queue lengths observed on the B198 Nene Quay approach to Freedom Bridge Roundabout. Data is presented for the AM (08:00 – 09:00) and PM (17:00 – 18:00) peak hours, with data being representative of both the nearside and offside lanes.

Table 2.1: Maximum and Average Queue Lengths on the B198 Nene Quay Approach to FBR

Time Segment	AM		Time Segment	PM	
	Average (m)	Max (m)		Average (m)	Max (m)
08:00	0	0	17:00	0	0
08:05	0	0	17:05	0	0
08:10	5	10	17:10	32	45
08:15	0	0	17:15	22	40
08:20	0	0	17:20	25	45
08:25	0	0	17:25	0	0
08;30	0	0	17:30	2	5
08:35	0	0	17:35	0	0
08:40	0	0	17:40	10	20
08:45	5	10	17:45	5	10
08:50	0	0	17:50	7	15
08:55	5	5	17:55	0	0

The data shows that the queues are more prevalent during the PM peak hour, with queue lengths reaching a maximum length of 45 metres, compared to 10 metres in the AM peak hour.

Greater queue lengths in the PM peak hour on the approach to Freedom Bridge Roundabout may reflect the tidal flow indicated within the turning counts (Figures 2.2 and 2.4), with a greater volume of traffic travelling southbound during the AM peak hour and northbound during the PM peak hour.

The queue length survey results show that there was no significant queueing issue during the AM peak hour, with the average queue lengths being formed by approximately 1 - 2 vehicles.

Figures 2.4 and 2.5 on the following page shows this data for both peak hours, reported in 5 minute intervals.

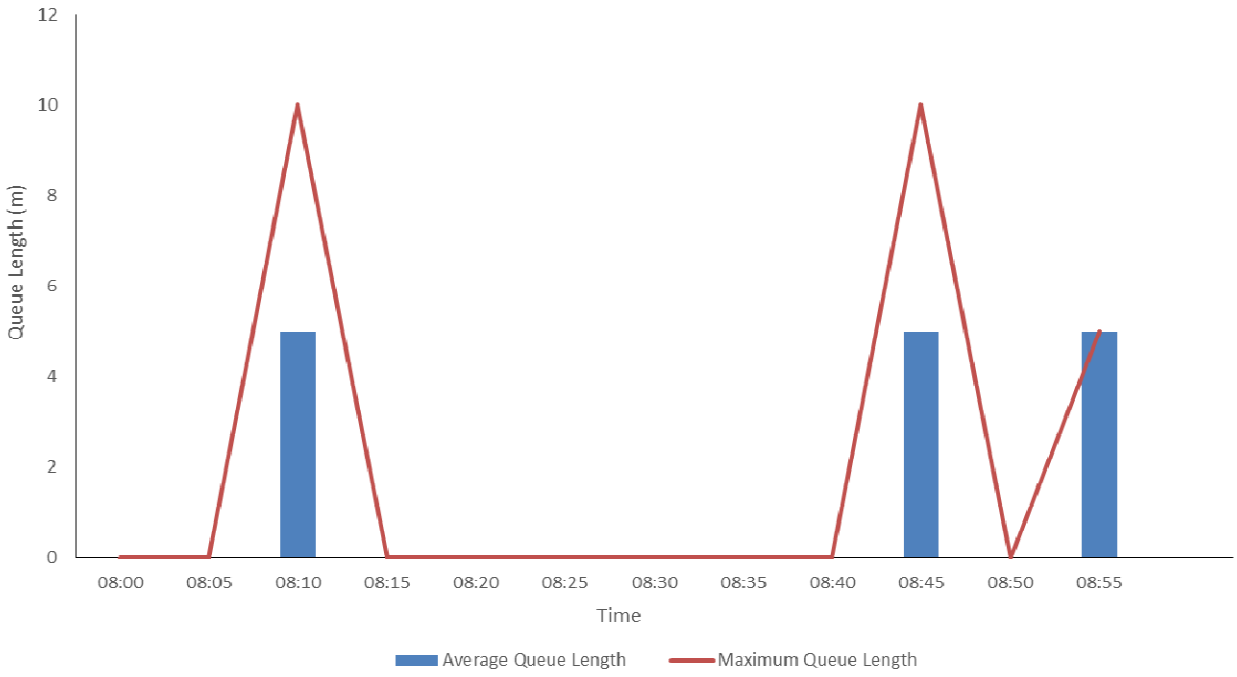


Figure 2.4: B198 Nene Quay Queue Lengths AM Peak Hour (08:00 - 09:00)

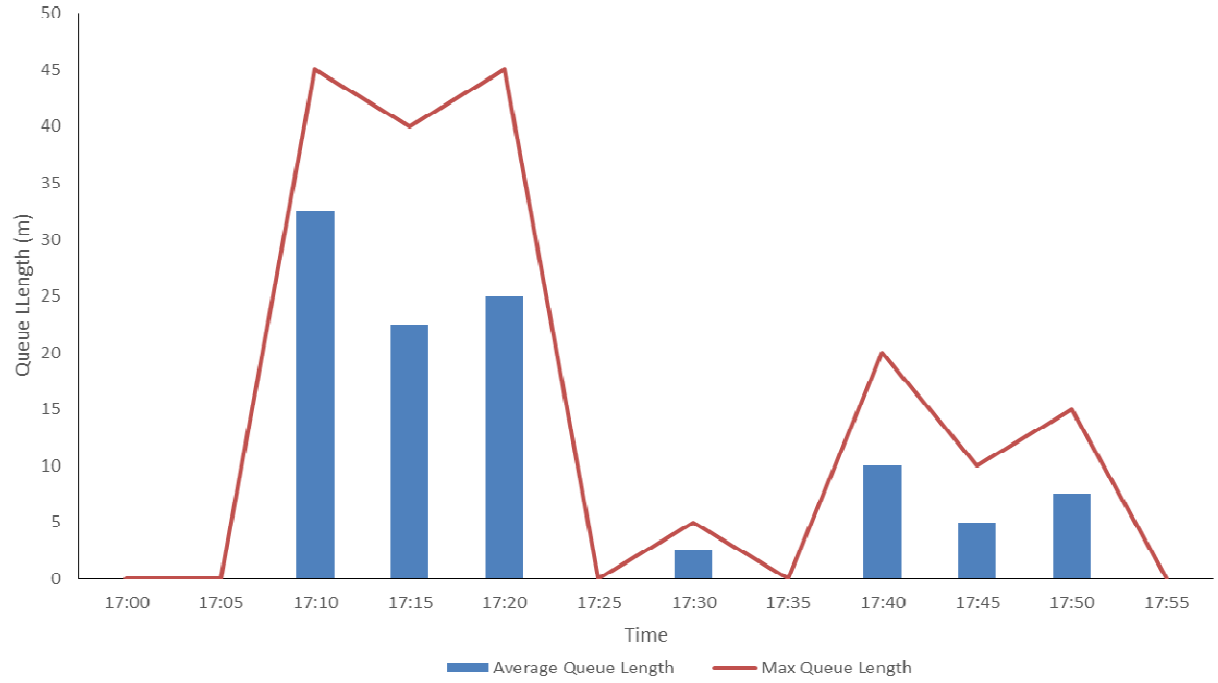


Figure 2.5: B198 Nene Quay Queue Lengths PM Peak Hour (17:00 - 18:00)

Journey Times and Delay

Satellite Navigation (TomTom) data has been used to assess journey times and delay on the B198 Nene Quay approach to Freedom Bridge Roundabout.

The TomTom dataset is based on information collected between 2nd November 2015 and 22nd January 2016, excluding weekends, bank holidays and the Christmas period. Time periods selected to assess journey time and delay include:

- Free Flow – between hours of 0:00 and 05:00;
- AM Peak – between hours of 08:00 and 09:00; and,
- PM Peak – between hours of 17:00 and 18:00.

Within the TomTom dataset the carriageway is divided into multiple sections called segments. In order to compare journey times and calculate delay, road segments have been totalled providing an average travel time for the length of the corridor.

To calculate delay, the average travel time for the Free Flow period has been used as the base measurement as it represents conditions of unobstructed travel. The additional travel time (beyond that recorded in the Free Flow period) for each of the peak hours is then taken as the delay, as shown in the equation below:

AM (or PM) Average Travel Time (s) – Free Flow Average Travel Time (s) = Delay (s)

The following tables highlight the journey time and delay for the Nene Quay approach to Freedom Bridge Roundabout. Segments used within this assessment total 303 metres (reaching Town Bridge).

Table 2.2: Journey Times and Delay for the Nene Quay Approach to FBR

Nene Quay		**Average Travel Time** (Seconds)	**Average Delay** (Seconds)
Free Flow	(00:00 – 06:00)	29.7	N/A
AM Peak	(08:00 – 09:00)	40.4	10.8
PM Peak	(17:00 – 18:00)	76.3	47.6

Table 2.2 shows the Free Flow time when approaching Freedom Bridge Roundabout is 29.7 seconds over 303 metres.

Nene Quay experiences delay across both peak hours, however PM peak hour delay is shown to be higher with 46 seconds added to journey times over this stretch. A higher PM peak hour delay reflects the higher volumes of traffic, as identified in Figure 2.3.

AM peak hour delay is shown to be less severe at 10.8 seconds. This is also demonstrated by the smaller queue lengths shown within Figure 2.4.

Average Speeds

Average speeds for the Nene Quay approach to Freedom Bridge Roundabout have been extracted from the same TomTom data set described above. Figures 2.6 and 2.7 on the following page highlight the average speeds and areas of congestion for both the AM and PM peak hours.

Figure 2.6: Nene Quay Average Speed AM Peak Hour (08:00 - 09:00)

The figure above shows the average speeds when approaching Freedom Bridge Roundabout during the AM peak are between 11 – 20mph.

Figure 2.7: Nene Quay Average Speed PM Peak Hour (17:00 - 18:00)

The figure above shows congestion is increased during the PM peak hour, with the average speed for motorists approaching Freedom Bridge Roundabout being recorded between 1 - 10mph.

Town Bridge

Traffic Flows

Turning counts were undertaken at Town Bridge on the 24th March 2016. The survey recorded vehicle turning movements at the junction over a 12-hour period, between 07:00 -19:00. The day of the survey was considered typical, with no incidents reported that might affect the observed turning movements.

The results from the survey are shown beneath in Figures 2.8 to 2.10 for the 12-hour period, AM peak hour (08:00 – 09:00) and PM peak hour (17:00 – 18:00). The following analysis of survey data focuses primarily on the approach of Old Market, in order to gain an understanding of the number of vehicles (during the peak hours) using Town Bridge as an alternative route to Freedom Bridge Roundabout and the southern section of the Cromwell Road corridor.

Survey results for the 12 hour period are shown beneath.

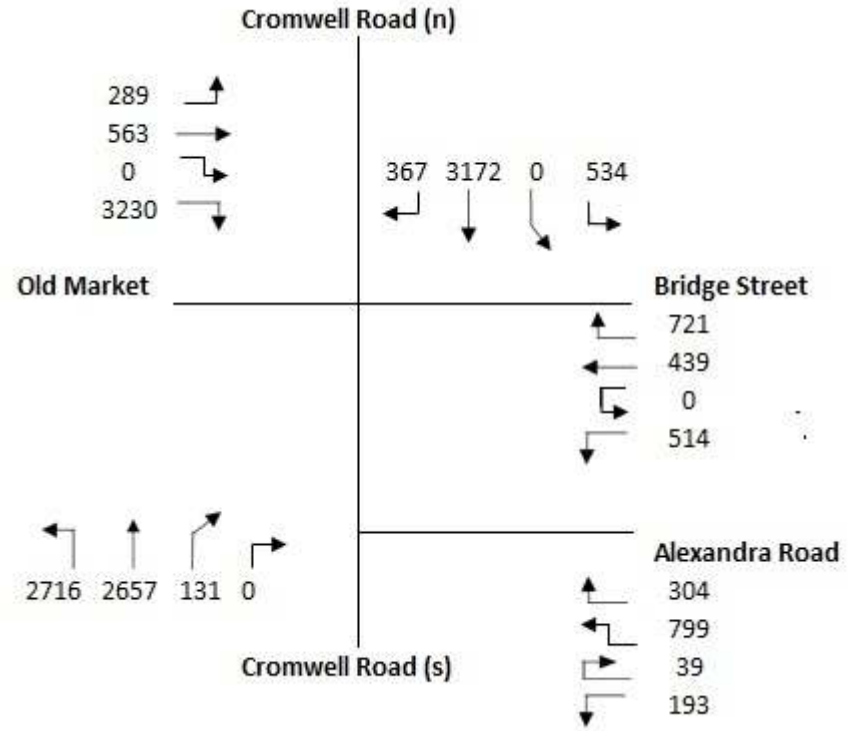


Figure 2.8: Town Bridge Junction 12 Hour Traffic Count (07:00 -19:00)

Over a 12 hour period, the number of vehicles originating from Old Market totals 4,082 vehicles, whilst 4,321 vehicles pass over Town Bridge. Of the total number of vehicles destined for Old Market, 2,716 vehicles originate from Cromwell Road South, which may suggest vehicles utilise Town Bridge in order to bypass Freedom Bridge Roundabout.

Ahead movements on Cromwell Road appear fairly unbalanced, with a greater (3,172) volume of traffic travelling southbound over the 12 hour period.

The results for the AM peak hour are shown in Figure 2.9 beneath.

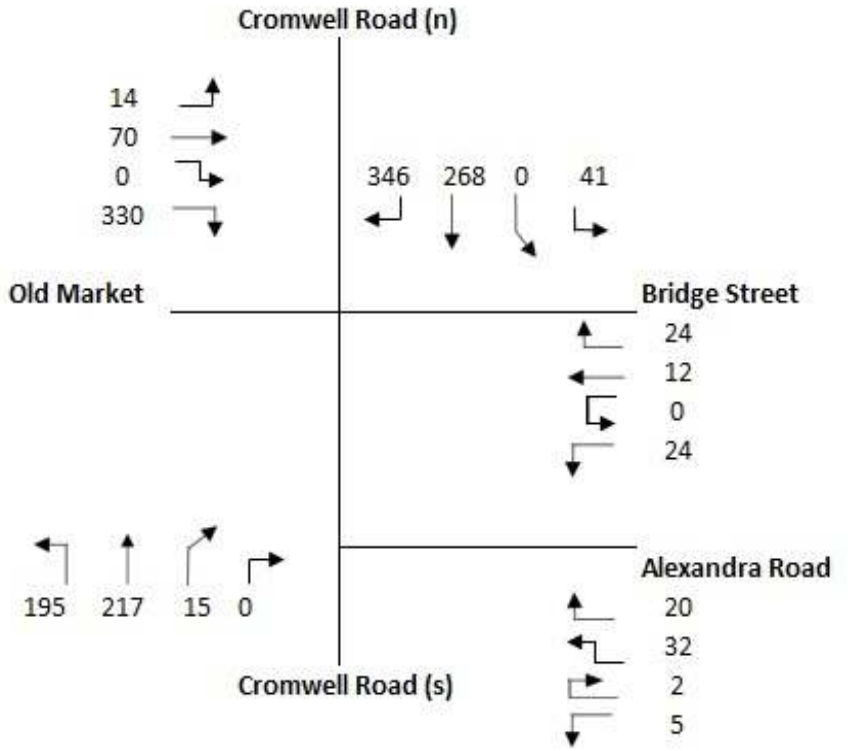


Figure 2.9: Town Bridge Junction AM Traffic Count (08:00 - 09:00)

During the AM peak hour a total of 414 vehicles were recorded originating from the Old Market approach, whilst 585 vehicles were destined from Cromwell Road. Similarly to the pattern shown across the 12 hour count, the highest turning movement from this approach is to Cromwell Road South.

Results from the PM peak hour are shown in Figure 2.10 on the following page.

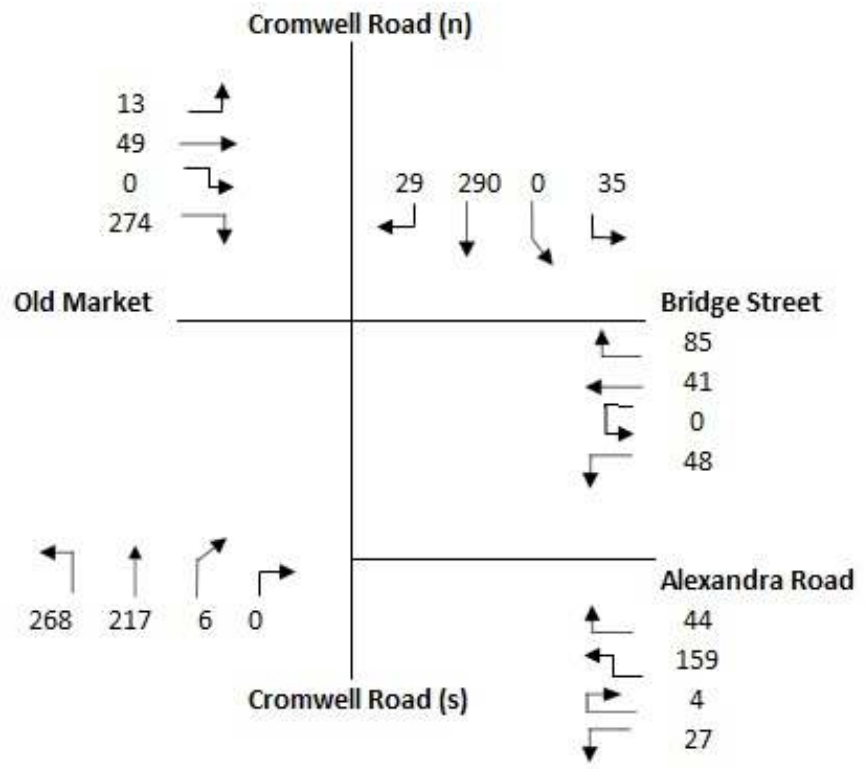


Figure 2.10: Town Bridge Junction PM Traffic Count (17:00 -18:00)

During the PM peak hour a total of 336 vehicles were recorded originating from the Old Market approach, whilst 497 vehicles were destined from Cromwell Road. In comparing peak hour traffic flows, results shows the number of vehicles both destined to and originating from this approach appear higher during the AM peak hour.

Journey Times and Delay

Satellite Navigation (TomTom) data has been used to assess journey times and delay on the Cromwell Road approaches, as well as the Old Market approach to Town Bridge Junction. Time periods selected for assessment include:

- Free Flow – between hours of 0:00 and 05:00;
- AM Peak – between hours of 08:00 and 09:00; and,
- PM Peak – between hours of 17:00 and 18:00.

The same method previously stated within this chapter has been used to calculate journey times and delay. Below provides a summary of the equation used for this assessment:

AM (or PM) Average Travel Time (s) – Free Flow Average Travel Time (s) = Delay (s)

The following tables highlight the journey time and delay for both the Cromwell North and South approaches alongside Old Market. Segments used within this assessment are indicated in Figure 2.11. The length of segments used varied per approach, which include:

- Old Market – 46.4 m;
- Cromwell Road North – 201.9 m; and,
- Cromwell Road South – 87.8 m.

Figure 2.11: Town Bridge Junction TomTom Segments used per Approach

Table 2.3: Journey Times and Delay for the Old Market Approach to Town Bridge Junction

Old Market Approach		**Average Travel Time** (Seconds)	**Average Delay** (Seconds)
Free Flow	(00:00 – 06:00)	5.8	N/A
AM Peak	(08:00 – 09:00)	27.5	21.6
PM Peak	(17:00 – 18:00)	18.3	12.5

Table 2.3 shows the Free Flow time when approaching the junction from this approach is 5.8 seconds over 46 metres.

Old Market approach experiences delay across both peak hours, however the AM peak hour delay is shown to be higher with 21.6 seconds added to journey times. A higher AM peak hour delay reflects the higher volumes of traffic originating from this approach, as identified in Figure 2.9.

PM peak hour delay is shown to be less severe at 12.5 seconds. This is also demonstrated by the smaller queue lengths shown within Figure 2.10.

Table 2.4: Journey Times and Delay for the Cromwell Road North Approach to Town Bridge Junction

Cromwell Road North Approach		Average Travel Time (Seconds)	Average Delay (Seconds)
Free Flow	(00:00 – 06:00)	20.2	N/A
AM Peak	(08:00 – 09:00)	24.3	4.1
PM Peak	(17:00 – 18:00)	27.1	6.9

Table 2.4 shows the Free Flow time when approaching the junction from this approach is 20.2 seconds over 201 metres.

Delay for motorists travelling southbound from Freedom Bridge Roundabout appears minimal with less than 10 seconds added to journey times in both peak hours.

Table 2.5: Journey Times and Delay for the Cromwell Road South Approach to Town Bridge Junction

Cromwell Road South Approach		Average Travel Time (Seconds)	Average Delay (Seconds)
Free Flow	(00:00 – 06:00)	21.8	N/A
AM Peak	(08:00 – 09:00)	36.4	14.5
PM Peak	(17:00 – 18:00)	52.1	30.2

Table 2.5 shows the Free Flow time when approaching the junction from this approach is 21.8 seconds over 87 metres.

Cromwell Road South approach experiences delay across both peak hours, however the PM peak hour delay is shown to be higher with 30.2 seconds added to journey times. This higher PM delay for motorists travelling northbound on Cromwell Road reflects the traffic flows presented in Figures 2.9 and 2.10, whereby a total of 491 vehicles originate from this approach during the PM peak hour compared to 428 in the AM peak hour.

Average Speeds

Average speeds for the three approaches assessed above have been extracted from the same TomTom data set described previously in this chapter. Figures 2.12 and 2.13 on the following pages highlight the average speeds and areas of congestion for both the AM and PM peak hours.

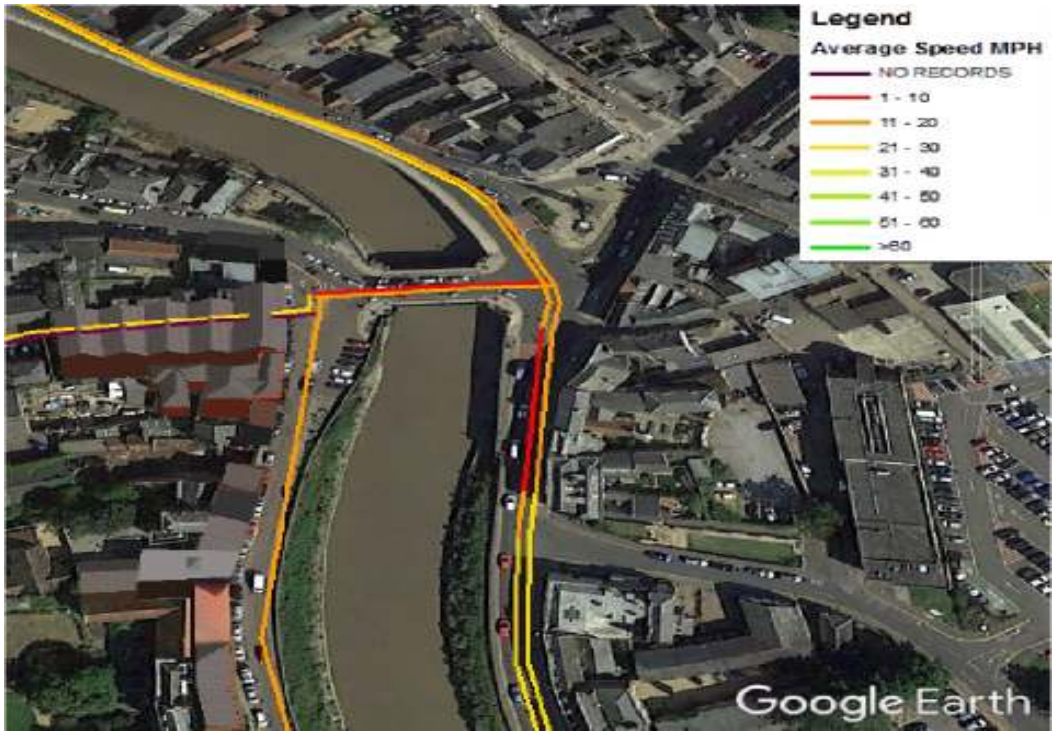


Figure 2.12: Town Bridge Junction Average Speed AM Peak Hour (08:00 – 09:00)

Figure 2.13: Town Bridge Junction Average Speed PM Peak Hour (17:00 – 18:00)

The figures above show a similar pattern in relation to average speed at this junction across peak hours. The average speeds appear lower on both Cromwell Road South and Old Market, with speeds recorded between 1 – 10mph. Speeds on Cromwell Road North approach appear to be higher, with average speeds of 11- 20 mph recorded.

Weasenham Lane Junction

Traffic Flows

Turning counts were undertaken at the Cromwell Road / Weasenham Lane Junction on the 14th January 2016. The survey recorded vehicle turning movements at the junction over a 12 hour period, between 07:00-19:00. The day of survey was considered typical, with no incidents reported that might affect the observed turning movements.

The results from the survey are shown within Figures 2.14 to 2.16 below for the 12-hour period, AM peak hour (08:00 – 09:00) and PM peak hour (17:00 – 18:00). The following analysis of survey data provides an indication of the volume of traffic joining Cromwell Road from Weasenham Lane and vice versa on a typical weekday.

The results from the 12 hour count are shown in Figure 2.14 beneath.

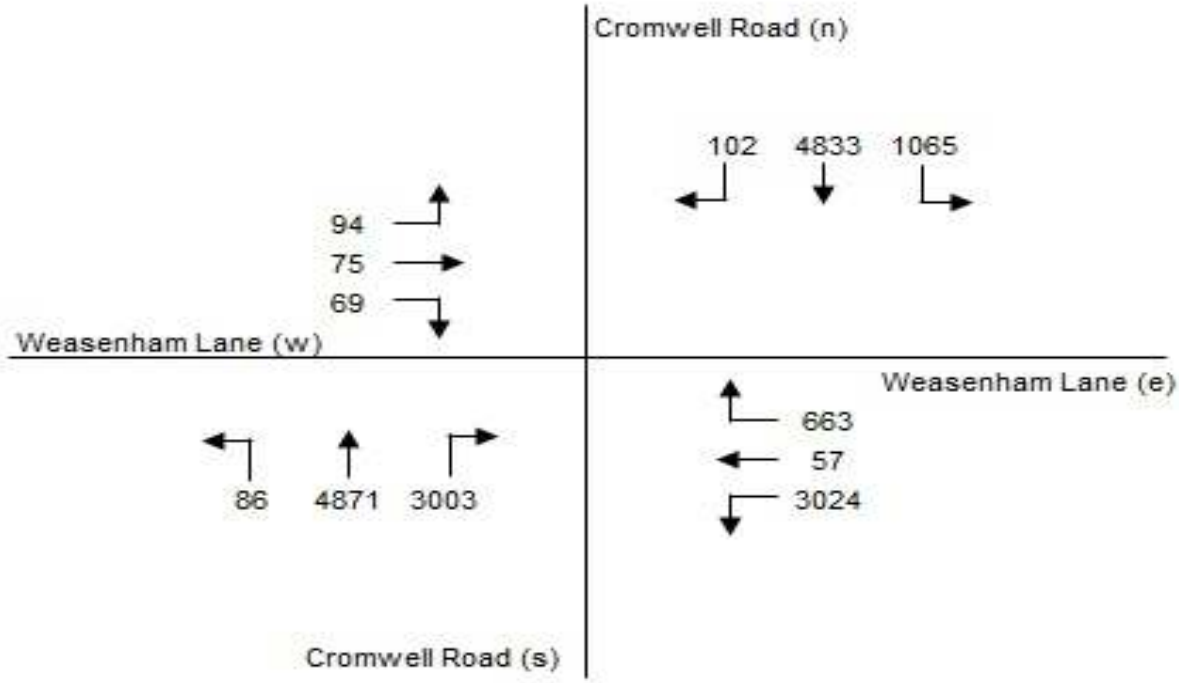


Figure 2.14: Weasenham Lane (West) 12 Hour Traffic Count (07:00 -19:00)

Over a 12 hour period, the number of vehicles originating from Weasenham Lane east totals 3,744 vehicles, whilst 4,143 vehicles arrive at Weasenham Lane.

The dominant turning movements for Weasenham Lane east are to Cromwell Road south, with, 3,024 vehicles turning left onto Cromwell Road South from Weasenham Lane, and 3,003 vehicles turning right onto Weasenham Lane east from Cromwell Road south.

The ahead movement for Cromwell Road appears well balanced in both directions, with 4,833 vehicles travelling southbound and 4,871 travelling northbound across the 12 hour survey period.

AM peak hour results are shown in Figure 2.15 on the following page.

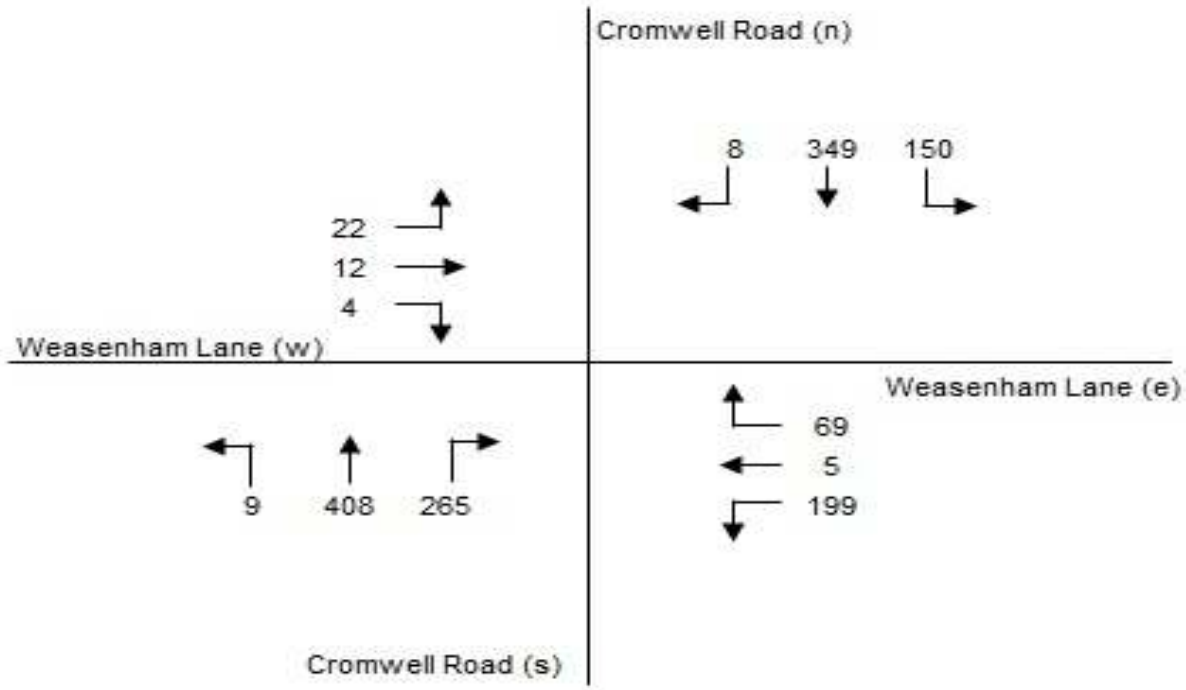


Figure 2.15: Weasenham Lane (West) AM Peak Hour Traffic Count (08:00 - 09:00)

Figure 2.15 shows that 273 vehicles originated from Weasenham Lane east during the AM peak hour, the majority of which (199) turned left towards the southern section of the corridor. Vehicles arriving at Weasenham Lane east totalled 427 during this time period, of which 265 vehicles originated from Cromwell Road south.

Traffic flows along Cromwell Road appear fairly balanced in both directions, however more vehicles are processed northbound through the junction during the AM peak hour.

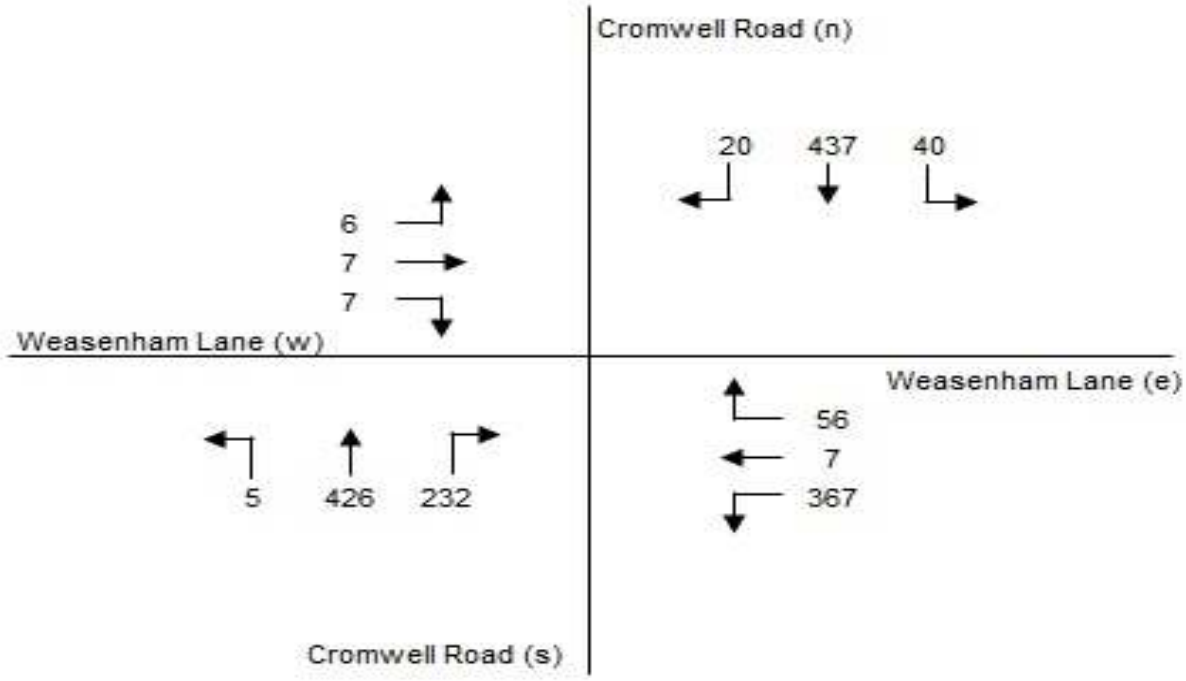


Figure 2.16: Weasenham Lane (West) PM Peak Hour Traffic Count (17:00 -18:00)

Figure 2.16 shows that 430 vehicles originate from Weasenham Lane east during the PM peak hour, the majority of which (367) turn left towards the A47 roundabout.

Vehicles arriving at Weasenham Lane east totals 279 during this time period, which is 149 vehicles less than in the AM peak hour movement, which is to be expected given the large amount of employment along Weasenham Lane. The dominant movement for vehicles entering Weasenham Lane east is from Cromwell Road south, with 232 vehicles making the right turn.

Queue Lengths

Queue length surveys were undertaken at the Cromwell Road / Weasenham Lane Junction on the 14th January 2016. Queue lengths were recorded on each approach arm of the junction over a 12-hour period, between 07:00 - 19:00. The day of survey was considered typical, with no incidents reported that might affect the observed congestion.

For the purpose of this scheme assessment queue lengths have been assessed for the following approaches (Figure 2.17 below):

- Cromwell Road South approach (Northbound movement);
- Cromwell Road North approach (Southbound movement), and:
- Weasenham Lane East approach.

Weasenham Lane West approach (access to Reason Residential Area) has not been assessed, due to the relatively low volume of traffic as shown in Figures 2.14 to 2.16.

Figure 2.17: Weasenham Lane Junction Approaches Assessed for Queue Lengths

The following series of tables and figures show the maximum and average queue lengths observed on Weasenham Lane East and Cromwell Road North and South approaches. Data is presented for the AM (08:00 – 09:00) and PM (17:00 – 18:00) peak hours, with data being representative of both the nearside and offside lanes.

Table 2.6: Maximum and Average Queue Lengths on Weasenham Lane East Approach

Time Segment	AM		Time Segment	PM	
	Average (m)	Max (m)		Average (m)	Max (m)
08:00	30	35	17:00	40	75
08:05	15	25	17:05	37.5	75
08:10	7.5	15	17:10	45	75
08:15	25	30	17:15	40	75
08:20	2.5	5	17:20	37.5	75
08:25	2.5	5	17:25	42.5	75
08:30	20	25	17:30	42.5	75
08:35	10	15	17:35	22.5	40
08:40	20	25	17:40	37.5	70
08:45	2.5	5	17:45	15	20
08:50	17.5	20	17:50	20	35
08:55	20	40	17:55	2.5	5

The data shows that the queues are more prevalent during the PM peak hour, with queue lengths reaching a maximum length of 75 metres, compared to a maximum of 40 metres in the AM peak hour.

Greater queue lengths in the PM peak hour on Weasenham Lane East may reflect the tidal flow indicated within the turning counts (Figures 2.15 and 2.16), with a greater volume of traffic originating from this approach during the PM peak hour.

Figures 2.18 and 2.19 on the following page shows this data for both peak hours, reported in 5 minute intervals.

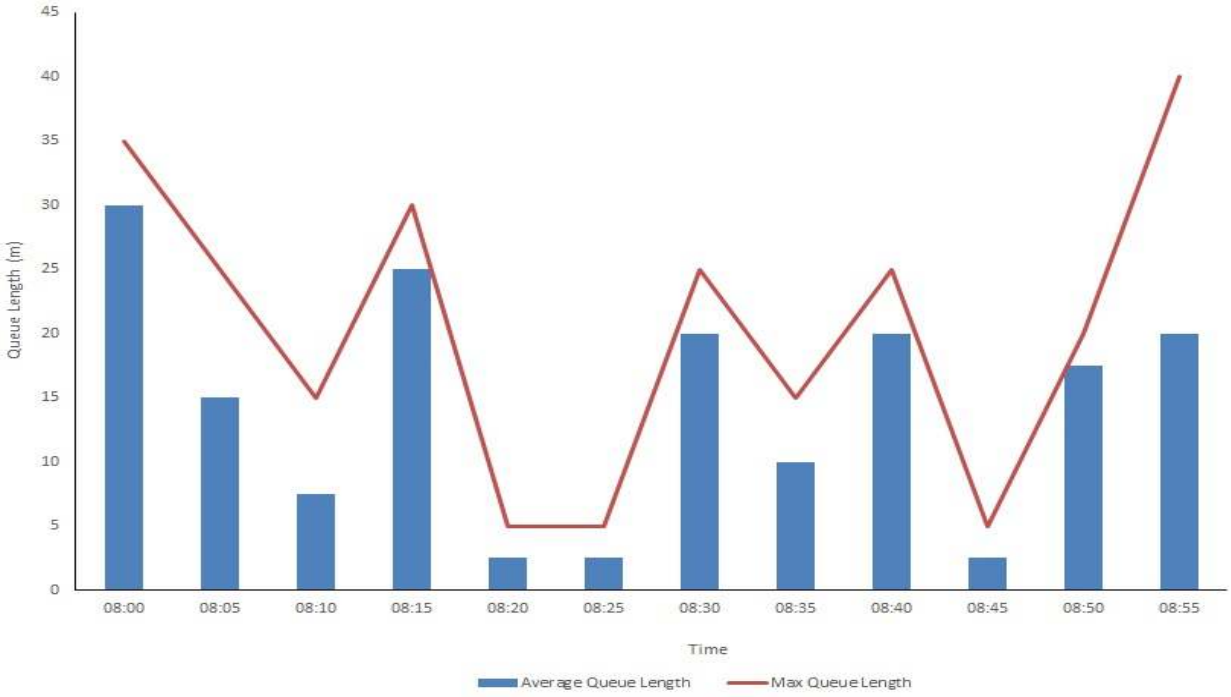


Figure 2.18: Weasenham Lane East Approach Queue Lengths AM Peak Hour (08:00 - 09:00)

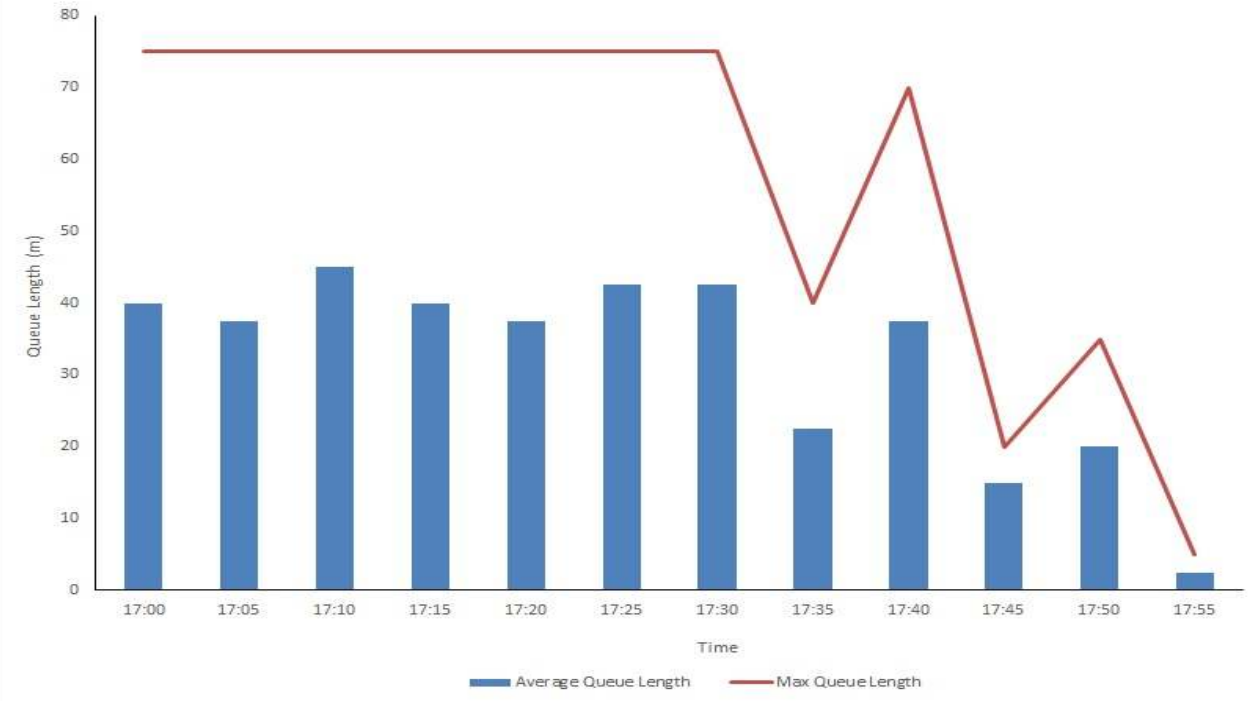


Figure 2.19: Weasenham Lane East Approach Queue Lengths PM Peak Hour (17:00 - 18:00)

Table 2.7: Maximum and Average Queue Lengths on Cromwell Road North Approach

Time Segment	AM		Time Segment	PM	
	Average (m)	Max (m)		Average (m)	Max (m)
08:00	18.3	45	17:00	25	75
08:05	15	25	17:05	28.3	75
08:10	10.8	20	17:10	26.6	75
08:15	15	20	17:15	25	75
08:20	11.6	30	17:20	35	75
08:25	18.3	40	17:25	28.3	75
08:30	16.6	45	17:30	20	55
08:35	13.3	35	17:35	16.6	50
08:40	15	30	17:40	23.3	60
08:45	6.6	10	17:45	10	25
08:50	11.6	30	17:50	20	50
08:55	9.16	17.5	17:55	18.3	40

The data shows that the queues are more prevalent during the PM peak hour, with queues reaching a maximum length of 75 metres, compared to a maximum of 45 metres in the AM peak hour.

Similarly to Weasenham Lane East, PM queue lengths are maintained at 75 metres for the period between 08:00 and 08:30.

Figures 2.20 and 2.21 on the following pages show this data for both peak hours, reported in 5 minute intervals.

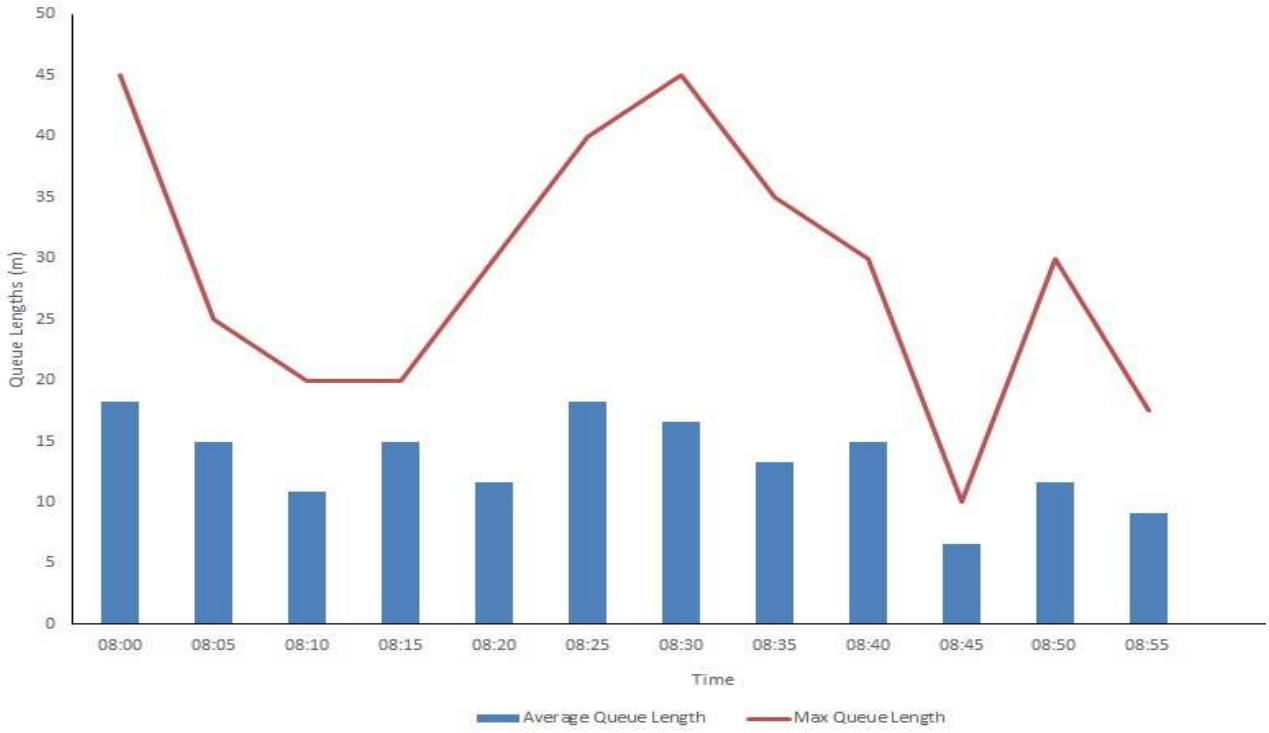


Figure 2.20: Cromwell Road North Approach Queue Lengths AM Peak Hour (08:00 - 09:00)

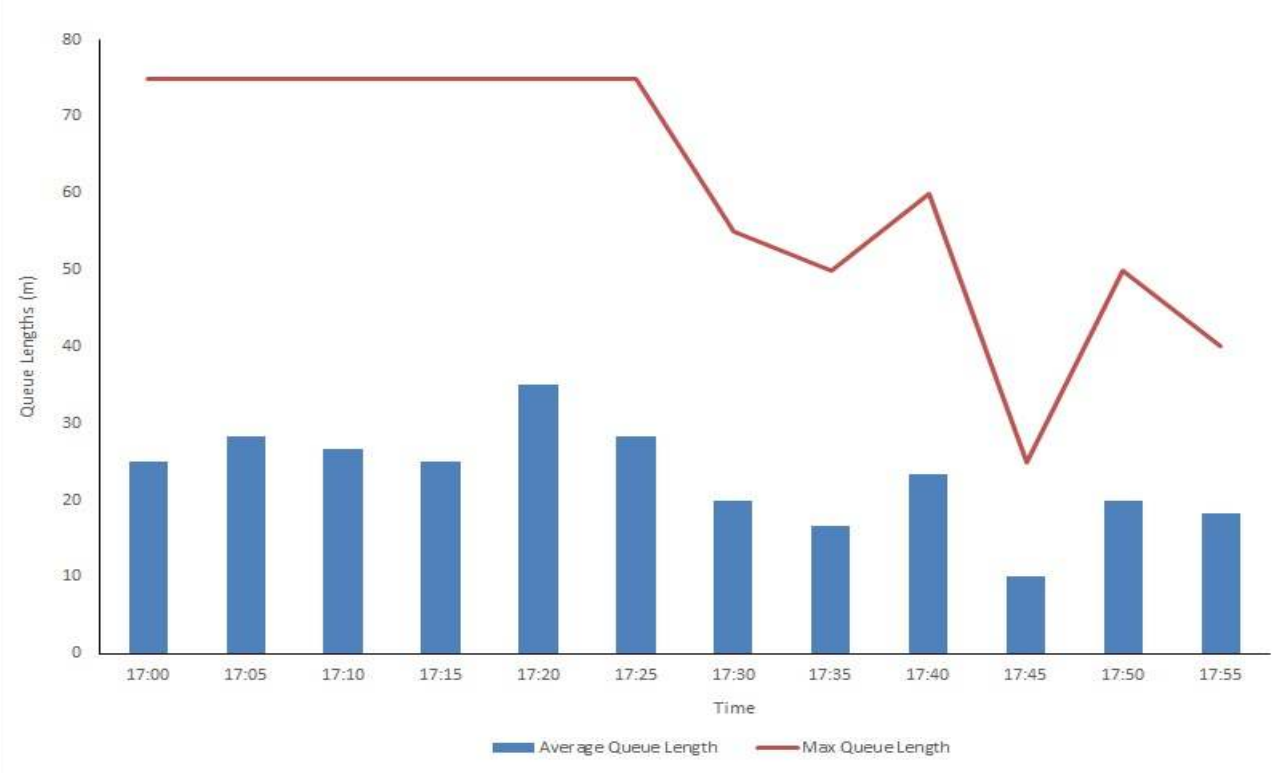


Figure 2.21: Cromwell Road North Approach Queue Lengths PM Peak Hour (17:00 - 18:00)

Table 2.8: Maximum and Average Queue Lengths on Cromwell Road South Approach

Time Segment	AM		Time Segment	PM	
	Average (m)	Max (m)		Average (m)	Max (m)
08:00	25	55	17:00	27.5	55
08:05	5	30	17:05	22.5	45
08:10	20	10	17:10	10	20
08:15	2.5	40	17:15	22.5	45
08:20	15	5	17:20	7.5	15
08:25	2.5	30	17:25	27.5	30
08:30	7.5	5	17:30	35	60
08:35	5	15	17:35	10	20
08:40	37.5	10	17:40	30	30
08:45	12.5	65	17:45	17.5	35
08:50	27.5	25	17:50	7.5	15
08:55	5	35	17:55	20	40

Queue lengths on the Cromwell Road South approach appear to be balanced across peak hours, with a maximum queue length of 65 metres in the AM peak hour and 60 metres in the PM peak. This balance in queue length reflects similar traffic flows indicated in Figures 2.15 and 2.16, whereby 683 vehicles originate from this approach during the morning peak and 663 retrospectively during the PM peak hour.

In comparing Cromwell Road North and South approaches, queue lengths appear to show the overall tidal pattern for the corridor, whereby a greater volume of traffic travel northbound during the AM peak and southbound during the PM peak.

Figures 2.22 and 2.23 on the following pages show this data for both peak hours, reported in five minute intervals.

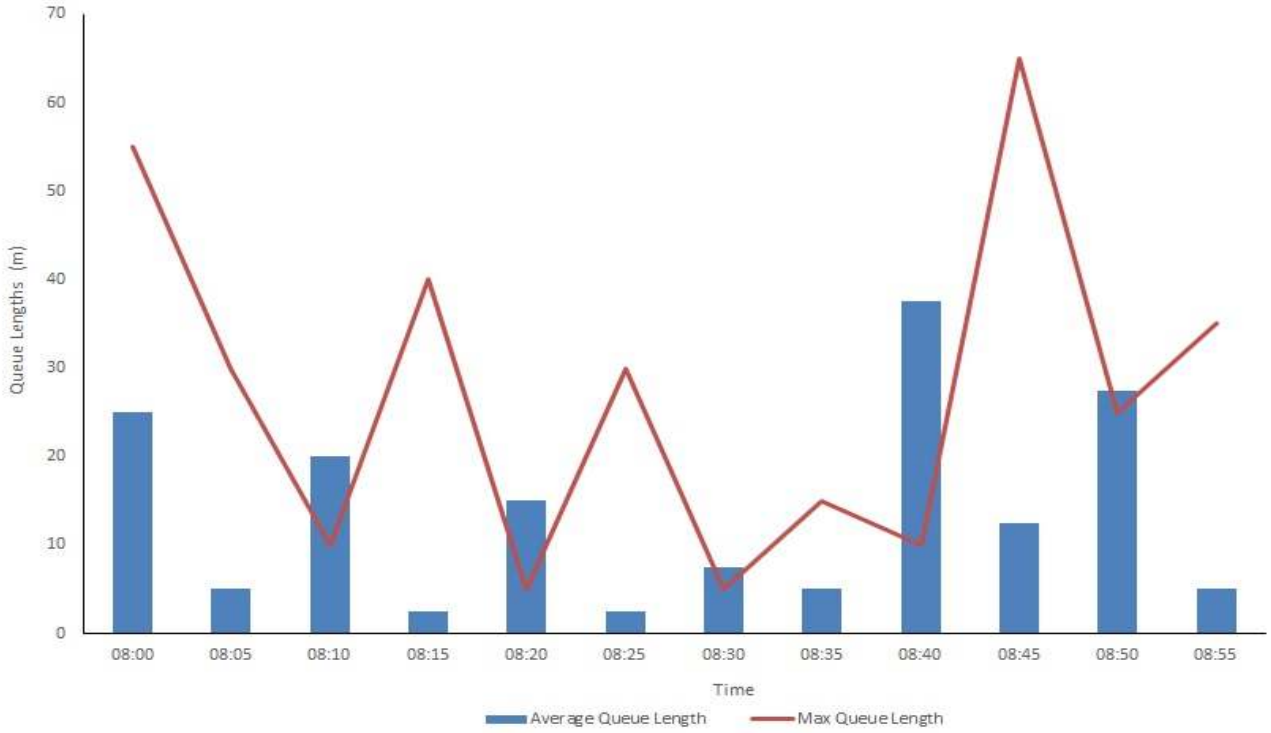


Figure 2.22: Cromwell Road South Approach Queue Lengths AM Peak Hour (08:00 - 09:00)

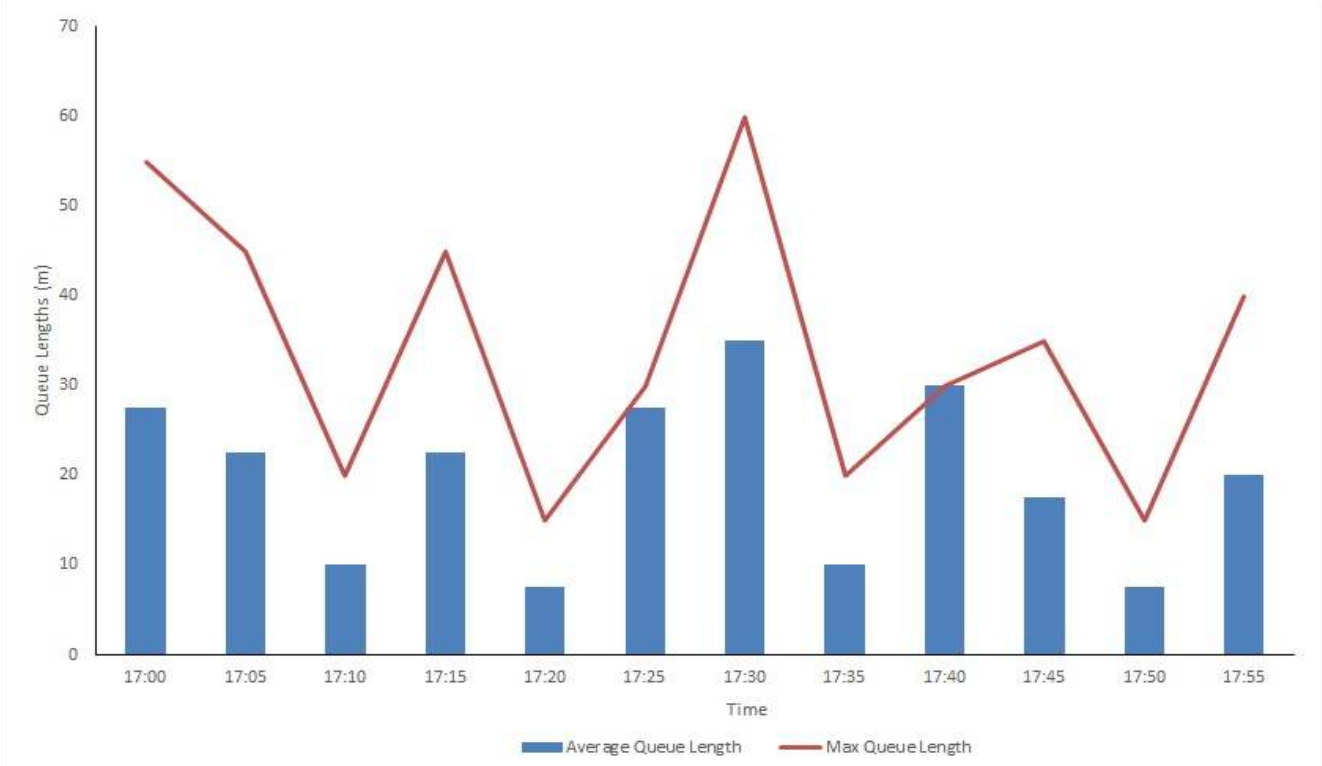


Figure 2.23: Cromwell Road South Approach Queue Lengths PM Peak Hour (17:00 - 18:00)

Journey Times and Delay

The same Satellite Navigation (TomTom) data has been used to assess journey times and delay at the Cromwell Road / Weasenham Lane Junction. Data has been extracted for the approaches of Cromwell Road North / South, and Weasenham Lane East (see Figure 2.17). The total length of segments used for each approach are detailed below and shown within Figure 2.24:

- Weasenham Lane East – 84.1 metres;
- Cromwell Road North – 170.8 metres; and,
- Cromwell Road South –

Figure 2.24: Cromwell Road / Weasenham Lane Junction TomTom Segments used per Approach

The tables on the following page show the results for each of the named approaches.

Table 2.9: Journey Times and Delay along Cromwell Road North Approach

Weasenham Lane Approach		Average Travel Time (Seconds)	Average Delay (Seconds)
Free Flow	(00:00 – 06:00)	13.3	N/A
AM Peak	(08:00 – 09:00)	26.1	12.8
PM Peak	(17:00 – 18:00)	46.4	33.1

Table 2.9 shows the Free Flow time when approaching the Weasenham Lane / Cromwell Road Junction (from the east) is 13.3 seconds over 84 metres.

Weasenham Lane East experiences delay across both peak hours, however the PM peak hour delay is higher with 33.1 seconds added to journey times. A higher PM peak hour delay reflects the higher volumes of traffic originating from this approach during this period, as identified in Figure 2.16.

Table 2.10: Journey Times and Delay along Cromwell Road North Approach

Cromwell Road North Approach		Average Travel Time (Seconds)	Average Delay (Seconds)
Free Flow	(00:00 – 06:00)	17.6	N/A
AM Peak	(08:00 – 09:00)	30.9	13.3
PM Peak	(17:00 – 18:00)	36.0	18.3

Table 2.10 shows the Free Flow time when approaching Weasenham Lane Junction (from the south) is 17.6 seconds over 170 metres.

Cromwell Road North experiences delay across both peak hours, however PM peak hour delay is slightly higher with 18.3 seconds added to journey times. This delay reflects the queue length data displayed within Table 2.7 and Figures 2.20 and 2.21.

Table 2.11: Journey Times and Delay along Cromwell Road South Approach

Cromwell Road South Approach		Average Travel Time (Seconds)	Average Delay (Seconds)
Free Flow	(00:00 – 06:00)	12.1	N/A
AM Peak	(08:00 – 09:00)	38.1	28.0
PM Peak	(17:00 – 18:00)	74.3	62.3

Table 2.11 shows the Free Flow time when approaching Weasenham Lane Junction (from the north) is 12.1 seconds over 159 metres.

Delay for this approach appears to be higher during the PM peak hour, with 62 seconds (1 minute 2 seconds) added to journey times.

In comparing Cromwell Road North / South approaches, delay appears to be higher across peak hours when travelling northbound along the corridor, which reflects traffic flows discussed earlier within this chapter.

Average Speeds

Average speeds for the three approaches assessed above have been extracted from the same TomTom data set described previously in this chapter. Figures 2.25 and 2.26 beneath highlight the average speeds and areas of congestion for both the AM and PM peak hours

Figure 2.25: Cromwell Road / Weasenham Lane Junction Average Speed AM Peak Hour (08:00 - 09:00)

The figure above highlights the average speed on all three approaches is between 11 – 20 mph when approaching the Weasenham Lane Junction. Speeds do however improve on all approaches once motorists have cleared the junction, with speeds between 21 - 30mph being recorded.

Figure 2.26: Cromwell Road / Weasenham Lane Junction Average Speed PM Peak Hour (17:00 - 18:00)

Congestion and average speeds in the PM peak hour are shown to be worse, with speeds on both Weasenham Lane and Cromwell Road North approaches recorded between 1 -10 mph. Speeds on the Cromwell Road South approach remain the same as the AM peak hour.

New Bridge Lane

Traffic Flows

Turning counts were undertaken at the Cromwell Road / New Bridge Lane Junction on the 14th January 2016. The survey recorded vehicle turning movements at the junction over a 12 hour period, between 07:00 -19:00. The day of survey was considered typical, with no incidents reported that might affect the observed turning movements.

The results from the survey are shown within Figures 2.27 to 2.29 below for the 12 - hour period, AM peak hour (08:00 – 09:00) and PM peak hour (17:00 – 18:00). The following analysis of survey data provides an indication of the volume of traffic joining Cromwell Road from New Bridge Lane and vice versa on a typical weekday.

The results from the 12 hour count are shown in Figure 2.27 beneath.

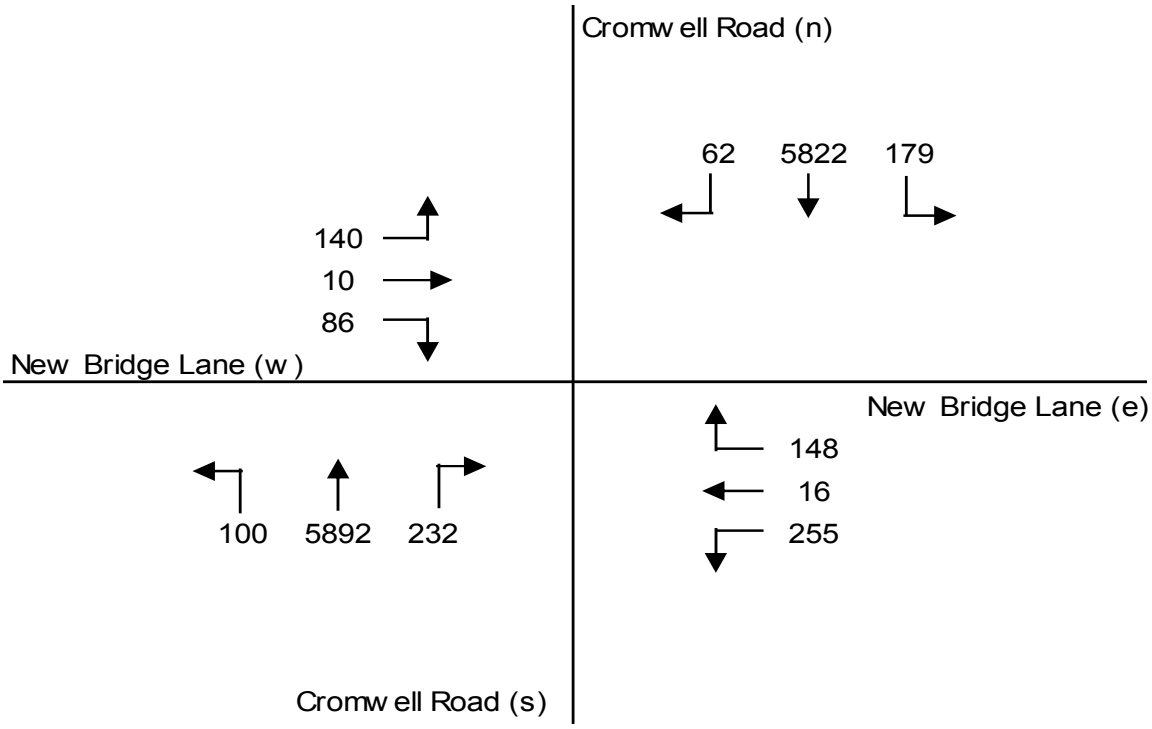


Figure 2.27: Cromwell Road / New Bridge Lane Junction 12 Hour Traffic Count

The dominant movement at the junction of Cromwell Road / New Bridge Lane is the ahead movement along Cromwell Road in both directions. Almost exactly the same amount of traffic enters New Bridge Lane east (421) as leaves (419) over the 12 hour period surveyed.

AM peak hour survey results for this junction are shown on the following page.

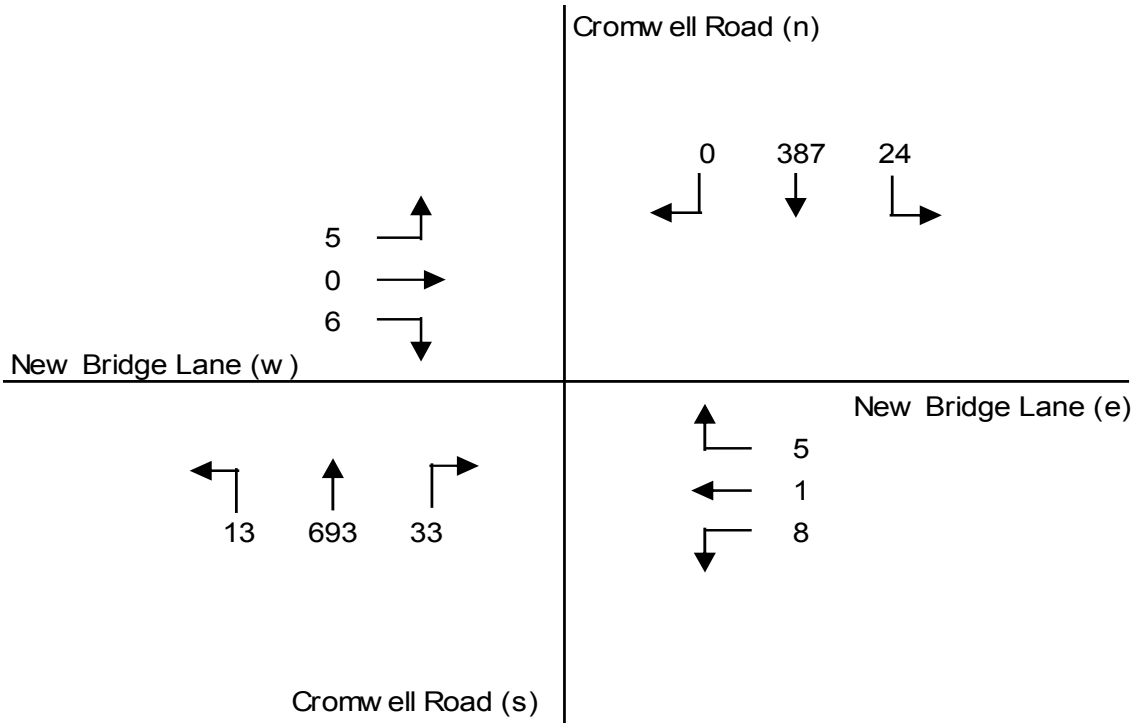


Figure 2.28: Cromwell Road / New Bridge Lane Junction AM Peak Hour Traffic Count (08:00 – 09:00)

The dominant traffic flows during the AM peak hour are ahead in both directions along Cromwell Road. Considerably more traffic enters New Bridge Lane east (57) than exits, which is expected as New Bridge Lane provides access to a number of employment locations. Figure 2.28 shows a greater proportion of vehicles entering New Bridge Lane east originate from Cromwell Road south and the A47.

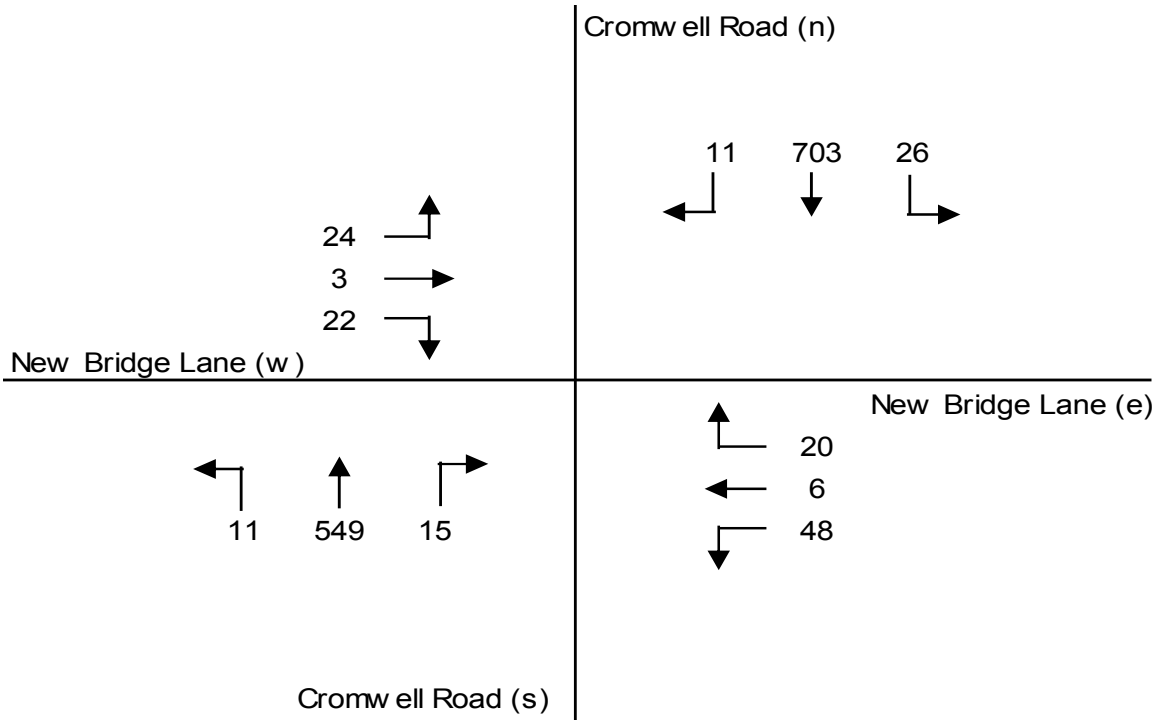


Figure 2.29: Cromwell Road / New Bridge Lane Junction PM Peak Hour Traffic Count (17:00 – 18:00)

Similarly to the AM peak hour, Figure 2.29 shows the dominant movement for vehicles originating from New Bridge Lane is to Cromwell Road south, with 48 vehicles making this movement.

The traffic data shown highlights traffic within the area is very tidal (as would be expected given the land use types). Vehicles generally use the main corridor of Cromwell Road in the AM peak hour to access the employment areas off New Bridge Lane, and then leave via the same corridor during the PM peak hour.

A47 / Cromwell Road Roundabout

Traffic Flows

Turning counts were undertaken at the B198 Cromwell Road / A47 roundabout on the 14th January 2016. The survey recorded vehicle turning movements at the junction over a 12-hour period, between 07:00-19:00. The day of survey was considered typical, with no incidents reported that might affect the observed turning movements.

The results from the survey are shown within Figures 2.30 to 2.32 below for the 12-hour period, AM peak (08:00 – 09:00) and PM peak (17:00 – 18:00). Extracted data from the survey provides an indication of the number of vehicles entering the corridor from the south on a daily basis.

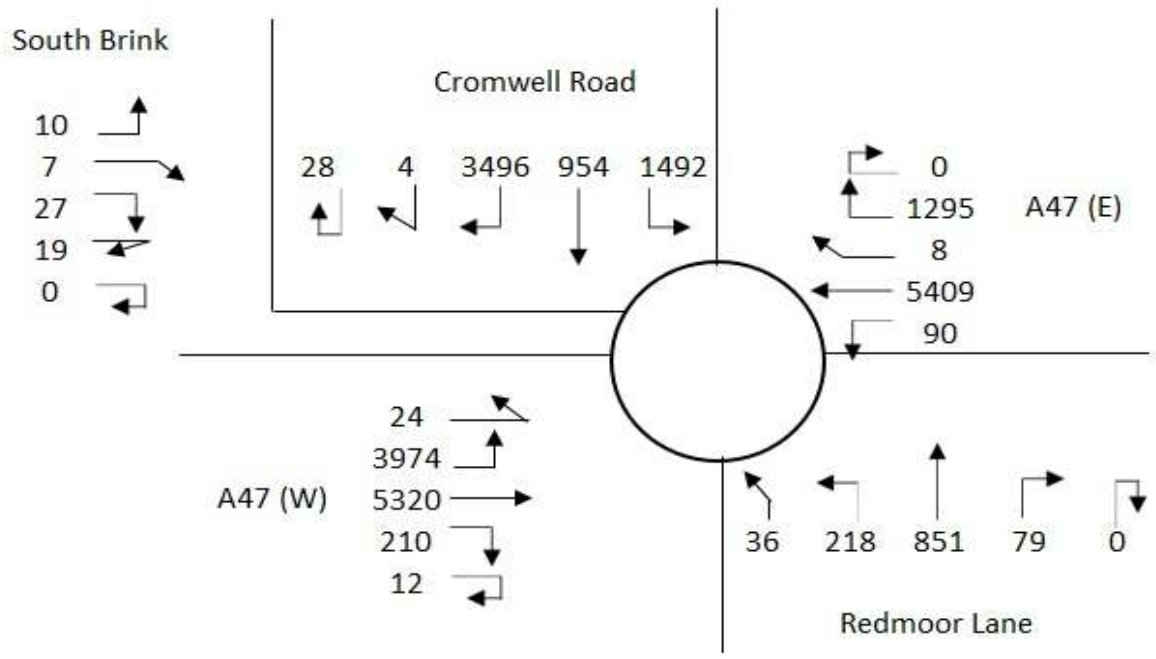


Figure 2.30: A47 / Cromwell Road Roundabout 12 Hour (07:00 – 19:00) Traffic Count

Figure 2.30 shows the largest movements at the roundabout over a 12 hour period are the trips between the A47 East and West. There are also a significant number of trips between Cromwell Road and the A47 West (towards Peterborough).

A total of 6,140 vehicles join the Cromwell Road corridor via the A47 roundabout, of which 3,974 vehicles originated from the A47 West approach.

5,954 vehicles originated from Cromwell Road over a 12 hour period, the majority of which were destined to the A47 West (3,496). The results from the turning count for the AM peak hour are shown beneath.

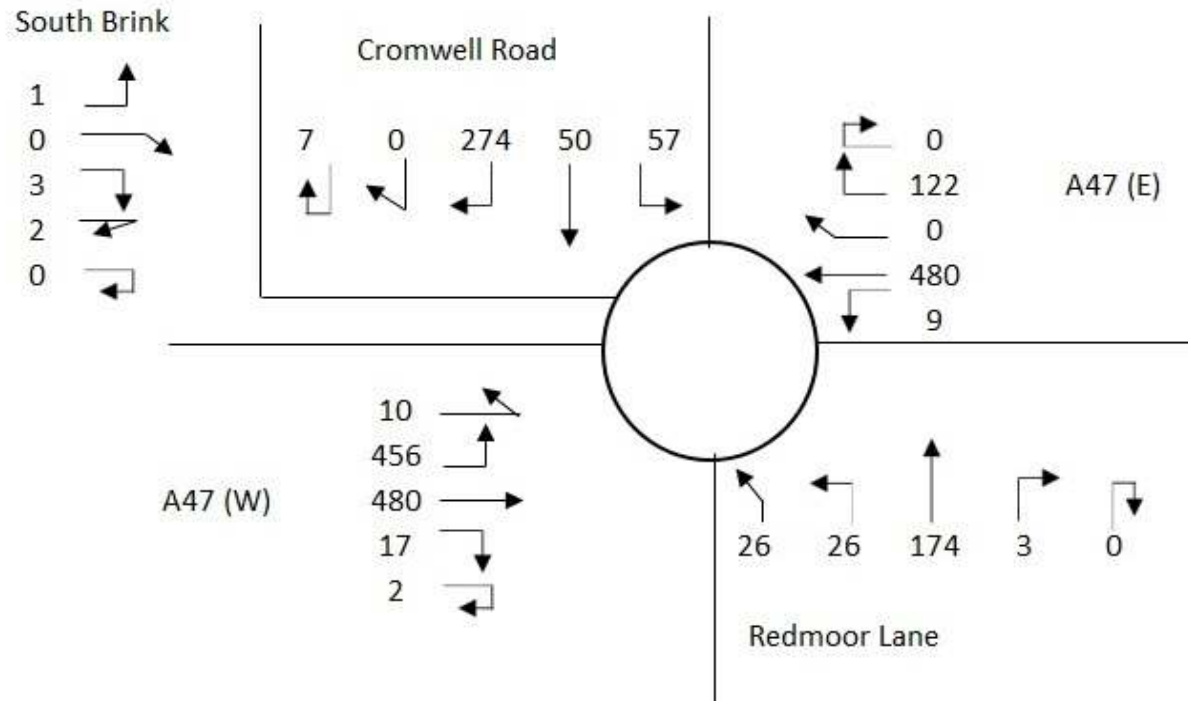


Figure 2.31: A47 / Cromwell Road Roundabout AM Peak (08:00 - 09:00) Traffic Count

During the AM peak hour, 760 vehicles arrived at Cromwell Road, 456 of which originated from the A47 West. The dominant movement for trips from Cromwell Road is to the A47 West.

The results from the turning count for the PM peak hour are shown beneath.

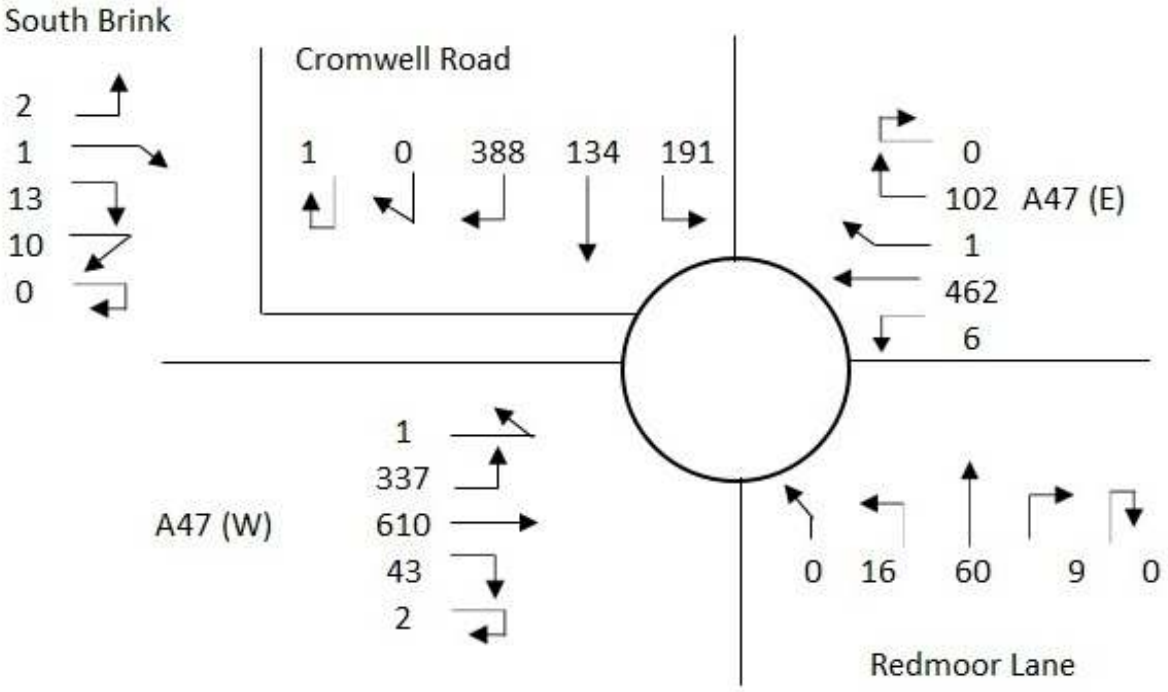


Figure 2.32: A47 / Cromwell Road Roundabout PM Peak (17:00 - 18:00) Traffic Count

Figure 2.32 shows that during the PM peak hour, 614 vehicles originate from Cromwell Road, whilst 501 vehicles enter the corridor via this junction.

Likewise to the AM peak hour, a greater proportion of vehicles entering the corridor originate from the A47 West approach (337). The turning count for this movement is however lower during the PM peak hour (Figure 2.30).

Queue Lengths

Queue length surveys were undertaken at the A47 / Cromwell Road Roundabout on the 14th January 2016. Queue lengths were recorded on each approach arm of the junction over a 12-hour period, between 07:00 -19:00. The day of survey was considered typical, with no incidents reported that might affect the observed congestion.

For the purpose of this scheme assessment, queue length data for Cromwell Road approach has been extracted.

Table 2.12 and Figure 2.30 below show the maximum and average queue lengths observed on the B198 Cromwell Road approach to the A47 Roundabout. Data is presented for the AM (08:00 – 09:00) and PM (17:00 – 18:00) peak hours, with data being representative of both the nearside and offside lanes.

Table 2.12: Maximum and Average Queue Lengths on the B198 Cromwell Road Approach to the A47 Roundabout

Time Segment	AM		Time Segment	PM	
	Average (m)	Max (m)		Average (m)	Max (m)
08:00	2.5	5	17:00	0	0
08:05	7.5	15	17:05	5	5
08:10	10	20	17:10	0	0
08:15	0	0	17:15	7.5	15
08:20	20	30	17:20	7.5	15
08:25	2.5	5	17:25	0	0
08:30	0	0	17:30	0	0
08:35	0	0	17:35	0	0
08:40	0	0	17:40	12.5	25
08:45	2.5	5	17:45	2.5	5
08:50	0	0	17:50	0	0
08:55	0	0	17:55	0	0

Queue lengths when approaching the A47 roundabout from Cromwell Road appear similar across the peak hours, with a maximum queue length of 30 metres in the AM peak and 25 metres during the PM peak hour.

Both peak hours have the equivalent of 30 (AM) and 35 (PM) minutes where no queue was recorded within the hour period.

Figures 2.33 and 2.34 on the following page shows this data for both peak hours, reported in 5 minute intervals.

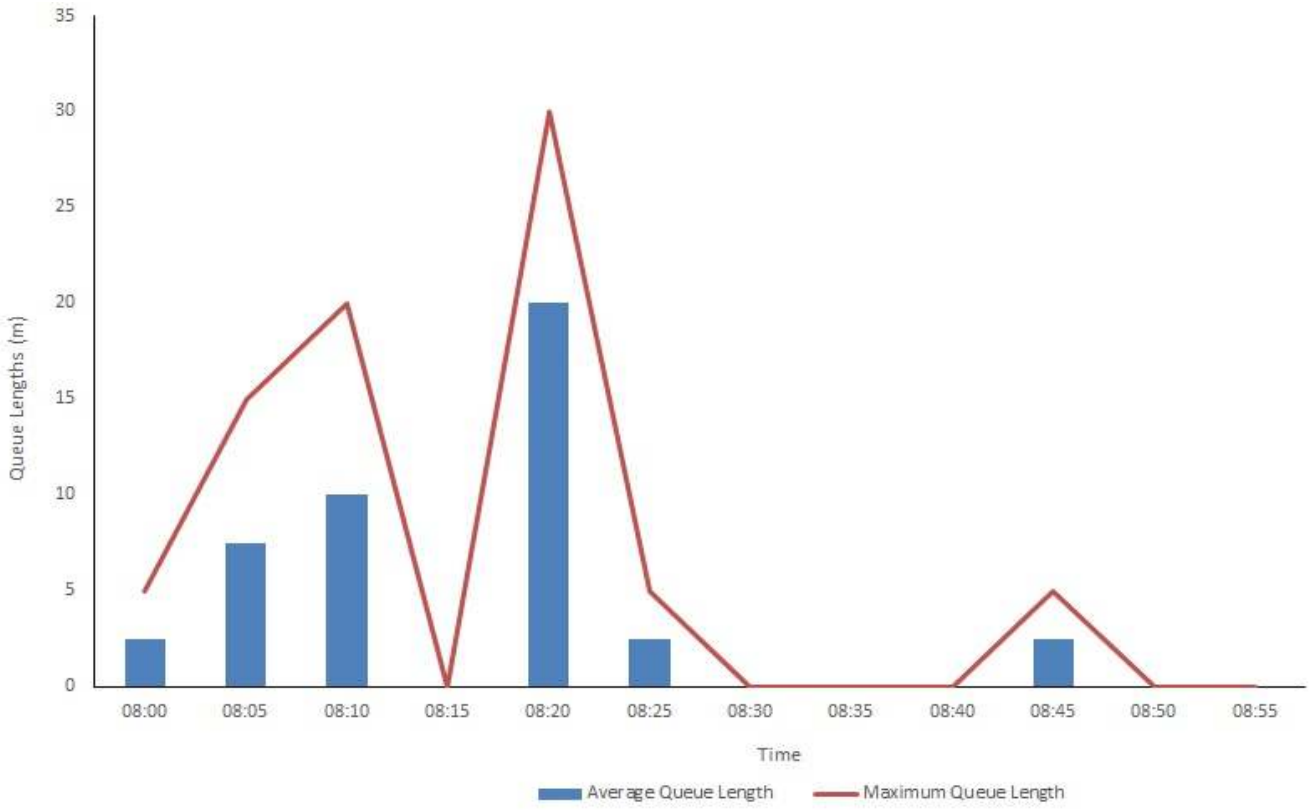


Figure 2.33: A47 / Cromwell Road Roundabout Queue Lengths AM Peak (08:00 - 09:00)

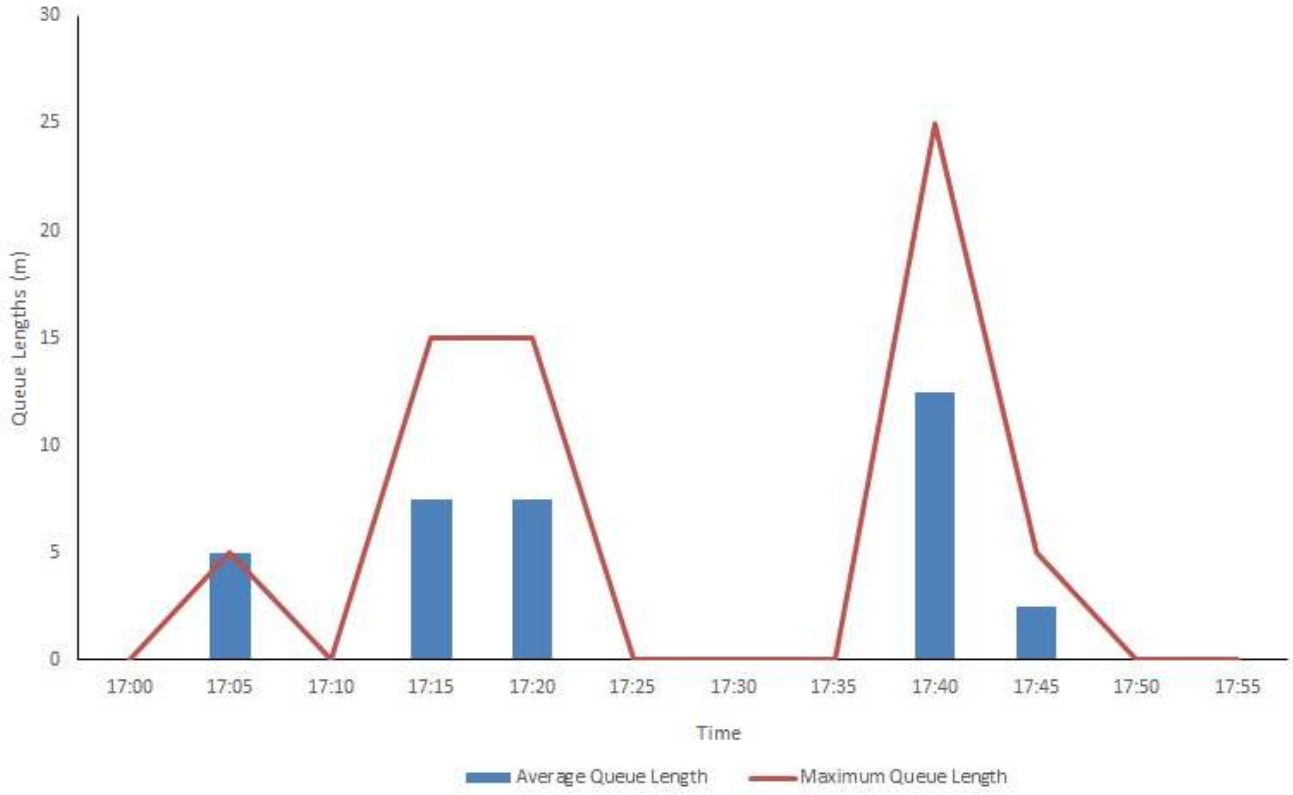


Figure 2.34: A47 / Cromwell Road Roundabout Queue Lengths PM Peak (17:00 – 18:00)

Journey Times and Delay Data

The same Satellite Navigation (TomTom) data has been used to assess journey times and delay on Cromwell Road when approaching the A47 roundabout. Road segments used in this assessment totals 453.5 metres from the stop line (reaching just south of the Tesco Junction).

Table 2.13: Journey Times and Delay for the Cromwell Road approach to the A47

Cromwell Road Northbound		**Average Travel Time** (Seconds)	**Average Delay** (Seconds)
Free Flow	(00:00 – 06:00)	29.4	N/A
AM Peak	(08:00 – 09:00)	37.0	7.5
PM Peak	(17:00 – 18:00)	49.8	20.4

Table 2.13 shows the Free Flow time when approaching the A47 roundabout from Cromwell Road is 29.4 seconds over 453 metres.

Delay on this approach is shown to be relatively minimal during the AM peak hour, with 7.5 seconds added to journey times. This increases to 20.7 seconds of delay during the PM peak hour. The slight increase in delay during the PM peak hour reflects the increase in the number of vehicles originating from this approach, from 388 vehicles in the AM to 674 vehicles during the PM peak hour (see Figures 2.28 and 2.29).

Average Speeds

Average speeds for the B198 Cromwell Road approach to the A47 roundabout has been extracted from the same TomTom data set described previously in this chapter. Figures 2.35 and 2.36 beneath highlight the average speeds and areas of congestion for both the AM and PM peak hours

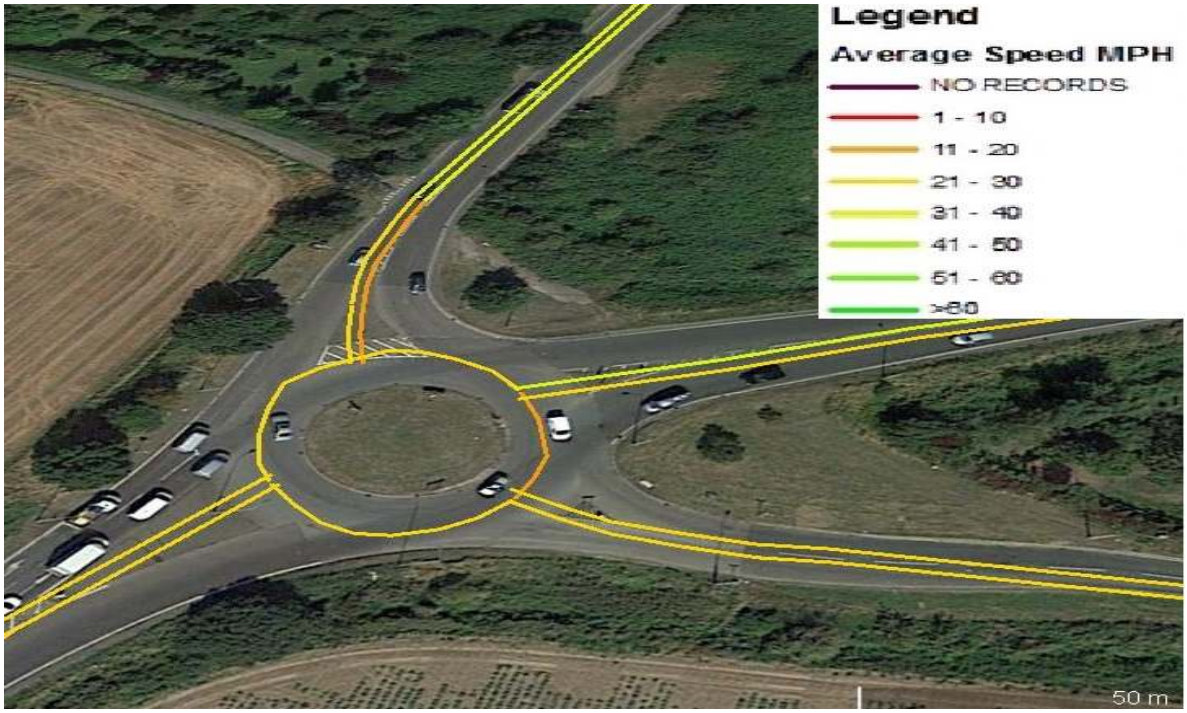


Figure 2.35: A47 / Cromwell Road Junction Average Speed AM Peak Hour (08:00 - 09:00)

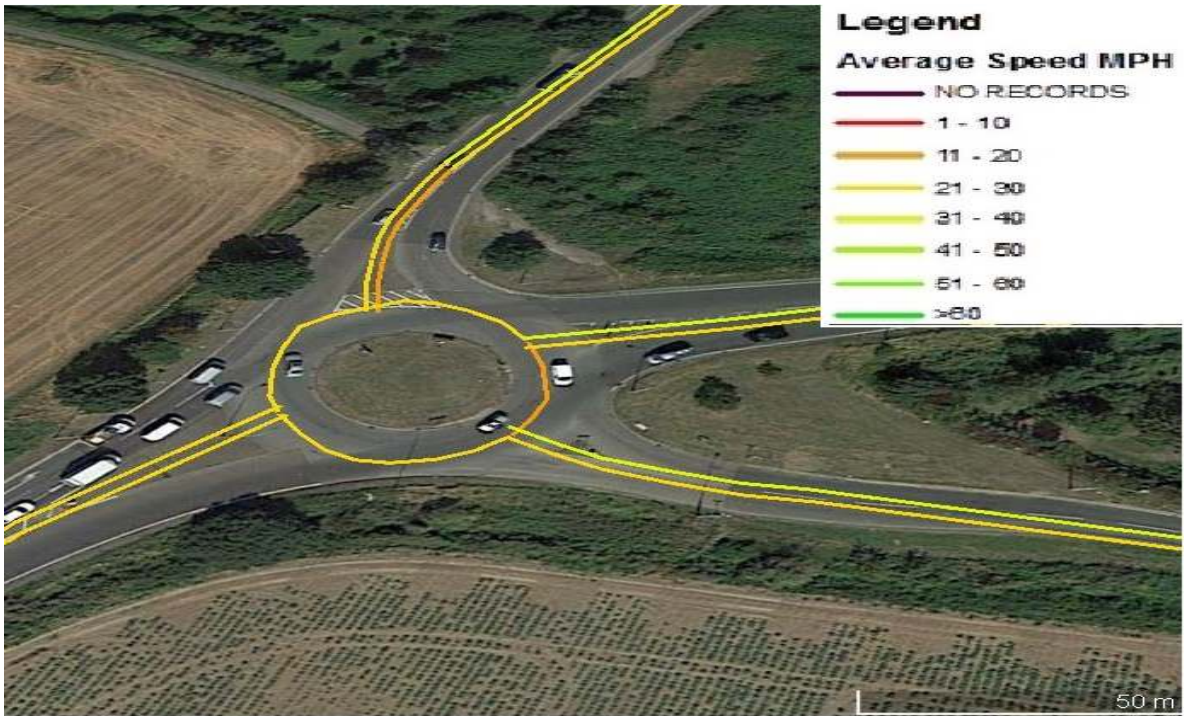


Figure 2.36: A47 / Cromwell Road Junction Average Speed PM Peak Hour (17:00 - 18:00)

Average speeds on the Cromwell Road approach to the roundabout appear to be same across peak hours, with speeds recorded between 11 – 20 mph.

Summary of Cromwell Road Corridor – Journey Times and Delay Data

Delay for the entire Cromwell Road corridor, from Freedom Bridge Roundabout in the north to the A47 / Cromwell Road roundabout in the south, is shown beneath in Tables 2.14 and 2.15.

Data summarised in these tables is from the same TomTom dataset previously mentioned within this chapter. Road segments used during this assessment total 1.5 miles.

Table 2.14: Journey Times and Delay for the CR Northbound

Cromwell Road Northbound		Average Travel Time (Seconds)	Average Delay (Seconds)
Free Flow	(00:00 – 06:00)	240.2	N/A
AM Peak	(08:00 – 09:00)	352.6	112.3
PM Peak	(17:00 – 18:00)	458.6	245.3

Table 2.15: Journey Times and Delay for the CR Southbound

Cromwell Road Southbound		Average Travel Time (Seconds)	Average Delay (Seconds)
Free Flow	(00:00 – 06:00)	269.5	N/A
AM Peak	(08:00 – 09:00)	348.3	78.8
PM Peak	(17:00 – 18:00)	529.2	259.7

As shown in Table 2.14 and Table 2.15, the Free Flow time along the Cromwell Road corridor is 240 seconds (4 minutes) northbound and 269 seconds (4 minutes and 29 seconds) southbound.

Delay is experienced in both directions along the corridor during both the AM and PM peak hours. However, delay is shown to be higher during the PM peak hour, especially when travelling southbound, whereby 259 seconds (4 minutes and 19 seconds) are added to journey times. The higher PM peak hour delay southbound reflects the higher volumes of traffic joining Cromwell Road from Weasenham Lane and travelling south to the A47.

Southbound delay during the AM peak hour is approximately half that experienced during the PM peak hour.

Northbound delay is heavier during the PM peak, with 245 seconds (4 minutes 5 seconds) added onto journey times. Delay during the AM peak decreases to 123 seconds (2 minute 3 seconds) over the hour period.

Accident Data

Accident data was obtained from Cambridgeshire County Council's website, for the period of 2010 to 2016. Over this period a total of thirty seven accidents were reported along the Cromwell Road corridor.

Table 2.16 provides a summary of the accidents that have occurred within this time period by severity,

Table 2.16: Accident Summary for Cromwell Road

Year	Fatal	Serious	Slight
2010	-	-	18
2011	-	1	7
2012	-	-	5
2013	-	-	2
2014	-	-	2
2015	-	-	1
2016	-	-	1

The locations of these accidents are displayed in Figures 2.37 and 2.38.

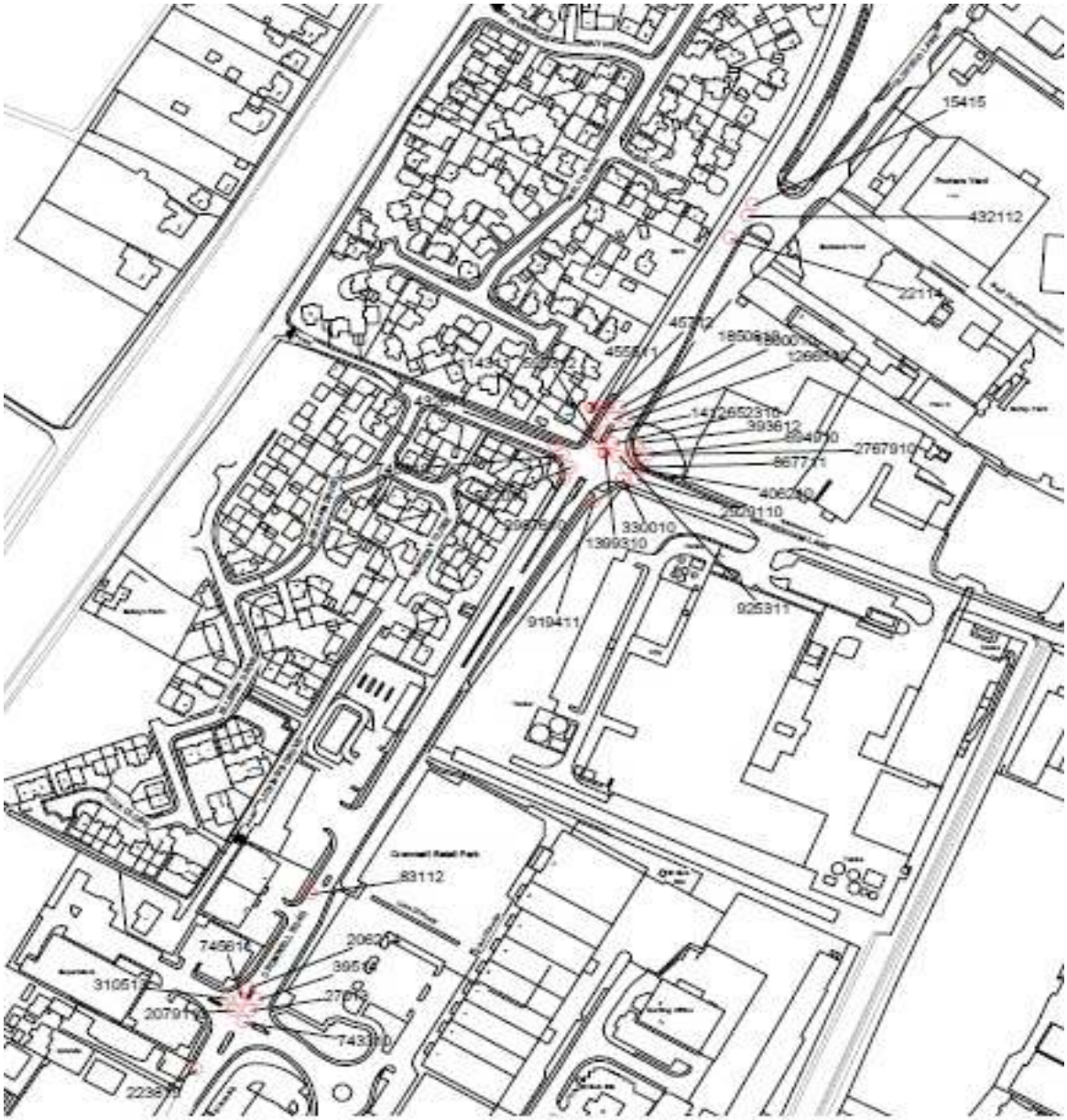


Figure 2.37: Cromwell Road Accident Plot 1 (2010 – 2016)

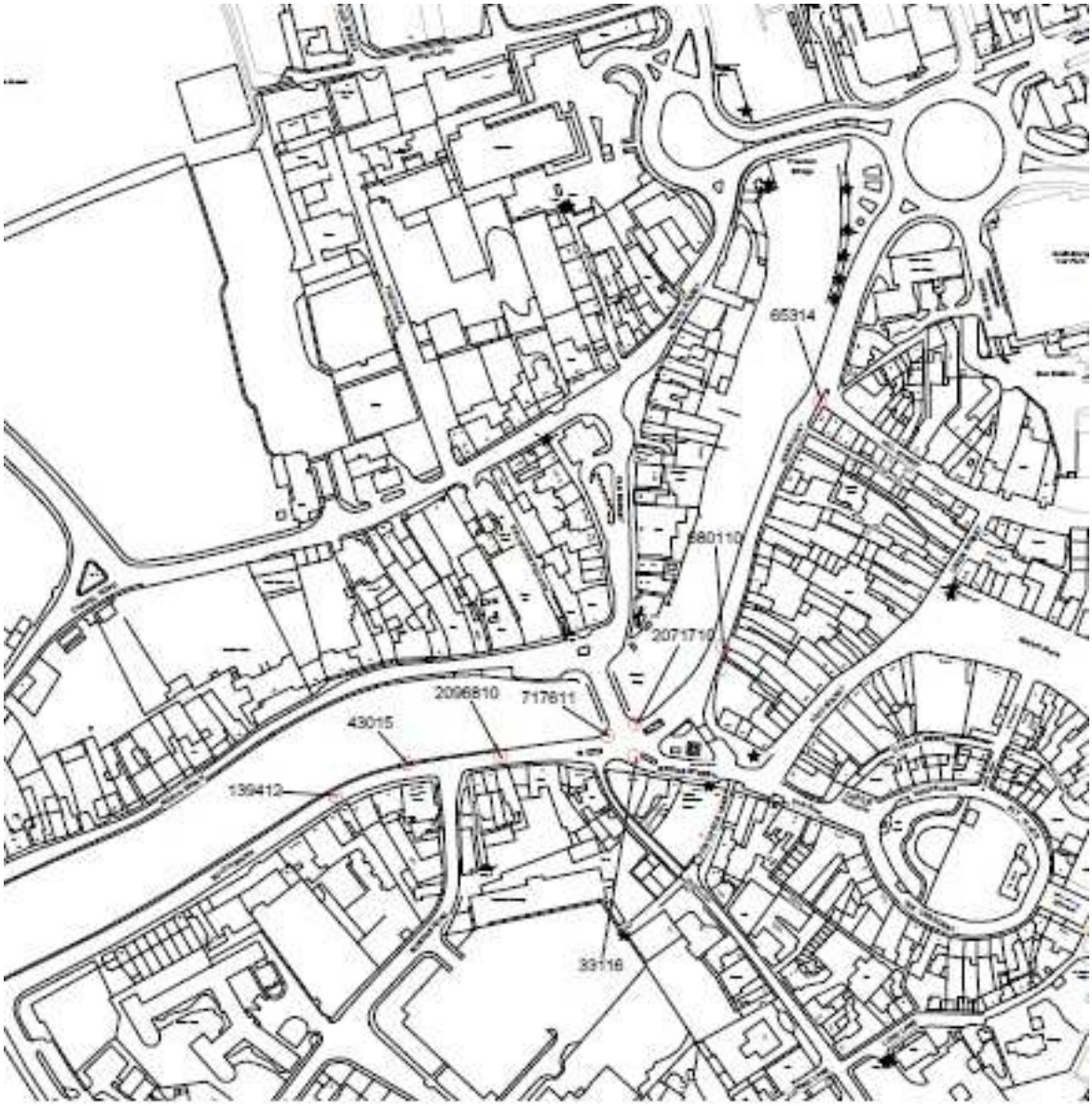


Figure 2.38: Cromwell Road Accident Plot 2 (2010 – 2015)

They show that the majority of accidents along the corridor were classified as slight in severity, with one accident at the Weasenham Lane Junction being serious.

Land Ownership / Highway Boundary

The boundary plans for Cromwell Road corridor including the junctions of South Brink, Weasenham Lane and the A47 Roundabout are shown beneath in Figure 2.39. Note: Green shading is representative of highway that is maintainable at public expense.

Figure 2.39: Cromwell Road Highway Boundary Plots

Flood Risk

Using data provided by The Environment Agency, Figure 2.40 shows Cromwell Road lies predominantly on Flood Zone 2 (Light Blue - Medium Risk) and Flood Zone 3 (Darker Blue - High Risk). Areas immediately next to the River Nene such as South / North Brink benefit from the flood defences in place.

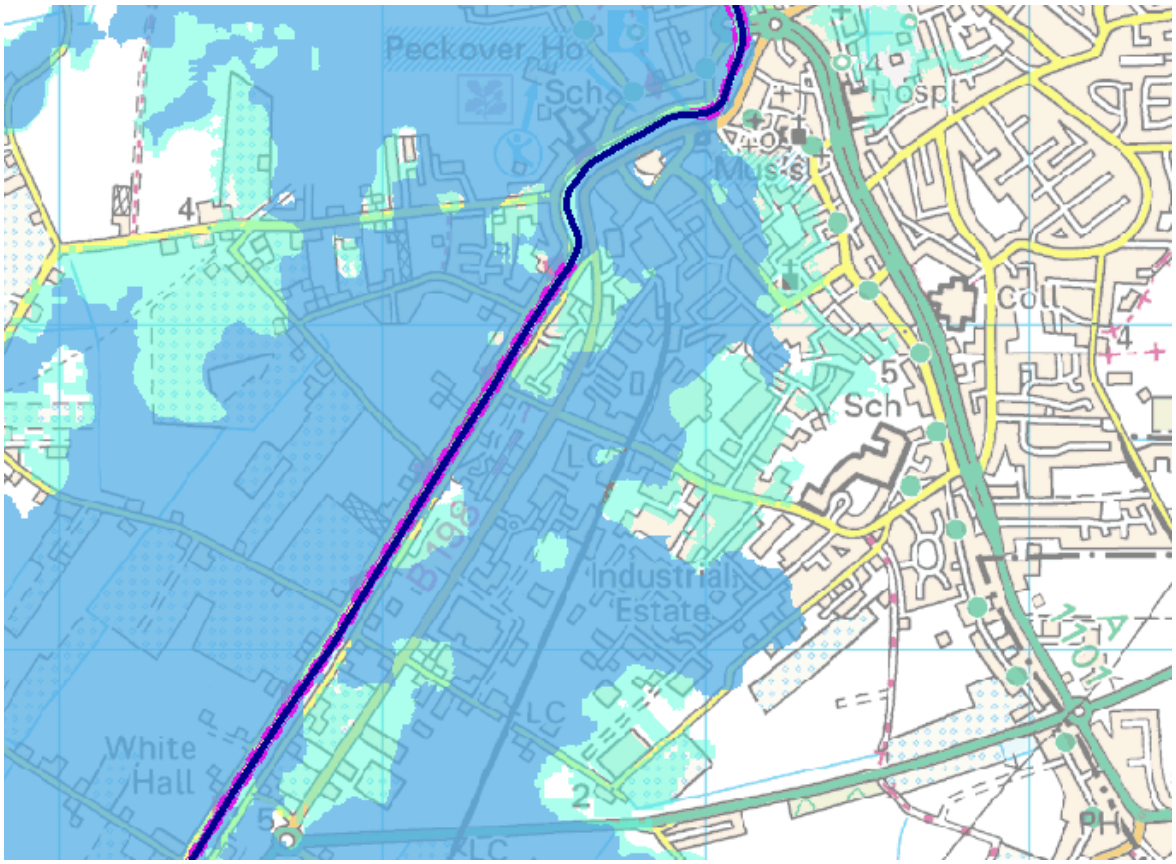


Figure 2.40: Flood Risk for Cromwell Road.

The design of highway improvements along this corridor would need to take account of this flood risk.

Environmental Issues

An environmental assessment of the study area has been undertaken using the Government's mapping tool MAGIC. The assessment identified the following environmental considerations.

Traditional Orchards and Deciduous Woodland north of the A47 and west of the South Brink Junction (Figure 2.41); and,

- The presence of breeding species which are found across the town.

These elements should be considered within any scheme design, but are not considered to be sensitive enough to significantly impact on the deliverability of a scheme at this location.

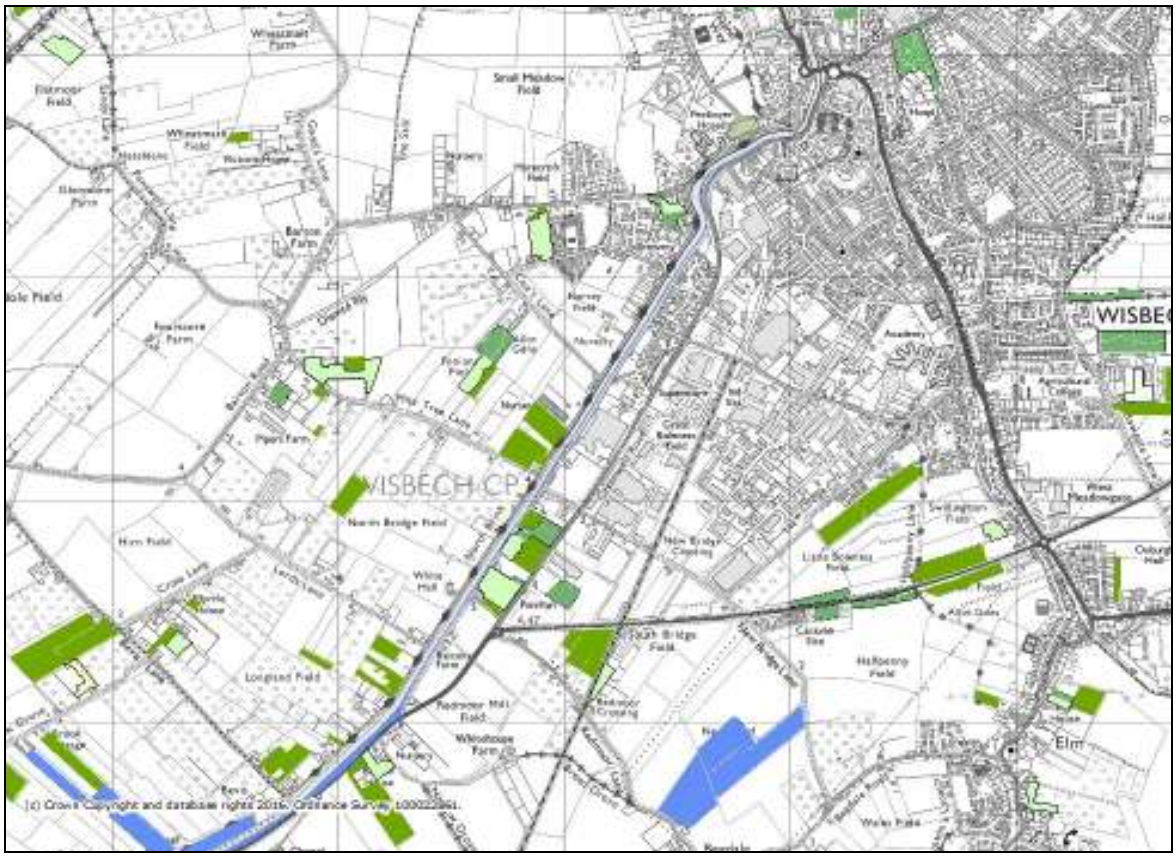


Figure 2.41: Ecological Issue (Habitats) to consider along Cromwell Road

3 Development Proposals

Introduction

This chapter provides an overview of the South West Wisbech extension, outlining the development proposal, and the potential impact development traffic could have on the operation of the lower section of Cromwell Road.

South Wisbech Development Site

The South West Wisbech Broad Location for Growth is defined in Policy LP8 of the Fenland Local Plan (2014) and includes around 217 acres of land to the north of the A47, with the River Nene forming the western boundary of the site and Elm Low Road the eastern boundary.

The Local Plan 2014 describes the South West Wisbech development site as follows:

"This area is located broadly to the north of the A47, south-east of New Drove, north and south of New bridge Lane, and along Cromwell Road between New bridge Lane and the A47/B198 roundabout. Will require improved east-west road links to relieve pressure on Weasenham Lane. This will form the basis of the Southern Access road also being investigated as part of the Wisbech Access study. The area will be predominantly for business purposes, though there is some potential for residential development. Existing areas of high quality woodland, including some mature orchards, should be retained and enhanced to serve as multifunctional public open space areas with amenity, biodiversity and community food value. Noise mitigation and screening measures should be provided along the A47, and between the residential and business areas as appropriate."

A Broad Concept Plan (BCP) of the site was produced in April 2015. The BCP shows the site split into 4 phases, these are Phase 1, Phase 1a, Phase 2 and Phase 3. The BCP is shown on the following page.

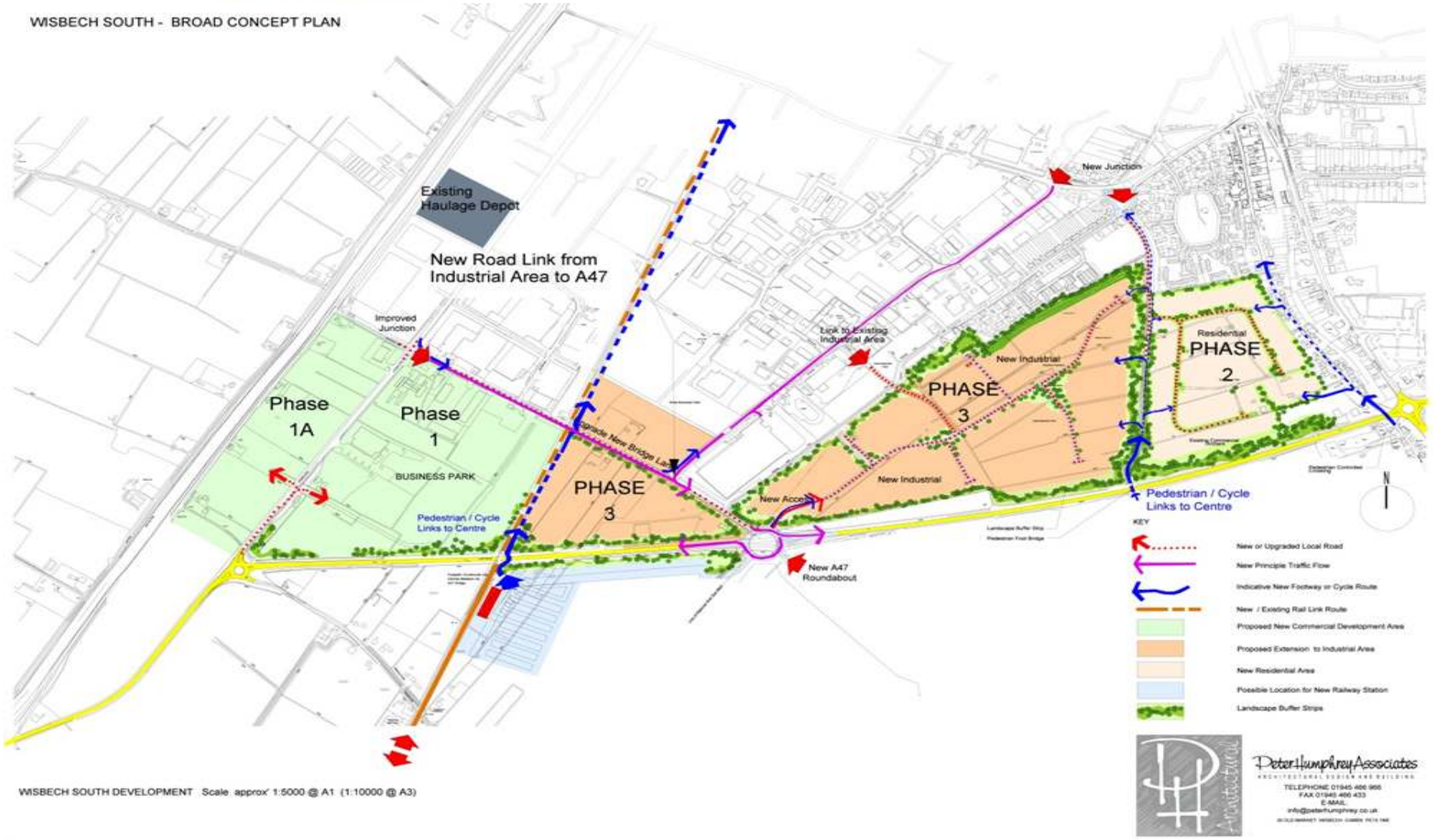


Figure 3.1: South Wisbech Broad Concept Plan

The composition of the four phases shown in the BCP are detailed beneath.

Assumptions for Phase 1

Phase 1 consists of a series of land parcels:

- **Site A:** This site is about 2ha and will consist of a mix of development split between office use (2,100 sq. m) and warehouse use (2896 sq. m).
- **Site B:** The site is about 2.4ha with expected job creation of 134.
- **Site C:** This site is 4.7ha and will create around 380 jobs on a breakdown of 10% B1 office use, 60% B2 industry use and 30% B8 distribution use.
- **Site D** About 1.2ha site, with an assumed 10% B1 office, 60% B2 Industry use and 30% B8 Distribution use. This site also includes a Pub / Restaurant.
- **Access Assumptions:** The BCP shows access to Phase 1 via a new junction with Cromwell Road. Previous traffic modelling work undertaken by Atkins to inform the Local Plan (Wisbech Traffic Model, Strategic Development Sites: March 2015) has assumed that this junction is a four arm signalised junction providing access to / from Cromwell Road from the Phase 1 and Phase 1A sites. This assumption has been retained for the Wisbech Access Study and is included within this particular assessment by virtue of the traffic flows extracted from the WATS model and used in the Option Assessment.

  As well as an access point onto Cromwell Road, this assessment has also included an additional access onto New Bridge Lane at the existing junction with Salter's Way.

Assumptions for Phase 1A

- Phase 1A will have one access point into and out of the site, as with Phase 1 this is assumed to be via a signalised junction with Cromwell Road. The site is about 10ha of proposed commercial development.

Assumptions for Phase 2

- Phase 2 has an indicative timeline of 2016 – 2021 and consists of 14.30ha of residential land use. The current assumptions are for 25 houses per hectare and will be built at a rate of around 80 dwellings per year for 5 years, with the total number of house estimated to be approximately 360. The site will be accessed from New Drove / Half Penny Lane.

Assumptions for Phase 3

- Phase 3 consists of approximately 35ha. of industrial land which is forecast to be developed between 2018 – 2031. This expected to generate 1,611 jobs between 2018 and 2025, and a further 1,144 jobs between 2025 and 2031(based on the same land use split as Phase 1).
- Access into Phase 3 has been assumed to be via three local access junctions along New Bridge Lane and Boleness Road.

Development Traffic

Forecast traffic flows for future years of 2021, 2026 and 2031 have been extracted from the 2015 Wisbech Access Transport Study (WATS) model.

The three phases of the Broad Concept Plan are represented within the WATS model using a series of SATURN zones dedicated to development traffic. The zones are shown in the figure beneath.

Figure 3.2: Representation of the Wisbech South West Phases in Saturn Zones

The zones from the 30000 series (30218, 30222, 30251, 30215 and 30221) represent the Wisbech South development site. Zones 121 (green) represent existing traffic generated by the areas adjacent to the development site.

South Wisbech Development Traffic and Impact on the Cromwell Road Corridor

To assess the impact of development traffic on the operation of the lower section of Cromwell Road, the following data has been extracted from the SATURN based WATS model or WATS VISSIM Model (2015 base):

- Predicted traffic growth from development zones as well as the number of vehicles destined for Weasenham Lane, New Bridge Lane and the A47 roundabout; and,
- Journey Times and delay to understand the impact of development traffic on vehicle delay along this route.

The Do Minimum Model has been used to extract the above data, which is presented for both the AM (08:00 – 09:00) and PM (17:00 – 18:00) peak hours, as well as the forecast years assessed within this study.

For information regarding the 'Do Minimum Model' please read the Cromwell Road Option Assessment Technical Note in conjunction with this report, see Appendix A.

South West Development Traffic Growth

The number of development trips destined for the Cromwell Road / Weasenham Lane Junction and the lower section of Cromwell Road (between Weasenham Lane and the A47 roundabout) has been assessed.

Traffic flows have been extracted from the zones shown in Figure 3.2 (excluding 30218) using the SLA tool within SATURN. The use of SLA has enabled the number of trips generated from each zone to be identified, whilst allowing the movement of the development traffic to be traced across the network.

Note: Zone 30218 has not been included within this assessment, due to traffic from this zone being shown to utilise South Brink rather than Cromwell Road in order to join the network.

The tables beneath shows traffic flows generated by each development zone as well as how many vehicles are expected to pass through Weasenham Lane junction and continue southbound toward the A47.

Table 3.1: South Wisbech Development Traffic Network Dispersal - 2021

SATURN Zone	AM			PM		
	Reaching WHL	New Bridge Lane	A47 Rdt.	Reaching WHL	New Bridge Lane	A47 Rdt.
30222	38	40	40	71	78	78
30251	0	0	0	0	0	0
30215	8	7	6	12	12	12
30221	15	14	13	7	6	6
Total	61	61	59	90	96	96

Traffic flows generated by the development site in the AM peak hour, appear similar across Weasenham Lane, New Bridge Lane and the A47 Junction. The Pm peak hour shows higher traffic flows, with an additional 96 vehicles predicted to travel through both New Bridge Lane and the A47 roundabout between 17:00 and 18:00.

Note, traffic flows shown for zone 30251 are consistent with the phasing of the sites within the BCP, as discussed earlier in this chapter.

Table 3.2: South Wisbech Development Traffic Network Dispersal – 2026

SATURN Zone	AM			PM		
	Reaching WHL	New Bridge Lane	A47 Rdt.	Reaching WHL	New Bridge Lane	A47 Rdt.
30222	37	43	43	69	80	80
30251	5	8	4	12	21	9
30215	12	10	10	31	30	29
30221	16	15	15	8	7	7
Total	70	76	72	120	138	125

Similarly to 2021, traffic flows in the AM peak hour of 2026 appear balanced across each of the junctions assessed, with between 70 – 76 vehicles added to each junction.

Traffic flows are shown to increase from 2021 during the PM peak hour, with the greatest traffic flow being 138 vehicles added to the New Bridge Lane Junction. Of these 138 vehicles, 80 vehicles are shown to originate from zone 30222 (which represents phase 1 in Figure 3.1), which reflects the close proximity to the New Bridge Lane junction.

Table 3.3: South Wisbech Development Traffic Network Dispersal - 2031

SATURN Zone	AM			PM		
	Reaching WHL	New Bridge Lane	A47 Rdt.	Reaching WHL	New Bridge Lane	A47 Rdt.
30222	37	44	44	76	77	77
30251	16	25	8	37	26	26
30215	20	17	16	65	51	49
30221	17	16	15	9	7	7
Total	90	102	83	187	161	159

New Bridge Lane is shown to have the greatest increase in traffic following the construction of the development site in the AM peak hour of 2031. This finding is consistent with 2021 and 2026 results.

During the PM peak hour, Weasenham Lane is shown to receive the greatest amount of traffic (187 vehicles) that is generated by the development site. New Bridge Lane and the A47 roundabout appear balanced with additional development traffic shown to be approximately 160 vehicles.

South Wisbech Development Traffic impact on Journey Time and Delay

Journey time and delay data have been extracted from the WATS Model to assess any changes in performance along the lower section of Cromwell Road (between New Bridge Lane and A47 Roundabout), due to the completion of South Wisbech site.

The tables below shows the modelled journey time and delay for peak hours of each of the forecast years assessed.

Table 3.4: Cromwell Road Journey Time Analysis (seconds)

Lower Cromwell Road	Journey Times (Seconds)					
	2021		2026		2031	
	AM	PM	AM	PM	AM	PM
Northbound	64.9	73.2	66.1	74.4	67.4	72.3
Southbound	80.5	85.5	80.6	86.4	80.4	84.4

Table 3.4 above shows that journey times along the lower section of Cromwell Road are expected to reach over a minute across all scenarios assessed. The highest journey time shown is 86.4 seconds (1 minute 26 seconds) for the PM peak hour of 2026.

Journey times presented for each of the carriageway directions appears balanced across the peak hours. However, it should be noted that both carriageway journey times appear higher during the PM peak hour.

When the future year modelled journey times are compared back to the observed journey times reported in Chapter 2 of this report, the following journey time increases can be expected:

- AM peak hour (northbound): 57.3 seconds in 2016 to 67.4 seconds in 2031;
- PM peak hour (northbound): 57.4 seconds in 2016 to 72.3 seconds in 2031;
- AM peak hour (southbound): 50.8 seconds in 2016 to 80.4 seconds in 2031; and,
- PM peak hour (southbound): 68.2 seconds in 2016 to 84.4 seconds in 2031.

The impact on delay on Cromwell Road is shown below.

Table 3.5: Cromwell Road Delay Analysis (seconds)

Lower Cromwell Road	Delay (Seconds)					
	2021		2026		2031	
	AM	PM	AM	PM	AM	PM
Northbound	9.2	9.3	9.2	9.4	10.2	10.6
Southbound	9.4	11.2	9.5	12.2	9.4	13.3

A function of the increased journey times along Cromwell Road, is a corresponding increase in delay. The highest delay shown is 13.3 seconds for the PM peak hour of 2031 when travelling southbound.

Delay shown in Table 3.5 is shown to be balanced across all scenarios assessed. Similarly to the pattern shown in Table 3.4, delay is shown to be higher during the PM peak hour for both carriageway directions.

4 Option Development

An Option Development workshop was held on the 3rd March 2016 at the Wisbech Boathouse Business Centre, to collectively discuss and devise improvement options for the following locations as part of the Wisbech Access Study:

- Elm High Road;
- Cromwell Road, and:
- Freedom Bridge Roundabout.

The workshop was attended by approximately twenty stakeholders of various planning, transport planning and highways disciplines, from:

- Cambridge County Council;
- Fenland District Council;
- Highways England;
- King's Lynn and West Norfolk Borough Council; and,
- Skanska / Atkins.

Attendees were divided into three groups, of around six members each, to concentrate on developing options for one of the three areas identified above. Once this process was complete, a group discussion was held to review each of the individual options, each of which was challenged by the remaining two groups.

Options Devised During the Initial Workshop

Six options were devised for Cromwell Road as a result of the workshop. Options devised for this study element consider improvement to different sections along the corridor including the Cromwell Road / A47 roundabout and the Cromwell Road / New Bridge Lane junction. In line with the requirements for funding, all of the options were focussed on enabling the growth identified for the South West Wisbech site.

Below is a summary of the options developed during the workshop, each of which are discussed in turn within this chapter:

- **CR 1 –** Divert general traffic onto South Brink and create a new gateway into Wisbech along the river;
- **CR 2 –** Remove current Tesco access, and re-configure the junction to form a new signalised junction with New Bridge Lane;
- **CR 3 –** Close Salters Way access onto Cromwell Road, providing sole access via New Bridge Lane;
- **CR 4 –** Close access from the residential estate onto Cromwell Road / Weasenham Lane junction, providing sole access via South Brink;
- **CR 5 –** Landscaping and footpath upgrade along the length of Cromwell Road, and:
- **CR 6 –** Create a larger, enhanced capacity A47 / Cromwell Road roundabout that could also facilitate the Western Link Road.

Note that following the Option Review Workshop, several options for CR 6 were discussed and this eventually evolved into Option CR 7 before any assessment had been undertaken, consequently Option CR 6 is referred to as Option CR 7 for the remainder of the study.

Option Review Workshop

A second workshop was held on the 19th October 2016 to further refine these options following initial assessment, and provide the opportunity to consider some more. Group discussions were used to collectively determine which options were operationally viable (either in their own right or in combination with others) after initial modelling assessments, and which were to be retained for further assessment and potential inclusion within the packaging assessment.

The discussion considered the following criteria:

- Initial modelling assessment results;
- Pedestrian / cycle facilities;
- Level of disruption to the network during construction; and,
- Level of benefit when compared to other options (where applicable).

Results from the initial modelling assessment were used to inform the workshop discussion, and some of the conclusions from this modelling work are discussed within this chapter. Further detail on this assessment is discussed in the following chapter 'Option Assessment', and full details are provided in the technical notes contained within Appendix A.

Additional options were also created during the review process, for inclusion within the option assessment process, these were:

- **CR 7 (a, b, c)** – Variation of Option 7, capacity enhancements through geometry changes;
- **CR 8** – Further junction improvements to Cromwell Road / Weasenham Lane;
- **CR 9** – Widening of Cromwell Road to two lanes in each direction between the A47 and New Bridge Lane,
- **CR10** – Junction improvements to Nene Quay / Town Bridge / South Brink Option.
- **CR 11** – Re-route the A47 to avoid Cromwell Road roundabout and instead link with a new A47 roundabout which serves the Wisbech South Development site. This option would also sever Redmoor Lane from the Cromwell Road roundabout.

Please note that no schemes have currently been assessed for CR 10, because:

- Improvements at this location are not directly associated with any growth site, which is a significant factor in the funding requirements. However, some options have been identified and could be assessed at a later date as part of a separate piece of work.

The requirement for options at this location may be reviewed once the packaging assessment has been undertaken and the level of benefit and the performance of the other identified options for Cromwell Road are fully understood.

Workshop Conclusions

Table 4.1 reports the outcome of the Review Workshop, indicating which of the options devised (disregarding CR 10) have either been retained or dismissed from further assessment within the study. Each of the options are then discussed in turn beneath.

Table 4.1: Workshop Conclusions

Option	Retain	Dismiss	Comments
CR 1		✓	• Reduces pressure along the corridor • Deceases performance at South Brink Junction • Road inappropriate for general use and restrictions too tight to upgrade
CR 2	✓		• Performed well, junction within capacity in 2021 and 2026 despite higher traffic flows • Crucially, unlocks access to the development site via New Bridge Lane
CR 3		✓	• More vehicles are processed out of NBL; • Closure of Salters Way causes NBL to operate over capacity, due to vehicles being unable to exit to the north due to queuing traffic at Tesco Junction
CR 4		✓	• Closure of WHL west provides marginal benefit through increased green time for other approaches – reduces delay, queues and LOS on all approaches • Relocating traffic to South Brink decreases junction performance, in 2021 and 2026
CR 5		✓	• Footpath / crossing point improvements to be a requirement alongside any option • **NOTE:** although discarded as an individual option for assessment, pedestrian and cyclist provision will be included within each of the options assessed.
CR 7		✓	• Benefit to all approaches: • Overall the junction is over capacity in peak hours and within future years assessed • Less benefit than additional changes found in Option 7a
CR 7c	✓		• Increased capacity at A47 (W) allows more vehicles to be processed, causing conflicts with the WLR approach; • Overall the junction is over capacity in peak hours during forecast years, further refinements will be required during more detailed assessment
CR 8	✓		• Helps junction capacity • Relieves some of the congestion issues that are encountered on the Southern Access Road, notably along Boleness Road
CR 9	✓		• Minimises delay when entering the corridor and on the approach to the A47 roundabout; • Increases capacity along the corridor for vehicles to/ from the south and west development sites
CR 11		✓	• Relieves congestion issues on Cromwell Road roundabout • May add additional journey time to A47 • Could simply move problem from one roundabout to another

Each of the options described above are discussed in turn beneath, the more detailed assessment of the retained options is then considered within the next chapter.

Option CR 1

Option 1 would provide a second north / south access route into Wisbech along South Brink. Vehicles would be diverted away from Cromwell Road and would instead use South Brink via Redmoor Lane. Vehicles would re-join Cromwell Road via South Brink Junction, half a mile southwest of Freedom Bridge Roundabout.

The option assumes that South Brink would be upgraded, however it would remain as a single carriageway for northbound traffic only. Figure 4.1 highlights the diversion route assumed for this option.

Figure 4.1: Option CR 1

Workshop Comments

Table 4.2 below summarises the strengths and weaknesses associated with this option.

Table 4.2: Option CR 1 Workshop Discussion

Strengths	Weaknesses
• Alleviates pressure along Cromwell Road, freeing capacity for South Wisbech Development Site traffic	• New route would take vehicles / passing traffic away from commercial and business units along Cromwell Road
	• Insufficient width along South Brink to cater for two way traffic, due to flood wall
	• Drivers likely to continue using Cromwell Road as core route, unless restrictions are implemented

Option Outcome

This option has been **dismissed** from further progression within the study, on the basis of:

- Weaknesses outweighing benefits;
- Doesn't cater for pedestrian facilities; and,
- Remaining options provide greater benefit along Cromwell Road.

Option CR 2

This option proposes to reconfigure the existing Tesco junction, creating a new signalised staggered junction with New Bridge Lane East. Retained access to New Bridge Lane West (for deliveries to Tesco) is incorporated into the new junction design.

Workshop Comments

Table 4.3 below summarises the strengths and weaknesses associated with this option.

Table 4.3: Option CR 2 Workshop Discussion

Strengths	Weaknesses
• Provides more capacity along the southern section of Cromwell Road and New Bridge Lane East	• Adds an additional set of traffic lights along the corridor, however they would be incorporated into the Tesco Junction
• Provides improved access to the South Development site	• Signals would add delay along congested gateway into the town
• Junction improvements allow for the alteration of lane allocations, catering for increased traffic flows	

Option Outcome

This option has been **shortlisted** for further progression within the study, on the basis of:

- Good initial modelling results, with scheme changes adding capacity through extending flares and altering lane allocations;
- Upgrading the southern section of the corridor improves the access into/ out of the South Wisbech Site; and,
- Pedestrian facilities will remain with the signalised junctions

Option CR 3

This option proposes to close the Salters Way access onto Cromwell Road, and re-route vehicles via the New Bridge Lane East junction. The rational to this option was to reduce the number of accesses onto Cromwell Road.

Workshop Comments

Table 4.4 below summarises the strengths and weaknesses associated with this option.

Table 4.4: Option CR 3 Workshop Discussion

Strengths	Weaknesses
• Rationalises the number of approaches onto Cromwell Road, allowing freer flowing traffic	• Higher traffic flows due to diversions from Salters Way, adds delay to New Bridge Lane East junction
• Relatively inexpensive scheme to implement	• Compromises the performance of Option CR2, following greater pressure on New Bridge Lane. • Potentially comprising the delivery of the South Wisbech Site
	• Impact on network including Tesco Junction and Cromwell Road (north and southbound)

Option Outcome

This option has been **dismissed** from further progression within the study, on the basis of:

- Weaknesses outweighing benefits / poor initial assessments;
- Doesn't cater for pedestrian facilities; and,
- Remaining options provide greater benefit along Cromwell Road and for the South Wisbech development site.

Option CR 4

This option proposes removing the Weasenham Lane West approach to the Cromwell Road / Weasenham Lane junction. Traffic from the Reason Homes housing estate would instead travel via South Brink via a new access into the western side of the development.

Workshop Comments

Table 4.5 on the following page summarises the strengths and weaknesses associated with this option.

Table 4.5: Option CR 4 Workshop Discussion

Strengths	Weaknesses
• Closure of Weasenham Lane West allows for greater signal green time on remaining approaches with higher traffic flows	• Sole access for residential site is via South Brink
• Allows for reallocation of lanes, increasing approach capacity on remaining approaches	• Pressure added to Cromwell Road / South Brink junction
	• South Brink is not suited to regular two way traffic including HGVs, and is too constrained to upgrade sufficiently

Option Outcome

This option has been **dismissed** from further progression within the study, on the basis of:

- Despite good initial assessment results, the benefit across future years was minimal, especially in the PM peak hour whereby traffic flows are higher along Cromwell Road; and,
- South Brink is not suited to regular two way traffic including HGVs, and is too constrained to upgrade sufficiently.

Option CR 5

This option proposes an upgrade to landscaping and pedestrian / cyclist facilities along the length of the Cromwell Road corridor.

Workshop Comments

Table 4.6 below highlights the strengths and weaknesses associated with this option.

Table 4.6: Option CR 5 Workshop Discussion

Strengths	Weaknesses
• Improves connectivity along the corridor	• A scheme that doesn't aim to reduce traffic along the corridor
• Landscaping would improve the appearance of Cromwell Road as a gateway into the town	• Scheme does little to facilitate traffic growth of the South Wisbech site
• Improvements could be completed in phases, incorporated into other schemes along the corridor, and included with future improvements / maintenance works	

Option Outcome

This option has been **dismissed** from further assessment within the study as a standalone option. However, it should be noted that pedestrian and cyclist improvements will be incorporated into other options progressed along this route.

Option CR 7

Option 7 proposes to upgrade and enhance the capacity of the A47 / Cromwell Road Roundabout, and ultimately facilitate the connection of the Western Link Road at this location (as determined by the assessment of the New River Crossing and Western Link Road, further details are available in both scheme reports). The additional arm of the Western Link Road would be located on the western side of the junction between Cromwell Road and the A47 West approaches.

The initial Option CR 7 assumed that the roundabout would be enlarged to an ICD of 37 m, both A47 arms would have two lane entries and exits for 250 metres and both Cromwell Road and the Western Link Road would have two lane approaches. The section of Redmoor Lane that links South Brink to Cromwell Road is assumed to be closed in this option.

Figure 4.2 on the following page shows how Option CR 7 appears within the model.

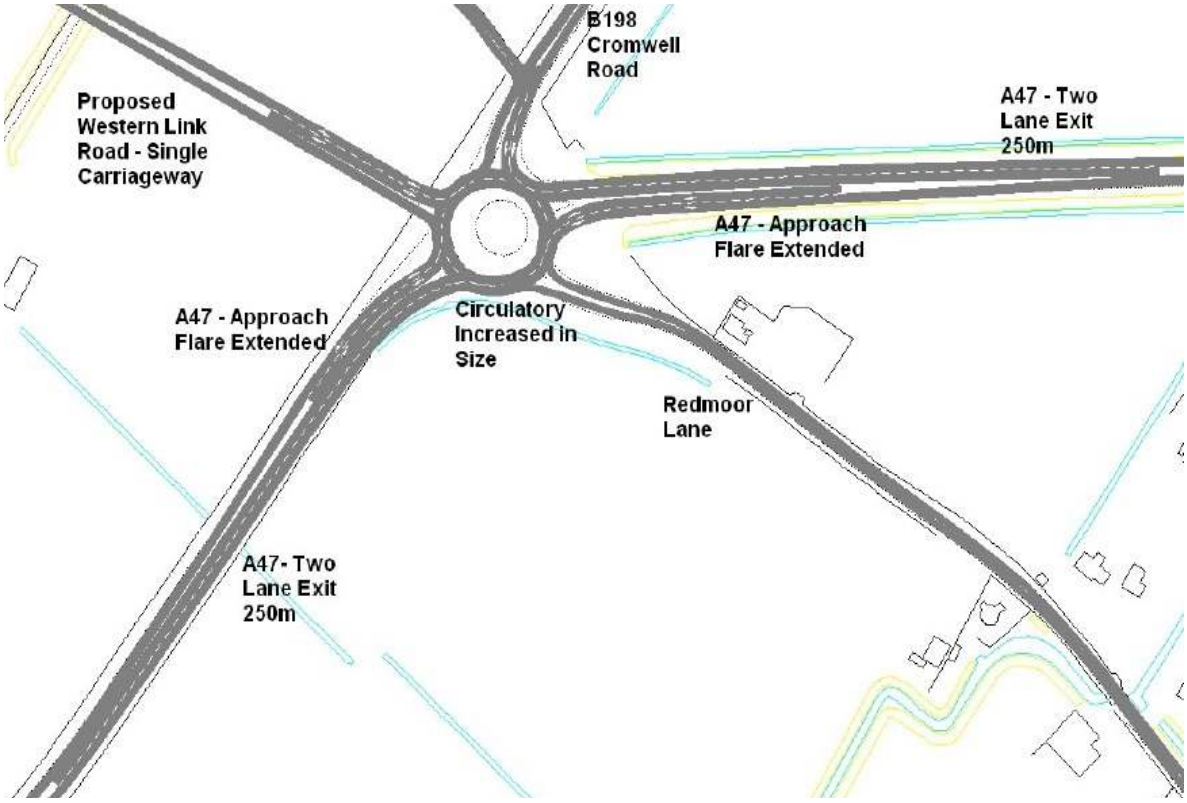


Figure 4.2: Option CR 7 Layout

Workshop Comments

Table 4.7 below summarises the strengths and weaknesses associated with this option.

Table 4.7: Option CR 7 Workshop Discussion

Strengths	Weaknesses
• Facilitates the Western Link Road	• High level of disruption during construction
• Facilitates growth of the South Wisbech development site. Additionally improves the gateway to this area	
• Mitigates against the impact of traffic growth along the A47	
• Largely built within highway boundary	
• Enables the capacity along the southern section of Cromwell Road to be increased	

Option Outcome

Initial modelling results of Option 7 showed that upgrading the roundabout provided a small amount of benefit, when assessed under the scenarios of future year traffic flows and with / without the Western Link Road. Despite this layout of CR 7 exacerbating issues of delay and queue lengths, the opportunity to develop the option further in order to address these issues was presented.

Option CR 7 Variation

The original Option CR 7 underwent several variations and refinements within the Option Assessment process to respond to the results from the traffic modelling and highway design input. These were:

- **Option CR 7** – this is the option described above, which was defined in the Option Development Workshop in March 2016;
- **Option CR 7a** – this was devised during the Option Refinement Workshop held in October 2016 following initial modelling results. An engineering site visit was undertaken and identified scope to add to the original Option CR7 by further increasing the ICD of the roundabout, and extending the two lane approach on the Western Link Road. The site visit also suggested reducing the two lane merge on both A47 exits down to 100 metres. As these recommendations further improved capacity in the option, they were incorporated into the option design and assessed as Option CR7a;
- **Option CR 7b –** this version of the option further increased the ICD of the roundabout to 60 metres to accommodate three lane approaches on both A47 approaches, CR7b also added a 30m flare to the Redmoor Lane approach. These changes were in response to the issue of the new WATS model which identified there was still some significant levels of congestion associated with Option CR7a (although it did offer a notable improvement over the Do Minimum scenario);
- **Option CR 7c –** this option removed the left dedicated lane from the A47 West to the Western Link Road. The provision of three lanes on the A47 West approach removed the need for this left dedicated lane. Removing this element from the scheme reduced the need for additional land take and the cost of the additional infrastructure associated with the left dedicated lane. Note that the left from the A47 West to the Western Link Road can still be segregated from the other turning movements at the roundabout itself.

Option Outcome

The final variation of Option CR 7c has been **shortlisted** for further assessment within the study, on the basis of:

- Initial modelling results – Indicating an increase in capacity at the roundabout enables RFC values to be within 0.85 threshold across forecast years; and,
- Issues of delay and queue lengths were predicted to be reduced compared to the original Option CR 7.

Option CR 8

Option 8 proposes improvements to the Cromwell Road / Weasenham Lane junction, by changing the layout from a signalised junction to a roundabout. Improvements to pedestrian facilities are incorporated into this option.

Workshop Comments

Table 4.8 below summarises the strengths and weaknesses associated with this option

Table 4.8: Option CR 8 Workshop Discussion

Strengths	Weaknesses
• Adds capacity to Weasenham Lane and Cromwell Road, enables the reallocation of lanes if required	• High level of disruption during construction, likely to impact the entire length of Cromwell Road corridor as well as hotspot areas of Weasenham lane, Elm High Road and Freedom Bridge Roundabout.
• Mitigates against the impact of development traffic (from south Wisbech site) on the wider network	• Concerns over gap availability for vehicles originating from the minor arm of Reasons Homes Residential site
• Helps facilitate the use of the Southern Access Road, helps alleviate pressure on Boleness Road.	• Roundabout likely to have a visual impact on the residential area to the west of the new roundabout
• Would remove delay associated with signals, especially during peak hours and Free Flow periods	
• Would reduce the number of traffic signals along the lower section of Cromwell Road	
• Opportunity to upgrade pedestrian facilities (crossing and footpaths) at the junction	

Option Outcome

The final variation of Option CR 8 has been **shortlisted** for further assessment within the study, on the basis of:

- Capacity is added to the junction within this location, also likely to help the wider network under forecasted development growth;
- Would help facilitate development growth of the South Wisbech Development site, a new roundabout is shown to help alleviate congestion on Boleness Road; and,
- Would facilitate pedestrian and cycle facility improvements along Cromwell Road.

Improvements to pedestrian facilities (both crossing points and footpaths) within this option will be included on all roundabout approaches to the junction. It is recommended that the upgrading of footpaths is extended along the entire length of Weasenham Lane within this option.

However it should be noted that implementing a pedestrian crossing over Weasenham Lane, in a central location between both the Elm High Road and Cromwell Road corridors is considered to be beyond the scope of this individual CR 8 scheme. This will however be considered further as the development site progresses.

Option CR 9

Option 9 proposes to widen the lower section of Cromwell Road (between the A47 and New Bridge Lane) to two lanes in each direction. This option includes the provision of a new junction which is being considered outside of the Wisbech Access Study, to provide access into the Phase 1A, and part of Phase 1 development sites. South Brink is assumed to be closed in this option.

Workshop Comments

Table 4.9 below summarises the strengths and weaknesses associated with this option.

Table 4.9: Option CR 9 Workshop Discussion

Strengths	Weaknesses
• Increases capacity along the southern section of Cromwell Road	• Encourages more traffic through Cromwell Road
• Facilitates access to the South Wisbech Development site	• Congestion from additional development site may make access to businesses etc. difficult for commuters
• Effectively achieved with Options CR 2 and CR 7A – minimal additional infrastructure needed to construct this option	• Assumes South Brink access will be closed, added vehicles along the corridor

Option Outcome

This option has been **shortlisted** for further progression within the study, on the basis that:

- Initial assessments are good, showing scheme benefit;
- Can be incorporated into other schemes, such as the A47 roundabout and New Bridge Lane; and,
- Facilitates the South Wisbech Development site.

Option CR 11

Option 11 proposes to make changes to the layout and access of individual approaches of the A47 / Cromwell Road roundabout, whilst providing an A47 bypass and new junction that serves the South Wisbech Development Site.

Through the proposed layout of this option the interaction between strategic A47 trips and localised traffic (destined for either the town centre or the development site) will be altered.

Figure 4.3 beneath shows the proposed network within this option (red), whilst the commentary that follows provides a description of the changes made to individual approaches within this option.

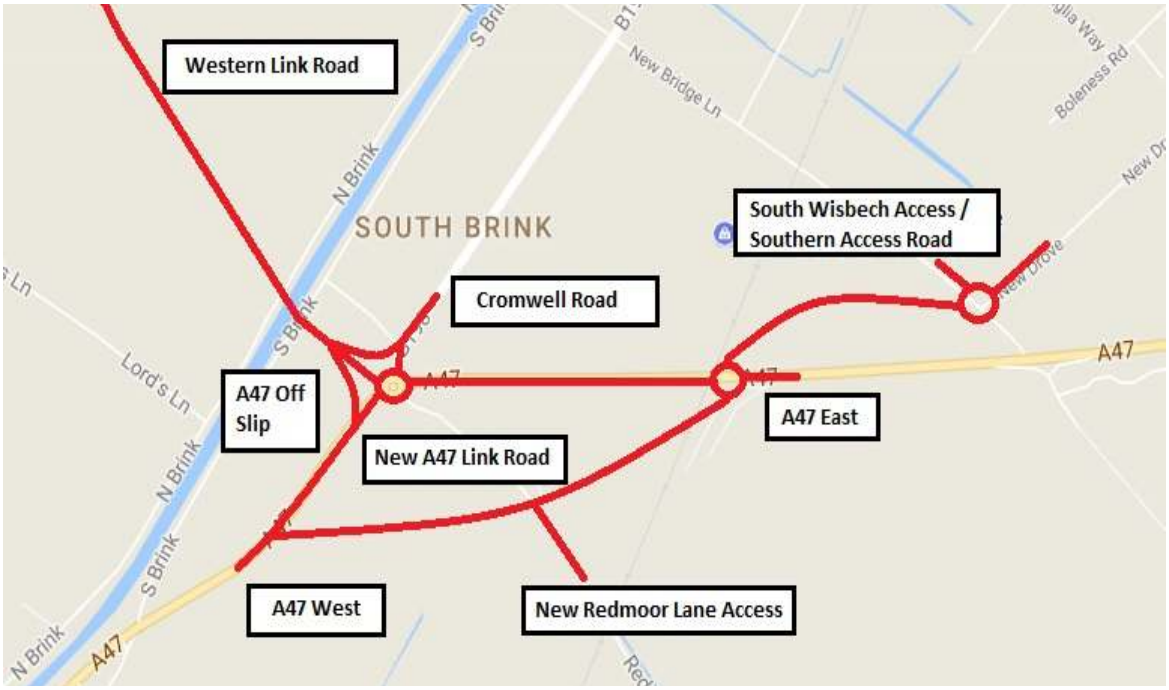


Figure 4.3: Option CR 11 Layout

A47 Approaches:

- Both the A47 West and A47 East approaches will no longer have to enter the Cromwell Road Roundabout if continuing along the A47. Instead vehicles making this movement will use a new link road (south of the existing roundabout) which connects into the wider network via a new A47 Junction as part of the South Wisbech Development Site;
- Vehicles originating from the A47 West can access the Western Link Road and Cromwell Road via a slip road and the existing Cromwell Road Roundabout; and,
- Vehicles originating from the A47 East can access the Western Link Road and Cromwell Road by using continuing straight ahead at the new A47 roundabout and using the existing A47 infrastructure.

Western Link Road:

- Vehicles originating from the link road will continue to enter the A47 / Cromwell Road roundabout to access the wider network;
- Vehicles destined for Cromwell Road from the link road can utilise a left lane slip road; and,
- Vehicles destined for the link road from the A47 West approach can also utilise a left lane slip to bypass the roundabout.

Cromwell Road:

- Access to Cromwell Road will remain via the A47 / Cromwell Road roundabout; and,
- Vehicles from this approach that are destined for either the A47 West or East approaches will have to use the new A47 junction, positioned to the west of the Cromwell Road roundabout.

Redmoor Lane:

- This approach will no longer be accessed via the A47 / Cromwell Road Roundabout, instead access is via a new priority junction positioned on the A47 bypass;
- Vehicles originating from / destined to Redmoor Lane will have to use the New A47 junction to connect to the wider network.

The New A47 Junction:

- The new A47 Junction will be a four arm roundabout, serving the new A47 bypass, the existing A47 infrastructure and the South Wisbech Development Site.

Workshop Comments

Table 4.10 below summarises the strengths and weaknesses associated with this option.

Table 4.10: Option CR 11 Workshop Discussion

Strengths	Weaknesses
• Facilitates a western link road	• Greater land take required for new bypass
• Layout wold alleviate queuing / delay on the A47 West approach to the Cromwell Road roundabout, as fewer vehicles would make this movement	• Vehicles travelling from Cromwell Road to the A47 West will have a small detour compared to existing route
• Segregates the strategic and localised trips through this layout	• Vehicles from Redmoor lane will have a small detour compared to existing route
• Layout proposed for Cromwell Road would improve operation of the roundabout, with less vehicles passing through it	• Rat running could be an issue for the new A47 Roundabout and development site
	• Existing issues of queuing on the A47 approaches to the Cromwell Road Roundabout could simply be moved to the new A47 junction
	• Close proximity between the new A47 junction and adjacent roundabouts causes concerns over stacking capacity and block backs

Option Outcome

This option has been **dismissed** from further progression within the study, on the basis that:

- A larger scheme to implement compared to remaining options, with the impact of delay to the A47 trunk road and possibility of moving an existing issue to the new roundabout outweighing the benefits to the operation of the Cromwell Road Roundabout; and,
- The need for detours (between Cromwell Road and A47 West) as well as the potential for rat running through the development may add strain to junctions on the wider network.

The Wisbech Access Study (WATS) Do Minimum Network

The Do Minimum Model will incorporate a new junction (Option CR 9) along Cromwell Road between New Bridge Lane and the A47 roundabout. Committed developments are expected to have built the new junction access prior to 2021 and therefore, it is important to understand the impact this junction will have on the Wisbech area.

The new development junction is proposed to be located 120m north of the A47 roundabout and will comprise of a staggered junction, similar in size to the New Bridge Lane / Tesco junction.

Option CR 2, incorporating New Bridge Lane signals into the Tesco Junction, will also be incorporated within the Do Minimum Model scenario.

With the close proximity of these two signalised junctions along Cromwell Road, each with their own flares, it was deemed necessary by designers to dual Cromwell Road from the A47 roundabout to New Bridge Lane, rather than losing a lane for a short distance, to then see the road dualled again for the next junction. Therefore, along with the new development site and Option CR 2 scheme, the Option CR 9 dualling scheme has also been incorporated in the DM scenario.

With the dualling of Cromwell Road to New Bridge Lane in both directions, the southern access to South Brink will be closed for safety reasons and vehicles will be re-routed within the network to exit/enter South Brink via the Purina Access/ South Brink junction to the north of Weasenham Lane.

The relationship between each junction and the justification for the inclusion within the Do Minimum model network is outlined on the following page:

- **Scheme CR2** – This is the signalisation of the Junction of the B198 Cromwell Road and New Bridge Lane, which provides the main access into the South Wisbech development site in the Do Minimum and Do Something Models. This option has been included to allow the proposed development traffic to exit the development zones and physically load onto the wider model network. Without including this improvement within the Do Minimum Model, the development traffic from South Wisbech would be 'stuck' at the edge of the network, and would not be fully accounted for within the model.
- **New Development Junction** – The New Development Junction located on the southern section of Cromwell Road is being assessed as a live planning application (January 2017) and is not a component part of the Wisbech Access Study. The form and location of the junction will be determined by the planning application process, it only features in the Wisbech Access Study to ensure that any surrounding schemes developed can be designed to work in connection with it. This has been included within the Do Minimum Model as it is considered likely to be implemented (in some form or the other) in the foreseeable future.
- **Scheme CR9** – This option consists of widening the B198 Cromwell Road to two lanes in each direction from New Bridge Lane to the roundabout with the A47. On the face of it, this appears to be quite a significant scheme to include within a Do Minimum Model, however with the inclusion of CR2 and the new development junction (each junction with two lane approaches in both directions), the length of single carriageway along this section is minimal and fragmented. The proximity of these junctions to each other, and the length of the approach lanes, mean that widening the remaining single carriageway to two lanes in each direction would be required from an operational, highway design and road safety perspective.

Option Development Summary

Based on the Option Review Workshop, the results from the transport modelling (which are discussed in further detail in the next chapter) as well as the information presented within the WATS Do Minimum section above, the following schemes have been retained for inclusion within the study:

- CR 7; and,
- CR 8.

As stated above, the widening of the lower portion of Cromwell Road, the upgrade of the New Bridge Lane / Tesco signals and the development junction (as outlined within Option CR 2 and 9) should be included within the Do Minimum Model. This will ultimately aid the operation of Option CR 7c and CR 8.

Further detail on the traffic modelling element of the Option Assessment is provided in the following chapter.

5 Option Assessment

Introduction

This chapter presents the results from the traffic modelling that was undertaken as part of the Option Assessment, and used to inform the Option Review Workshop and ultimately option selection.

The operational performance for each of the shortlisted options identified in the previous chapter (CR 7c and CR 8) have been summarised within this chapter. Further detail on the model development, and full results outputs are provided in the Cromwell Road Option Assessment Technical Note contained within Appendix A.

Additional model summaries of dismissed options including CR 2, CR 3, CR 4, CR 9 and CR 11 can also be found in Appendix A.

Modelling Assessment

In order to evaluate proposed schemes and quantify potential benefits, both the existing conditions and new design proposals have been assessed using traffic modelling software.

Modelling assessments for these schemes have been conducted using the VISSIM micro-simulation software (version 5.40-09), which is part of the PTV Vision Transport modelling. The five basic components that VISSIM is built upon include:

- Highway network (Link / connectors);
- Traffic control systems (signals, stop-give way controls);
- Traffic inputs;
- Vehicle type and compositions; and,
- Vehicle routes.

VISSIM has been used to analyse the movement of motorised and non-motorised traffic, including car, bus, pedestrian and cycle operations, under constraints such as lane configuration, traffic composition and junction form.

More information regarding VISSIM and the Wisbech VISSIM Model validation can be found within the 'Wisbech VISSIM Model LMVR report'.

Modelled Scenarios

The following scenarios have been assessed for shortlisted options for both the AM and PM peak hours for the forecast years assessed within this report:

- Do Minimum scenario; and,
- Do Something (with scheme).

The initial option assessment was undertaken using two sets of traffic flows for both the Do Minimum and Do Something scenarios, to represent the impact of changes beyond the model network. These traffic flow sets were:

- Without Western Link Road (w/out WLR); and,
- With Western Link Road (with WLR).

The purpose of this was to ensure that the options being assessed were still able to provide benefit, and operate efficiently, in both scenarios as there was still some uncertainty over the delivery of the Western Link Road at that stage of the study.

However, work undertaken on the development of the WLR (see the *Western Link Road Report*) provided further clarity on the development and phasing of the WLR, which was reflected in the reassessment of these options using the new WATS model (November 2015). This work identified that the WLR was not required in its entirety before 2031, and consequently the reassessment of the new options across the whole study was undertaken on traffic flows that did not include the WLR (w/out WLR) to ensure that they could operate without the diversionary benefits that the WLR was expected to deliver.

The exception to this is Option CR 7c, which has retained the 'with WLR' and 'w/out WLR' scenarios during the reassessment using the new model flows, as this junction directly forms a part of the Western Link Road, and would experience higher volumes of traffic as a result. Therefore the 'with WLR' scenario would be considered as the worst case scenario for this Option, whereas the 'w/out WLR' would be seen as the worst case scenario for the other options as they would not benefit from the diversion of traffic away from Wisbech itself as a result of the WLR.

Modelling Summary

Results of each of the shortlisted options are discussed in turn below. Please note, the following colour coding has been used to highlight the difference in scheme operation over the forecasted years;

- Green: No issues, scheme operates within capacity;
- Yellow: Scheme operates close to capacity, either one approach or junction overall. Or, if a schemes performance is constrained by the need for improvements at an adjacent junction; and,
- Red: Scheme operates at / overcapacity, either one approach or junction overall.

Option CR 7c

Option CR 7c enables the Western Link Road to be facilitated, through an enhanced roundabout of 60 m.

As stated on the previous page, this option has only been assessed under the 'With Western Link Road' scenario, as this is considered the as the worst case scenario for this Option.

Table 5.1 beneath highlights the results for this option.

Table 5.1: Option CR 7c Model Result Summary

	With WLR	
	2026	2031
AM Peak	All approaches to roundabout within capacity and performing better than DM. Cromwell Road marginally worse as a result of giving way to Western Link Road traffic. Junction LOS C.	All approaches to roundabout within capacity and performing better than DM. Cromwell Road marginally worse as a result of giving way to Western Link Road traffic. Junction LOS C.
PM Peak	All approaches to roundabout operating better than DM, although A47 (W) operating over capacity due to constraints in wider network. Junction LOS F.	All approaches to roundabout operating better than DM, although A47 (W) operating over capacity due to constraints in wider network. Junction LOS F.

Figure 5.1 shows that this option is expected to operate within capacity, providing benefit over the Do Minimum network.

Results for the AM peak hour of both 2026 and 2031 show that the addition of the Western Link Road makes the operation of Cromwell Road slightly worse (than it currently does) due to the give way controls on the roundabout.

Due to network constraints, the A47 West approach is predicted to be operating over capacity, as vehicles cannot proceed onto the A47 eastbound due to queuing back from the next adjacent A47 junction to the east. Despite this being identified within the model, the junction is still performing better than the Do Minimum network.

Option CR 8

Option CR 8 changes the Cromwell Road / Weasenham Lane junction from a signalised junction to a roundabout.

Table 5.2 beneath highlights the results for this option.

Table 5.2: Option CR 8 Model Result Summary

	Cromwell Road Option 8		
	Without WLR		
	2021	2026	2031
AM Peak	All approaches to junction well within capacity with LOS A. Delays significantly reduced.	All approaches to junction well within capacity with overall LOS A. Delays significantly reduced.	All approaches to junction within capacity with overall LOS C. Delays significantly reduced.
PM Peak	All approaches operating within capacity and delays reduced. Overall LOS C.	All approaches to roundabout operating better than DM, junction operating at capacity due to constraints in wider network. Junction LOS E.	All approaches to roundabout operating better than DM, junction operating over capacity due to constraints in wider network. Junction LOS F.

Table 5.2 shows that this option is expected to operate within capacity, providing benefit over the Do Minimum network.

Results for the AM peak hour of both 2026 and 2031 show that the addition of the roundabout makes the operation of this Weasenham Lane Junction operate better, with a LOS A and C recorded. Delays during this forecast years are predicted to be significantly reduced.

In the PM peak hour in 2026 and 2031, all approaches operate better than the Do Minimum, however the junction is at capacity due to constraints elsewhere on the wider network.

6 Concept Highway Design

Introduction

This chapter outlines the Concept Highway Design and cost - estimate for the preferred options identified within this report. The chapter includes:

- Design Assumptions and Input decisions;
- Concept Design Drawings;
- STATS Review; and,
- Road Safety Review.

Preferred Option

The schemes within the Wisbech Access Study have been designed to concept design level. Designs are based on national and local highway standards, and make clear reference where departures from standards are proposed. Concept designs are adequate to undertake transport assessments, and to inform Outline Business Cases. Any further level of design would require highway surveys, including topographical surveys.

Scheme designs have been informed by an initial STATs search, to identify if any public utilities would be affected by the scheme which may compromise scheme delivery.

As identified within the previous chapter, Options CR 7c and CR 8 were the preferred options progressed to the concept design stage of the Wisbech Access Study.

The descriptions below provide a summary of each option:

- **CR 7c** - An enhanced roundabout with a 60 metre ICD, three lane circulatory (in parts) and three lane approaches on both the A47 East and West arms; and,
- **CR 8** – Changes made to the Cromwell Road / Weasenham Lane Junction, from signalisation to a roundabout.

Design Assumptions and Input Decisions

All designs are concept designs based on Ordinance Survey mapping. Level information is unknown and therefore embankments/cuttings and footprints should be treated as indicative.

Both schemes have been designed using the Manual for Streets 1 & 2 alongside the Cambridgeshire Estate Road specification. Scheme assumptions concerning geometric parameters alongside capacity decisions have been informed by the assessment work described earlier within this report.

The design assumptions made for each of the options are identified on the following page.

CR 7c – A47 / Cromwell Road Roundabout

- 3.65 metre lane widths on the A47 and Western Link Road keeping in Highways England Standards;
- 3m lanes on remaining arms in keeping with local character and within Cambridgeshire CC requirements;
- Footways reinstated at back of new carriageway to match existing; and,
- Land take required to fit larger roundabout, focused on the North and West in the concept design.

Figures 6.1 and 6.2 on the following pages shows the concept design for both the options described above.

CR 8 – A47 / Cromwell Road Roundabout

- 3m lanes in keeping with local character and within Cambridgeshire CC requirements; and,
- Land take required to fit roundabout, focused largely on the western side of the roundabout, as shown in Concept design.

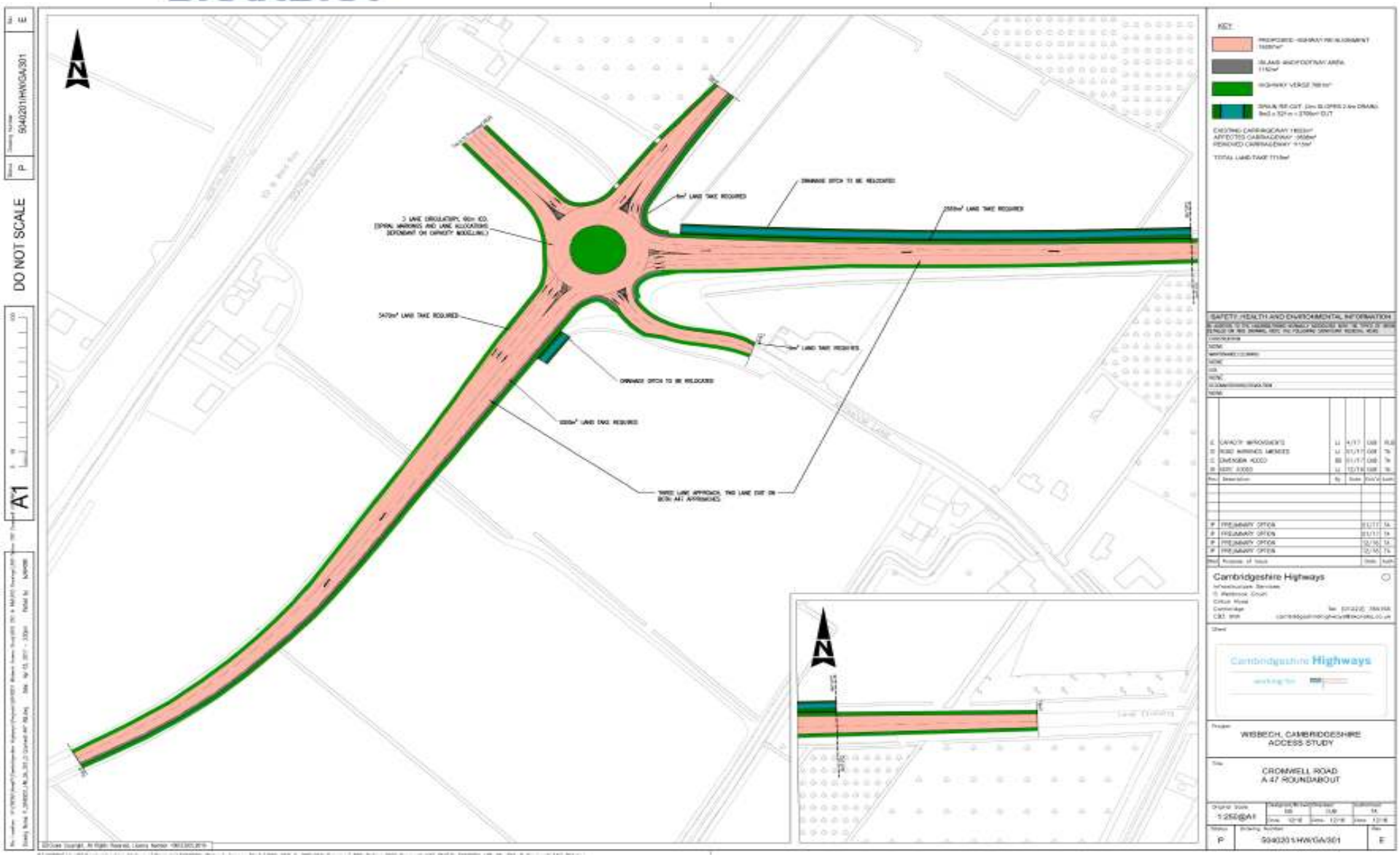


Figure 6.1: CR 7c Concept Highway Design

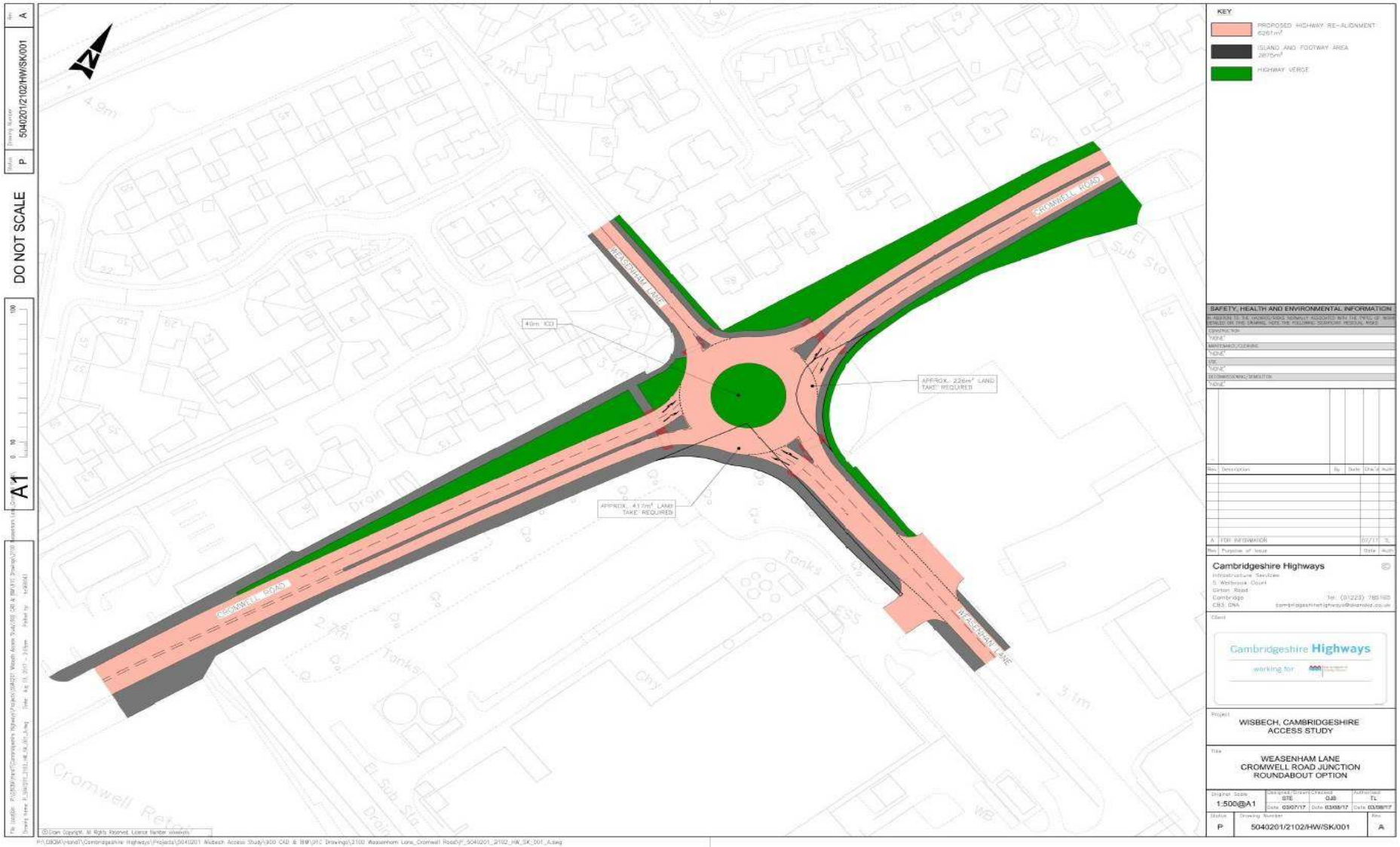


Figure 6.2: CR 8 Concept Highway Design

STATS Review

As part of the concept design process, searches have been undertaken to determine whether any STATS exist within the vicinity of the proposed schemes. STATS refers to utilities or services which run beneath the surface of the road, for example:

- Electricity Cables;
- Gas Mains;
- Water Mains and sewers; and,
- Telecommunications Wires.

This information will be necessary for further design stages, including more detailed scheme cost estimates. The presence of STATS may also dictate amendments to a scheme design at a later point.

Figure 6.3 and Table 6.1 beneath shows the STATS present within the vicinity of the A47 roundabout. The cells highlighted in blue within the tables beneath indicate the STATS present for within this scheme location.

As CR 8 was devised and assessed at a later date, STATs plans for this location are unknown. This data should be obtained when developing the Concept Highway design further.

Table 6.1: STATs Present at the A47 / Cromwell Road Roundabout

Anglian Water surface sewer (SWS)	Anglian Water portable water (AW)	Anglian Water foul sewer (Foul)	National Grid LP Gas Main (Gas LP)	National Grid MP Gas Main (Gas MP)
UKPN overhead electric (Elec OH)	UKPN underground electric (Elec UG)	Gas Main (Fulcrum MPG)	BT open reach underground Comms (BT)	Virgin Media underground Comms (VM)

Figure 6.3: CR 7c STATS Plan

Road Safety Review

The Concept Designs have been subject to an initial Road Safety Review by Cambridgeshire County Council. The purpose of the Road Safety Review is to identify potential safety issues associated with the schemes prior to any further design phase, and in particular any that could compromise scheme deliverability.

Note that this does not constitute a formal Road Safety Audit, and is instead initial feedback based on the Concept Designs. It should also be noted that does it does not necessarily reflect the opinions of Highways England. Schemes that fall within the jurisdiction of Highways England will also need to satisfy their Road Safety Requirements as part of the design process.

Comments from the Road Safety Review are documented in following table for CR 7c. Road safety comments for Scheme CR 8 are unknown due to this scheme being devised and assessed at a later date. This information should be obtained whilst before finalising this scheme.

Table 6.4: Road Safety Review for Option CR 7c

Road Safety Feedback	Comment
The merge length on Cromwell Road is short, increasing the potential for side swipes	This can be rectified in the detailed design stage. Widening of the southern part of Cromwell Road would negate these issues
This option plan does not tie into any other plans provided	There is no guarantee that all schemes will be delivered, and so schemes have been developed in isolation, but with the ability to be incorporated into adjacent schemes
A new development for Cromwell Road with north eastern corner already proposed and safety audited. A copy will be provided	Reviewed and comments noted.
Unclear how the different options will work together	There is no guarantee that all schemes will be delivered, and so schemes have been developed in isolation. However, all schemes also compatible.

Scheme Cost Estimate

A cost estimate has been produced for Options CR 7c and CR 8.

This costs are produced using 2017 prices and it should be noted that the construction industry inflation is approximately 4 - 5% per annum.

Although the costs below are considered robust, these cost estimates are based on concept level designs, and may alter in the future subject to further information becoming available during later design stages.

The cost estimates include the following items:

- Drainage;
- Carriageway;
- Junctions;
- Footpaths;
- Street Lighting;
- Signing and Lining;
- Preliminaries, including design (10% const. cost) and supervision (20% const. cost);
- Traffic Management;
- Land purchase and compulsory purchase estimates;
- Demolition;
- Land Acquisition, and,
- Optimism Bias @ 45%.

The cost estimates excludes the following items:

- Services Diversions;
- Contaminated Land Treatment; and,
- Local Planning Fees.

Land Acquisition and Demolition Costs

The following costs have been applied where land acquisition or demolition is required by a scheme. These costs are considered relevant to the location of the schemes and are derived from experience of other similar schemes within the region.

- Land Acquisition – Agricultural £37, 500 per hectare;
- Land Acquisition – Urban / Built £125,000 per hectare;
- Compulsory Purchase Order – Dwelling £277,500 per dwelling; and,
- Demolition – £70m2 or £7,500 per dwelling.

Optimism Bias

The scheme costs also include 45% optimism bias. This is an uplift that is applied to the final scheme cost in line with DfT guidance on preparing scheme cost estimates. The DfT describes optimism bias in their Web Tag Note 'A1.2 Scheme Costs' (November 2014) as:

'*Optimism bias is the demonstrated systematic tendency for appraisers to be overly optimistic about key parameters. Theorists on cost overrun suggest that optimism bias could be caused by the organisation of the decision-making process and strategic behaviour of stakeholders involved in the planning and decision-making processes.*

Different levels of optimism bias should be applied to scheme costs depending on the nature of the scheme (road, rail, ITS etc.) and how developed proposals or designs are. The schemes costed as part of the study are road schemes and are all at the first stage of scheme development. As a result of this an optimism bias of 45% is applied to the scheme costs.

Cost estimates for each of the schemes, including optimism bias are summarised in the table beneath. More detailed breakdowns of the costs are provided in Appendix B. Note that these costs assume schemes are delivered in isolation, and do not reflect the potential cost savings that may be associated with delivering adjacent or overlapping schemes at the same time.

Table 6.3: Option CR 7c Scheme Cost Estimate

Item	Cost
Land Acquisition	£28,942.50
Demolition	£0.00
Construction	£1,903,278.86
Design (10% of const. cost)	£191,127.89
Supervision, Site Facilities & Site Fences (20% of const. cost)	£382,255.77
Traffic Management	£260,000.00
Sub Total	**£2,765,605.01**
Optimism Bias (@45%)	£1,248,122.26
Total	**£4,013,727.27**

Table 6.4: Option CR 8 Scheme Cost Estimate

Item	Cost
Land Acquisition	£0.00
Demolition	£0.00
Construction	£1,381,159.86
Design (10% of const. cost)	£138,115.99
Supervision, Site Facilities & Site Fences (20% of const. cost)	£276,231.97
Traffic Management	£122,500.00
Sub Total	**£1,918,007.82**
Optimism Bias (@45%)	£863,103.52
Total	**£2,781,111.34**

7 Summary

Skanska have been commissioned by Cambridgeshire County Council to undertake an assessment of options to improve the operation of the Cromwell Road corridor, to the west of the town. This assessment forms the first phase of the Wisbech Access Study.

The purpose of this scheme assessment is to identify a series of junction and carriageway improvements that will unlock capacity on the network. The key driver behind investigating corridor improvements for this location concerns capacity restraints and peak hour congestion, particularly in hotspot areas of the A47 / Cromwell Road Roundabout and Weasenham Lane Junction.

This report has considered the existing conditions along the corridor including traffic flow and congestion, land use and ownership, flood risk and other ecological considerations.

Development proposals for the South Wisbech site and West Wisbech, are also discussed within chapter three of this report. Despite the South and West sites not being solely related to Cromwell Road, predicted volumes of traffic and the expected impact on lower Cromwell Road, between the A47 roundabout and New Bridge Lane have been explored.

A summary of the Option Development and Option Review Workshop held in March and October 2016 is outlined within Chapter four of this report, whereby the context and procedure of the day is explained. Over the course of the two workshops a total of eleven options were discussed and reviewed for either dismissal or progression within the study.

The outcome of the second workshop was that two options were shortlisted for further progression within the Wisbech Access Study, and one other being incorporated into the Do Minimum Model. The three shortlisted options included:

- **CR 7c –** Variation of Option 7, creating a larger, enhanced capacity A47 / Cromwell Road roundabout that could also facilitate the Western Link Road; and,
- **CR 8 –** Changing the layout of the Cromwell Road / Weasenham Lane junction from signalisation to a roundabout.

The modelling assessments of these options suggests all options are expected to operate within capacity across future years assessed, offering benefit over the Do Minimum network.

In the case of Option CR 7c, Cromwell Road (AM) and A47 West (PM) are shown to operate worse than existing conditions, however this is shown to be caused by either the introduction of the Western Link Road approach or issues elsewhere on the network (e.g. Elm High Road Roundabout). To mitigate against the latter issue, it is suggested that this option be paired with schemes that address wider network issues.

CR 8 is predicted to operate within capacity, providing benefit over the Do Minimum network across forecast years. However the AM peak hour is predicted to operate better than the PM peak period, due to the PM peak period having greater constraints elsewhere on the network.

The report includes details of the Concept Highway Design for all three options shortlisted from the second workshop, including a plan, STAT information, Road Safety review comments and cost estimates.

Appendix A – VISSIM Assessment Report

Technical note

Project:	Wisbech Access Study	**To:**	Richard Jones
Subject:	Cromwell Road Option Assessment	**From:**	Emma White / Rachel McKay
Date:	5 Jan 2017	**cc:**	

1. Introduction

Atkins has been appointed by Skanska on behalf of Fenland District Council (FDC) and Cambridgeshire County Council (CCC) to evaluate a number of proposed highway improvement schemes around Wisbech, as part of the wider Wisbech Access Study.

In March 2016 Atkins undertook base year VISSIM modelling for the AM (0800-0900) and PM (1700-1800) peak periods which were successfully validated to observed traffic flows and journey times. Further details on this modelling can be located in the 'Wisbech VISSIM Model LMVR' report dated September 2016.

An option development workshop was held on 3rd March 2016 to propose and develop options for the network. The options were considered in 3 separate streams – Freedom Bridge Roundabout, Cromwell Road and Elm High Road. A number of options were selected for each of these areas to be taken forward for modelling to assess their performance.

The options have been divided into 3 separate technical notes, for ease of reporting, and represent the 3 separate streams from the workshop.

This note documents the assessment and results of the Cromwell Road proposed option modelling. Depending on the requirement of the individual options, schemes have been modelled in either VISSIM or LinSig. LinSig has been used to test signalisation schemes and VISSIM to test the priority options.

All options have been assessed using two traffic flow scenarios. The first is 'without Western Link Road' and the second is the 'with Western Link Road' which assumes the creation of a new link road connecting the A1101 to the north with the A47 to the south of Wisbech, via a route to the west of Wisbech. The 'with Western Link Road' scenario has a reduced number of trips through the model network, as a proportion of this traffic has been diverted via the new link road.

All assumptions made during this assessment, and documented within this report, have been agreed with the Wisbech Access Study Project Team (CCC / FDC / Skanska).

All options within this note have been modelled based on concept drawings in order to investigate feasibility. At this stage of the project it is recognised the drawings may not necessarily conform to highway standards. Once performance has been assessed and the better performing options selected to be taken forward agreed, detailed design will be undertaken.

The following Options shown in Table 1 below have been assessed and are documented in more detail in each section of the Technical note.

Table 1. Cromwell Road Option Testing

Option	Description	Software
2	Closes the Tesco signalised junction and combines with New Bridge Lane as a new signalised junction	LinSig
3	Closes the Salters Way access, with traffic re-routed via New Bridge Lane	VISSIM
4	Reason Homes Access at Weasenham Lane junction closed, traffic re-routed via South Brink	VISSIM
7	Increase capacity at the A47 / Cromwell Road roundabout and to incorporate an additional arm to serve the Western Link Road	VISSIM

The option numbering was developed during the Option Development Workshop held in March 2016.

The technical covers the following;

- Methodology;
- Option 2 assessment;
- Option 3 assessment;
- Option 4 assessment;
- Option 7 assessment;
- Option Adjustments;
- Option 7a assessment;
- Option 9 assessment; and,
- Conclusions.

2. Methodology

2.1. Traffic Flows

The options for Cromwell Road were tested with the base year (2016) and future year's traffic flows 2021, 2026 and 2031 with and without the Western Link Road (WLR).

At present, a re-validation of the WATS SATURN model to 2015/2016 traffic counts and updates to the road network is currently taking place independently to this project. It was originally planned to use the re-validated WATS SATURN model to inform the VISSIM modelling of the future year flows.

The WATS SATURN model refresh is currently being undertaken so the future year flows utilised in VISSIM for this part of the assessment have been taken from the 2016 *forecast* from the 2008 base model (the first forecast year).

To ensure the 2015 updated WATS model was fit for purpose, a comparison of the 2008 SATURN model counts to the 2015 traffic counts was undertaken and reported in the 'Saturn Wisbech Benchmarking TN' dated 26th August 2016. It was concluded that the 2016 forecast modelled data matches closer to the 2015 traffic count data, suggesting the 2016 forecast modelled data should be used for option testing as opposed to using the 2008 base year modelled data.

However, some limitations were identified with using the previous WATS model including:

- The network structure within the 2008 SATURN model along Cromwell Road is now out of date. The developments have since been built on site and therefore, there are notable discrepancies between SATURN and VISSIM representations;
- Within SATURN there are 3 zones that feed onto New Bridge Lane, rather than being split across various new accesses; and,

- The SATURN model appears to have forecast much higher trip generation along Cromwell Road than is actually occurring on site. This is due to out of date development assumptions that were originally made in 2008 that were not actually built (office development space that was rejected).

Therefore, the future traffic flows along the southern end of Cromwell Road and from the Wisbech South Development are considered to be particularly high in the 2008 WATS model and therefore have a knock on effect on the future year flows utilised in VISSIM.

The re-validated WATS model that is currently being undertaken is using the same traffic data as the VISSIM model and should therefore provide more realistic future year flows to assess all the options once completed in January 2017.

However, the flows utilised for this assessment could be considered to represent a worst case scenario and are suitable to inform decisions for which options should be taken forward for option packaging and which should be ruled out.

The traffic flows for 2021, 2026 and 2031 were created using the following process:

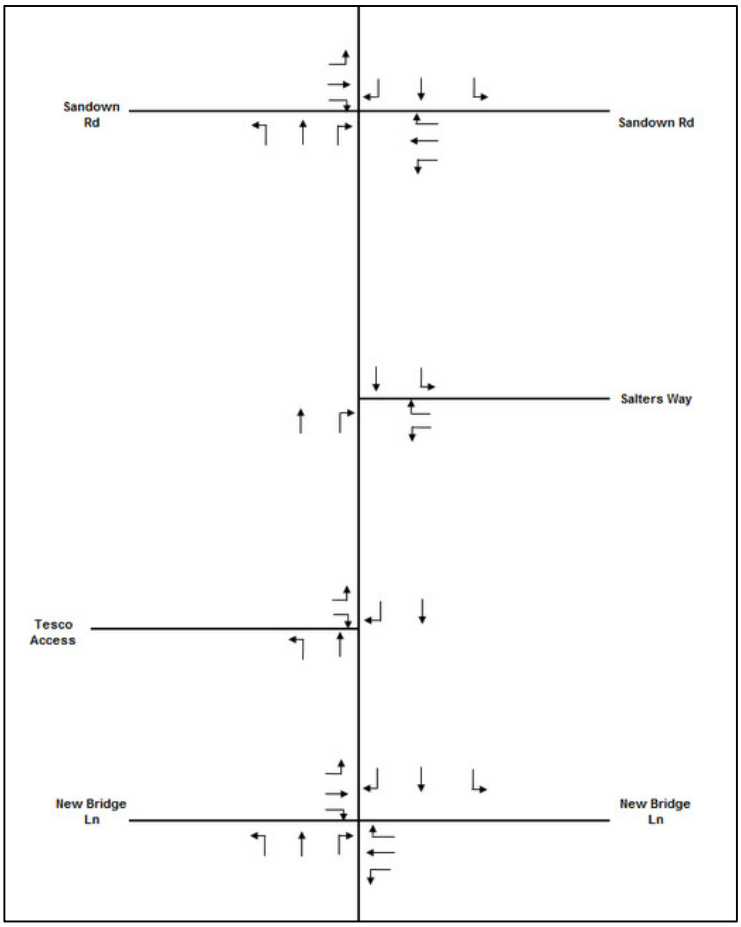
- Turning counts for the VISSIM network were extracted from the 2016, 2021 and 2026 Saturn model (2008 Base);
- The absolute and percentage difference between SATURN modelled 2016 and each future year were calculated;
- The percentage difference for each future year was then applied to the VISSIM 2016 flows. Large percentage differences (below 50% or above 150%) were sense checked and absolute values were applied if necessary (a large percentage difference may not be a large absolute difference);
- The flows were then balanced for use in VISSIM; and,
- This process was carried out for both light and heavy vehicles separately.

The following assumptions have been included within the modelling process, as agreed with the Project Team:

- Traffic flows in the south of Cromwell Road from the new developments have been distributed between New Bridge Lane / Tesco and Salters Way (as SATURN was loading them all onto New Bridge Lane);
- Traffic to and from Sandown Road west and Tesco has been split 50-50 as this development was unconfirmed at the time the 2008 WATS SATURN model was developed; and,
- Where there is no flow, as the roads were not coded into the 2008 WATS SATURN models, the 2016 count data utilised in VISSIM has been used and no growth assumed (as the model will have incorporated the growth in the existing movements).

Figure 1 shows the network structure along Cromwell Road, for the above accesses.

Figure 1. Junction locations along Cromwell Road

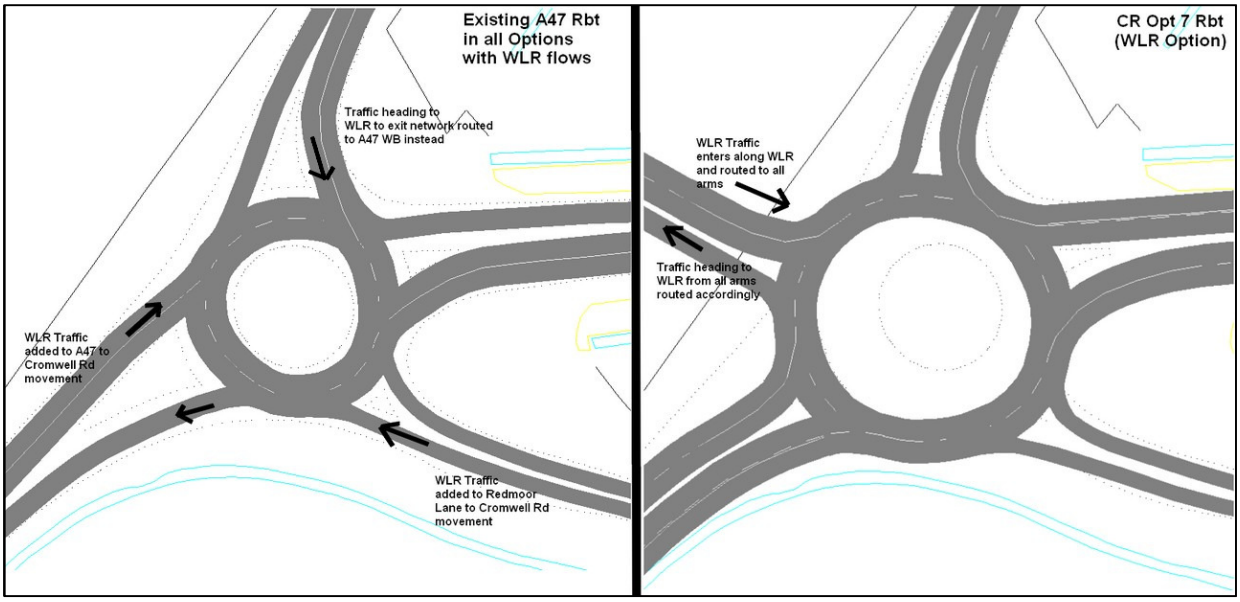


All options have been modelled with and without the WLR. The WLR is proposed to run from the A47 / Cromwell Road roundabout, over the river and join with the A1101 North End to the north of Wisbech. Only one option within the model network directly connects onto the proposed Western Link Road which is CR Opt 7. As each of the options have been assessed as standalone schemes, the following assumptions have been made regarding how the WLR traffic enters / leaves the network in the absence of CR Opt 7. These assumptions revolve around redistributing this traffic onto other arms of the roundabout where the WLR connects with the model network. . The assumptions regarding traffic at the B198/A47 roundabout include:

- The WLR trips entering the network to travel north along Cromwell Road has been split 50/50 between the A47 West and Redmoor Lane approaches when CR Opt 7 is not applied;
- All other WLR trips to other arms have been removed entirely as these leave the network from this junction;
- In the absence of CR Opt 7, trips from Cromwell Road to the WLR have been applied to the Cromwell Road to A47 West movement;
- All other trips heading to the WLR from other arms have been removed, as they would not enter the model network beyond this junction; and,
- CR Opt 7 has the WLR arm at the roundabout, so all movements to and from the WLR have been included in this option.

Figure 2 shows the existing layout of the A47 roundabout compared with CR Opt 7 detailing this in more detail.

Figure 2. WLR Flow Assignment



The VISSIM models are considered to reflect the flows for 2021 and 2026 as accurately as feasible. Until the new WATS SATURN model is available the full accuracy of the flows is unknown. Due to the higher flows it was agreed 2031 would not be assessed using these flows but will be included once the WATS model is refreshed. The methodology and limitations have all been discussed and agreed with Skanska.

2.2. Do Minimum VISSIM Modelling

In order to evaluate and quantify the benefits of the proposed options in the future years, a Do Minimum (DM) scenario is required for each future year for with and without the WLR. The Base VISSIM model was updated with the 2021 and 2026 flows to create a DM scenario.

As a result of the increased flows in the future years, especially along Cromwell Road, optimisations were made to the existing signal timings as follows:

AM Peak Without WLR:

- SC102 Cromwell Rd / Tesco: Max A increased from 50s to 60s;
- SC104 Cromwell Rd / Sandown Rd: Include phase B in stage 2 maximums, Max C increased from 15s to 30s; and,
- SC105 Cromwell Rd / Weasenham Lane: Max C increased from 19s to 29s.

PM Peak Without WLR:

- SC105 Cromwell Rd / Weasenham Lane: Max A increased from 31s to 40s and added gap out B to stage 2.

AM Peak With WLR – no changes, signals as Without WLR.

PM Peak With WLR:

- SC205 Elm High Rd / Weasenham Lane: Max D increased from 15s to 36s;
- SC104 Cromwell Rd / Sandown Rd: added Max B of 25s, Max D decreased to 10s from 15s, Max E decreased to 7s from 10s, Max F decreased to 15s from 30s and Max G decreased to 25s from 30s; and,
- SC105 Cromwell Rd / Weasenham Lane: Gap B added to stage 2, Max A decreased to 25s from 31s, Max C increased to 40s from 29s and Max D increased from 22s to 30s.

2.3. LinSig

To test whether the signalisation schemes (Option 2) would operate within capacity on site initial LinSig analysis was undertaken. No base/DM LinSig model was created.

LinSig models vehicles as Passenger Car Unit (PCU) which is a method used to allow for the different vehicle types within a traffic flow group to be assessed in a consistent manner. The traffic flows used within VISSIM are in vehicles and have been taken directly from the manual classified turning count surveys. Therefore, in order to use LinSig to assess the proposed options, the surveyed flows were required to be converted into PCUs. The same PCU factors that were utilised in the WATS SATURN model were used for this to maintain consistency which are: 1 for car or light goods vehicle (LGV); 2 for heavy goods vehicles (HGV) and buses; and 0.4 for a motorcycle.

The base year VISSIM balanced traffic flows were already separated into lights, heavies and buses. The appropriate factor was used accordingly and then the totals for light, heavies and buses were added together to determine total PCUs for the network. This flow in PCUs was used in the LinSig models for each of the options tested. Where different options required the closure of a link, flows were re-routed over alternative links.

It should be noted that the flows in LinSig are demand flows as LinSig does not model the whole network therefore traffic has not been held up in other parts of the network.

LinSig version 3.2.32 was utilised.

3. Cromwell Road Option 2

This option closes the current New Bridge Lane (W) approach and allows access via the signalised Tesco junction. The New Bridge Lane (E) approach is signalised and combined with the Tesco signals to create a staggered signalised junction.

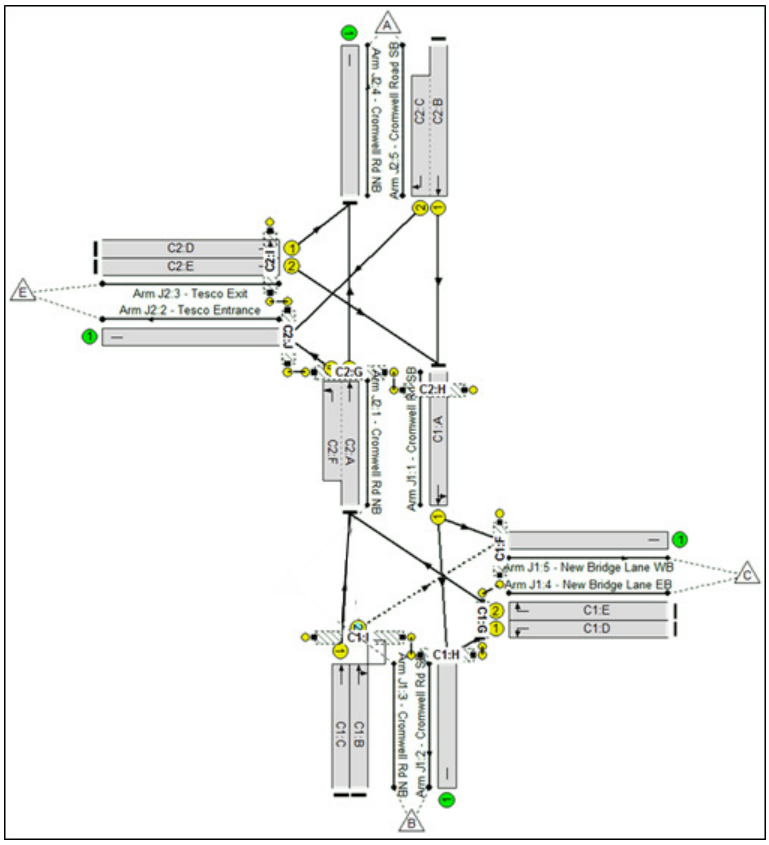
3.1. Network Changes

Figure 3 shows a diagram of the LinSig model for this option.

A list of network changes are as follows:

- New Bridge Lane (W) approach / exit is closed with access relocated onto the Tesco approach (flows adjusted accordingly);
- New Bridge Lane (E) approach is signalised and has been combined with the Tesco signals to create a staggered signalised junction. Access to Tesco via Cromwell Road and the associated signalisation junction is removed;
- New Bridge Lane (E) approach is extended to 2 long lanes; and,
- Cromwell Road northbound has been dualled.

Figure 3. LinSig Diagram of Cromwell Road Option 2

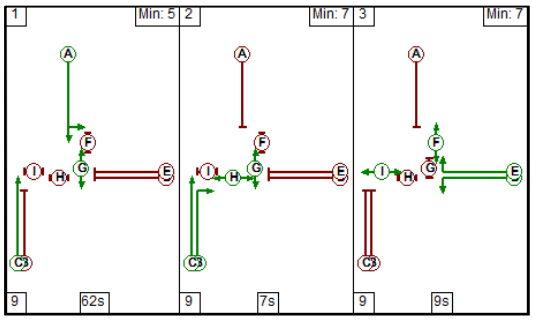


3.2. Signal Staging

Figure 4 shows the stages used for this option. Controller 1 was used for the Cromwell Rd and New Bridge Lane junction whilst Controller 2 was used for access to Tesco. Cycle Time optimisation was undertaken and the models were optimised for delay.

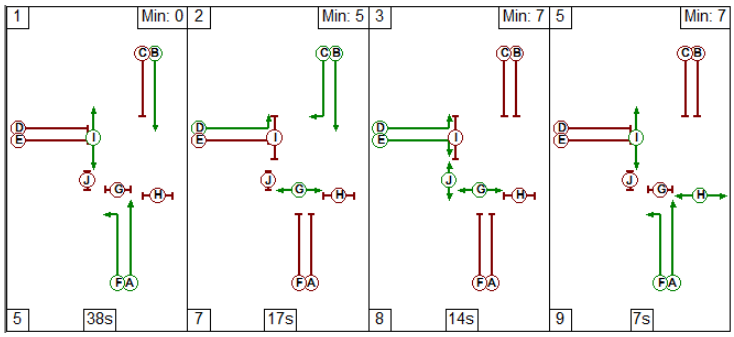
Figure 4. Stage Diagrams for Cromwell Road Option 2

Controller 1:



Technical note

Controller 2:



3.3. 2016 Results

Table 2 shows a summary for the 2016 AM and PM Peak Option 2 results.

Table 2. 2016 Summary of Results for Cromwell Road Option 2

			AM Peak CT 80 secs				PM Peak CT 105 secs			
	Link Number	Name	DOS (%)	Queue (pcu)	Av. Delay Per PCU (s/pcu)	Flow	DOS (%)	Queue (pcu)	Av. Delay Per PCU (s/pcu)	Flow
New Bridge Road / Cromwell Road Junction	1/1	Cromwell Rd SB Ahead Left	54%	5.20	13.20	550	71%	7.90	12.40	884
	2/1	Cromwell Rd SB	28%	0.20	1.30	544	47%	0.40	1.70	911
	3/1	Cromwell Rd NB Ahead	56%	8.80	8.90	755	44%	7.00	6.30	658
	3/2	Cromwell Rd NB Right	16%	1.10	36.50	50	9%	0.60	49.90	21
	4/1	New Bridge Lane EB Left	8%	0.40	39.20	18	25%	1.40	57.20	46
	4/2	New Bridge Lane EB Right	4%	0.30	35.40	13	12%	0.80	50.60	29
	5/1	New Bridge Lane WB	4%	0.00	1.00	74	2%	0.00	1.00	40
Tesco / Cromwell Road Junction	1/2+1/1	Cromwell Rd NB Left Ahead	66%	4.60	10.70	768	51%	13.90	10.40	687
	2/1	Tesco Entrance	5%	0.00	1.00	96	14%	0.10	1.10	265
	3/1	Tesco Exit Left	9%	0.90	23.60	51	21%	2.60	34.30	108
	3/2	Tesco Exit Right	22%	1.20	41.00	54	60%	4.10	66.70	122
	4/1	Cromwell Rd NB	40%	0.30	1.50	770	35%	0.30	1.40	672
	5/1+5/2	Cromwell Road SB Ahead Right	47%	6.90	15.20	543	67%	13.50	19.60	904
	Overall PRC %		36.60				26.00			
	Overall Delay (pcu/Hr)		10.81				16.62			

For both peaks the junction operates within capacity, with a PRC of 36.6% in the AM peak, and 26% in the PM peak. During the PM peak, the DoS of access points into the junction of Cromwell Road and New Bridge Lane are generally higher, with Cromwell Road SB over 70%. Queues do not extend through the junctions to block side road traffic during either of the two peaks.

3.4. 2021 Without WLR Results Summary

A summary of the 2021 Without WLR LinSig results for Cromwell Road Option 2 are shown for the AM and PM Peak Table 3.

Table 3. 2021 Without WLR Summary of Results for Cromwell Road Option 2

			AM Peak CT 80 secs				PM Peak CT 105 secs			
	Link Number	Name	DOS (%)	Queue (pcu)	Av. Delay Per PCU (s/pcu)	Flow	DOS (%)	Queue (pcu)	Av. Delay Per PCU (s/pcu)	Flow
New Bridge Road / Cromwell Road Junction	1/1	Cromwell Rd SB Ahead Left	75%	8.40	24.60	583	79%	10.60	15.30	983
	2/1	Cromwell Rd SB	35%	0.30	1.40	687	52%	0.50	1.90	1008
	3/1	Cromwell Rd NB Ahead	59%	9.60	9.40	801	51%	8.70	6.90	759
	3/2	Cromwell Rd NB Right	71%	9.20	36.70	404	61%	4.70	63.20	144
	4/1	New Bridge Lane EB Left	62%	3.90	52.60	148	31%	1.70	58.50	56
	4/2	New Bridge Lane EB Right	9%	0.60	35.70	28	16%	1.10	51.10	38
	5/1	New Bridge Lane WB	23%	7.30	1.50	448	9%	2.80	1.10	175
Tesco / Cromwell Road Junction	1/2+1/1	Cromwell Rd NB Left Ahead	68%	5.30	11.40	829	56%	14.00	10.40	797
	2/1	Tesco Entrance	11%	0.10	1.00	218	19%	0.10	1.10	372
	3/1	Tesco Exit Left	20%	2.00	24.70	115	20%	2.50	33.30	105
	3/2	Tesco Exit Right	50%	3.00	47.40	121	70%	5.80	68.70	169
	4/1	Cromwell Rd NB	43%	0.40	1.60	833	35%	0.30	1.40	669
	5/1+5/2	Cromwell Road SB Ahead Right	47%	6.20	17.40	569	72%	16.10	21.80	953
	Overall PRC %		19.80				13.30			
	Overall Delay (pcu/Hr)		21.29				22.87			

Table 3 shows that Option 2 is forecast to remain within capacity despite the higher traffic flows in 2021 without Western Link Road.

3.5. 2021 With WLR Results Summary

A summary of the 2021 with WLR LinSig results for Cromwell Road Option 2 are shown for the AM and PM Peak in Table 4.

Table 4. 2021 With WLR Summary of Results for Cromwell Road Option 2

			AM Peak CT 80 secs				PM Peak CT 105 secs			
	Link Number	Name	DOS (%)	Queue (pcu)	Av. Delay Per PCU (s/pcu)	Flow	DOS (%)	Queue (pcu)	Av. Delay Per PCU (s/pcu)	Flow
New Bridge Road / Cromwell Road Junction	1/1	Cromwell Rd SB Ahead Left	69%	6.90	28.10	421	73%	10.50	14.20	897
	2/1	Cromwell Rd SB	27%	0.20	1.30	521	44%	0.40	1.60	845
	3/1	Cromwell Rd NB Ahead	60%	10.00	9.50	812	55%	10.00	7.50	826
	3/2	Cromwell Rd NB Right	64%	9.70	27.70	482	56%	4.30	61.20	134
	4/1	New Bridge Lane EB Left	49%	2.90	47.20	117	35%	2.00	59.60	64
	4/2	New Bridge Lane EB Right	41%	2.90	40.70	126	13%	0.90	50.70	30
	5/1	New Bridge Lane WB	26%	8.30	1.60	499	13%	2.30	1.10	250
Tesco / Cromwell Road Junction	1/2+1/1	Cromwell Rd NB Left Ahead	75%	14.90	13.50	938	60%	14.10	10.50	856
	2/1	Tesco Entrance	15%	0.10	1.10	298	21%	0.10	1.20	397
	3/1	Tesco Exit Left	20%	2.00	24.70	114	39%	5.40	35.50	218
	3/2	Tesco Exit Right	50%	3.00	47.50	122	68%	6.20	62.70	189
	4/1	Cromwell Rd NB	46%	0.40	1.70	890	41%	0.40	1.60	801
	5/1+5/2	Cromwell Road SB Ahead Right	53%	4.00	21.80	435	66%	13.10	21.30	832
	Overall PRC %		20.00				24.20			
	Overall Delay (pcu/Hr)		21.57				22.81			

Table 4 shows that Option 2 is forecast to remain within capacity despite the higher traffic flows in 2021 with the Western Link Road. At the Tesco / Cromwell Road junction, the northbound internal stop line queue extends back to the downstream junction and may impact the operation of this junction.

3.6. 2026 Without WLR Results

A summary of the 2026 without WLR LinSig results for Cromwell Road Option 2 are shown for the AM and PM Peak in Table 5.

Table 5. 2026 Without WLR Summary of Results for Cromwell Road Option 2

			AM Peak CT 80 secs				PM Peak CT 105 secs			
	Link Number	Name	DOS (%)	Queue (pcu)	Av. Delay Per PCU (s/pcu)	Flow	DOS (%)	Queue (pcu)	Av. Delay Per PCU (s/pcu)	Flow
New Bridge Road / Cromwell Road Junction	1/1	Cromwell Rd SB Ahead Left	78%	8.80	25.80	606	82%	11.00	16.60	1014
	2/1	Cromwell Rd SB	39%	0.30	1.50	765	55%	0.60	2.10	1070
	3/1	Cromwell Rd NB Ahead	68%	12.90	11.10	928	52%	9.20	7.10	783
	3/2	Cromwell Rd NB Right	75%	10.20	38.80	429	53%	4.10	60.00	127
	4/1	New Bridge Lane EB Left	78%	5.70	66.30	187	43%	2.60	62.10	79
	4/2	New Bridge Lane EB Right	13%	0.80	36.30	40	36%	2.60	54.90	85
	5/1	New Bridge Lane WB	24%	7.90	1.60	457	8%	2.30	1.10	150
Tesco / Cromwell Road Junction	1/2+1/1	Cromwell Rd NB Left Ahead	80%	15.30	14.40	968	70%	14.60	17.50	868
	2/1	Tesco Entrance	13%	0.10	1.10	246	23%	0.10	1.20	437
	3/1	Tesco Exit Left	20%	2.00	24.70	115	30%	4.70	27.00	219
	3/2	Tesco Exit Right	50%	3.00	47.50	122	63%	7.40	50.90	245
	4/1	Cromwell Rd NB	49%	0.50	1.80	956	43%	0.40	1.60	832
	5/1+5/2	Cromwell Road SB Ahead Right	50%	6.70	18.00	603	80%	19.70	30.30	951
	Overall PRC %		13.00				9.90			
	Overall Delay (pcu/Hr)		26.04				29.52			

Table 5 shows that Option 2 is forecast to remain within capacity despite the traffic growth in 2026. At the Tesco / Cromwell Road junction the northbound internal stop line queue extends back to the downstream junction (DoS 80% AM Peak) and may impact on the operation of this junction.

3.7. 2026 With WLR Results

A summary of the 2026 with WLR LinSig results for Cromwell Road Option 2 are shown for the AM and PM Peak in Table 6.

Table 6. 2026 With WLR Summary of Results for Cromwell Road Option 2

			AM Peak CT 80 secs				PM Peak CT 105 secs			
	Link Number	Name	DOS (%)	Queue (pcu)	Av. Delay Per PCU	Flow	DOS (%)	Queue (pcu)	Av. Delay Per PCU	Flow
New Bridge Road / Cromwell Road Junction	1/1	Cromwell Rd SB Ahead Left	88%	10.80	34.60	661	65%	14.60	11.90	777
	2/1	Cromwell Rd SB	39%	0.30	1.50	764	47%	0.40	1.70	907
	3/1	Cromwell Rd NB Ahead	68%	12.50	10.90	919	58%	11.50	8.60	847
	3/2	Cromwell Rd NB Right	85%	13.20	45.80	508	48%	3.60	58.20	115
	4/1	New Bridge Lane EB Left	53%	3.20	48.70	127	64%	4.80	66.80	140
	4/2	New Bridge Lane EB Right	5%	0.30	35.50	16	11%	0.80	47.50	30
	5/1	New Bridge Lane WB	28%	10.10	1.80	532	7%	1.70	1.00	125
Tesco / Cromwell Road Junction	1/2+1/1	Cromwell Rd NB Left Ahead	76%	6.70	13.60	935	82%	19.90	24.60	877
	2/1	Tesco Entrance	14%	0.10	1.10	280	22%	0.10	1.20	433
	3/1	Tesco Exit Left	9%	0.90	23.60	52	28%	4.40	23.80	219
	3/2	Tesco Exit Right	50%	3.00	47.50	122	77%	8.40	66.40	243
	4/1	Cromwell Rd NB	44%	0.40	1.70	850	48%	0.50	1.80	929
	5/1+5/2	Cromwell Road SB Ahead Right	57%	7.80	19.20	682	70%	9.60	26.10	800
	Overall PRC %		2.40				10.40			
	Overall Delay (pcu/Hr)		27.66				28.25			

Table 6 shows that Option 2 is forecast to operate at capacity in 2026 with the Western Link Road. As per the 2021 results, the internal northbound stop line queue at the Tesco / Cromwell Road junction extends back to the downstream junction (DoS 82% PM Peak) and may impact the operation of this junction.

It should be noted that the flow at Cromwell Road for the AM 2026 with WLR is slightly lower than 2021 with WLR. This may be due to the re-routing of vehicles in the SATURN model due to the new link road and the high traffic flows/issues along Cromwell Road.

4. Cromwell Road Option 3

4.1. Network Changes

This option has been modelled within the micro-simulation software VISSIM. The base model has been utilised and updated with the following changes:

- Salters Way has been removed and all vehicles are now routed via New Bridge Lane (east);

- Flows have remained the same, but Salters Way traffic has been re-routed and added onto New Bridge Lane; and,
- The Tesco junction remains the same as existing conditions (signalised).

4.2. 2016 Results

A summary of each approach to New Bridge Lane and the Tesco junction have been compared back to the existing conditions results and are shown in Tables 7 and 8 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 7. 2016 AM Peak Approach Comparison Results Cromwell Road Option 3

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	Base	CR Opt 3	Base	CR Opt 3	Base	CR Opt 3	Base	CR Opt 3
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	517	***519***	5.6	***5.0***	23.6	***23.5***	C	***C***
	New Bridge Ln (E)	23	***83***	***0.3***	7.2	***31.0***	59.7	***D***	F
	Cromwell Rd (S)	756	***757***	6.4	***6.2***	***22.6***	24.0	***C***	C
	New Bridge Ln (W)	***18***	17	***0.8***	1.4	***35.0***	52.3	***D***	F
	Tesco Access	***83***	82	***0.0***	***0.0***	20.4	***19.4***	C	***B***
	Overall Junction Summary	1396	***1459***	***2.7***	3.9	***23.1***	26.1	***C***	C

Table 7 shows that closing Salters Way causes the New Bridge Lane (E) approach to operate over capacity. This is due to vehicles being unable to exit to the north when vehicles are queueing at the Tesco junction.

When vehicles are able to exit, they appear to be blocking the west arm, which is also operating over capacity in Option 3.

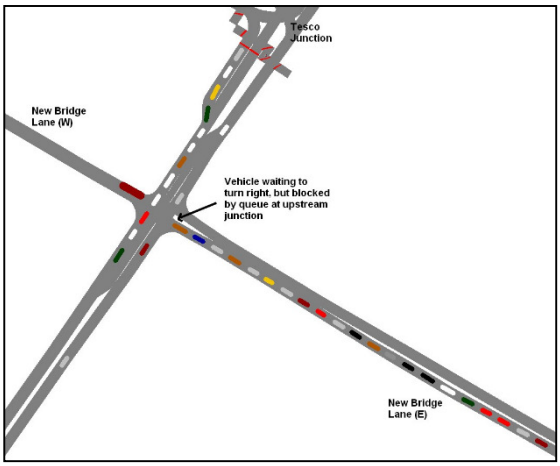
All other approaches remain relatively unchanged by the closure of Salters Way.

Table 8. 2016 PM Peak Approach Comparison Results Cromwell Road Option 3

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	Base	CR Opt 3	Base	CR Opt 3	Base	CR Opt 3	Base	CR Opt 3
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***871***	867	***33.1***	33.5	***34.6***	35.5	***C***	D
	New Bridge Ln (E)	71	***155***	***15.8***	299.7	***133.6***	938.0	***F***	F
	Cromwell Rd (S)	***645***	640	***4.7***	8.2	***26.4***	36.1	***C***	D
	New Bridge Ln (W)	***51***	50	***5.3***	11.7	***72.4***	144.6	***F***	F
	Tesco Access	***174***	173	***0.0***	***0.0***	21.1	***21.0***	C	***C***
	Overall Junction Summary	1811	***1884***	***11.7***	70.2	***35.5***	110.4	***D***	F

Table 8 is consistent with the AM peak in that the New Bridge Lane (E) approach is forecast to operate worse than the base, although the dis-benefits are much greater in the PM Peak. Queues and delays are significantly worse as vehicles struggle to exit along New Bridge Lane, pushing the overall performance of the junction over capacity, as shown in Figure 5.

Figure 5. Cromwell Road Option 3 Queuing



It is worth noting however, that Option 2, as described in Section 3, looks at signalising New Bridge Lane, so there is the possibility that this option could perform better with the approach signalised.

4.3. 2021 Without WLR Results Summary

A summary of each approach to the New Bridge Lane and Tesco junctions have been compared back to the 2021 Without WLR DM results and are shown in Tables 9 and 10 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 9. 2021 Without WLR AM Peak Approach Comparison Results Cromwell Road Option 3

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***522***	521	6.0	***5.1***	27.3	***26.2***	C	***C***
	New Bridge Ln (E)	***106***	82	***178.4***	561.5	***498.6***	1463.7	***F***	F
	Cromwell Rd (S)	1090	***1105***	174.3	***122.2***	55.3	***43.0***	E	***D***
	New Bridge Ln (W)	***18***	***18***	6.6	***5.9***	162.5	***149.2***	F	***F***
	Tesco Access	**211**	***212***	***0.0***	***0.0***	**25.4**	***22.6***	**C**	***C***
	Overall Junction Summary	***1945***	1937	***72.8***	138.6	***66.8***	96.3	***E***	F

Table 10.2021 Without WLR PM Peak Approach Comparison Results Cromwell Road Option 3

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***836***	732	31.4	***18.4***	36.9	***31.0***	D	***C***
	New Bridge Ln (E)	23	***49***	***288.4***	570.5	***1379.4***	2172.4	***F***	F
	Cromwell Rd (S)	749	***788***	311.5	***158.4***	156.1	***73.8***	F	***E***
	New Bridge Ln (W)	21	***36***	100.3	***89.1***	1075.0	***978.2***	F	***F***
	Tesco Access	***218***	**207**	***0.1***	**6.8**	**32.8**	***25.1***	**C**	***C***
	Overall Junction Summary	***1848***	1812	***145.9***	168.2	***107.5***	119.1	***F***	F

Tables 9 and 10 show that vehicles are still unable to exit from New Bridge Lane (E) with delays and queues increasing significantly from the DM scenario.

4.4. 2021 With WLR Results

A summary of each approach to the New Bridge Lane and Tesco junctions have been compared back to the 2021 With WLR DM results and are shown in Tables 11 and 12 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 11.2021 With WLR AM Peak Approach Comparison Results Cromwell Road Option 3

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	407	***416***	2.8	***2.1***	29.0	***27.7***	C	***C***
	New Bridge Ln (E)	***48***	31	***577.0***	621.8	***1947.1***	2248.0	***F***	F
	Cromwell Rd (S)	1150	***1157***	***235.3***	243.2	***61.1***	66.5	***E***	E
	New Bridge Ln (W)	***17***	16	***8.0***	11.2	***215.7***	281.7	***F***	F
	Tesco Access	***213***	***213***	***0.0***	***0.0***	21.1	***20.8***	C	***C***
	Overall Junction Summary	***1833***	***1833***	***164.2***	175.3	98.3	***92.4***	F	***F***

Table 12.2021 With WLR PM Peak Approach Comparison Results Cromwell Road Option 3

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***822***	810	31.2	***26.3***	37.7	***35.4***	D	***D***
	New Bridge Ln (E)	***18***	***18***	***318.4***	584.3	***1711.3***	2532.8	***F***	F
	Cromwell Rd (S)	784	***835***	458.1	***370.8***	193.0	***154.2***	F	***F***
	New Bridge Ln (W)	12	***15***	139.7	***132.7***	1768.9	***1675.2***	F	***F***
	Tesco Access	353	***354***	2.5	***1.0***	38.9	***32.2***	D	***C***
	Overall Junction Summary	1990	***2032***	***189.6***	222.6	124.3	***115.4***	F	***F***

Tables 11 and 12 show that the New Bridge Lane (E) is still forecast to operate over capacity as the WLR has not reduced trips to / from New Bridge Lane.

4.5. 2026 Without WLR Results

A summary of each approach to the New Bridge Lane and Tesco junctions have been compared back to the 2026 Without WLR DM results and are shown in Tables 13 and 14 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 13.2026 Without WLR AM Peak Approach Comparison Results Cromwell Road Option 3

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	532	***533***	7.7	***5.5***	29.2	***26.2***	C	***C***
	New Bridge Ln (E)	***73***	54	***487.3***	621.4	***1425.1***	2006.6	***F***	F
	Cromwell Rd (S)	1033	***1103***	361.9	***271.7***	102.1	***72.2***	F	***E***
	New Bridge Ln (W)	17	***18***	13.5	***11.8***	334.9	***284.7***	F	***F***
	Tesco Access	***215***	214	***0.0***	***0.0***	30.8	***26.3***	C	***C***
	Overall Junction Summary	1871	***1921***	***173.7***	181.7	123.1	***111.6***	F	***F***

Table 14.2026 Without WLR PM Peak Approach Comparison Results Cromwell Road Option 3

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***572***	566	***81.2***	82.4	***101.5***	106.2	***F***	F
	New Bridge Ln (E)	2	***5***	***577.9***	627.4	***863.4***	1246.2	***F***	F
	Cromwell Rd (S)	292	***310***	624.7	***591.3***	652.7	***550.0***	F	***F***
	New Bridge Ln (W)	***3***	***3***	***145.8***	147.9	***714.9***	927.6	***F***	F
	Tesco Access	***300***	296	***89.1***	91.0	232.8	***225.5***	F	***F***
	Overall Junction Summary	1171	***1178***	***303.3***	307.6	278.1	***258.8***	F	***F***

Tables 13 and 14 are consistent with the 2021 results although the delays and queues are exacerbated with the traffic growth forecast in 2026. In the PM Peak, vehicles are unable to exit as the demand is close to 240 vehicles, where only 5 vehicles actually exit as a result of queuing vehicles along Cromwell Road blocking the exit.

4.6. 2026 With WLR Results

A summary of each approach to the New Bridge Lane and Tesco junctions have been compared back to the 2026 With WLR DM results and are shown in Tables 15 and 16 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 15.2026 With WLR AM Peak Approach Comparison Results Cromwell Road Option 3

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	633	***636***	10.9	***9.4***	30.0	***28.8***	C	***C***
	New Bridge Ln (E)	***92***	42	***217.5***	580.6	***713.0***	2043.4	***F***	F
	Cromwell Rd (S)	1057	***1088***	***367.9***	375.2	96.5	***95.5***	F	***F***
	New Bridge Ln (W)	***17***	16	19.9	***19.7***	***464.7***	468.2	***F***	F
	Tesco Access	***152***	150	***0.0***	***0.0***	27.8	***25.6***	C	***C***
	Overall Junction Summary	***1952***	1932	***122.9***	196.6	***99.6***	113.3	***F***	F

Table 16.2026 With WLR PM Peak Approach Comparison Results Cromwell Road Option 3

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3	DM	CR Opt 3
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***736***	733	115.2	***105.4***	91.6	***85.8***	F	***F***
	New Bridge Ln (E)	***39***	19	***564.4***	630.5	***2268.2***	2831.2	***F***	F
	Cromwell Rd (S)	686	***720***	584.1	***562.3***	283.6	***258.1***	F	***F***
	New Bridge Ln (W)	***12***	***12***	***159.1***	160.4	2361.9	***2302.1***	F	***F***
	Tesco Access	410	***411***	4.8	***3.5***	41.6	***38.0***	D	***D***
	Overall Junction Summary	1880	***1894***	***285.1***	292.0	207.0	***184.4***	F	***F***

Tables 15 and 16 are consistent with all other results and show significant delays along New Bridge Lane as vehicles are unable to exit. However, more vehicles are processed out of New Bridge Lane compared with the 2026 Without WLR results, as there is less traffic travelling along Cromwell Road to Freedom Bridge, leading to less congestion along Cromwell Road from the Town Bridge junction.

5. Cromwell Road Option 4

5.1. Network Changes

This option has been modelled within the micro-simulation software VISSIM. The base model has been utilised and updated with the following changes:

- Weasenham Lane (W) access to the Reason Homes estate closed at the Cromwell Road / Weasenham Lane junction;
- Reason Homes Estate will now enter and exit via South Brink;
- Estate related traffic in the model has been transferred from Weasenham Lane (W) to South Brink; and,
- The junction signals have not been adjusted from the existing conditions, but the Weasenham Lane (W) arm at the junction will not be called, therefore, providing a shorter cycle time at the junction.

5.2. 2016 Results

A summary of each approach to the Weasenham Lane and South Brink junctions have been compared back to the existing conditions results and are shown in Tables 17 and 18 for the AM and PM peaks respectively.

Table 17. 2016 AM Peak Approach Comparison Results Cromwell Road Option 4

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	Base	CR Opt 4	Base	CR Opt 4	Base	CR Opt 4	Base	CR Opt 4
Cromwell Rd / Weasenham Ln	Cromwell Rd (N)	522	***528***	31.4	***19.3***	39.9	***26.7***	D	***C***
	Weasenham Ln (E)	289	***290***	17.0	***10.8***	37.0	***25.1***	D	***C***
	Cromwell Rd (S)	732	***735***	59.9	***24.7***	41.7	***22.2***	D	***C***
	Weasenham Ln (W)	***37***	0	2.5	***0.0***	44.0	***0.0***	D	***A***
	Overall Junction Summary	***1582***	1552	27.7	***13.7***	40.4	***24.2***	D	***C***
Cromwell Rd / South Brink	Cromwell Rd (N)	***518***	517	***0.0***	***0.0***	***1.7***	1.7	***A***	A
	Purina Access	***11***	***11***	***0.0***	***0.0***	***3.4***	3.6	***A***	A
	Cromwell Rd (S)	***502***	498	***0.0***	***0.0***	***1.3***	1.6	***A***	A
	South Brink	70	***108***	***0.2***	0.3	***3.1***	3.8	***A***	A
	Overall Junction Summary	1099	***1134***	***0.0***	0.1	***1.6***	1.9	***A***	A

Table 17 shows that by closing the Weasenham Lane (W) approach to the junction, thereby providing more green time to the remaining arms, reduces delays and queues at all approaches, reducing the LOS from a D to a C.

Relocating traffic to South Brink is forecast not have a detrimental impact on the junction as all approaches are still operating well within capacity with an LOS A on all approaches, although as expected delays have marginally increased as traffic flows have increased as a result of the re-routing of traffic.

Table 18. 2016 PM Peak Approach Comparison Results Cromwell Road Option 4

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	Base	CR Opt 4	Base	CR Opt 4	Base	CR Opt 4	Base	CR Opt 4
Cromwell Rd / Weasenham Ln	Cromwell Rd (N)	606	***617***	76.8	***48.8***	67.6	***43.5***	E	***D***
	Weasenham Ln (E)	***445***	439	94.4	***32.5***	101.7	***42.9***	F	***D***
	Cromwell Rd (S)	***742***	737	56.6	***23.6***	39.4	***21.2***	D	***C***
	Weasenham Ln (W)	***20***	0	1.3	***0.0***	45.2	***0.0***	D	***A***
	Overall Junction Summary	***1813***	1793	57.3	***26.2***	64.3	***34.3***	E	***C***
Cromwell Rd / South Brink	Cromwell Rd (N)	700	***708***	12.3	***0.2***	14.9	***3.1***	B	***A***
	Purina Access	***17***	***17***	***0.0***	***0.0***	13.6	***7.0***	B	***A***
	Cromwell Rd (S)	565	***568***	***0.0***	***0.0***	***1.5***	1.7	***A***	A
	South Brink	27	***48***	***0.1***	0.2	***3.8***	6.0	***A***	A
	Overall Junction Summary	1309	***1340***	3.1	***0.1***	8.9	***2.6***	A	***A***

Table 18 shows that the Weasenham Lane junction is now forecast to operate within capacity with a LOS C rather than at capacity with a LOS E. Queues and delays have decreased on all arms as a result of removing the Weasenham Lane (W) approach stage, especially for the Weasenham Lane (E) approach, which is forecast to be operating within capacity rather than over capacity.

As a result of improving the performance along Cromwell Road, the South Brink junction is also forecast to operate better by closing Weasenham Lane (W). Queues and delays southbound along Cromwell Road are shorter and therefore do not extend as far back upstream along Cromwell Road as currently occurs. The South Brink approach is forecast to operate marginally worse with the extra traffic, although it is still operating well within capacity with a LOS of A.

5.3. 2021 Without WLR Results Summary

A summary of each approach to the Weasenham Lane and South Brink junctions have been compared back to the 2021 Without WLR DM results and are shown in Tables 19 and 20 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 19.2021 Without WLR AM Peak Approach Comparison Results Cromwell Road Option 4

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4
Cromwell Rd / Weasenham Ln	Cromwell Rd (N)	556	***561***	47.0	***26.0***	51.4	***31.5***	D	***C***
	Weasenham Ln (E)	***295***	288	24.4	***14.3***	47.9	***31.1***	D	***C***
	Cromwell Rd (S)	***716***	713	43.5	***23.8***	35.0	***21.9***	C	***C***
	Weasenham Ln (W)	***56***	0	4.8	***0.0***	55.1	***0.0***	E	***A***
	Overall Junction Summary	***1622***	1562	29.9	***16.0***	43.6	***27.0***	D	***C***
Cromwell Rd / South Brink	Cromwell Rd (N)	***554***	553	***0.0***	***0.0***	***1.7***	1.8	***A***	A
	Purina Access	***12***	***12***	***0.0***	***0.0***	***3.3***	3.7	***A***	A
	Cromwell Rd (S)	***486***	462	***0.0***	***0.0***	***1.1***	1.5	***A***	A
	South Brink	70	***127***	***0.1***	0.3	***2.8***	3.5	***A***	A
	Overall Junction Summary	1124	***1154***	***0.0***	0.1	***1.5***	1.9	***A***	A

Table 20.2021 Without WLR PM Peak Approach Comparison Results Cromwell Road Option 4

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4
Cromwell Rd / Weasenham Ln	Cromwell Rd (N)	***530***	511	81.3	***76.6***	84.2	***82.2***	F	***F***
	Weasenham Ln (E)	***408***	396	***246.8***	248.7	***261.9***	275.9	***F***	F
	Cromwell Rd (S)	639	***650***	84.9	***65.5***	64.6	***51.0***	E	***D***
	Weasenham Ln (W)	***24***	0	1.8	***0.0***	57.3	***0.0***	E	***A***
	Overall Junction Summary	***1600***	1557	103.7	***97.7***	120.8	***117.8***	F	***F***
Cromwell Rd / South Brink	Cromwell Rd (N)	***596***	592	***5.8***	18.4	***14.9***	30.1	***B***	D
	Purina Access	***12***	10	2.8	***2.3***	173.2	***125.1***	F	***F***
	Cromwell Rd (S)	464	***469***	72.6	***67.3***	139.2	***125.7***	F	***F***
	South Brink	25	***46***	***3.1***	16.5	***82.2***	166.7	***F***	F
	Overall Junction Summary	1095	***1117***	***21.0***	26.1	***69.0***	76.1	***F***	F

Table 19 shows that in the AM peak the Weasenham Lane junction is forecast to operate better with Option 4, and the South Brink junction is performing marginally worse, although it is still forecast to operate well within capacity.

Table 20 shows that both junction in the PM peak are forecast to operate over capacity with long queues and delays as a result of extensive queuing along Cromwell Road in both directions blocking access from South Brink.

5.4. 2021 With WLR Results Summary

A summary of each approach to the Weasenham Lane and South Brink junctions have been compared back to the 2021 With WLR DM results and are shown in Tables 21 and 22 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 21.2021 With WLR AM Peak Approach Comparison Results Cromwell Road Option 4

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4
Cromwell Rd / Weasenham Ln	Cromwell Rd (N)	***394***	382	20.5	***11.2***	35.3	***21.7***	D	***C***
	Weasenham Ln (E)	***294***	276	15.8	***6.2***	34.1	***18.3***	C	***B***
	Cromwell Rd (S)	***458***	449	14.5	***6.5***	22.9	***13.5***	C	***B***
	Weasenham Ln (W)	***50***	-	***2.9***	-	***39.5***	-	***D***	-
	Overall Junction Summary	***1198***	1107	13.4	***6.0***	30.4	***17.5***	C	***B***
Cromwell Rd / South Brink	Cromwell Rd (N)	***407***	401	***0.0***	***0.0***	***1.4***	1.5	***A***	A
	Purina Access	***10***	***10***	***0.0***	***0.0***	2.3	***2.3***	A	***A***
	Cromwell Rd (S)	***315***	287	***0.0***	***0.0***	***1.0***	1.1	***A***	A
	South Brink	69	***119***	***0.1***	***0.1***	***2.0***	2.0	***A***	A
	Overall Junction Summary	800	***817***	***0.0***	***0.0***	***1.3***	1.5	***A***	A

Table 22.2021 With WLR PM Peak Approach Comparison Results Cromwell Road Option 4

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4
Cromwell Rd / Weasenham Ln	Cromwell Rd (N)	***463***	433	***39.0***	44.1	***54.9***	60.8	***D***	E
	Weasenham Ln (E)	436	***438***	***47.6***	48.2	***59.1***	59.9	***E***	E
	Cromwell Rd (S)	***785***	***785***	***27.0***	29.3	***23.0***	24.4	***C***	C
	Weasenham Ln (W)	***26***	-	***1.7***	-	***45.9***	-	***D***	-
	Overall Junction Summary	***1709***	1656	***28.8***	30.4	***41.3***	43.4	***D***	D
Cromwell Rd / South Brink	Cromwell Rd (N)	***533***	532	***0.0***	0.2	***2.3***	3.0	***A***	A
	Purina Access	***14***	***14***	***0.0***	***0.0***	***3.8***	3.9	***A***	A
	Cromwell Rd (S)	***595***	***595***	***0.0***	***0.0***	***1.2***	1.4	***A***	A
	South Brink	26	***53***	***0.1***	0.2	***3.0***	4.9	***A***	A
	Overall Junction Summary	1168	***1193***	***0.0***	0.1	***1.7***	2.3	***A***	A

Table 21 shows that Option 4 provides some benefits over the DM network for the AM peak period.

Table 22 shows that Option 4 performs worse than the DM network, although the differences are nominal and the junctions are operating within capacity as a result of the WLR reducing traffic volumes between Cromwell Road / Freedom Bridge.

5.5. 2026 Without WLR Results

A summary of each approach to the Weasenham Lane and South Brink junctions have been compared back to the 2026 Without WLR DM results and are shown in Tables 23 and 24 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 23.2026 Without WLR AM Peak Approach Comparison Results Cromwell Road Option 4

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4
Cromwell Rd / Weasenham Ln	Cromwell Rd (N)	630	***663***	91.8	***47.2***	78.0	***40.9***	E	***D***
	Weasenham Ln (E)	***293***	292	24.9	***16.9***	49.4	***35.8***	D	***D***
	Cromwell Rd (S)	710	***716***	41.6	***23.9***	33.4	***21.0***	C	***C***
	Weasenham Ln (W)	***53***	0	4.7	***0.0***	57.5	***0.0***	E	***A***
	Overall Junction Summary	***1686***	1670	40.8	***22.0***	53.7	***31.5***	D	***C***
Cromwell Rd / South Brink	Cromwell Rd (N)	645	***658***	22.9	***0.0***	34.3	***2.2***	D	***A***
	Purina Access	***12***	***12***	***0.0***	***0.0***	46.2	***5.0***	E	***A***
	Cromwell Rd (S)	***472***	460	***0.0***	***0.0***	***1.2***	1.6	***A***	A
	South Brink	63	***125***	10.7	***0.4***	24.4	***4.3***	C	***A***
	Overall Junction Summary	1193	***1254***	8.4	***0.1***	20.6	***2.2***	C	***A***

Table 24.2026 Without WLR PM Peak Approach Comparison Results Cromwell Road Option 4

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4
Cromwell Rd / Weasenham Ln	Cromwell Rd (N)	***372***	349	102.6	***97.1***	153.1	***151.7***	F	***F***
	Weasenham Ln (E)	***290***	289	290.1	***256.6***	367.2	***301.5***	F	***F***
	Cromwell Rd (S)	431	***452***	266.3	***256.9***	252.7	***241.1***	F	***F***
	Weasenham Ln (W)	***20***	0	1.9	***0.0***	101.4	***0.0***	F	***A***
	Overall Junction Summary	***1113***	1090	165.3	***152.6***	245.7	***225.2***	F	***F***
Cromwell Rd / South Brink	Cromwell Rd (N)	448	***450***	***78.0***	94.6	***111.9***	140.7	***F***	F
	Purina Access	4	***6***	18.5	***17.1***	***161.1***	206.4	***F***	F
	Cromwell Rd (S)	338	***365***	***205.5***	205.8	472.6	***432.6***	F	***F***
	South Brink	26	***28***	***11.3***	54.6	***282.3***	326.8	***F***	F
	Overall Junction Summary	816	***849***	***78.2***	93.0	***260.9***	267.7	***F***	F

Tables 23 and 24 show that Option 4 is still forecast to provide benefits over the DM at the Weasenham Lane junction, although in the PM peak both junctions are operating over capacity with long delays forecast along Cromwell Road.

5.6. 2026 With WLR Results

A summary of each approach to the Weasenham Lane and South Brink junctions have been compared back to the 2026 With WLR DM results and are shown in Tables 25 and 26 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 25. 2026 With WLR AM Peak Approach Comparison Results Cromwell Road Option 4

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4
Cromwell Rd / Weasenham Ln	Cromwell Rd (N)	***534***	532	27.8	***17.0***	35.9	***23.7***	D	***C***
	Weasenham Ln (E)	***264***	262	14.4	***8.7***	35.5	***23.2***	D	***C***
	Cromwell Rd (S)	***535***	533	19.0	***10.4***	24.7	***15.1***	C	***B***
	Weasenham Ln (W)	***47***	-	***3.0***	-	***42.5***	-	***D***	-
	Overall Junction Summary	***1380***	1329	16.0	***9.0***	31.7	***20.1***	C	***C***
Cromwell Rd / South Brink	Cromwell Rd (N)	***537***	535	***0.0***	***0.0***	***1.6***	1.8	***A***	A
	Purina Access	***10***	***10***	***0.0***	***0.0***	***2.7***	3.3	***A***	A
	Cromwell Rd (S)	***374***	353	***0.0***	***0.0***	***1.0***	1.1	***A***	A
	South Brink	71	***118***	***0.1***	0.2	***2.4***	2.7	***A***	A
	Overall Junction Summary	991	***1017***	***0.0***	***0.0***	***1.5***	1.7	***A***	A

Table 26. 2026 With WLR PM Peak Approach Comparison Results Cromwell Road Option 4

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4	DM	CR Opt 4
Cromwell Rd / Weasenham Ln	Cromwell Rd (N)	***420***	375	93.6	***74.1***	127.8	***112.5***	F	***F***
	Weasenham Ln (E)	***409***	407	144.5	***112.9***	165.3	***130.5***	F	***F***
	Cromwell Rd (S)	***793***	***793***	28.4	***24.0***	22.7	***20.1***	C	***C***
	Weasenham Ln (W)	***27***	-	***1.7***	-	***47.8***	-	***D***	-
	Overall Junction Summary	***1648***	1576	67.1	***52.7***	84.1	***69.3***	F	***E***
Cromwell Rd / South Brink	Cromwell Rd (N)	***492***	475	***34.1***	38.0	69.3	***60.3***	F	***F***
	Purina Access	***14***	***14***	***0.0***	***0.0***	30.6	***26.4***	D	***D***
	Cromwell Rd (S)	***651***	644	***0.0***	***0.0***	1.6	***1.5***	A	***A***
	South Brink	27	***49***	***0.1***	8.7	***3.2***	16.1	***A***	C
	Overall Junction Summary	***1184***	1182	***8.5***	11.7	27.2	***24.7***	D	***C***

Tables 25 and 26 show that in 2026 with the WLR, Option 4 is forecast to provide benefits to both junctions, with the exception of the South Brink junction in the AM peak, although it is still operating well within capacity with an LOS A.

6. Cromwell Road Option 7

6.1. Network Changes

This option has been modelled within the micro-simulation software VISSIM. The base model has been utilised and updated with the following changes which are shown in Figures 6 and 7:

- The A47 / B198 Cromwell Road roundabout is to be upgraded to improve capacity and incorporate an additional arm to serve the proposed Western Link Road;
- The new Western Link arm has been added between the A47 (W) and the B198 Cromwell Road approaches;
- The existing roundabout has been enlarged with a ICD of approximately 37m to accommodate the 5th arm;

- The two A47 exits have been widened to 2 lane merge sections for 250m with the approach flares slightly extended in length;
- By introducing two lane exits, vehicles can utilise both lanes at all approaches (except Redmoor Lane) to travel to the A47;

Figure 6. Cromwell Road Option 7 Proposed Layout

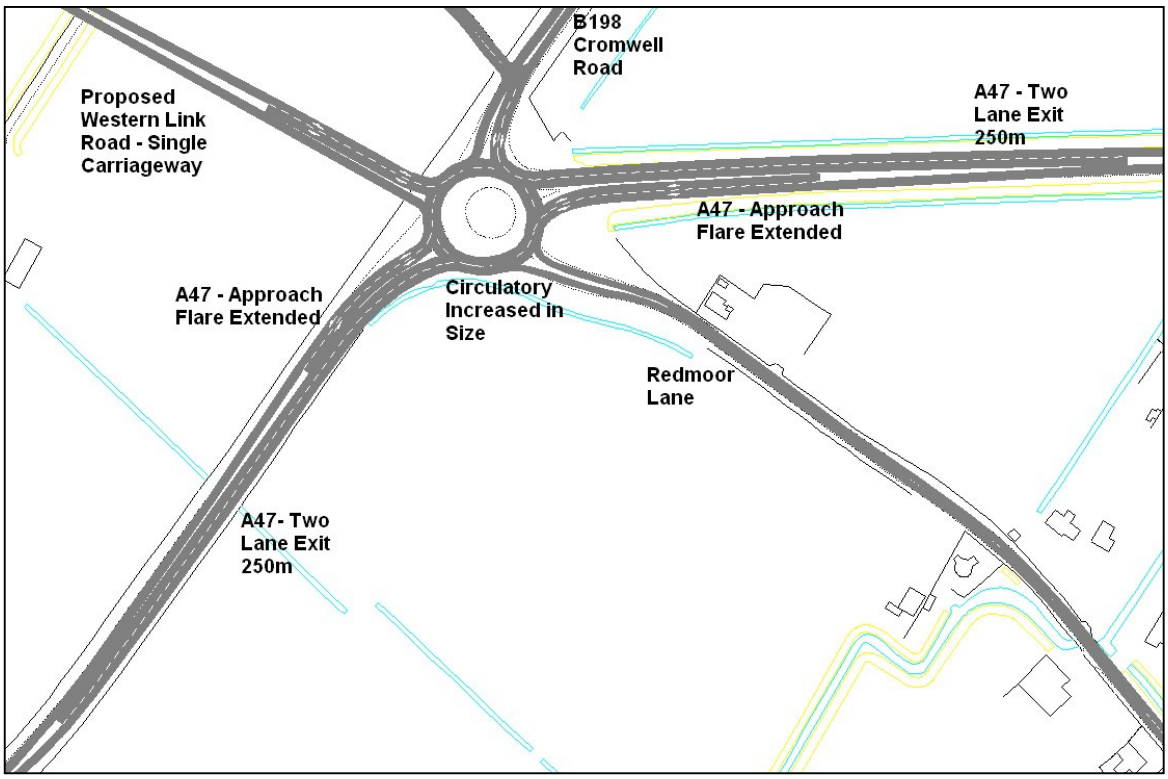
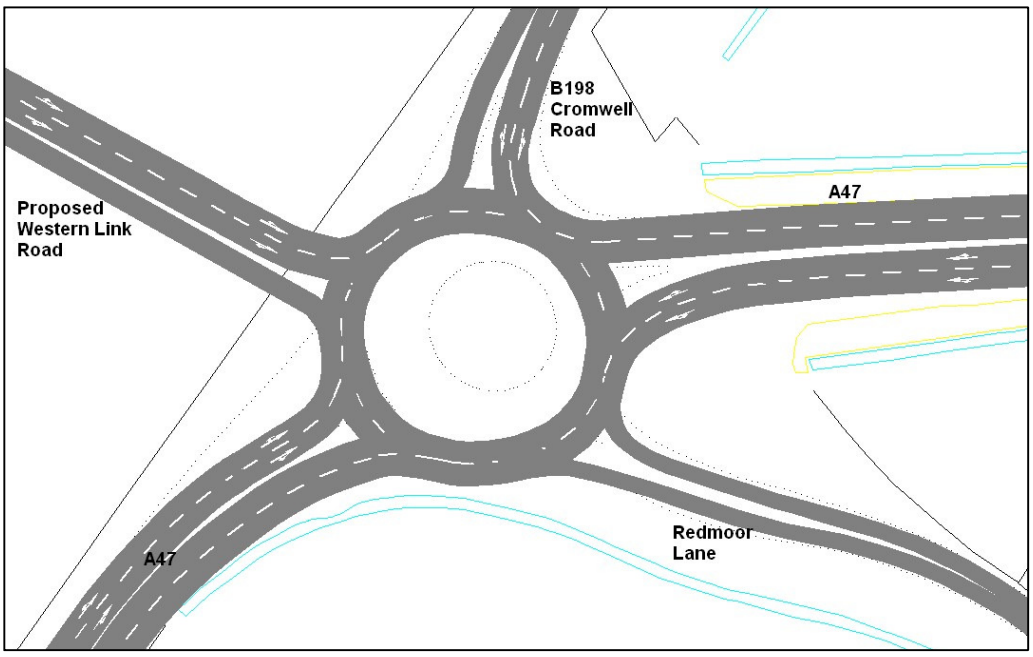


Figure 7. Cromwell Road Option 7 Lane Allocations



6.2. 2016 Results

A summary of each approach to the A47 / Cromwell Road roundabout have been compared back to the existing conditions results and are shown in Tables 27 and 28 for the AM and PM peaks respectively.

Table 27. 2016 AM Peak Approach Comparison Results Cromwell Road Option 7

		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	Base	CR Opt 7	Base	CR Opt 7	Base	CR Opt 7	Base	CR Opt 7
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	515	***518***	1.7	***0.7***	12.2	***10.0***	B	***B***
	A47 (E)	***610***	***610***	5.1	***1.3***	15.1	***8.8***	C	***A***
	Redmoor Ln	***230***	***230***	4.0	***1.6***	15.7	***9.2***	C	***A***
	A47 (W)	989	***991***	6.4	***4.5***	15.0	***14.1***	B	***B***
	Western Link Rd	-	**-**	-	**-**	-	**-**	-	**-**
	South Brink	***6***	***6***	***0.0***	***0.0***	***6.7***	9.1	***A***	A
	Overall Junction Summary	2350	***2355***	3.5	***1.4***	14.5	***11.4***	B	***B***

Table 27 shows that upgrading the roundabout is forecast to improve queues and delays for all approaches, with the exception of South Brink.

However, the assessment has not taken into account any traffic utilising the Western Link Road, which could have an impact on other arms. Therefore, it is important that this should be modelled fully in order to understand the full impact to traffic.

Table 28. 2016 PM Peak Approach Comparison Results Cromwell Road Option 7

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	Base	CR Opt 7	Base	CR Opt 7	Base	CR Opt 7	Base	CR Opt 7
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	***873***	871	***18.2***	18.3	20.8	***19.2***	C	***C***
	A47 (E)	***633***	630	11.9	***2.1***	21.4	***10.0***	C	***A***
	Redmoor Ln	***100***	***100***	1.0	***0.4***	13.2	***8.6***	B	***A***
	A47 (W)	***1099***	1096	4.4	***2.4***	12.6	***10.5***	B	***B***
	Western Link Rd	-	**-**	-	**-**	-	**-**	-	**-**
	South Brink	***27***	26	***0.5***	0.6	***24.8***	25.3	***C***	D
	Overall Junction Summary	***2731***	**2725**	7.2	***4.0***	17.5	***13.2***	C	***B***

Table 28 is consistent with the AM peak and shows improvement to delays and queues at all approaches to the roundabout.

6.3. 2021 Without WLR Results Summary

A summary of each approach to the A47 / Cromwell Road roundabout have been compared back to the 2021 Without WLR DM results and are shown in Tables 29 and 30 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 29.2021 Without WLR AM Peak Approach Comparison Results Cromwell Road Option 7

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	586	***589***	8.8	***7.5***	***18.0***	18.4	***C***	C
	A47 (E)	919	***925***	15.7	***4.8***	25.6	***14.3***	D	***B***
	Redmoor Ln	249	***251***	21.8	***5.4***	53.2	***19.6***	F	***C***
	A47 (W)	1024	***1030***	361.8	***289.5***	***146.7***	148.2	***F***	F
	Western Link Rd	-	**-**	-	**-**	-	**-**	-	**-**
	South Brink	***6***	***6***	***0.0***	***0.0***	12.5	***12.3***	B	***B***
	Overall Junction Summary	2785	***2798***	81.6	***51.2***	70.6	***64.7***	F	***F***

Table 30. 2021 Without WLR PM Peak Approach Comparison Results Cromwell Road Option 7

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	845	***847***	72.7	***15.3***	45.2	***20.8***	E	***C***
	A47 (E)	***774***	772	63.2	***44.9***	50.3	***35.9***	F	***E***
	Redmoor Ln	***99***	98	4.0	***0.9***	42.7	***32.1***	E	***D***
	A47 (W)	***1083***	1044	355.4	***290.0***	162.7	***122.7***	F	***F***
	Western Link Rd	-	**-**	-	**-**	-	**-**	-	**-**
	South Brink	23	***24***	0.7	***0.5***	30.3	***27.3***	D	***D***
	Overall Junction Summary	***2824***	**2783**	99.2	***58.6***	90.7	***61.9***	F	***F***

Tables 29 and 30 show that the upgraded roundabout provides benefits to the majority of arms in the AM and peak and all arms in the PM peak, although in both peaks the roundabout is operating over capacity with long delays forecast on the A47 W approach.

6.4. 2021 With WLR Results Summary

A summary of each approach to the A47 / Cromwell Road roundabout have been compared back to the 2021 With WLR DM results and are shown in Tables 31 and 32 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 31.2021 With WLR AM Peak Approach Comparison Results Cromwell Road Option 7

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	393	***398***	***0.1***	0.5	***7.8***	12.9	***A***	B
	A47 (E)	782	***839***	***2.0***	6.3	***14.5***	15.7	***B***	C
	Redmoor Ln	***330***	178	10.1	***3.4***	25.2	***17.9***	D	***C***
	A47 (W)	1014	***1049***	454.1	***370.7***	177.6	***167.3***	F	***F***
	Western Link Rd	-	***501***	-	***398.1***	-	***351.3***	-	***F***
	South Brink	***6***	***6***	***0.0***	***0.0***	***6.8***	14.6	***A***	B
	Overall Junction Summary	2523	***2971***	***93.3***	129.8	***80.0***	124.8	***F***	F

Table 32.2021 With WLR PM Peak Approach Comparison Results Cromwell Road Option 7

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	756	***767***	***7.6***	102.1	***17.7***	61.3	***C***	F
	A47 (E)	805	***917***	37.9	***23.5***	44.6	***32.3***	E	***D***
	Redmoor Ln	***219***	171	32.1	***7.1***	96.9	***33.5***	F	***D***
	A47 (W)	920	***1005***	671.3	***537.4***	279.3	***247.2***	F	***F***
	Western Link Rd	-	***697***	-	***308.1***	-	***232.5***	-	***F***
	South Brink	***25***	***25***	***0.4***	***0.4***	***23.1***	30.7	***C***	D
	Overall Junction Summary	2725	***3582***	***149.9***	163.1	***119.5***	137.3	***F***	F

Tables 31 and 32 show that the upgraded roundabout provides benefits to the majority of arms in both peaks, although long delays are forecast on the A47 W and the WLR approaches as vehicles struggle to exit onto the roundabout. The roundabout is operating over capacity in both peaks, and with the addition of the WLR approach delay, pushes the junction to perform worse than the DM scenario.

6.5. 2026 Without WLR Results Summary

A summary of each approach to the A47 / Cromwell Road roundabout have been compared back to the 2026 Without WLR DM results and are shown in Tables 33 and 34 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 33.2026 Without WLR AM Peak Approach Comparison Results Cromwell Road Option 7

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	***579***	578	13.4	***6.0***	20.5	***14.4***	C	***B***
	A47 (E)	974	***986***	107.3	***23.5***	63.0	***32.2***	F	***D***
	Redmoor Ln	245	***288***	161.2	***23.4***	300.7	***53.9***	F	***F***
	A47 (W)	***758***	669	805.7	***802.0***	***347.9***	423.1	***F***	F
	Western Link Rd	-	***-***	-	***-***	-	***-***	-	***-***
	South Brink	***6***	***6***	***0.0***	***0.0***	11.0	***10.2***	B	***B***
	Overall Junction Summary	***2563***	2527	217.5	***142.5***	159.0	***131.1***	F	***F***

Table 34.2026 Without WLR PM Peak Approach Comparison Results Cromwell Road Option 7

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	587	***631***	142.1	***8.8***	115.6	***13.7***	F	***B***
	A47 (E)	389	***432***	639.3	***483.4***	379.6	***291.6***	F	***F***
	Redmoor Ln	73	***83***	74.7	***32.6***	416.8	***352.4***	F	***F***
	A47 (W)	***425***	348	867.2	***850.3***	559.6	***471.3***	F	***F***
	Western Link Rd	-	***-***	-	***-***	-	***-***	-	***-***
	South Brink	24	***25***	7.1	***6.5***	204.0	***119.4***	F	***F***
	Overall Junction Summary	1497	***1518***	346.1	***230.3***	326.0	***212.9***	F	***F***

Tables 33 and 34 show that the upgraded roundabout is forecast to provide benefits to all approaches in both peaks with the exception of the A47 W approach in the AM peak.

Most approaches are operating over capacity in 2026 as the volume of traffic travelling to Cromwell Road causes queuing back and partial blocking of the circulatory throughout the PM peak. This is represented by much lower flows making it through the junction compared with the AM peak, even though the demand is higher in the PM Peak. The traffic can not exit the approaches, due to the congestion around the circulatory.

6.6. 2026 With WLR Results Summary

A summary of each approach to the A47 / Cromwell Road roundabout have been compared back to the 2026 With WLR DM results and are shown in Tables 35 and 36 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 35.2026 With WLR AM Peak Approach Comparison Results Cromwell Road Option 7

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	***671***	643	6.2	***4.3***	15.1	***14.1***	C	***B***
	A47 (E)	1005	***1046***	58.0	***50.4***	***49.5***	50.7	***E***	F
	Redmoor Ln	***239***	159	260.0	***8.9***	473.5	***46.9***	F	***E***
	A47 (W)	***699***	610	***864.9***	880.4	***393.4***	466.8	***F***	F
	Western Link Rd	-	***392***	-	***398.0***	-	***439.1***	-	***F***
	South Brink	***6***	***6***	***0.0***	***0.0***	***10.3***	11.6	***B***	B
	Overall Junction Summary	2620	***2855***	237.8	***223.7***	***170.2***	182.5	***F***	F

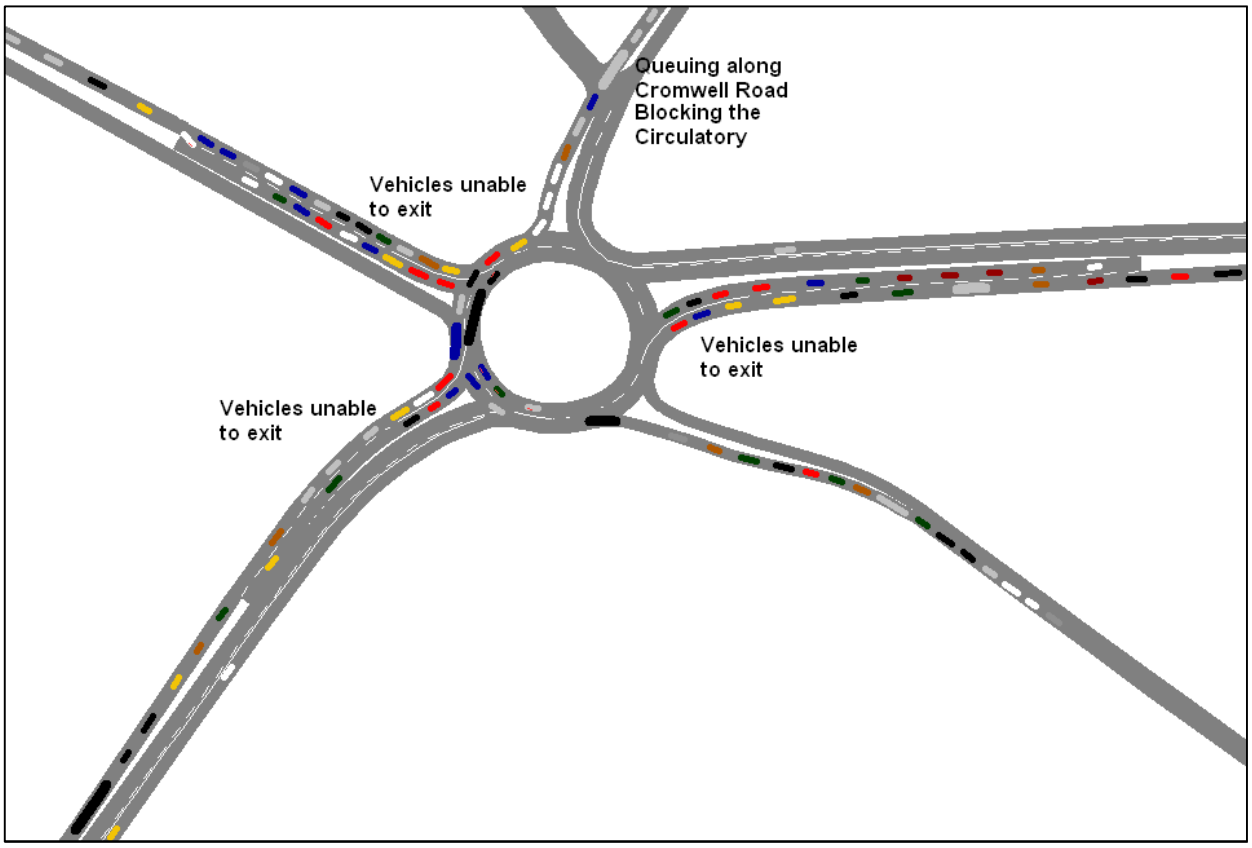
Table 36.2026 With WLR PM Peak Approach Comparison Results Cromwell Road Option 7

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7	DM	CR Opt 7
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	718	***722***	***8.4***	15.5	***19.3***	20.6	***C***	C
	A47 (E)	832	***947***	***152.5***	176.6	***100.7***	120.0	***F***	F
	Redmoor Ln	197	***224***	236.9	***45.2***	597.6	***130.2***	F	***F***
	A47 (W)	***598***	539	912.5	***905.5***	***542.1***	618.6	***F***	F
	Western Link Rd	-	***503***	-	***380.4***	-	***399.4***	-	***F***
	South Brink	***26***	***26***	0.7	***0.5***	31.5	***25.3***	D	***D***
	Overall Junction Summary	2372	***2962***	262.2	***253.9***	***224.2***	227.5	***F***	F

Tables 35 and 36 show that the upgraded roundabout in Option 7 performs worse overall compared to the DM, as a result of the WLR flows being included in Option 7, causing more conflicts for all approaches.

As in the without WLR scenarios, there is significant congestion along Cromwell Road in the PM peak which queues back to the roundabout, resulting in the WLR and A47 W approaches being blocked as shown in Figure 8.

Figure 8. Cromwell Road Option 7 PM Peak Congestion



7. Cromwell Road Option Adjustment

On 19th October 2016 a workshop was held to review the options detailed above and during this workshop it was agreed which options should be discarded, which should be taken forward as they were, or which could be modified.

Of the four options originally assessed for Cromwell Road, Option 4 was discarded due to concerns over access to the estate from South Brink. Options 2, 3 and 7 were retained.

After further discussions surrounding the potential to enhance the A47 roundabout in Option 7, a site visit was conducted by engineers with a view to provide more detail regarding the potential width and possible left slips within the current boundary. The modified option was renamed Option 7a.

During the workshop it was also agreed to assess a new option, Option 9, which looked at dualling Cromwell Road northbound, and is also included in the following sections.

8. Cromwell Road Option 7a

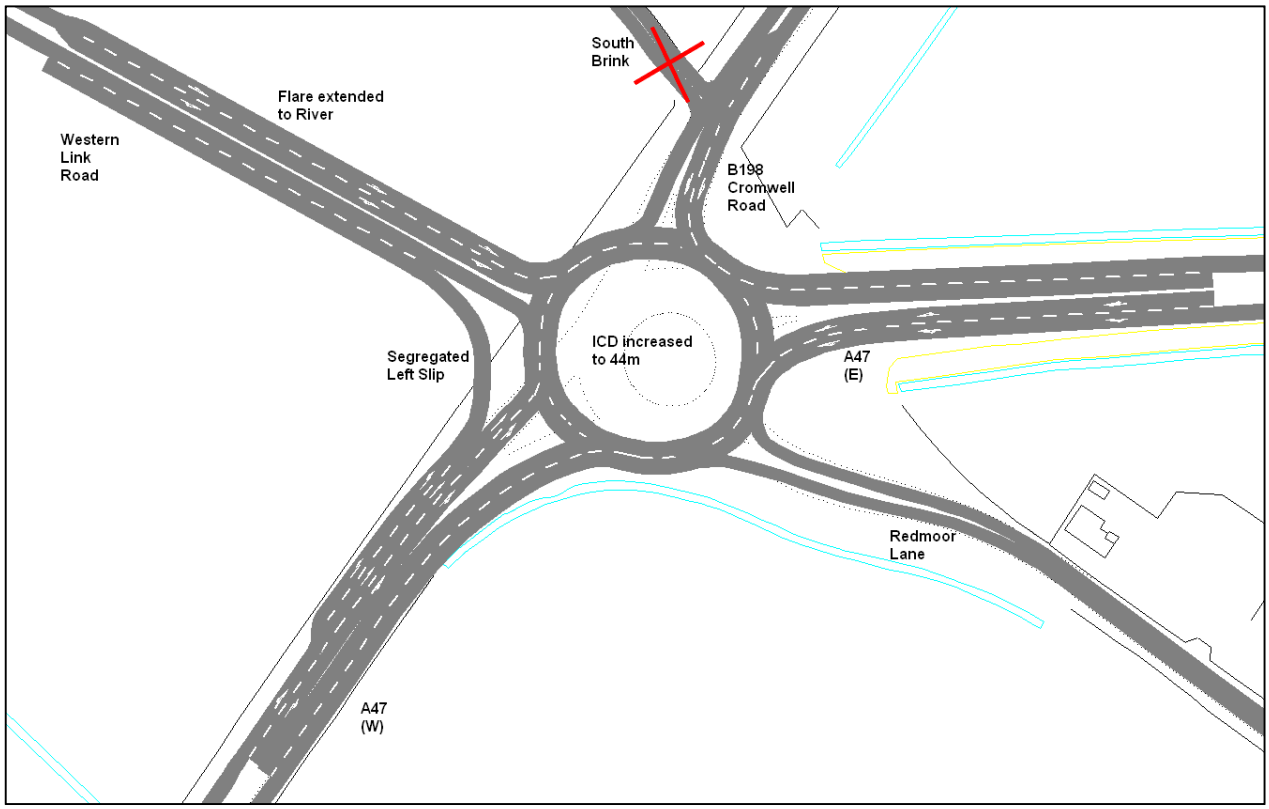
8.1. Network Changes

This option has been modelled within the micro-simulation software VISSIM. The original Option 7 model was updated as follows with further details provided in Figure 9:

- The ICD of the roundabout increased to 44m;
- A segregated left slip from the A47 (W) to Western Link Road (WLR) incorporated;
- Lane drop merges reduced to 100m along the A47 exits;

- Flare on WLR increased to 118m and pulled back to downstream of the river crossing;
- The flare at the A47 (W) approach has been increased to 134m to accommodate the slip and,
- South Brink has been included in the modelling, although it is proposed that this access will be closed due to safety.

Figure 9. Cromwell Road Option 7a VISSIM Layout



This option has been modelled for the future years of 2021 and 2026 with the Western Link Road only, as the roundabout would not be constructed if the Link Road is not built. The results have been compared back to the Do Minimum (DM) and Option 7 results to quantify any benefits.

8.2. 2021 With WLR Results Summary

A summary of each approach to the A47 / Cromwell Road roundabout have been compared back to the 2021 With WLR DM and CR Opt 7 results and are shown in Tables 37 and 38 for the AM and PM peaks respectively.

The light blue shaded cells represent the optimum performer.

Table 37. 2021 With WLR AM Peak Approach Comparison Results Cromwell Road Option 7a

		AM Peak											
		Volume			Avg Queue (m)			Delay (s)			LOS		
Junction	Approach	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	393	***398***	396	***0.1***	0.5	0.7	***7.8***	12.9	14.3	***A***	B	B
	A47 (E)	782	***839***	***839***	***2.0***	6.3	8.5	***14.5***	15.7	18.8	***B***	C	C
	Redmoor Ln	***330***	178	178	10.1	3.4	***3.1***	25.2	17.9	***17.7***	D	C	***C***
	A47 (W)	1014	1049	***1130***	454.1	370.7	***25.8***	177.6	167.3	***28.2***	F	F	***D***
	Western Link Rd	-	***501***	465	-	398.1	***192.7***	-	351.3	***226.3***	-	F	***F***
	South Brink	***6***	***6***	***6***	***0.0***	***0.0***	***0.0***	***6.8***	14.6	9.8	***A***	B	A
	Overall Junction Summary	2523	2971	***3014***	93.3	129.8	***38.5***	80.0	124.8	***53.2***	F	F	***F***

Table 38. 2021 With WLR PM Peak Approach Comparison Results Cromwell Road Option 7a

		PM Peak											
		Volume			Avg Queue (m)			Delay (s)			LOS		
Junction	Approach	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	756	***767***	761	***7.6***	102.1	123.2	***17.7***	61.3	72.7	***C***	F	F
	A47 (E)	805	***917***	910	37.9	***23.5***	29.7	44.6	***32.3***	39.5	E	***D***	E
	Redmoor Ln	***219***	171	171	32.1	7.1	***3.6***	96.9	33.5	***26.8***	F	D	***D***
	A47 (W)	920	1005	***1291***	671.3	537.4	***187.4***	279.3	247.2	***100.5***	F	F	***F***
	Western Link Rd	-	***697***	446	-	308.1	***201.0***	-	***232.5***	278.6	-	***F***	F
	South Brink	***25***	***25***	***25***	0.4	0.4	***0.2***	***23.1***	30.7	26.9	***C***	D	D
	Overall Junction Summary	2725	3582	***3604***	149.9	163.1	***90.9***	119.5	137.3	***95.9***	F	F	***F***

Tables 37 and 38 show that by increasing capacity at the A47 (W) approach allows for more vehicles to be processed, which provides more conflicts for the WLR approach. In the PM peak the delays have increased although with Option 7, the approach was over capacity already.

In both peaks, overall the junction is operating over capacity with both Option 7 and 7a.

8.3. 2026 With WLR Results Summary

A summary of each approach to the A47 / Cromwell Road roundabout have been compared back to the 2026 With WLR DM and CR Opt 7 results and are shown in Tables 39 and 40 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 39. 2026 With WLR AM Peak Approach Comparison Results Cromwell Road Option 7a

		AM Peak											
		Volume			Avg Queue (m)			Delay (s)			LOS		
Junction	Approach	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	***671***	643	651	6.2	***4.3***	11.3	15.1	***14.1***	20.1	C	***B***	C
	A47 (E)	1005	1046	***1051***	58.0	50.4	***42.4***	49.5	50.7	***45.1***	E	F	***E***
	Redmoor Ln	***239***	159	160	260.0	8.9	***5.4***	473.5	46.9	***33.8***	F	E	***D***
	A47 (W)	699	610	***908***	864.9	880.4	***492.6***	393.4	466.8	***227.7***	F	F	***F***
	Western Link Rd	-	***392***	214	-	398.0	***223.4***	-	***439.1***	525.7	-	***F***	F
	South Brink	***6***	***6***	***6***	***0.0***	***0.0***	***0.0***	***10.3***	11.6	15.4	***B***	B	C
	Overall Junction Summary	2620	2855	***2993***	237.8	223.7	***129.2***	170.2	182.5	***128.0***	F	F	***F***

Table 40. 2026 With WLR PM Peak Approach Comparison Results Cromwell Road Option 7a

		PM Peak											
		Volume			Avg Queue (m)			Delay (s)			LOS		
Junction	Approach	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a	DM	CR Opt 7	CR Opt 7a
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	718	***722***	715	***8.4***	15.5	16.1	***19.3***	20.6	21.3	***C***	C	C
	A47 (E)	832	947	***953***	***152.5***	176.6	155.2	***100.7***	120.0	106.4	***F***	F	F
	Redmoor Ln	197	224	***226***	236.9	45.2	***15.3***	597.6	130.2	***69.1***	F	F	***F***
	A47 (W)	598	539	***820***	912.5	905.5	***687.2***	542.1	618.6	***388.6***	F	F	***F***
	Western Link Rd	-	***503***	237	-	380.4	***222.2***	-	***399.4***	523.3	-	***F***	F
	South Brink	***26***	***26***	***26***	0.7	0.5	***0.4***	31.5	25.3	***22.2***	D	D	***C***
	Overall Junction Summary	2372	2962	***2977***	262.2	253.9	***182.7***	224.2	227.5	***190.7***	F	F	***F***

Tables 39 and 40 show that delays along the A47 (W) approach are forecast to reduce as a result of providing the left slip and increasing capacity for the approach.

As a result of lower delays along for the A47, the Western Link Road delays increase, with fewer vehicles being processed.

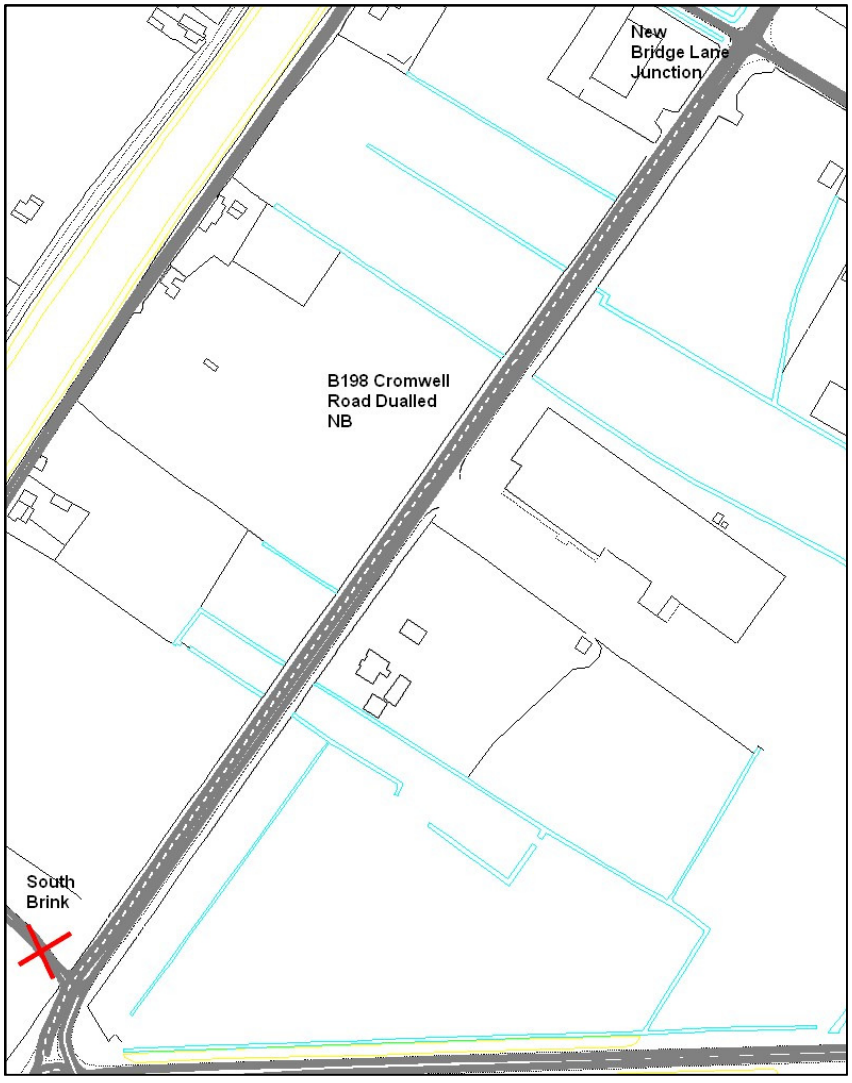
In 2026 there is also congestion along Cromwell Road which extends back to the roundabout, blocking access for the WLR.

9. Cromwell Road Option 9

9.1. Network Changes

From the previous option testing results, it was noted that Cromwell Road experienced significant congestion as a result of the development traffic. Therefore, to try to alleviate this congestion, it was decided to model a new option which involved dualling the B198 Cromwell Road in a northbound direction between the A47 roundabout and New Bridge Lane junction as shown in Figure 10.

Figure 10. Cromwell Road Option 9 VISSIM Layout



It is proposed that the South Brink junction would be closed as part of this option, although for the purpose of this modelling, it has been left open.

This option has been modelled for the future years of 2021 and 2026 with and without the Western Link Road, with the results compared back to the Do Minimum (DM) scenario to quantify any benefits.

9.2. 2021 Without WLR Results Summary

A summary of each approach to the A47 / Cromwell Road roundabout and New Bridge Lane junction have been compared back to the 2021 Without WLR DM results and are shown in Tables 41 and 42 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 41. 2021 Without WLR AM Peak Approach Comparison Results Cromwell Road Option 9

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	586	***602***	***8.8***	15.7	***18.0***	21.3	***C***	C
	A47 (E)	919	***924***	15.7	***9.4***	25.6	***21.8***	D	***C***
	Redmoor Ln	***249***	***249***	21.8	***17.6***	53.2	***42.7***	F	***E***
	A47 (W)	1024	***1077***	361.8	***193.8***	146.7	***104.2***	F	***F***
	South Brink	***6***	***6***	***0.0***	0.1	***12.5***	28.0	***B***	D
	Overall Junction Summary	2785	***2857***	81.6	***47.3***	70.6	***54.4***	F	***F***
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***522***	***522***	***6.0***	8.3	***27.3***	30.4	***C***	C
	New Bridge Ln (E)	106	***117***	178.4	***93.9***	498.6	***246.7***	F	***F***
	Cromwell Rd (S)	1090	***1119***	174.3	***33.2***	55.3	***32.5***	E	***C***
	New Bridge Ln (W)	***18***	***18***	6.6	***5.2***	162.5	***128.9***	F	***F***
	Tesco Access	211	***213***	***0.0***	0.1	***25.4***	29.9	***C***	C
	Overall Junction Summary	1945	***1988***	72.8	***37.2***	66.8	***44.5***	E	***D***

Table 42. 2021 Without WLR PM Peak Approach Comparison Results Elm High Road Option 9

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	***845***	824	72.7	***69.5***	45.2	***41.4***	E	***E***
	A47 (E)	774	***778***	63.2	***12.9***	50.3	***24.3***	F	***C***
	Redmoor Ln	99	***100***	4.0	***1.5***	42.7	***17.4***	E	***C***
	A47 (W)	1083	***1186***	355.4	***107.0***	162.7	***73.2***	F	***F***
	South Brink	23	***24***	***0.7***	1.9	***30.3***	59.4	***D***	F
	Overall Junction Summary	2824	***2911***	99.2	***38.5***	90.7	***49.1***	F	***E***
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***836***	814	***31.4***	43.1	***36.9***	48.0	***D***	D
	New Bridge Ln (E)	***23***	18	***288.4***	303.7	1379.4	***1035.5***	F	***F***
	Cromwell Rd (S)	749	***762***	311.5	***243.4***	***156.1***	163.5	***F***	F
	New Bridge Ln (W)	***21***	14	***100.3***	113.5	1075.0	***962.4***	F	***F***
	Tesco Access	***218***	216	***0.1***	2.3	***32.8***	42.3	***C***	D
	Overall Junction Summary	***1848***	1824	***145.9***	153.0	***107.5***	110.0	***F***	F

Tables 41 and 42 show that by dualling the northbound carriageway of Cromwell Road improves the performance of the A47 roundabout, increasing flow throughput. However, as flows increase northbound, they cause more delays along Cromwell Road at the New Bridge Lane junction.

9.3. 2021 With WLR Results Summary

A summary of each approach to the A47 / Cromwell Road roundabout and New Bridge Lane junction have been compared back to the 2021 With WLR DM results and are shown in Tables 43 and 44 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 43. 2021 With WLR AM Peak Approach Comparison Results Cromwell Road Option 9

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	393	***400***	***0.1***	0.2	***7.8***	8.2	***A***	A
	A47 (E)	***782***	780	***2.0***	2.1	14.5	***12.5***	B	***B***
	Redmoor Ln	330	***331***	10.1	***7.4***	25.2	***17.7***	D	***C***
	A47 (W)	1014	***1107***	454.1	***266.2***	177.6	***126.4***	F	***F***
	South Brink	***6***	***6***	***0.0***	0.1	***6.8***	15.7	***A***	C
	Overall Junction Summary	2523	***2623***	93.3	***55.2***	80.0	***60.4***	F	***F***
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***407***	***407***	***2.8***	5.4	***29.0***	34.2	***C***	C
	New Bridge Ln (E)	48	***66***	577.0	***535.7***	1947.1	***1324.3***	F	***F***
	Cromwell Rd (S)	1150	***1193***	235.3	***70.7***	61.1	***44.8***	E	***D***
	New Bridge Ln (W)	***17***	14	***8.0***	10.0	215.7	***196.7***	F	***F***
	Tesco Access	***213***	212	***0.0***	***0.0***	***21.1***	27.2	***C***	C
	Overall Junction Summary	1833	***1893***	***164.2***	172.9	98.3	***86.4***	F	***F***

Table 44. 2021 With WLR PM Peak Approach Comparison Results Cromwell Road Option 9

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	***756***	703	***7.6***	8.5	***17.7***	18.9	***C***	C
	A47 (E)	***805***	800	37.9	***10.5***	44.6	***22.8***	E	***C***
	Redmoor Ln	***219***	217	32.1	***6.5***	96.9	***26.3***	F	***D***
	A47 (W)	920	***1185***	671.3	***309.8***	279.3	***147.1***	F	***F***
	South Brink	***25***	24	***0.4***	1.1	***23.1***	44.5	***C***	E
	Overall Junction Summary	2725	***2929***	149.9	***67.3***	119.5	***72.6***	F	***F***
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***822***	768	***31.2***	44.4	***37.7***	56.8	***D***	E
	New Bridge Ln (E)	***18***	7	***318.4***	363.6	1711.3	***725.4***	F	***F***
	Cromwell Rd (S)	784	***815***	458.1	***390.8***	***193.0***	294.7	***F***	F
	New Bridge Ln (W)	***12***	4	139.7	***137.4***	1768.9	***910.5***	F	***F***
	Tesco Access	***353***	347	***2.5***	10.3	***38.9***	58.8	***D***	E
	Overall Junction Summary	***1990***	1940	***189.6***	197.3	***124.3***	161.9	***F***	F

Tables 43 and 44 show that the dualling provides benefits to the A47 roundabout approaches, especially the A47 (W) approach, but that Cromwell Road at the New Bridge Lane junction experiences longer delays as a result of more traffic being processed through the A47 roundabout.

9.4. 2026 Without WLR Results Summary

A summary of each approach to the A47 / Cromwell Road roundabout and New Bridge Lane junction have been compared back to the 2026 Without WLR DM results and are shown in Tables 45 and 46 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 45. 2026 Without WLR AM Peak Approach Comparison Results Cromwell Road Option 9

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	***579***	555	13.4	***5.5***	20.5	***15.7***	C	***C***
	A47 (E)	974	***977***	107.3	***19.5***	63.0	***26.4***	F	***D***
	Redmoor Ln	245	***286***	161.2	***40.7***	300.7	***75.2***	F	***F***
	A47 (W)	758	***904***	805.7	***686.6***	347.9	***252.5***	F	***F***
	South Brink	***6***	***6***	***0.0***	0.2	***11.0***	33.2	***B***	D
	Overall Junction Summary	2563	***2728***	217.5	***150.5***	159.0	***104.2***	F	***F***
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	532	***534***	***7.7***	15.0	***29.2***	38.4	***C***	D
	New Bridge Ln (E)	***73***	46	487.3	***444.0***	1425.1	***1204.5***	F	***F***
	Cromwell Rd (S)	1033	***1090***	361.9	***317.2***	***102.1***	183.9	***F***	F
	New Bridge Ln (W)	***17***	10	***13.5***	42.8	***334.9***	978.4	***F***	F
	Tesco Access	***215***	213	***0.0***	0.1	***30.8***	37.3	***C***	D
	Overall Junction Summary	1871	***1893***	***173.7***	180.2	***123.1***	145.8	***F***	F

Table 46. 2026 Without WLR PM Peak Approach Comparison Results Cromwell Road Option 9

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	***587***	511	142.1	***96.2***	115.6	***78.1***	F	***F***
	A47 (E)	389	***554***	639.3	***383.4***	379.6	***225.2***	F	***F***
	Redmoor Ln	73	***89***	74.7	***28.9***	416.8	***231.5***	F	***F***
	A47 (W)	425	***679***	867.2	***691.8***	559.6	***312.8***	F	***F***
	South Brink	***24***	14	***7.1***	23.8	204.0	***143.4***	F	***F***
	Overall Junction Summary	1497	***1847***	346.1	***244.8***	326.0	***213.6***	F	***F***
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***572***	469	***81.2***	108.2	***101.5***	153.7	***F***	F
	New Bridge Ln (E)	***2***	***2***	***577.9***	587.3	863.4	***667.3***	F	***F***
	Cromwell Rd (S)	292	***376***	624.7	***536.8***	***652.7***	753.3	***F***	F
	New Bridge Ln (W)	***3***	2	***145.8***	151.1	714.9	***517.8***	F	***F***
	Tesco Access	***300***	265	***89.1***	107.3	***232.8***	286.0	***F***	F
	Overall Junction Summary	***1171***	1111	***303.3***	304.6	***278.1***	382.0	***F***	F

Tables 45 and 46 show that although the A47 roundabout is operating over capacity, delays have been significantly reduced as a result of dualling Cromwell Road northbound. 200 more vehicles are being processed from the A47 (W) approach as the dualling increases capacity and the blocking back observed in the DM scenario occurs less frequently.

Delays have increased for Cromwell Road (S) approach at the Tesco junction as a result of more vehicles being processed from the A47 (W) approach.

9.5. 2026 With WLR Results Summary

A summary of each approach to the A47 / Cromwell Road roundabout and New Bridge Lane junction have been compared back to the 2026 Without WLR DM results and are shown in Tables 47 and 48 for the AM and PM peaks respectively. The light blue shaded cells represent the optimum performer.

Table 47. 2026 With WLR AM Peak Approach Comparison Results Cromwell Road Option 9

		AM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	***671***	617	6.2	***4.7***	15.1	***13.8***	C	***B***
	A47 (E)	1005	***1018***	58.0	***22.7***	49.5	***29.6***	E	***D***
	Redmoor Ln	239	***299***	260.0	***131.5***	473.5	***197.3***	F	***F***
	A47 (W)	699	***808***	864.9	***795.9***	393.4	***316.3***	F	***F***
	South Brink	***6***	***6***	***0.0***	0.3	***10.3***	42.7	***B***	E
	Overall Junction Summary	2620	***2748***	237.8	***191.0***	170.2	***128.1***	F	***F***
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	633	***635***	***10.9***	29.3	***30.0***	45.8	***C***	D
	New Bridge Ln (E)	***92***	37	***217.5***	341.1	***713.0***	1233.6	***F***	F
	Cromwell Rd (S)	1057	***1101***	367.9	***312.3***	***96.5***	180.1	***F***	F
	New Bridge Ln (W)	***17***	8	***19.9***	52.2	***464.7***	1030.8	***F***	F
	Tesco Access	***152***	150	***0.0***	***0.0***	***27.8***	33.5	***C***	C
	Overall Junction Summary	***1952***	1932	***122.9***	158.4	***99.6***	141.8	***F***	F

Table 48. 2026 With WLR PM Peak Approach Comparison Results Cromwell Road Option 9

		PM Peak							
		Volume		Avg Queue (m)		Delay (s)		LOS	
Junction	Approach	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9	DM	CR Opt 9
A47 / B198 Cromwell Rd Rbt	Cromwell Rd	***718***	622	8.4	***6.4***	19.3	***17.2***	C	***C***
	A47 (E)	***832***	826	152.5	***67.8***	100.7	***62.7***	F	***F***
	Redmoor Ln	197	***237***	236.9	***67.2***	597.6	***170.0***	F	***F***
	A47 (W)	598	***780***	912.5	***772.6***	542.1	***375.5***	F	***F***
	South Brink	***26***	17	***0.7***	26.0	***31.5***	517.4	***D***	F
	Overall Junction Summary	2372	***2482***	262.2	***188.0***	224.2	***158.0***	F	***F***
Cromwell Rd / New Bridge Lane	Cromwell Rd (N)	***736***	641	***115.2***	125.0	***91.6***	127.0	***F***	F
	New Bridge Ln (E)	***39***	6	***564.4***	579.8	2268.2	***1556.0***	F	***F***
	Cromwell Rd (S)	686	***720***	584.1	***554.2***	***283.6***	553.3	***F***	F
	New Bridge Ln (W)	***12***	3	159.1	***158.5***	2361.9	***1932.5***	F	***F***
	Tesco Access	***410***	397	***4.8***	18.7	***41.6***	74.9	***D***	E
	Overall Junction Summary	***1880***	1767	***285.1***	287.5	***207.0***	301.3	***F***	F

Tables 47 and 48 are consistent with previous results and show that the A47 roundabout performance is forecast to improve significantly, although the Cromwell Road approaches at the New Bridge Lane junction experience longer delays as more vehicles are processed northbound.

10. Cromwell Road Conclusions

10.1. Option 2

Cromwell Road Option 2 creates a staggered signalised junction with Tesco and New Bridge Lane (E). Overall in all years the signalised junction operates within capacity. However, at the Tesco / Cromwell Road junction, the northbound internal stop line queue extends back to the downstream junction and may impact the operation of this junction, though this could be mitigated through a shift in traffic signal timings/operation if needed.

10.2. Option 3

The closure of Salters Way and re-routing via New Bridge Lane (E) causes additional delays along New Bridge Lane as vehicles struggle to exit due to the close proximity to the signalised Tesco junction. In the future years 2021 and 2026, as traffic flows increase, vehicles are still unable to exit causing significant delays to this approach of over 15 minutes.

10.3. Option 4

The closure of the Reason Homes access at the Weasenham Lane junction helps to improve performance at the Weasenham Lane junction as a result of reducing the cycle time by closing the west arm. The South Brink junction sees a slight increase in delay as a result of additional vehicles using the junction although it is still forecast to operate well within capacity.

The future year assessment has forecast that the closure still provides benefits, although in the PM peak, there is significant congestion in both directions along Cromwell Road, which results in the blocking at both junctions pushing them to operate over capacity without the Link Road. The 2026 With Link Road PM Peak assessment shows that the junction is forecast to operate at capacity.

10.4. Option 7

The upgrade to the A47 / B198 Cromwell Road roundabout to improve capacity and incorporate an additional arm to serve the proposed Western Link Road, provides benefits to all approaches in both peaks in the 2016 assessment. However, there were no Link Road flows in 2016.

The 2021 Without WLR assessment showed that the upgraded roundabout provided benefits to most arms in the AM peak and to all approaches in the PM peak although the junction is operating over capacity in both peaks with significant delays along the A47 W approach.

The 2021 With WLR assessment, incorporated flows along the link road and from all other arms, and has shown that the upgraded roundabout provides improvements to delays for most arms in both peaks. However the Link Road approach is operating well over capacity with long delays as vehicles struggle to exit with high volumes travelling to Cromwell Road from all arms. As a result of the additional delay along the WLR, Option 7 performs worse than the DM.

In 2026 in both with and without the Link Road, especially in the PM peak, the congestion along Cromwell Road extends back to the roundabout, frequently blocking access for the Link Road and A47 W approaches and occasionally the A47 E approach, resulting in very long delays on most arms. However, despite the long delays, the upgraded roundabout does provide some benefits.

The roundabout is operating over capacity in both the AM and PM peaks in 2021 and 2026.

10.5. CR Option 7a

The results for both 2021 and 2026 have shown that the enhancements in capacity along the A47 (W) approach helps to reduce delays and processes more vehicles than Option 7, although this has a knock on effect for the WLR approach as delays increase and fewer vehicles are processed.

In 2026 the delays are significantly worse for the WLR, although this could be a feature of the congestion along Cromwell Road and the high flows forecast from the 2008 WATS model.

10.6. CR Option 9

The results have shown that dualling the B198 Cromwell Road northbound between the A47 roundabout and New Bridge Lane junction significantly improves delays for the A47 (W) approach at the roundabout and more vehicles can be processed. However, as more vehicles are able to travel northbound along Cromwell Road, delays have increased at the New Bridge Lane junction.

SKANSKA

Appendix B – Scheme Cost Summary

Wisbech Access Study 07/12/2016

CR7c
Western Link Road, Cromwell Rd, A47 Roundabout

Highways Only

Site Clearance Generally						8000	m2	1.00	8,000.00
Construction Assumptions:									
Carriageway	s/c	40	15.00	Footpath		25	12.00		
	b/c	60	15.00			65	15.00		
	rd b	200	40.00						
	sub base	450	37.50			260	25.00		
	Capping lc	400	40.00						
		0	3.00						
	terram	1150				350			
		2300				700			
	exc & CA		35.00				30.00		
			185.50				82.00		
Excavate & construct carriageway areas						4674	m2	185.50	867,027.00
Construct Verges						7801	m2	35.00	266,035.00
Excavate & construct footway areas						1152	m2	82.00	94,464.00
Construct roundabout islands, inc approach barriers etc						1	no	120,000.00	120,000.00
Carriageway kerbs						3000	m	33.00	99,000.00
Footway edgings						2000	m	23.00	46,000.00
Alter existing junctions						0	item	20,000.00	-
Carriageway drainage & alterations						1	allow	45,000.00	45,000.00
Timber post & rail fence						800	m	22.00	17,600.00
Street lighting & alterations						1	allow	122,142.86	122,142.86
Surveys						1	item	35,000.00	35,000.00
Landscaping						1	item	76,010.00	76,010.00
Duct provision						1	allow	75,000.00	75,000.00
Signs & lines						1	allow	40,000.00	40,000.00
									1,911,278.86
Prelims									
	Land Acquisition					7718	m2	3.75	28,942.50
	Demolition						m2		-
	Design					10%			191,127.89
	Staff, supervision, accommodation, temp fences					20%			382,255.77
	Traffic Management		on trunk road			26	weeks	10,000.00	260,000.00
									2,773,605.01
	Add Contingency & Optimism Bias					45%			1,248,122.26
									4,021,727.27

Risks/Assumptions

Soil conditions (contamination etc)
Vandalism

A47 Roundabout works costed seperately

SKANSKA

Wisbech Access Study 21/07/2017

WEASENHAM LANE 5040201/2102/hw/sk/001

Highways Only

Construction Assumptions;

Carriageway	s/c	40	15.00	Footpath	25	12.00	
	b/c	60	15.00		65	15.00	
	rd b	200	40.00				
	sub base	450	37.5		260	25.00	
	Capping l	520	40.00				
	terram& tsting		3.00				
		1270			350		
	exc & CA		35.00			30.00	
			185.50			82.00	

General Site Clearence	6500 m3	4.00	26,000.00	
Exc & realign drainage ditch	600 m3	55.00	33,000.00	
Form new verge	2744 m2	35.00	96,040.00	
BO existg carriageway & reinstate	1000 m2	55.00	55,000.00	
Excavate & construct new carriageway areas	1878.3 m2	185.50	348,424.65	
Excavate & construct footway areas	2866 m2	82.00	235,012.00	-
Plane & resurface carriageway	4382.7 m2	25.00	109,567.50	-
BO & replace kerbs	475 m	120.00	57,000.00	-
Carriageway kerbs	1010 m	33.00	33,330.00	-
Alter existing junctions & Ped Crossings	2 item	35,000.00	70,000.00	-
Carriageway drainage & alterations	1 allow	122,028.57	122,028.57	-
Street lighting & alterations	1 allow	82,857.14	82,857.14	-
Duct provision	1 allow	20,000.00	20,000.00	-
Signs & lines	1 allow	30,400.00	30,400.00	-
Surveys	1 item	35,000.00	35,000.00	-
Landscaping	1 item	27,500.00	27,500.00	-
			1,381,159.86	

Prelims

Land Acquisition		m2		-
Demolition		m2		-
Design	10%			138,115.99
Staff, supervision, accommodation & Fees	20%			276,231.97
Traffic Management	14 weeks		8,750.00	122,500.00
				1,918,007.82
Add Contingency & Optimism Bias	45%			863,103.52
				2,781,111.34

Risks/Assumptions

Soil conditions (contamination etc) not covered
Assume drainage connects onto existing arterial SW.
Assumes street lights reconnected to existing supplies.

Assumes clear site.
Works carried out in one continuous visit