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Warwickshire County Council
Rugby Borough Council

Rugby Borough Local Plan

Strategic Transport Assessment
Modelling Analysis and Overview

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1 INTRODUCTION

1.1 Vectos Microsim (VM) has been assisting Rugby Borough Council (RBC) and Warwickshire County Council (WCC) in the assessment of options pertaining to the delivery of growth in housing and employment through the Rugby Borough Council Local Plan.

1.2 The purpose of this Strategic Transport Assessment (STA) report is to provide an overview of the work completed to date, to document the assumptions adopted at each stage of the study and present the associated findings.

Objectives

1.3 There are a number of objectives associated with the STA which are summarised as follows:

- To assess the likely impact on the highway network of the emerging strategies concerning the delivery of housing and employment sites through the Rugby Borough Local Plan.
- To identify a mitigation package, to accompany the Local plan proposals which seeks to minimise the residual impacts on the highway network which are predicted to occur as a result of the Local Plan proposals.
- To assess the impacts of the Local Plan at key stages of delivery in order that a phased infrastructure strategy can be determined.
- To assess the impacts of various alignment and indicative design options for the delivery of a South West Link Road.

Report Structure

1.4 The remainder of this report is set out as follows:

- **Chapter 2** – Provides an overview of the 2016 Rugby Wide Area (RWA) Base Model update and development of the 2021, 2026 and 2031 Forecast Models.
- **Chapter 3** – Summarises the key stages of the assessment as well as an overview of the development of the Local Plan models, alongside an overview of how growth in traffic volumes has been calculated as well as any redistribution mechanisms adopted within the scenarios.
- **Chapter 4 –** Outlines the results reported upon within this STA Report.

- **Chapter 5 –** Presents the findings from the first stage of the assessment concerning the impacts of allocating all sites identified within the Local Plan.
- **Chapter 6 -** Presents the findings from the second stage of the assessment which focusses on the impacts associated with the first 5 years of the Local Plan.
- **Chapter 7 -** Documents the findings from the third stage of the assessment which assesses the impacts associated with the first 10 years of the Local Plan proposals.
- **Chapter 8 -** Provides detail of the assessment of the various alignment and junction arrangement options for the delivery of the South West Link Road to facilitate growth in the South West area of Rugby.
- **Chapter 9 –** Presents the findings of the Sensitivity Testing undertaken in relation to various detailed design options related to the delivery of the South West Link Road.
- **Chapter 10 -** Presents the summary findings from the work alongside the initial conclusions.

2 BACKGROUND

2.1 The following section of the report provides detail on the background of the assessment to be undertaken. This includes detail on the Rugby Wide Area Base Model update, and subsequent model forecasting process.

2016 RWA Base Model Objectives

2.2 Following the completion of the original Local Plan assessment work, in September 2016, concerns were highlighted around the age of the data which was used to underpin the RWA Base model since it was originally based on 2009 count data.

2.3 Although it was considered suitable for the purposes of a strategic level assessment, the Base model was, nevertheless, subject to an update in response to these concerns. The development of this updated model is summarised in the following section, and has been fully documented within the accompanying Local Model Validation Report (LMVR)[1].

2.4 The Base model update comprised the following stages:

- Review and amend the network coverage;
- Review the network calibration and inclusions to reflect the 2016 network conditions;
- Update the demand matrices to reflect 2016 traffic levels using 2011 Census distribution information alongside ANPR data to ensure that routing behaviours are accurately represented; and
- Validate the updated model against independent data sets as per WebTAG requirements.

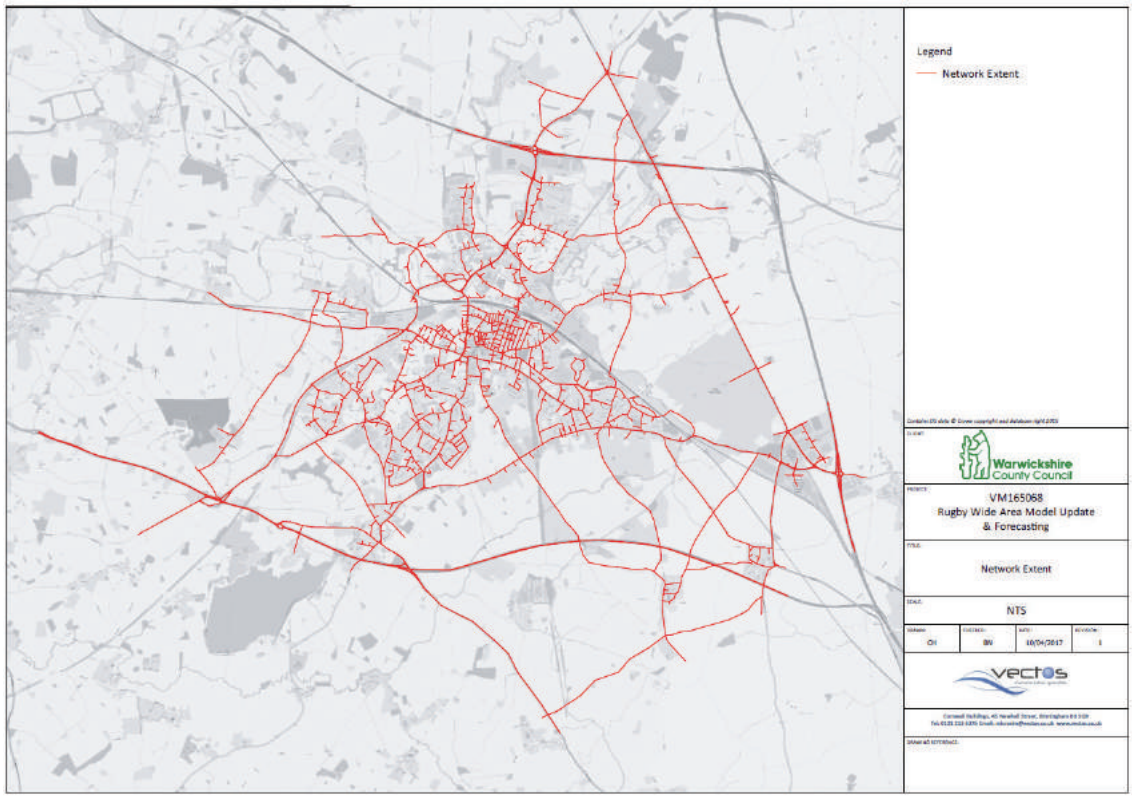
Study Area

2.5 The study area was revisited as part of the update and a refined study area was defined by WCC and has been revised from the original model to cover the villages of Barby and Kilsby, to the south of the M45. The previous study area has also been trimmed at the northern and western extent to remove the area of the network that was previously considered to be

[1] VM165068.R002_Rugby Wide Area LMVR

'buffer network' which was not sufficiently detailed to be included within the update. The resultant revised study area is demonstrated in **Figure 1**.

Figure 1 – Model Extent Plot



2016 Base Model Data Input

2.6 WCC commissioned a number of different data surveys for use in updating the RWA model. This section details the data utilised in the update, and how it has been applied in order to inform network conditions within the proposed model area.

Junction Count Surveys

2.7 A total of 13 two-way link counts and 95 junction counts were available for the purposes of the model update. These junction counts were combined with link flow data collected via Automatic Traffic Counts (ATCs) and routing data extracted from interrogation of Census data coupled with the collation of town centre routing information via ANPR surveys to inform the matrix estimation and assess model calibration. The count data used to inform the model calibration was largely collected in 2016, with the exception of counts at the following locations, which were collected in 2015:

- Butlers Leap/Mill Road
- Aqua Place/Mill Road

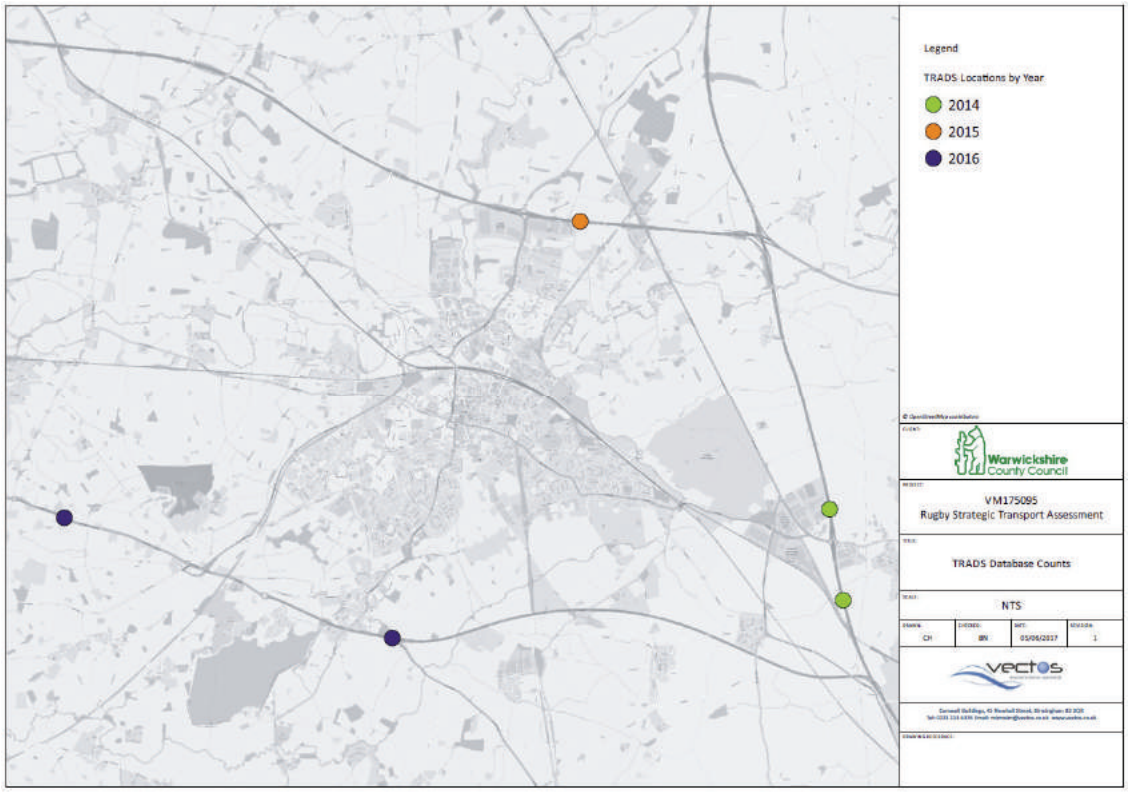
- Mill Road/Technology Drive
- Lawford Road/A4071

2.8 The location of each of the observed counts used within the model development are shown in **Figure 2**:

Figure 2 - Count Locations

2.9 This data was supplemented with counts for the M1, M45 and M6 using Highways England TRADS database. Counts were selected for the most recent data collection available on the database at the time of the model build, with the most recent M1 counts being from 2014, M6 counts from 2015 and A45/M45 counts from 2016.

Figure 3 TRADS Data Locations



2.10 The distribution of counts highlighted within **Figure 2 and Figure 3** demonstrates that an extensive coverage of count data collected across the study area was achieved.

2.11 It is important to note that the junction count used in the calibration process at the Dunchurch Crossroads was collected in June 2016 when all schools were in school term time including Bilton Grange school, as previously concerns had been raised regarding the suitability of the historic count which was collected when Bilton Grange school was on holiday.

2.12 During the data collection period it was acknowledged that unforeseen roadworks resulted in an invalid count at the Butlers Leap/Clifton Road junction. As such this count was replaced by existing data already held by WCC at this junction. The new data at this junction was matched with data for adjacent junctions also (particularly in the Mill Road area) to ensure that the effects of the road closure were negated, within the count data, through the replacement data. Thus the impact of Butlers Leap closure has been overcome through the inclusion, within the calibration process, of supplementary count data.

2.13 In addition to the individual calibration counts presented above, 20 link counts were collected and retained for independent link flow validation checks, therefore not used in

matrix estimation or in assessing model calibration. In total this provided 40 link count samples.

2.14 Model validation is the process of checking the calibrated model against observed traffic data independent of the model development process. The following figure shows the location of the link counts used for validation purposes:

Figure 4 – Link Validation Count Locations

Queue Surveys

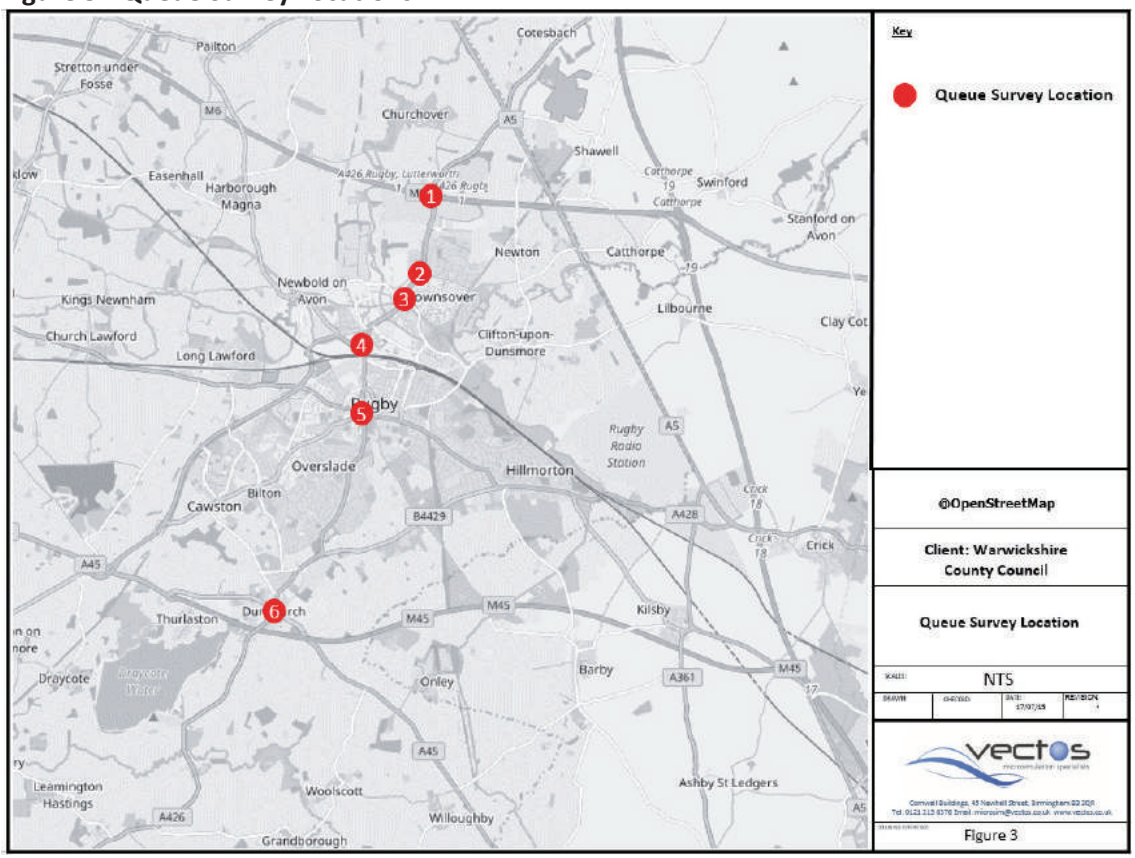
2.15 Data on the queuing levels experienced during the peak periods, at a number of locations across the study area, was also collected. This information was processed in the form of maximum queue lengths in vehicles, at 5 minute intervals for both AM and PM model periods. This data was subsequently reviewed against the modelled queues at the corresponding locations.

2.16 The queuing surveys were collected and reviewed at 6 specific junctions as identified below and within **Figure 5**:

- 1 – M6/A426 Junction
- 2 – A426/Newton Manor Lane Roundabout

- 3 – A426/Boughton Road/Brownsover Road Roundabout
- 4 – Avon Mill (A426/B4112) Roundabout
- 5 – Rugby Gyratory
- 6 - Dunchurch Crossroads

Figure 5 - Queue Survey Locations



2.17 Queue data can prove challenging when validating a microsimulation model. Neither TfL, DMRB nor WebTAG provide any specific guidelines on queue assessments. DMRB actually states that *"precise validation of queue lengths can be difficult because of the volatility of the observed data"*[2].

2.18 Likewise, TfL identify that "*the level of accuracy in queue measurement surveys can often [sic] lower than for other surveys as the definition of a queue can be ambiguous as well as difficult to identify*"[3].

[2] Design Manual for Roads and Bridges, *Volume 12 Traffic Appraisal of Road Schemes*: *Section 2 Traffic Appraisal Advice*, Chapter 4, Para. 4.4.32

[3] TfL, *Traffic Modelling Guidelines*:*Traffic Manager and Network Performance Best Practice Version 3.0*, Para 2.4.4.3

2.19 Queue length surveys are able to provide an estimation of conditions at the site but cannot be expected to be replicated accurately within a model, and accordingly the queue data has been used simply as a guide to inform model calibration. Primary reasons for this include:

- The tendency for the model results to fluctuate between different model runs;
- The day-to-day variance in real-life conditions at the site meaning that results taken from one day cannot be applied too rigidly; and
- The software's mathematical interpretation of queue lengths compared with the subjective nature of human interpretation during manual surveys.

2.20 When extracting queue data from the model, it is commonplace to extract the maximum queue length within a given period. To align with the recorded observed data, which was collected at roughly 5 minute intervals, the modelled counterpart equates to the maximum queue recorded from every time-step within each minute period.

2.21 This often results in modelled queue lengths showing higher values than the observed, as manually recorded observed queues are snapshots of one instance within the minute rather than a constant analysis of queue lengths across the whole minute period.

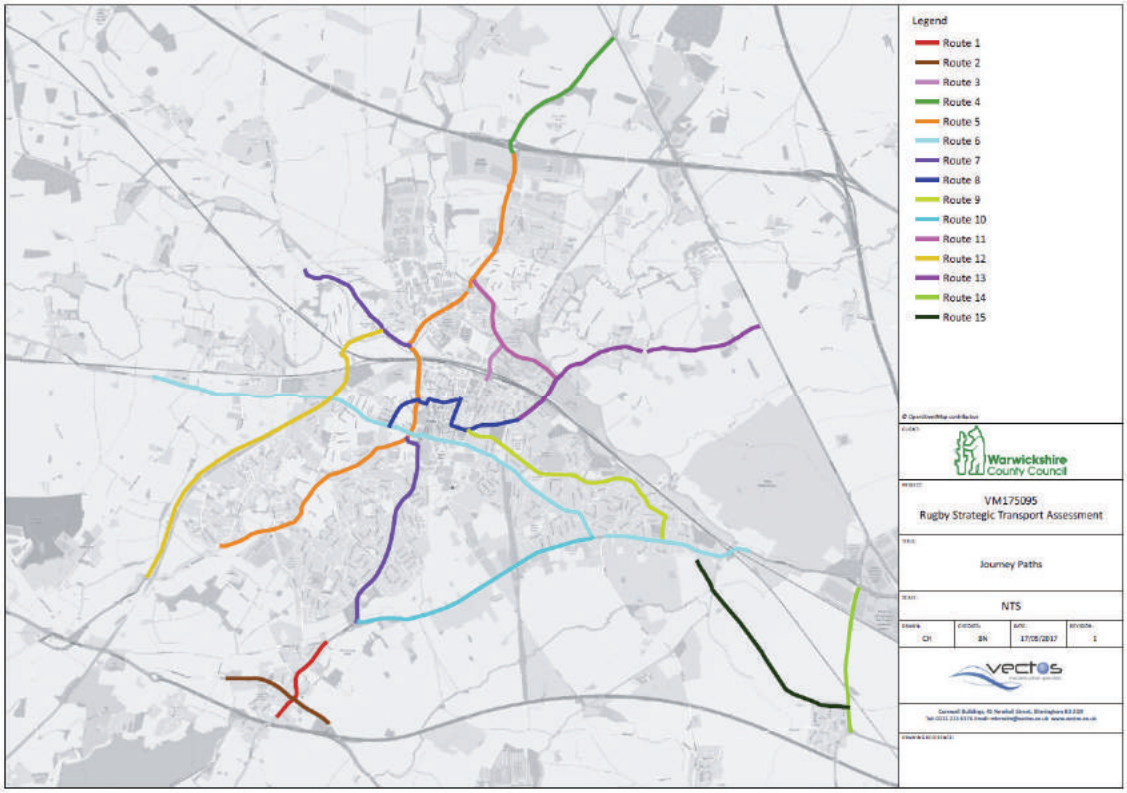
2.22 As a result queueing comparisons have been used to inform calibration, but have not been explicitly validated within this model.

Journey Time Data

2.23 In addition to the retention of link counts for the purposes of model validation, journey time data was also used in the validation process. Journey times were obtained from either observed journey time surveys or Traffic Master data.

2.24 The Traffic Master data was supplied by WCC, for the routes identified within **Figure 6**. A further breakdown of these routes by section is provided within the supporting LMVR. The coverage of the journey time validation routes was agreed in advance with WCC. For each defined section of each route, the path distance was extracted from the Traffic Master data set and was matched with a corresponding journey time paths within the updated S-Paramics model for the purpose of comparing observed and modelled journey times.

Figure 6 – Traffic Master Journey Time Routes

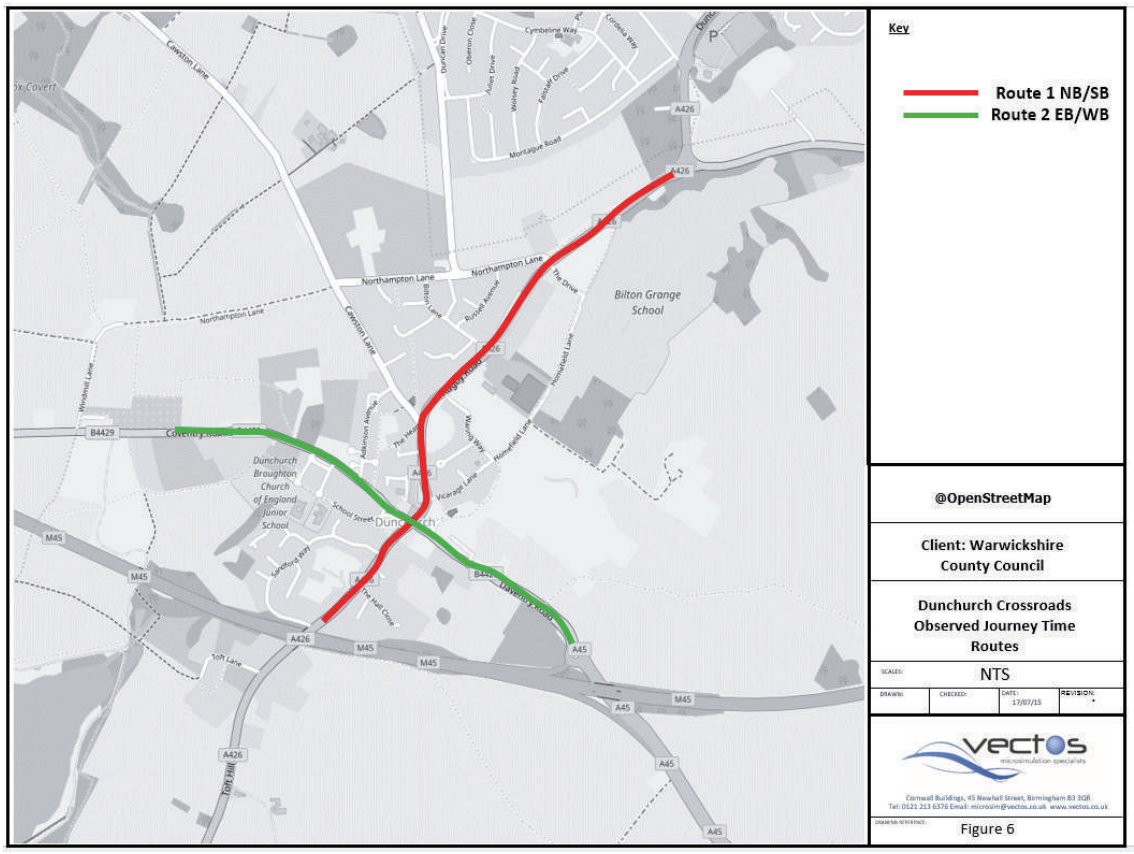


- **Route 1** –A426 Dunchurch Crossroads
- **Route 2** – B4429 Dunchurch Crossroads
- **Route 3** – Mill Road
- **Route 4** – A426 (M6 Junction 1 - A426/A5 roundabout)
- **Route 5** – A426 Leicester Road Corridor (M6 Junction 1 to Rugby Gyratory)
- **Route 6** – Coventry Road/Lawford Heath Lane to Crick Road/Moors Lane junction
- **Route 7** – A426 Dunchurch Road (A426/Ashlawn Road roundabout to Rugby Gyratory)
- **Route 8** – Oliver Street/Lawford Road junction to north of Rugby Road/Butlers Lane junction
- **Route 9** – Murray Road/Clifton Road roundabout to A428 Crick Road/Watts Lane junction
- **Route 10** – Ashlawn Road roundabout to A428/Barby Lane junction
- **Route 11** - A426/Boughton Road roundabout to Clifton Road/Butlers Leap junction
- **Route 12** – A4071/Coventry Road roundabout to A4071/B4112 roundabout

- **Route 13** – Eastlands Road roundabout to A5 Watling Street
- **Route 14** - A5/A361 roundabout to A5/A428 roundabout
- **Route 15** - A428/Kilsby Road junction to Rugby Road/A5 junction

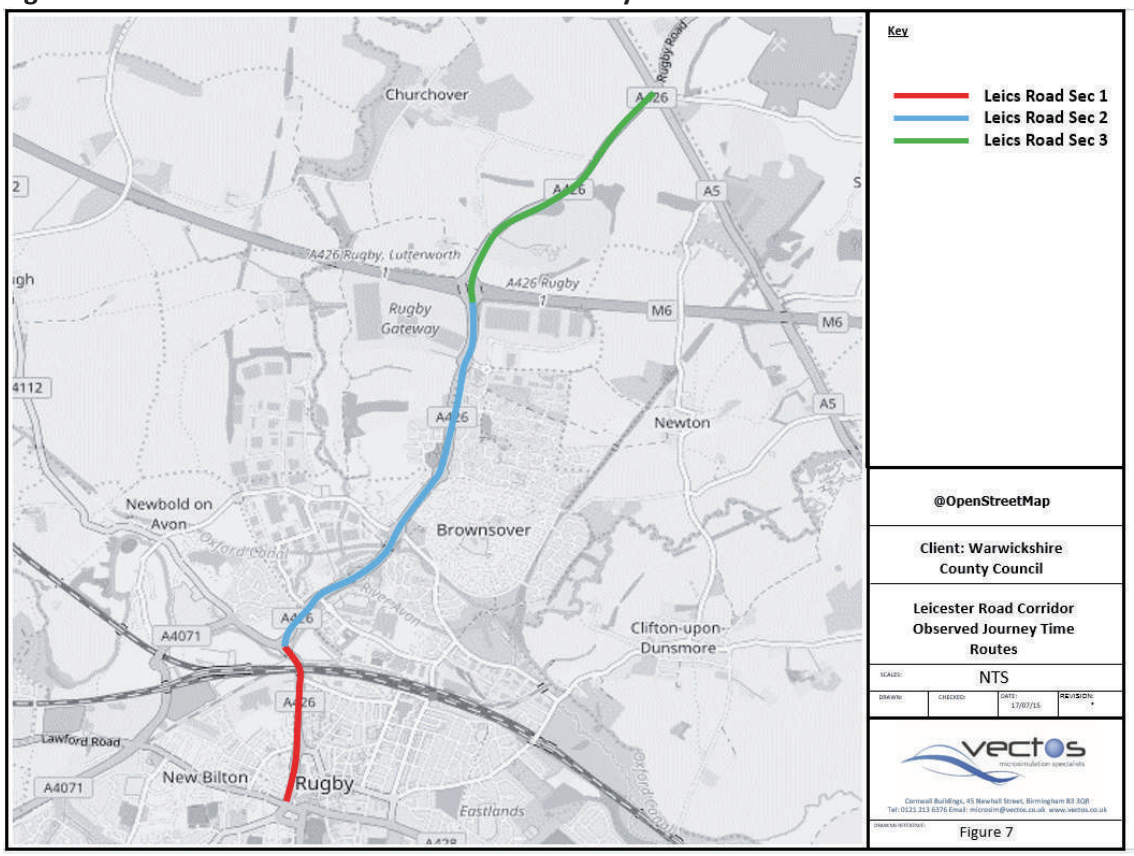
2.25 Additional to the Traffic Master data, observed journey time data was available from surveys undertaken within Rugby, at a number of the most congested areas of the network. These journey time surveys were collected at the Dunchurch Crossroads, along the Leicester Road corridor and around the Mill Road area. The coverage of the observed journey time surveys is outlined within the following figures.

Figure 7 - Dunchurch Crossroads Observed Journey Time Routes



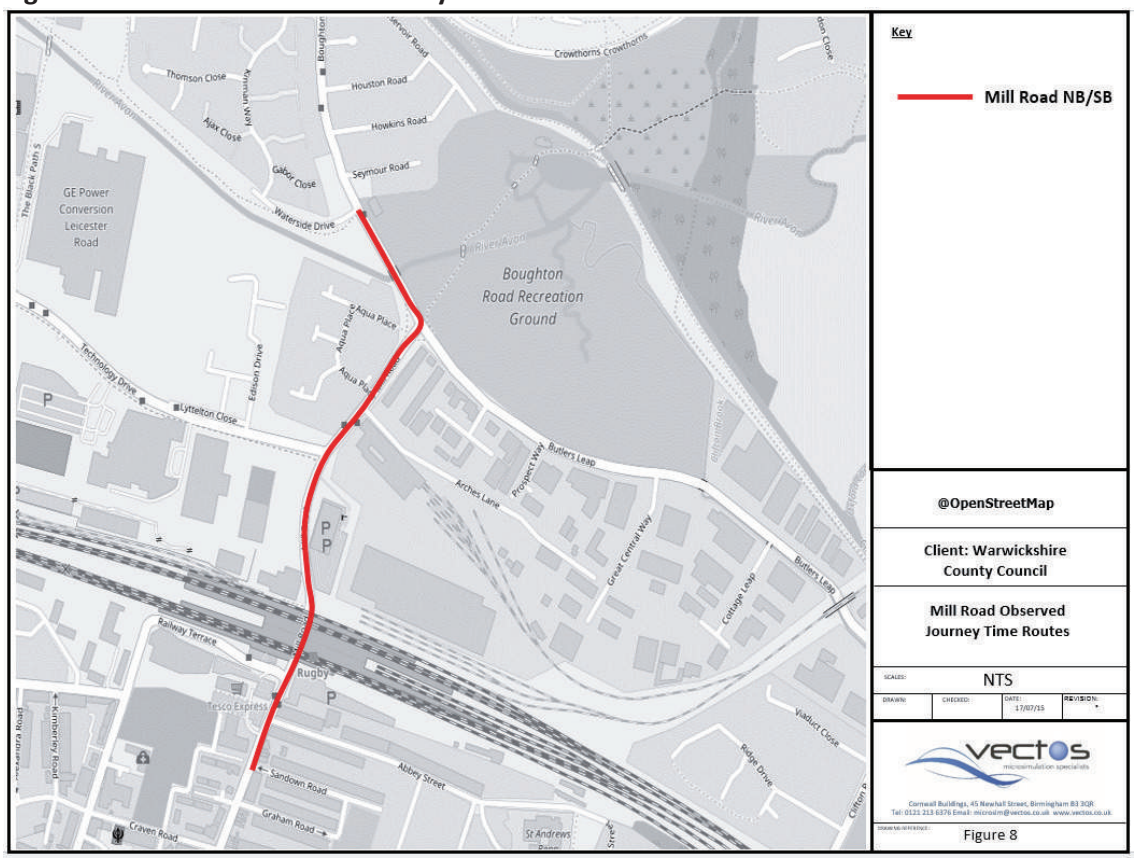
- **Dunchurch Route 1** – Ashlawn Road roundabout to A426/Sandford Way junction
- **Dunchurch Route 2** – Coventry Road/Halfway Lane junction to B4429/A45 roundabout

Figure 8 - Leicester Road Corridor Observed Journey Time Routes



- **Leicester Road Section 1** – Rugby Gyratory to Avon Mill roundabout
- **Leicester Road Section 2** – Avon Mill roundabout to M6/A426 junction
- **Leicester Road Section 3** - M6/A426 junction to Gibbet Hill roundabout

Figure 9 Mill Road Observed Journey Time Locations



- **Mill Road NB/SB** – Boughton Road/Waterside Drive junction to Murray Road/Sandown Road junction

Census and Automatic Number Plate Recognition (ANPR) Data

2.26 Origin-Destination data available from the Census 2011 release includes travel-to-work and migration patterns. This data has been used to provide an indication of the travel patterns and inform the development of a prior matrix.

2.27 An ANPR survey, capturing a cordon around the Rugby town centre (collected in April 2016), was also utilised, which aided in the development of the Origin-Destination matrices.

Time Periods

2.28 The model has been developed to be inclusive of both AM (07:00 to 10:00) and PM (16:00 to 19:00) time periods. The periods have been included using discrete hourly intervals.

Base Model Calibration

2.29 The model calibration process has been carried out, where possible, in accordance with the criteria specified within WebTAG guidance. These guidelines are summarised in the following table:

Table 1 - WebTAG Model Assessment Criteria

Criteria and Measure	Acceptability
Assigned Hourly Flows	
Individual flows within 100vph (flows<700vph)	85% of all cases
Individual flows within 15% (flows 700-2700vph)	85% of all cases
Individual flows within 400vph (flows>2700vph)	85% of all cases
GEH statistic: individual flows GEH<5	85% of all cases
Modelled Journey Times	
Times within 15% (or 1 minute, if higher)	85% of all cases

2.30 This information represents the 'target' standards by which the performance of a model is compared to actual on-street observations and it is necessary, through the model development process, to ensure the model closely meets these standards. The guidance indicates that a model need not necessarily exceed all criteria to be considered 'fit for purpose' but, in the majority of cases concerning model development, they are often seen as the target to aim for.

Model Calibration Summary

2.31 The model has been calibrated in line with current traffic modelling guidelines and GEH comparisons have been undertaken using all available observed data.

2.32 The observed flows were checked against the modelled flows on the network and the level of convergence between flows has been calculated. The initial assessment measure is the GEH statistic, which is a common comparative measure in this context. The formula of the GEH statistic is as follows:

$$GEH = \sqrt{\frac{(O-E)^2}{0.5(O+E)}}$$

Where

O = Observed flow

E = Modelled assigned flow

2.33 The GEH is a measure that includes both the absolute and the relative difference. The convergence is considered acceptable if the GEH statistic is less than 5 in 85% of data (DMRB, Volume 12).

2.34 A summary of the outcome of these comparisons is provided within the following tables.

Table 2 – Link and Turn Count Calibration Summary

Period	% GEH less than 5
07:00-08:00	93%
08:00-09:00	90%
09:00-10:00	93%
16:00-17:00	91%
17:00-18:00	88%
18:00-19:00	90%

Table 3 – Link Calibration Summary

Period	% GEH less than 5
07:00-08:00	91%
08:00-09:00	90%
09:00-10:00	93%
16:00-17:00	91%
17:00-18:00	90%
18:00-19:00	91%

Overall it is reasonable to conclude that a very high level of calibration has been achieved within the AM and PM peak hours during the model development process. The link, turn, and flow calibration demonstrates a level of adherence that exceeds the requirement outlined within WebTAG. Further detail on the model calibration results are presented in the Local Model Validation Report.

Base Model Validation

2.35 Model validation is the process of checking the calibrated model against observed traffic data independent of the model development process. The model validation has been undertaken in line with the guidance outlined in WebTAG guidance, as well as the HA Guidelines for the Use of Microsimulation Software (July, 2007).

2.36 WebTAG requires that, once a model has been successfully calibrated, an independent check of the model should be undertaken using data that has not been used to inform any of the

model calibration. In this case link counts, Traffic Master journey time data and observed journey time data was used to inform the model validation checks. In terms of journey time validation, WebTAG guidance states that modelled journey times should fall within 15% or 1 minute of observed journey times, in 85% or more of cases.

Model Validation Summary

2.37 Validation checks have been undertaken for both the AM and PM periods, using an extensive source of data. This data has been utilised to inform the following checks:

- Independent link flow validation;
- Journey time validation using observed journey time data;
- Journey time validation undertaken using Traffic Master Data.

2.38 Independent validation checks have been undertaken using link counts, and a summary of the validation levels is provided below:

Table 4 – Model Validation

Period	Link Validation	Observed Journey Time Validation	Traffic Master Data Validation
07:00-08:00	90%	100%	n/a
08:00-09:00	93%	92%	93%
09:00-10:00	100%	100%	n/a
16:00-17:00	85%	92%	n/a
17:00-18:00	90%	100%	95%
18:00-19:00	88%	100%	n/a

2.39 Journey times have been validated to WebTAG criteria within the AM and PM periods. Given the extensive coverage of journey time data available for model validation, and the model performance against observed and Traffic Master Data, the overall level of journey time validation achieved exceeds the DMRB standards.

Table 5 Journey Time Validation

	0800-0900	1700-1800
Count	40	40
Pass	93%	95%
Fail	7%	5%

2.40 Based on the outcome of both the link and journey time comparisons it is reasonable to conclude that the model demonstrates level of validation that far exceeds WebTAG standards.

RWA Forecast Model Development

2.41 Following the development of the updated 2016 RWA Base Model it was necessary to develop three Forecast models, which contained all known committed developments and infrastructure. Accordingly 2021, 2026 and 2031 Reference Case models have been developed. These models would enable traffic impacts as a result of the inclusion of sites which are considered committed to be identified, and in due course, would enable impacts identified as a result of the inclusion of Local Plan sites to be attributed specifically to the Local Plan sites.

2.42 The development of Reference Case models provides a robust basis for which the Local Plan impacts can be assessed against.

2.43 The following sections provide details on the committed development and growth assumptions within the model, along with the infrastructure required. Additional detail on the Forecasting Methodology can be found in the RWA Forecasting Report[4].

Committed Development Sites

2.44 In order that the model can be deemed as suitable for use as a tool for assessing development implications within the area, it was considered necessary that all relevant committed development trips should be included within the model. All developments that have been approved up to and including 2016, irrespective of development magnitude, have been included.

2.45 RBC recently provided a list of residential developments for which planning permission had been granted within the Rugby Wide Area model extent. Rugby Borough Council's "Local Plan Publication Draft Employment Land Background Paper" 2016 has been used to inform the committed employment sites.

2.46 In the majority of instances, a Transport Assessment, or Transport Statement was available for each of the developments. As such the Reference Case models include the site layout, access, trip generation and network interventions specifically associated with these developments as set out in the accompanying transport documents.

[4] VM165068.R003_RWA Forecasting Report

2.47 Where such documents have not been available, WCC standard residential trip rates have been applied for Residential sites, and the trip rates used in previous Strategic Transport Assessment work within Rugby has been applied for Employment sites.

2.48 In the case of the DIRFT III, employment trips have been provided by WCC, broken down by 'warehousing' and 'terminal trips', and between Car/LGV and HGV trips.

2.49 **Tables 6-8** detail the developments that have been accounted for within the Reference models, whilst **Appendix A** summarises the trip rates applied.

Table 6 Committed Residential Developments within Model

Development	2021 Ref (dwellings)	2026 Ref (dwellings)	2031 Ref (dwellings)
Eden Park	240	500	907
Cawston Extension	281	431	431
Cawston Lane	250	250	250
Coton Park East Phase B1 & B2	145	145	145
Back Lane South, Long Lawford	112	112	112
Ridgeway Farm, Ashlawn Road	96	96	96
Dipbar fields, Dunchurch	86	86	86
Coton House	65	65	65
Land at Leicester Road	230	230	230
Gateway Phase R4	132	132	132
Williams Field - Cawston Extension	113	113	113
Former Warwickshire College Site	112	112	112
Former Ballast Pits	76	76	76
Webb Ellis Business Park	67	67	67
Land at Homefields, Dunchurch	50	50	50
Rugby Radio Mast	761	1961	3161
Newton Lane	40	40	40
Newbold Farm	13	13	13

Table 7 Committed Employment Developments within Model

Development	GFA (m^2) 2021 Ref	GFA (m^2) 2026 Ref	GFA (m^2) 2031 Ref
Rugby Gateway	66,000m^2	66,000m^2	66,000m^2
Central Park	30,000m^2	30,000m^2	30,000m^2
Paynes Lane	10,000m^2	10,000m^2	10,000m^2
Europark	2,000m^2	2,000m^2	2,000m^2
HTA Precision	10,000m^2	10,000m^2	10,000m^2
Rugby Radio Mast	60,000m^2	60,000m^2	60,000m^2
DIRFT Phase III	120,000m^2	300,000m^2	713,478m^2
Somers Road	3,000m^2	3000m^2	3000m^2

*completed development at Gateway and Central Park sites included in Base Model

Table 8 Committed Retail Developments within Model

Development	GFA (m^2) 2021 Ref	GFA (m^2) 2026 Ref	GFA (m^2) 2031 Ref
Elliott's Field Phase II	11,963m^2	11,963m^2	11,963m^2

2.50 Further to the above developments explicitly modelled, an allowance has been made for the committed development at Magna Park in Leicestershire, which relates to the Land at Mere Lane site, approved in October 2016. Although this site is outside of the model extent, it is anticipated that some trips would route through the study area. The TA for this site has been reviewed, and the trips predicted to enter the model at the northern extent at the Gibbet Hill roundabout extracted and input into the model.

Model Forecasting

2.51 In order that the model can be deemed as suitable for use as a tool for assessing development implications within the area it was considered necessary that additional to including the relevant committed development trips, the demands within the model should be reflective of 2021, 2026 & 2031 predicted traffic levels.

2.52 As with the development of the Baseline traffic models, guidance on the development of forecast models is also provided within WebTAG. WebTAG guidance indicates that, when developing a Reference forecast the impact of both national and local changes should be accounted for. Critically, TAG guidance states that:

"Overall demand in the forecast should be constrained to the Department's projections… In order to maintain consistency with national projections, the core scenario should be based on trip end growth factors from the NTEM Dataset… In most cases, some adjustments to the NTEM dataset will be required at the local level" (TAG M4, para 7.3.2 to 7.3.4)

2.53 In the absence of available variable demand modelling, any forecasting method proposed must take cognisance of this fact when setting the overall growth levels within the model network.

2.54 Therefore at every stage of the model forecasting reference has been made to the TEMPRO assumptions which have, were necessary, been updated to account for the newly proposed and/or committed development levels as appropriate.

2.55 The 2021, 2026 and 2031 demands were forecast via the inclusion of the committed development demands only, before being compared against TEMPRO growth figures to ensure that the forecast level of growth in TEMPRO was matched or exceeded in this assessment.

2.56 A review of the TEMPRO factors for the forecast assessment years has been undertaken, to enable a comparison between forecast growth, and the growth delivered through the inclusion of committed development trips to be established. The TEMPRO factors applied to inform the forecasting were the 'Rugby' factors using TEMPRO Version 7. The assumptions within TEMPRO were updated for future housing and jobs, based upon the number of dwellings included at the committed development sites, and the number of jobs related to the committed development employment sites, as informed via the Rugby Borough Council's "Local Plan Publication Draft Employment Land Background Paper", and the DIRFT Phase III TA. Accordingly the revised TEMPRO factors to apply are outlined below:

Table 9 NTEM Adjusted TEMPRO Growth Factors

Area	AM Period			PM Period		
	Origin	Destination	Average	Origin	Destination	Average
Rugby – 2016-2021	1.0549	1.0976	1.076	1.0890	1.0621	1.076
Rugby – 2016-2026	1.0866	1.1389	1.112	1.1285	1.0956	1.112
Rugby – 2016-2031	1.1046	1.2039	1.154	1.1836	1.1209	1.152

- 2016 – 2021 AM Growth – 7.6%
- 2016 – 2021 PM Growth – 7.6%
- 2016 – 2026 AM Growth – 11.2%
- 2016 – 2026 PM Growth – 11.2%
- 2016 – 2031 AM Growth – 15.4%
- 2016 – 2031 PM Growth – 15.2%

Demand Summary

2.57 The resultant hourly demands assigned in each scenario are summarised within Table 10.

Table 10 Reference Case Demands Summary

	07-08	08-09	09-10	16-17	17-18	18-19
2021 Reference	38347	41366	31198	43611	43278	30622
2026 Reference	40207	42547	32545	45395	44866	31844
2031 Reference	42200	43760	34024	47319	46548	33218

Network Mitigation

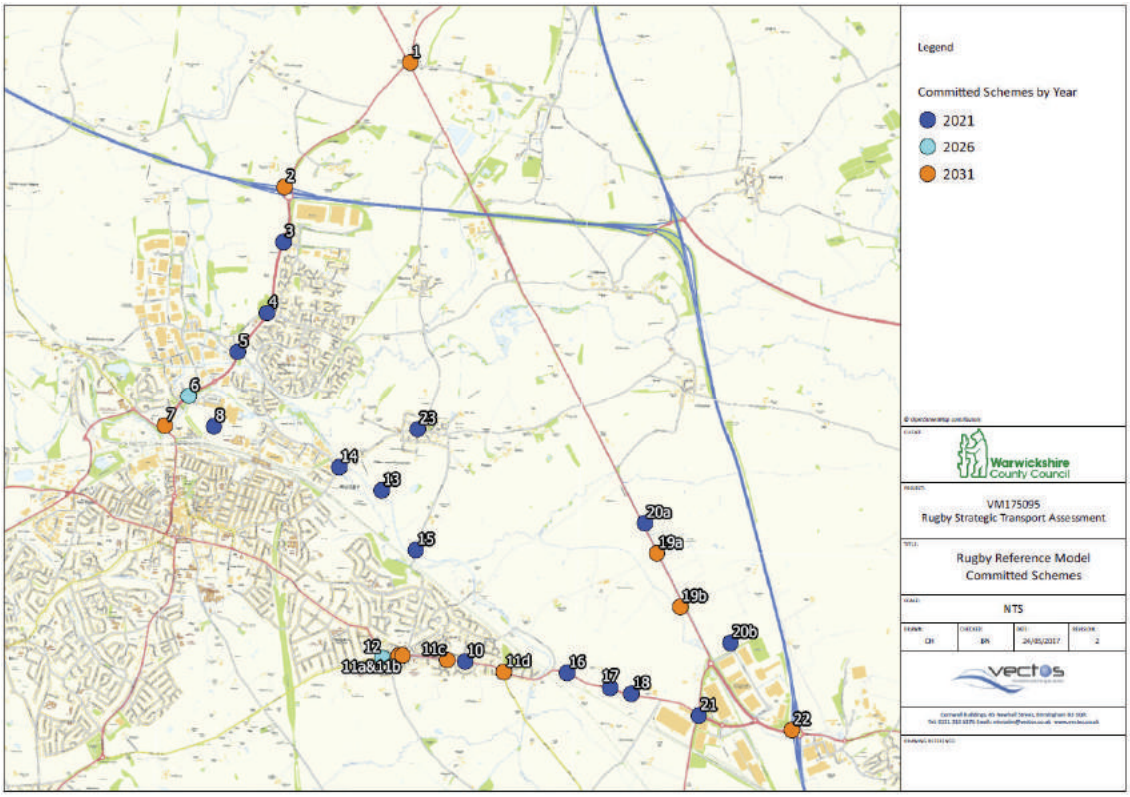
2.58 Alongside the inclusion of the committed development sites within the model, it was also necessary to include the committed infrastructure schemes within the study area, in each of the years of assessment. The network mitigation schemes included have been detailed by WCC, and are set out below, along with the scenario in which the scheme has been included.

Table 11 Committed Infrastructure Schemes

Scheme	2021 Model	2026 Model	2031 Model
1 - A5/A426 Gibbet Hill Roundabout – widening and signalisation	N	Y	Y
2 - M6 Junction 1 – Traffic control improvements	N	N	Y
3 - A426 Leicester Road/Central Park Drive (Gateway Access)	Y	Y	Y
4 - A426 Leicester Road/Newton Manor Lane (Gateway Access)	Y	Y	Y
5 - A426 Leicester Road/Boughton Road Roundabout Signalisation	N	N	Y
6 - A426 Leicester Road/Technology Drive Traffic Signals	Y	Y	Y
7 - Avon Mill/Newbold Road/Hunters Lane Widening and new junction	N	Y	Y
8 - D3060 Hunters Lane Extension	Y	Y	Y
9 - Boughton Road/Crow Thorns Signalisation	N	Y	Y
10 - A428/Watts Lane Signalisation	Y	Y	Y
11 - A428 Corridor, Hillmorton, Ghost Island Right Turns	N	Y	Y
12 - Ashlawn Road/Hillmorton Road Signalisation	N	Y	Y
13 - Rugby Radio Station Link Road	Y	Y	Y
14 - Clifton Road/Butlers Leap/Radio Station Link Road Signals	Y	Y	Y
15 - Hillmorton Lane/The Kent/Rugby Radio Station Link Road Signals	Y	Y	Y
16 - A428 Crick Road Western Traffic Signalised Junction	Y	Y	Y
17 - A428 Crick Road Central Priority Junction	Y	Y	Y
18 - A428 Crick Road Eastern Roundabout Junction	Y	Y	Y
19a - A5 (Northern) Roundabout Access to Rugby Radio Station site	N	N	Y
19b - A5 (Southern) Roundabout Access to Rugby Radio Station site	N	N	Y
20a - A5 Northern Access to DIRFT III	Y	Y	Y
20b - A5 Southern Access to DIRFT III	Y	Y	Y
21 - A5/A428 Halfway House Roundabout Widening	Y	Y	Y
22 - M1 Junction 18 Partial Signalisation	N	N	Y
23 - Clifton Upon Dunsmore Traffic Calming	Y	Y	Y

2.59 **Figure 10** below outlines the location of each of the mitigation schemes listed in **Table 11** within the study area.

Figure 10 Committed Infrastructure Location



Areas of Constraint

2.60 Throughout the assessment work there have been a number of areas which have been continuously highlighted as likely to constrain the delivery of development within the Rugby area. Most of these areas are ones which already suffer from issues around traffic congestion and are likely to experience further issues due to the growth in traffic volumes predicted to occur as a result development sites already identified and approved.

2.61 Further details on the current conditions in these areas has been provided within the following section of this report. However, it should be recognised that this is simply intended to highlight some key areas of concern and by no means represents a comprehensive list of the issues which will need to be considered in ensuring that the development strategy identified in the Local Plan can come forward with minimal additional impact.

2.62 The areas of constraint include:

- A428/A426 'Rugby Gyratory'

- A426/B4429 ‘Dunchurch Crossroads’
- A426 North (between Newbold Road and M6 Junction 1)

A428/A426 ‘Rugby Gyratory’

2.63 The Gyratory within Rugby Town Centre is a junction which is critical to the overall network operation and is the point of convergence for 5 key routes into Rugby town centre. The Gyratory was recently upgraded in response to queuing conditions observed in the area and also in preparation for forthcoming developments including the Rugby Radio Mast (RRM) Sustainable Urban Extension.

2.64 It is considered that the scheme proposals that have been delivered are likely to represent the maximum capacity option for that area whilst ensuring non-motorised users are well provided for. As such, the likelihood of additional highway capacity enhancements being identified in this area is considered very low. The area also suffers from an issue with air quality that means that it is considered favourable to promote options which limit the amount of additional traffic which needs to utilise the Gyratory.

A426/B4429 ‘Dunchurch Crossroads’

2.65 The Dunchurch Crossroads connects the A426 with the M45/A45 via the B4429 Daventry Road. The area is one which already suffers from heavy queuing and experiences issues with air quality. At the time of writing this Report, VM understand that interim proposals may have been identified which could provide some additional capacity at the junction but that, after these proposals have been delivered, options for enhancing the capacity of the junction via direct intervention are likely to have been exhausted.

2.66 The situation at the crossroads is very similar to that which is observed at the Rugby Gyratory insofar as there are not likely to be any further, significant, measures identified for the junction which will improve the conditions both in terms of congestion and air quality. As with the Gyratory, it is therefore considered favourable to promote options which limit the amount of additional traffic which is likely to travel through the crossroads as the Local Plan is brought forward.

A426 North

2.67 The A426 between Rugby town centre and the M6 is considered to be a route of key local importance which also serves a strategic function. There are a number of schemes that are

to be delivered by developments coming forward within Rugby that will, to some extent, support growth on this corridor.

2.68 Whilst there is likely to be some capacity for additional improvements in this area, particularly to the north of the corridor, it is still an area of concern as the scope for improvements is limited. The significant role the route plays in linking the town and the M6 means that traffic volumes are likely to increase irrespective of the development approach adopted via the Local Plan.

2.69 It is considered likely that, at some point, traffic growth along the corridor will reach a point beyond which the capacity in the area will be exceeded. This means traffic impacts in this area throughout the assessment of options is considered to be a material concern.

Local Plan Transport Strategy

2.70 The evidence presented within subsequent sections of this Report reveals some areas where network benefits will be limited as a result of the developments and associated highway infrastructure coming forward through the Local Plan, whereas other areas will benefit substantially. In all cases the work completed thus far is intended to identify a set of proposals which will serve to minimise the impact predicted to occur as a result of delivering the development sites identified through this Local Plan review.

2.71 It is considered difficult to justify funding and delivery of measures which improve the network on the basis of alleviating existing congestion issues since these are not generated by the additional traffic volumes associated with the new developments. Therefore there must be an intrinsic link between the development proposals and schemes identified to ensure an appropriate case for funding can be made.

2.72 However, it is recommended that, subsequent to this work, more detailed analysis is completed which looks at options for improving the transport infrastructure network beyond simply seeking to mitigate the impacts associated with the Local Plan.

2.73 It is envisaged that work of this nature would continue throughout the Local Plan determination process and beyond. It would also be used to support funding bids and to inform the production of business cases to enable funds to be secured to aid the scheme delivery.

Background Summary

2.74 This section of the report has highlighted the development of the 2016 RWA Base Model, along with the 2021, 2026 and 2031 Reference Case models.

2.75 As summarised in this chapter, the Rugby STA report produced in September 2016 was undertaken using the then existing 2010 Rugby Wide Area (RWA) S-Paramics model. Although the 2010 RWA model was been calibrated to the necessary standards it was outlined in the previous STA that the assessment would benefit from being re-visited once the 2016 Base Model was available, to ensure that the traffic conditions identified within the model reflect those which are occurring on-street.

2.76 It is also necessary to revisit the testing in the updated model to ensure that the effects of infrastructure which has been delivered since the last update is accurately accounted for within the model. The previous STA concluded that, once available, the 2016 RWA model would supersede the existing RWA model and all subsequent testing would need to be completed within that model.

2.77 Accordingly this section details the development of the updated models to be used in this round of STA testing.

3 ASSESSMENT

Methodology

3.1 The assessment has been completed using the 2016 RWA S-Paramics micro-simulation model. Paramics is a micro-simulation traffic model that simulates the behaviour of each individual vehicle and presents its output as a real time visual display for traffic management and road network design.

3.2 Paramics allows a detailed representation of the highway network in the form of modelling a high level of detail, such as individual lanes, traffic signals, junctions, pedestrian crossings and bus stops as well as the events which occur on it. Each individual vehicle is separately represented and therefore the program can take an account of each individual driver's behaviour.

3.3 The output is a visual display which shows the changing position of individual vehicles and queues on the highway network in real time. The advantage of a visual display enables non-technical stakeholders to view the results of highway and development proposals in terms of traffic flows and congestion.

3.4 There are a number of advantages of using Paramics to inform the assessment as it allows a visual interrogation of the network to be completed alongside the empirical analysis. This, in turn, enables the identification of potential schemes to be completed within the same assessment and, unlike other approaches, does not require supplementary analysis to be completed using isolated junction modelling tools to support the overall analysis.

3.5 The RWA S-Paramics model also operates under conditions of dynamic assignment which means that the reassignment of vehicles in response to congestion as a result of traffic growth or, alternatively, in response to the alleviation of congestion through schemes, can be considered within the assessment work.

3.6 In line with the standard approach to the development of traffic models, the RWA model has been developed for the AM and PM peak periods of 07:00 to 10:00 and 16:00 to 19:00 respectively. WebTAG guidance states that traffic models should be developed for the period when traffic flows are 'markedly' highest within the fully modelled area which, in most towns and cities, is encompassed within the hours identified.

3.7 Whilst it is acknowledged that there are additional impacts which occur during hours outside of the core modelled periods these traffic peaks are often localised and do not represent a step change in the overall traffic volumes when considered in the context of the entire study area which, in this case, includes the whole of Rugby town as well as the M1 and M6.

3.8 Issues pertaining to localised impacts such as school pick up trips during the PM hour of 15:00 to 16:00 or factory shift change impacts can be assessed through micro simulation modelling but it is recommended that bespoke models are developed which encompass only the affected areas within the analysis since it would be very costly and resource intensive to develop a large scale microsimulation model of the study area for hours outside of those which have been modelled thus far.

Stages of Assessment

3.9 The objectives set out in paragraph 1.3 have been addressed through four key stages which are described below:

Stage 1 – 2031 Local Plan Assessment

3.10 The first stage of the assessment considered the implications of allocating all residential sites identified through the RBC Housing Trajectory, and all employment sites as advised by the RBC Local Plan Employment Land Background Paper. The primary objective of this stage of the assessment was to determine an appropriate highway mitigation strategy necessary to facilitate the Local Plan as well as identifying the residual impacts likely to occur as a result of the allocation strategy.

Stage 2 – 2021 Local Plan Phasing Assessment

3.11 The second stage assessed the implications of allocating the identified Local Plan housing and employment sites to be delivered up to 2021 (i.e. over 5 years). This amounted to the inclusion of an additional 1,578 houses on top of the 2021 Reference Case. Using the resulting 2021 Local Plan model, the highway infrastructure mitigation schemes to be delivered by 2021 have been identified, in order to develop an initial phasing strategy up to 2021.

Stage 3 – Phasing Assessment 2026 Local Plan Scenario

3.12 The third stage of the assessment replicated the Stage 2 assessment only with consideration being given to the first 10 years of development being delivered in order that a second phase

of infrastructure could be identified. The purpose of both Stage 2 and Stage 3 is to identify an initial phasing strategy which enables the infrastructure to be graded (with infrastructure that is identified within Stages 2 and 3 being considered more critical than the measures identified within Stage 1). The 10 year development profile predicted delivery of an additional 5,463 houses and 2,750 jobs on top of the 2026 Reference Case.

Stage 4 – South West Link Road Assessment

3.13 The fourth phase of the assessment focussed on the South West Link Road and was intended to establish which elements of the South West Link Road were considered essential and which, if any, elements were considered desirable. The purpose of this stage of the assessment is to establish the minimum infrastructure requirements for the South West Link Road.

Stage 5 – South West Link Road Sensitivity Testing

3.14 The final phase of the assessment again focussed on the South West Link Road and was intended to establish the impact of a range of key design elements of the South West Link road.

2031 Local Plan Model Development

3.15 The Local Plan model was developed using a forecasting methodology consistent with the following assumptions outlined in the development of the 2021, 2026 and 2031 Reference models:

- NTEM Adjusted Growth Forecasting
- Capping of background demands at forecast growth levels
- Peak Spreading

3.16 In terms of including specific local plan sites, the sites for inclusion were outlined by RBC (based upon the RBC Housing Trajectory), and a discrete set of demands was derived for each of the development sites.

3.17 Some of the Local Plan sites to be included within the model also consist of employment land being delivered within or adjacent to some of the residential sites. Where it was considered necessary to include employment land within the assessment, this was done using trip rates,

based on land use, provided by WCC. These are summarised for B1, B2 and B8 employment land use type in **Appendix A.**

3.18 The Local Plan sites included within the model are summarised in **Figures 11 and 12**, whilst **Table 12 and Table 13, and Appendix A** outline the sites included along with the source of the trip generation information applied:

Table 12 Local Plan Residential Sites

Development	Dwellings	Trip Rates Applied
Coton Park East Expansion	800	Site Specific
Coton House Expansion	100	Site Specific
Bilton Fields, Ashlawn Road (MP)	860	Site Specific
Homestead Farm (WCC)	350	Updated STA Trip Rates
Land South Of Dunkleys Farm (WCC)	580	Updated STA Trip Rates
Land south of Montague Rd (TW)	40	Updated STA Trip Rates
Land south of Montague Rd (RE & Sworders)	260	Updated STA Trip Rates
Land W Cawston Lane (G)	70	Updated STA Trip Rates
Land South of Alwyn Road (TW)	770	Updated STA Trip Rates
Land North of Dunkleys Farm (WCC)	235	Updated STA Trip Rates
Deeley Land (dbs)	575	Updated STA Trip Rates
Land West of Cawston Lane (WCC)	155	Updated STA Trip Rates
Cawston Spinney (dbs)	570	Updated STA Trip Rates
Coventry Road (G)	175	Updated STA Trip Rates
Lodge Farm, A45	1500	Site Specific
Land North of Coventry Road Long Lawford	100	Site Specific
RRM Expansion	3039	Site Specific
Total	**10,179**	-

3.19 Following discussions with WCC it was determined that the trip rates applied to the Lodge Farm site would be a suitable proxy for the trip rates for all residential sites in the South-West Rugby area. These trip rates were referred to as Updated STA Trip Rates.

3.20 The trip rates for Lodge Farm are based on local trip rates from the Cawston area and these are higher than the STA trip rates adopted for residential sites elsewhere within the model, and as such, by applying the Lodge Farm trip rates to the South West Rugby residential sites, an additional level of robustness was achieved within the work.

3.21 For a number of the development sites additional site specific work has already been undertaken. In such instances the site specific trip rates applied to the development site in question were adopted for this assessment.

Figure 11 Local Plan Residential Sites

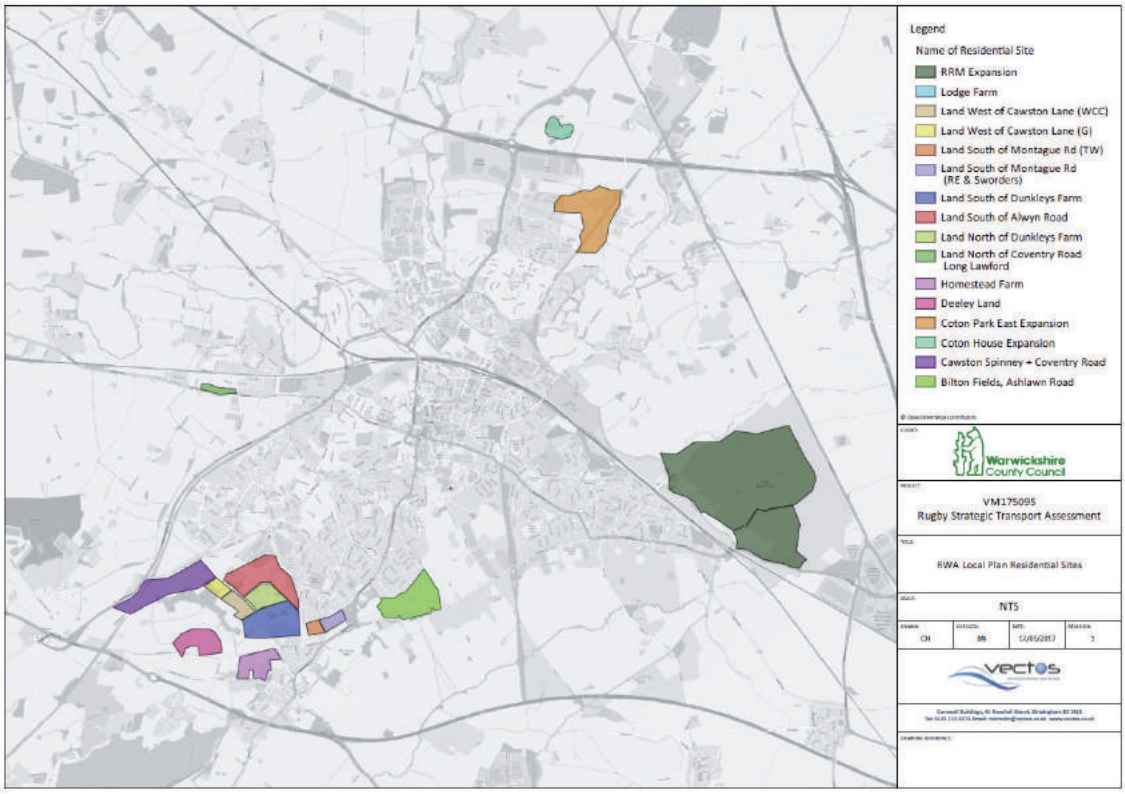


Table 13 Local Plan Employment Sites

Development	Floor Area (Jobs)	Trip Rates Applied
Coton Park East Employment (B1/B2/B8)	20000m^2 (500 jobs)	STA Employment
Cawston Spinney (B8)	180000m^2 (2250 jobs)	STA Employment
Total	**200,000m^2 (2750 jobs)**	-

Figure 12 Local Plan Employment Sites

3.22 The trip generated by each site, derived as a result of the aforementioned trip rate calculations have, in the majority of cases been distributed using 2011 Census Journey to Work data, which has been specifically tailored for the MSOA that the site lies within.

3.23 The one exception to this is the Lodge Farm site, which lies within an MSOA boundary for which the current journey to work data is based on a large MSO covering multiple dispersed residential areas. It was considered that a distribution derived from this MSOA would not represent the likely travel patterns of a sizeable residential site in this area, due to the rural nature of the MSOA. In this instance, through liaison with the site promoters, WCC were able to provide VM with a site specific gravity model distribution pattern to be applied to the site for the testing.

3.24 Once the demands had been assigned to the model, a modal shift allowance was made for all Local Plan sites of 10% whilst sites which contained an element of Residential and Employment were subject to a further 10% reduction to allow for internalisation. At this stage the mode shift factor has been applied on the basis that site promoters will be tasked with achieving this target through the delivery process, and, on that basis, was considered an appropriate assumption for this stage of testing. These adjustments have been applied only to the new sites being promoted through the Local Plan.

3.25 No assumptions have been applied to account for the potential shift in background traffic in response to the delivery of enhancements to existing and provision of new sustainable transport services and, as a result, when assessed in the context of the overall demands assigned within the model, these adjustments affect less than 1% of the assigned demand totals within the model.

Demand Forecasting

3.26 The sites identified through the Local Plan Housing Trajectory (which lie within the study area), could potentially deliver up to 10,179 dwellings. Rural sites that lie outside of the model extent have not been explicitly included within this assessment, however, have been accounted for via the application of NTEM adjusted external growth. The purpose of adjusting the external growth by NTEM is that, in line with the guidance set out within WebTAG, it compensates for the element of national uncertainty, around growth forecasts, that are influencing factors which occur outside of the modelled area. Those trips influenced by these uncertain factors are simply travelling through the model and so, since the uncertainty surrounding these elements is higher, so too are the forecasts to ensure that the testing is robust.

3.27 The 10,179 dwellings are considered to be a robust, and worst case assessment, on the basis that it is unlikely that the full build out of the large residential sites that have been accounted for within the modelling, (e.g. Rugby Radio Mast) will be delivered by this time. Additionally the delivery of the employment land in the Local Plan scenario amounts to 2,750 jobs being created for inclusion within the model.

3.28 The growth levels identified for assignment within the model, following adjustments to the TEMPRO database to account for the additional housing and jobs delivered, have been summarised within the following **Table 14**:

Table 14 Adjusted TEMPRO Assumptions

Housing Assumptions	2031 Reference Case		2031 Local Plan	
	AM	PM	AM	PM
Committed Housing Numbers	6086		6086	
Local Plan Housing Numbers	-		10179	
Total	6086		16265	
Committed Jobs Created (inc DIRFT III)	7377		7377	
Local Plan Jobs Created	-		2750	
Total	7377		10127	
TEMPRO	**AM**	**PM**	**AM**	**PM**
Growth Factor	1.16	1.16	1.30	1.28
Diff (%)	-	-	14%	12%

3.29 **Table 14** reveals that the houses and jobs identified for inclusion within the Local Plan model are predicted to result in an additional increase in traffic volumes, when compared to the Reference Case, of between 12% and 14%. Meaning that, overall, growth within the newly updated Local Plan scenarios is predicted to be close to a 30% increase from 2016 levels. This is considered to be a significant increase in traffic volumes, particularly when considering the extent of the study area.

Peak Spreading

3.30 As outlined in the Reference Case model development, peak spreading was also applied to the Local Plan model demands.

3.31 Peak spreading assumptions had already been applied to the 2031 Reference demands. On that basis the additional peak spreading assumptions were only applied to the growth that could be considered as occurring in addition to the growth already contained within the original 2031 Reference Case.

3.32 The peak spreading proportions were initially consistent with those applied in the 2031 Reference Case development. However, after the application of these proportions it was apparent that there was a shift in demand within the AM model period. The shift occurred to such an extent that the 07:00 to 08:00 demand levels exceeded those within the 08:00 to 09:00. Whilst there is potential for this situation to occur, the principle of peak spreading is such that vehicles are redistributed away from the most congested peak hour in response to congestion. If the traffic volumes within the pre-peak exceed those within the peak then there is a potential for the peak spreading to invalidate this assumption. This would not be considered valid as trips will not shift into the most congested model period.

3.33 As a result the AM peak spreading proportions were readjusted to ensure that demand in the 07:00 to 08:00 hour did not substantially exceed the level of demand within the 08:00 to 09:00 peak hour.

3.34 In order that this principle could be achieved 30% of the 07:00 to 08:00 increase was redistributed, proportionally, back across the 08:00 to 09:00 and 09:00 to 10:00 hours. By undertaking this redistribution the profile of the demands across the AM period remaining consistent with the Reference Case, with a peak in demands in the 0800-0900 hour.

3.35 The resultant peak spreading proportions assigned to the AM period are summarised within the following table:

Table 15 Revised AM Peak Spreading Proportions

0700-0800	0800-0900	0900-1000
34.07%	24.32%	41.61%

Demand Summary

3.36 The resultant hourly demands assigned in the Local Plan scenario are summarised within the following table, alongside the demands assigned in the 2021, 2026 and 2031 Reference Case scenarios.

Table 16 Scenario Vehicle Demand Levels

	07-08	08-09	09-10	16-17	17-18	18-19
2021 Reference	38347	41366	31198	43611	43278	30622
2026 Reference	40207	42547	32545	45395	44866	31844
2031 Reference	42200	43760	34024	47319	46548	33218
2031 Local Plan	**46940**	**49862**	**38910**	**53926**	**52164**	**37682**

4 RESULTS ANALYSIS

Overview

4.1 The assessment work comprised a number of discrete stages and, at each stage, the results analysis that was completed was tailored to ensure that it was proportionate and provided the level of detail necessary with regards the decisions which were to be informed via the modelling.

4.2 In response to the differing needs for each stage of the assessment, a tiered approach to the results analysis was adopted whereby Stages 1, 2 and 3 focussed largely on strategic level impacts whilst Stage 4 and Stage 5 included a more refined set of outputs which reflected the greater level of detail required of the modelling assessment at this stage. An overview of the results that have been extracted and reported is described within the following section:

Number of Runs

4.3 All analysis has been based, consistently, on a minimum of 10 and a maximum of 20 runs per scenario. In all cases 20 runs per period were undertaken and any 'failed' runs discounted.

Network Wide Statistics

4.4 A number of statistics used in the analysis have been obtained from assessing each individual trip that has occurred within the network. This information is collected within Paramics via the 'Trips-all' file and contains information specific to each individual trip completed within the model period. This information is aggregated and processed to provide the following comparative statistics:

- **Average Time (seconds)** – The average travel time of a completed trip during the model simulation period.
- **Average Speed (Km/h)** – The average speed travelled by all vehicles that completed a journey during the model simulation period.
- **Completed Trips (vehicles)** – The number of completed trips recorded during the model simulation.

4.5 The first two measurements are averages so can be used to compare between the various scenarios. The final measurement is an absolute and is dependent on congestion on the network (as this will prevent trips from completing) and the demand within the model (i.e.

the number of trips actually trying to complete). As demand differs between scenarios, as well as small variations between runs of the same scenario, we cannot expect the number of completed trips to be the same. However, as the demands do not differ significantly it can still provide an indication of the relative congestion on each network.

Model Stability

4.6 Due to the deterministic nature of assignment within Paramics, it is possible for vehicles to continue to attempt to enter a network even when congestion has reached such an extent that the network is effectively 'grid-locked'. In some cases the grid-lock can occur due to problems that will require mitigation, in other cases it can be something as simple as vehicles entering a mini-roundabout from all three approaches at exactly the same time.

4.7 When a model becomes grid-locked, vehicles still continue to be assigned to the network and so delay begins to increase exponentially. It should be acknowledged that these issues may be occurring due to a need for mitigation in one or more areas of the model but, if the models do not lock up every time it can be concluded that the problem is not severe enough to cause the network to cease to function. Furthermore, the fact that some model runs are completed without issue indicates that a mitigation strategy can only provide additional improvements and should be deliverable. If it is model error causing the issues then these results should also be discounted due to the fact that they cannot be considered realistic.

4.8 It should also be acknowledged that experience gained elsewhere in the application of Paramics micro-simulation modelling, in projects of a similar size, has highlighted that the level of stability within the models frequently improves as development plans evolve and mitigation schemes are refined. This is also partly due to developments within the plan proceeding with applications which enables more localised impacts to be identified and mitigated through the development specific transport assessment work. This level of detail cannot be achieved within a high level strategic assessment. All mitigation proposals will be subject to further detailed assessments, refinements and optimisation through the planning process and it is expected that improved network performance and stability will be realised as a result.

4.9 As has been mentioned previously, where model stability has been particularly poor, the propensity for a model to lock up (and thus to be considered to have failed) is assessed to allow the reliability of the model network across the various scenarios to be better understood.

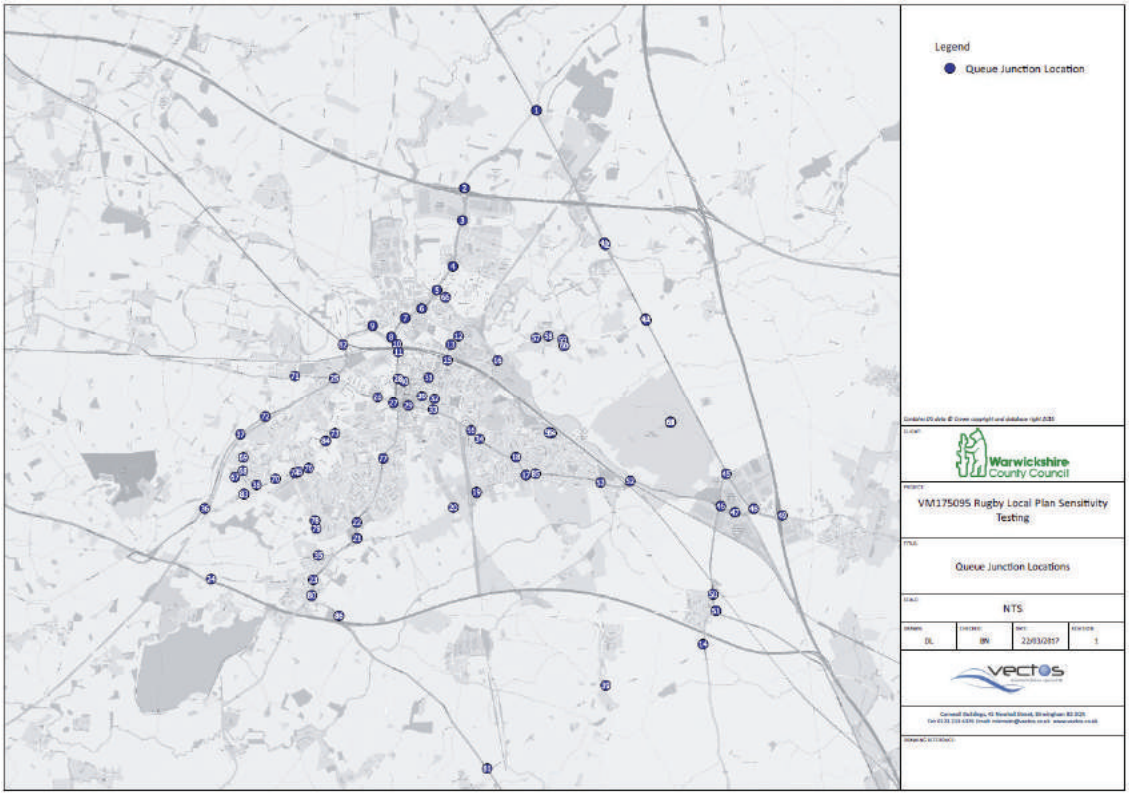
Queue Lengths

4.10 A second, more detailed, level of analysis has been undertaken in the form of queue length analysis. Queue length analysis is intended to accompany the network wide analysis as it provides a more detailed picture of the impacts at specific junctions within the model network.

4.11 At this stage the analysis of queue lengths has been based on the average hourly maximum queue length. Results presented for each junction are based on the worst performing single approach. The hourly maximum for each individual model run has been calculated and then the average of all runs has been calculated for each hour. The maximum of these values, across all hours, is reported as the maximum periodic average maximum queue length. All queues are reported in numbers of vehicles.

4.12 The junctions for which average hourly maximum queue lengths have been calculated and compared are illustrated within **Figure 13.**

Figure 13 RWA Junction Queue Analysis Locations



4.13 Junctions where queue differences have not been presented on the maps simply represent junctions which did not trigger any of the assessment criteria across any one approach.

4.14 At this stage these results simply identify areas where further attention is required. A queue length increase of 50 vehicles does not necessarily mean that a scheme will not work, but it may indicate that further optimisation of the layout or any signal times are required. Furthermore it may not account for improvements on other arms of the same junction which, when investigated further, may contain additional capacity which could be unlocked to reduce the queue length on the offending approach.

4.15 The classifications for the queue length analysis are outlined as follows:

- **Queue Reduction** (a reduction in queue lengths of greater than 5 vehicles)
- **Moderate Increase** (an increase in queue lengths of between 15 and 30 vehicles)
- **Significant Increase** (an increase in queue lengths of between 30 and 50 vehicles)
- **Very Significant Increase** (an increase in queue length of over 50 vehicles)

4.16 The classifications detailed above are based upon best practice and the approach adopted in similar studies elsewhere within the county.

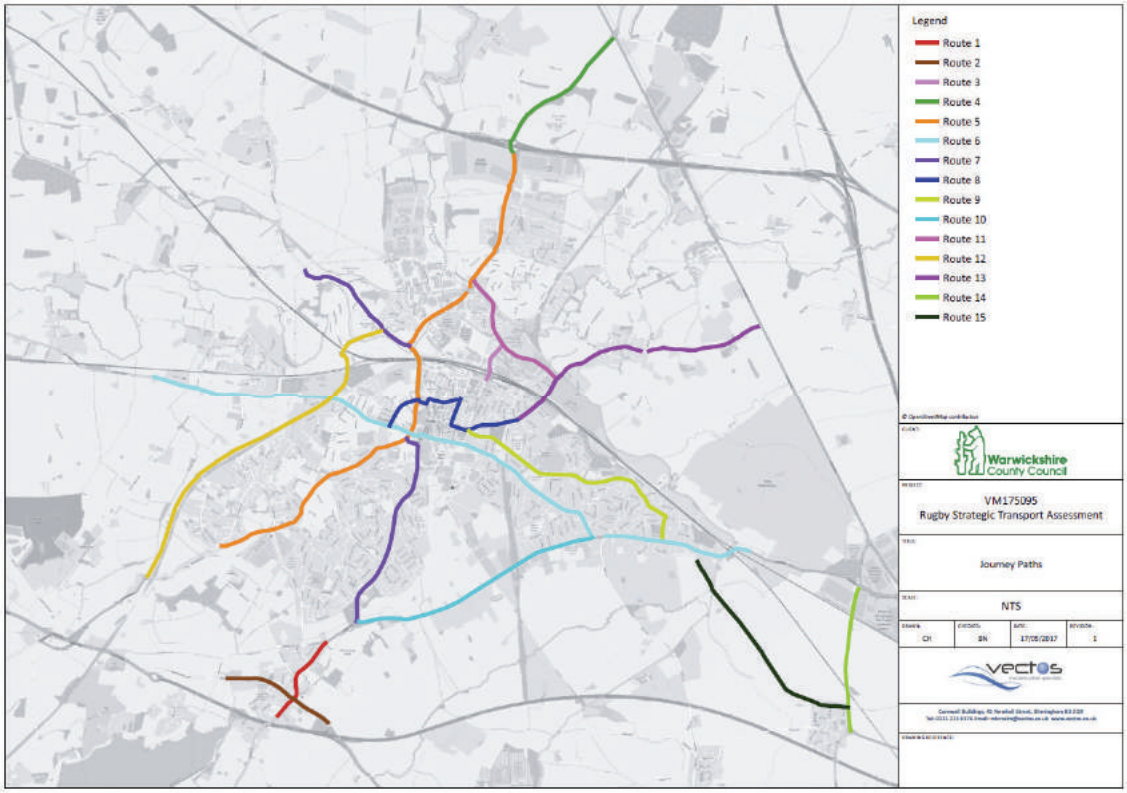
Journey Time Analysis

4.17 In addition to the analysis of queue lengths, journey time routes were defined within the modelling and the time it takes vehicles to traverse these routes was collected and presented within the analysis. At that stage the purpose of analysis was simply to ascertain which routes experienced the lowest and greatest levels of delay across a number of different allocation options. Building upon that analysis, the purpose of the comparisons during this stage of work is to identify which areas of the network, when compared to the Reference Conditions, are likely to suffer the greatest changes in levels of delay when the allocated demand is assigned to the network.

4.18 A series of key routes were defined within the model network and these routes have been illustrated within **Figure 14**.

4.19 In order that the impact on delay across various routes can be better understood the routes have been filtered by direction and have been split into sections. The purpose of this disaggregation is to ensure that a sufficient sample size is collected from the analysis as the number of vehicles travelling across the entire length of a number of the routes is likely to be substantially smaller than the number of vehicles travelling along each of the component parts of the route.

Figure 14 RWA Journey Time Analysis Paths



4.20 The average time it takes for vehicles to travel across each section of the route has been collected and aggregated for each scenario and then the level of deviation from the Reference Case conditions has been summarised using the following classification bands:

- **Delay Reduction** - A reduction in overall delay levels of -15% or more
- **No Significant Change** - A difference in journey times of between -15% and +15% falls within this category
- **Moderate Increase** - An increase in journey times of more than 15% but less than 25%
- **Significant Increase** – An increase in journey times of more than 25% but less than 50%
- **Very Significant Increase** – An increase in journey times, when compared to the Reference Case, of more than 50%

4.21 At this stage it was decided to classify journey time differences of between -15% and +15% as not significant. The intention is to highlight those areas which suffer the greatest impacts as these impacts are more pertinent to this stage of the assessment. The classifications adopted are in line with those that have been recommended by WCC and are such that they

reflect the DMRB acceptability standards for comparisons between observed and modelled journey times. It should be noted that although the current methodology does not consider an increase in delay of less than 15%, on a single section of a route, as significant, during assessment of planning applications a lower threshold may be considered appropriate as it would be expected that the mitigation schemes are optimised in that regard.

4.22 The benefit of undertaking delay analysis on key routes, compared to simply reviewing the network wide average journey time and speed, is that it begins to allow a more detailed picture of where the additional delays or journey time improvements are likely to occur.

Detailed Junction Flow/Demand Analysis

4.23 At times within the testing it was determined that the strategic measures used within the standard reporting should be supplemented with detailed analysis of the changes in traffic volumes and demands at key locations within the model network.

4.24 The measures identified previously within this report are those which are considered necessary to support the strategic level assessment of options. They do not, however, provide an indication of the localised impacts associated with the various options.

4.25 Whilst it is not considered necessary, at this stage, to undertake detailed analysis of every location that has been included within the modelled area, there are some areas which have been identified as critical to the overall network operation and, in these cases, a detailed assessment of changes in traffic flows was considered appropriate as an aid to the decision making process.

4.26 In order that the impacts in these areas could be fully understood the average throughput that occurs within the model scenario was compared to the predicted demands for the junction during the same period.

4.27 Junction demands were extracted by running the models with limited congestion effects to obtain a clear picture of the desired routing of traffic through the study area when congestion effects are alleviated.

4.28 To some extent it is hoped that this alleviation will occur, in part, as a result of the localised mitigation strategies, associated with each of the sites that would accompany the delivery of the strategic infrastructure.

4.29 The findings from each of the assessment stages described previously have been presented within the remainder of this Report.

5 STAGE 1 – 2031 LOCAL PLAN ASSESSMENT

Overview

5.1 The first stage of the assessment work was intended to assess the implications of allocating all sites identified for delivery within the latest Local Plan proposals. This enabled the identification of an appropriate highway infrastructure strategy to accompany the Local Plan as well as highlighting the residual impacts likely to occur as a result of the strategy being tested.

Objectives

5.2 The objectives of the first stage of the assessment focus on the 2031 scenario only and have been summarised as follows:

- To assess the impacts of allocating the Housing and Employment growth in line with the proposals put forward within RBCs Local Plan.
- To determine a potential mitigation strategy, in response to the emerging impacts identified as a result of the inclusion of the Local Plan sites, which will eventually comprise the Local Plan Infrastructure Delivery Plan.
- To assess the overall level of network performance predicted to occur once the growth and associated mitigation strategy has been included within the modelling.

2031 Local Plan Do Nothing Scenario

5.3 The initial stage of this testing involved creating the Local Plan demands and including within the 2031 Reference Case model network. This formed the 2031 Local Plan Do Nothing scenario. This scenario was run and reviewed, and it was clear that not delivering any mitigation schemes alongside the inclusion of the Local Plan site would result in a model network that reaches capacity and gridlocks on each of the runs analysed.

5.4 It was determined that mitigation schemes would be necessary for inclusion within the network, and comparing model results against a 2031 Local Plan Do Nothing scenario would not provide the basis for a meaningful comparison.

Test Scenarios

5.5 Inclusion of the network infrastructure identified for mitigating the impacts of Local Plan development trips, alongside the development sites and associated traffic growth, resulted in the following model scenarios being assessed as part of Stage 1:

- **Scenario 01: 2031 RWA Reference Case –** The Rugby Wide Area model forecast to 2031 with growth aligned to the TEMPRO predictions post-adjustment for the committed housing and employment numbers.
- **Scenario 02: 2031 RWA Local Plan** - The 2031 Reference Case + the Local Plan housing and employment sites outlined by RBC comprising an additional 10,179 dwellings and 2,750 jobs, with mitigation schemes included in response to congestion observed within the model.

Stage 1 Mitigation Proposals

5.6 As part of the assessment work, a series of mitigation proposals were included within the model network. The starting point for this work was a 2031 RWA Local Plan Do Nothing network, which was subject to a series of reviews once the new development demands had been assigned to establish the areas of impact.

5.7 The process of identifying the infrastructure for inclusion within the model network was iterative with measures being included in response to issues observed on the network and then subject to further optimisation as the network operation began to stabilise.

5.8 It should be acknowledged that the schemes proposed within the modelling have not been subject to any detailed design or safety review at this stage. Furthermore, it should not be assumed that the schemes recommended through this study are fixed and will be delivered in the form described within this report. Rather it is intended that the schemes proposed are outline schemes which may change through further optimisation and detailed design that will precede the final delivery. Thus, the concept and location of the schemes are considered fundamental rather than the precise form at this stage.

5.9 Throughout the modelling exercise, signals times have been refined and optimised, in some cases through the use of signal plans. It is expected that specific requirements to optimise signalised junctions will be identified during the detailed planning phases associated with one or more of the allocated sites.

5.10 The infrastructure proposals largely comprise individual junction enhancements and network amendments included in response to issues identified in the model network. Additionally it was identified at an early stage that, to accommodate the level of housing and employment land identified within the southern parts of the study area, the South West Link Road (SWLR) would be required to ensure that the development trips could access the existing highway network as well as improving the dispersion of traffic in an attempt to mitigate some of the impacts identified.

5.11 Further details on the assumptions incorporated within the Do Something scenario network are provided as follows:

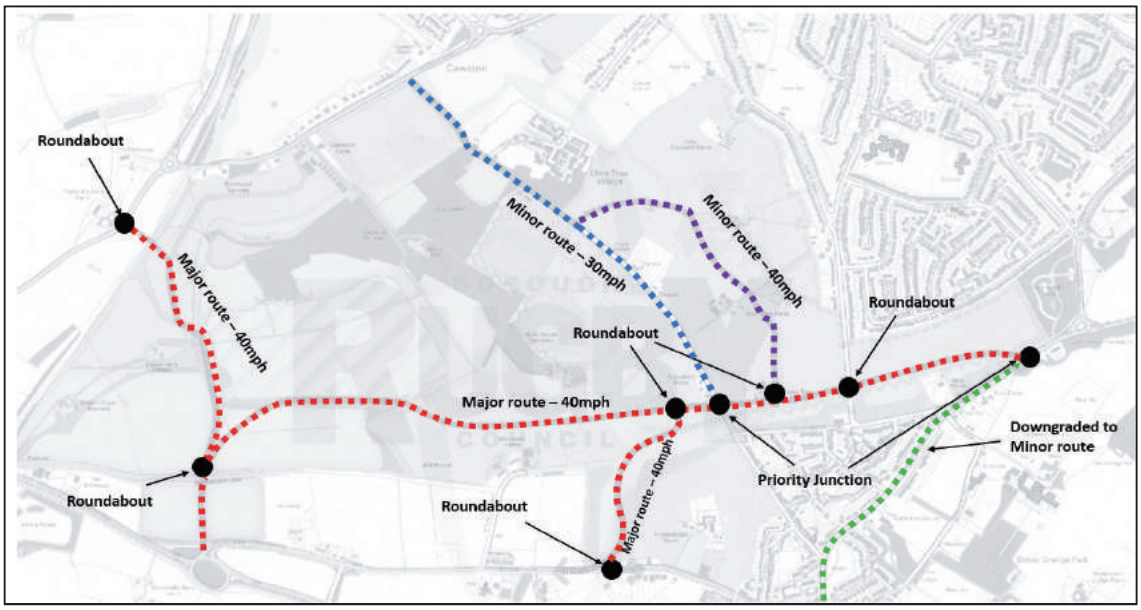
South West Link Road

5.12 As has already been mentioned, the large quantum of development to the south of Rugby was identified as likely to induce impacts on the transport network at an early stage.

5.13 Through the assessment a link road was identified as likely to minimise some of the impacts identified as a result of the traffic growth. Primarily the mitigation occurs through the role of the SWLR in diverting traffic away from Dunchurch, which is a heavily constrained part of the network as well as providing additional highway capacity in the southwest.

5.14 The alignment of the link road was also considered very beneficial insofar as it enabled Dunchurch, an existing congestion hot-spot, to be bypassed. An overview of the link alignment tested at this stage of the assessment is outlined in **Figure 15**. Further testing on the alignment of the link road is also presented in **Section 9** of this report.

Figure 15 Link Road Alignment Tested in Stage 1 Assessment



Mitigation Measures

5.15 Testing in Stage 1 revealed that the SWLR alone was not sufficient in providing network operation that didn't result in gridlocking, and, as a result, measures were identified and included within the modelling to create the final Do Something model scenario.

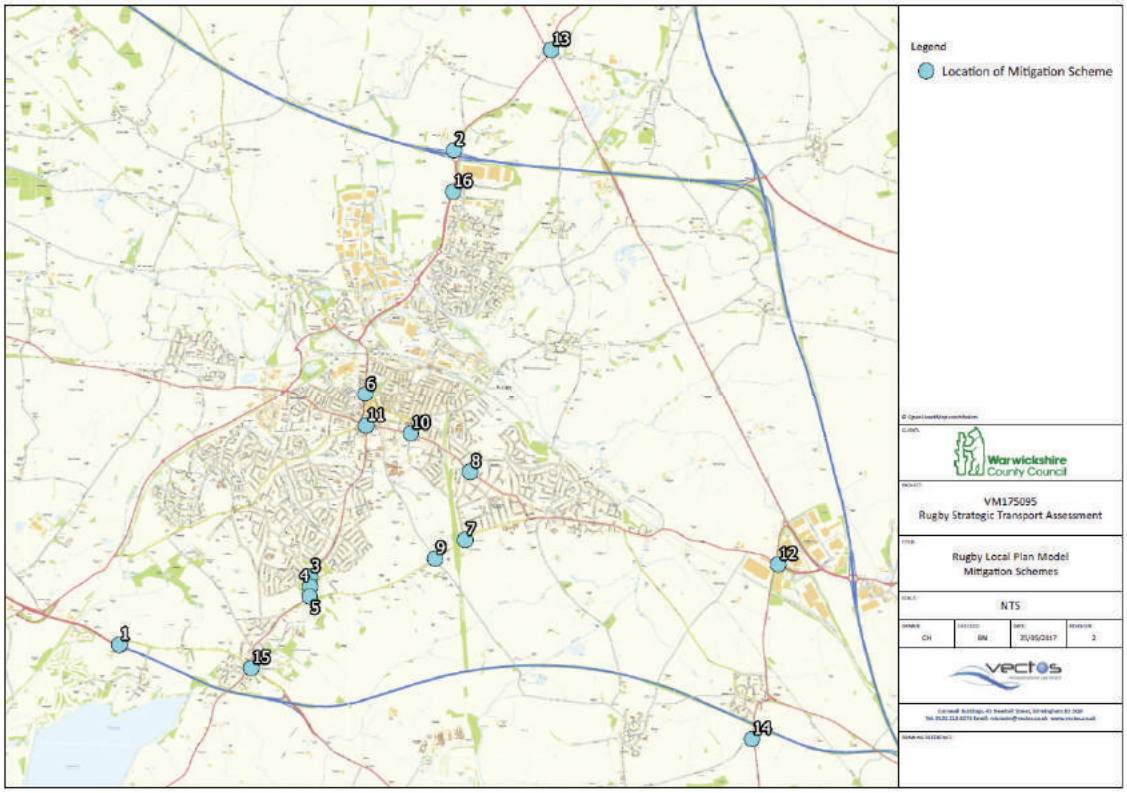
5.16 An overview of the location of these measures, alongside a description of what has been assumed in each scenario, has been provided within the following **Table 17 and Figure 16 and Appendix B** respectively:

Table 17 Stage 1 Mitigation Summary

Ref	Scheme	Description
1	M45/A45/Coventry Road Roundabout	Signalisation of the eastern and western A45 approaches with a new arm to the north forming the SW Employment Land access. The B4429 alignment has also be revised
2	M6 Junction 1	Signalisation of all entry arms to the junction. Extension of two lane flare on northern entry and exit arms to allow vehicles to travel north through the junction in two lanes and merge further away from junction
3	Dunchurch Road/Bawnmore Road Roundabout	Widening of roundabout circulatory along with approach and exit lanes. North to south movement and south to north movements to be made in two lanes with merge on exit. Southbound exit two lanes to A426/Ashlawn Road roundabout
4	A426 Rugby Road	Provision of two lane section of carriageway in a southbound direction between Dunchurch Road/Bawnmore Road and A426/Ashlawn Road junctions

5	A426 Rugby Road/Ashlawn Road Roundabout	Widening the western arm exit to two lanes to allow vehicles to travel through the junction in two lanes from the A426 N to A426 S. Revised priorities on the circulatory and widening the A426 S approach as part of the South West Link Road scheme.
6	Newbold Rd/ Corporation St/Evreux Way Roundabout	Widening of the northern exit to allow vehicles to travel south to north through the roundabout in two lanes and merge upon exit
7	B4429 Ashlawn Rd/Percival Rd	Right turn lane for movement into Percival Road
8	A428 Hillmorton Rd/Percival Rd	Addition of a right turn lane on A428 Hillmorton Rd for movement into Percival Road
9	Ashlawn Rd/Onley Lane/Barby Road	Right turn lane for movement into Onley Lane and Barby Road
10	Hillmorton Rd/Whitehall Rd/B. Williams Way Roundabout	Widening of Hillmorton Road/Whitehall Road roundabout with two lane entry on Hillmorton Road W and E approaches, along with two lane exit on Hillmorton E. Whitehall Road also widened to two lanes on approach to the junction.
11	Rugby Gyratory	Alteration to existing signal configuration
12	A428/A5 Roundabout	Signalisation of A428 eastbound approach to improve traffic flow from the A5 S approach. Widening of the western exit to allow movement east to west through the junction to be made in two lanes
13	A5/A426 Gibbet Lane Roundabout	Widening of A5 and A426 approach arms to the junction and circulatory. Signal timing optimisation.
14	Daventry Road/The Ridgeway	Addition of right turn lane on Daventry Road southbound approach
15	Dunchurch Crossroads	Additional right turn lane on Rugby Road approach and Southam Road approach
16	A426/Central Park Drive Roundabout	Additional lane on southbound entry to roundabout and widening of eastern circulatory from two to three lanes. Partial signalisation of the roundabout on the A426 SB entry arm

Figure 16 Identified Mitigation Scheme Locations



Sustainable Transport

5.17 The exercise currently being undertaken assumes that a standard 10% mode shift target will be applied to the new sites. This affects new Local Plan demands only and, in reality, accounts for less than 1% of the assigned model demands in any option (i.e. is not likely to be significant).

5.18 This document has focused on the highway network mitigation required in order to achieve an acceptable level of network performance when considering RBC's Local Plan allocation.

5.19 The exercise has been based around modelling outcomes which primarily focus on car based trips. However, there are wider ranging sustainable transport issues which need to be considered in conjunction with this report.

5.20 It is critical that sustainable transport improvements form part of the mitigation package to support the housing and employment growth proposals within Rugby Borough. Such improvements will:

- Contribute towards the delivery of sustainable development within the District;
- Maximise the number of journeys made by sustainable transport modes from trips generated as a result of new development;

- Reduce the impact of car based travel on the local and strategic highway network;
- Deliver an integrated approach to transport provision to serve new development.

5.21 WCC has developed a Sustainable Transport Strategy document, which at the time of writing this report is in draft format. It is anticipated that any strategy promoted in this strategy would, ultimately, seek to reduce traffic levels compared to those reported within the following sections of this report and, therefore, these impacts should be seen as a 'worst case'.

5.22 There will be sufficient time post Local Plan adoption, to enable a more thorough strategy to be determined which maximises opportunities for sustainable transport measures and reduced car based trips across the town centre. It should be recognised that the Infrastructure Delivery Plan is a living document and will be complemented through the sustainable transport strategy. Work will continue beyond the adoption of the Local Plan on both of these documents which, it is expected, will work towards identifying the opportunities to reduce car based trips across the study area, and particularly through the town centre.

5.23 It is recommended some funding should be secured through the delivery of the housing sites allocated through the Local Plan to ensure that the operation of the network can be safeguarded against any unforeseen transport impacts. This money should also be targeted to ensure that the opportunities for encouraging a greater adoption of sustainable modes, and therefore discouraging car trips within the same areas, are maximised.

Stage 1 Results Analysis

5.24 The assignment of the Local Plan development demands onto the model network without any additional infrastructure resulted in a significant level of growth in traffic volumes which, in turn, resulted in the network becoming over-capacity. These capacity issues were observed and a mitigation package derived in response. This formed the 2031 RWA Local Plan scenario. The performance of this scenario against the 2031 RWA Reference Case is presented in the following section

Model Stability

5.25 The stability levels recorded in each scenario, for both AM and PM time periods, is presented within the following **Table 18**:

Table 18 Stage 1 Model Stability Assessment 2031 Reference vs. 2031 Local Plan

	2031 Ref Case	2031 Local Plan
AM	100%	100%
PM	100%	100%

5.26 The analysis of the model stability reveals that, with the mitigation measures, the Local Plan model reflects a level of stability that is comparable with the 2031 Reference Case.

5.27 The remainder of the analysis focuses on the network wide statistics and queue/delay comparisons between the Reference Case and the Local Plan Do Something scenarios.

Network Wide Statistics

5.28 The network wide statistics were assessed for both the 2031 RWA Reference Case and the 2031 RWA Local Plan scenario. A summary of these values is presented within the following **Table 19** and **Table 20 and Figures 17-19** for the AM and PM respectively.

Table 19 Network Stats 2031 Ref Case vs. 2031 Local Plan AM (07:00 to 10:00)

Scenario	Completed Trips (veh.)	Average Speed (mph)	Average Delay (s)
Reference	116970	31	360
Local Plan	133809	30	386
Diff (%)	12.3%	-2%	7.2%

Table 20 Network Stats 2031 Ref Case vs. 2031 Local Plan PM (16:00 to 19:00)

Scenario	Completed Trips (veh.)	Average Speed (mph)	Average Delay (s)
Reference	124318	30	370
Local Plan	137018	28	422
Diff (%)	10.2%	-7.0%	14.2%

Figure 17 Completed Trips Comparison (2031 Reference vs 2031 Local Plan)

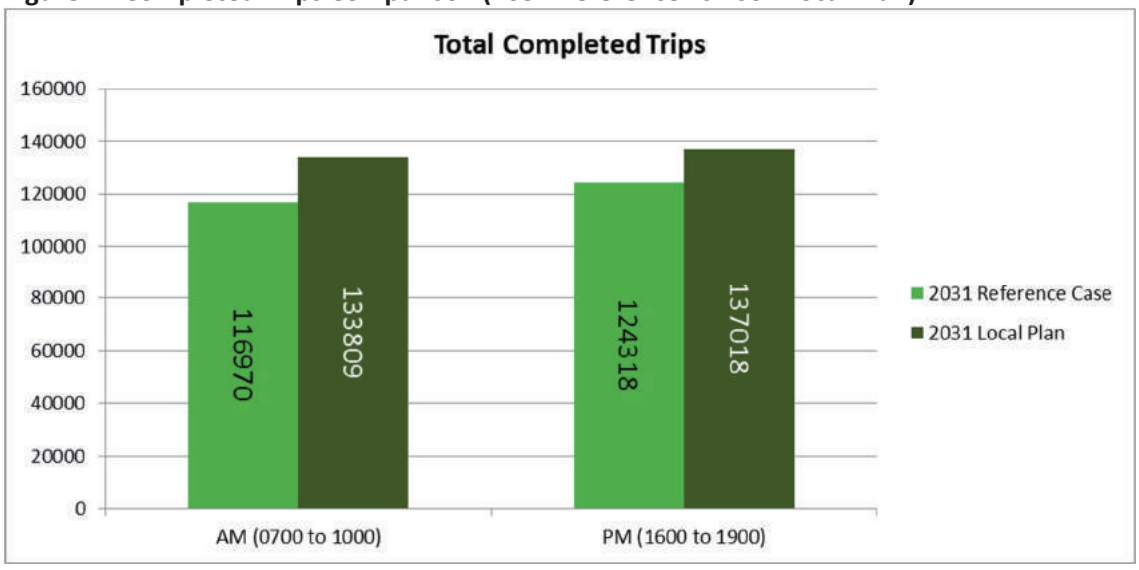


Figure 18 Average Speed Comparison (2031 Reference vs 2031 Local Plan)

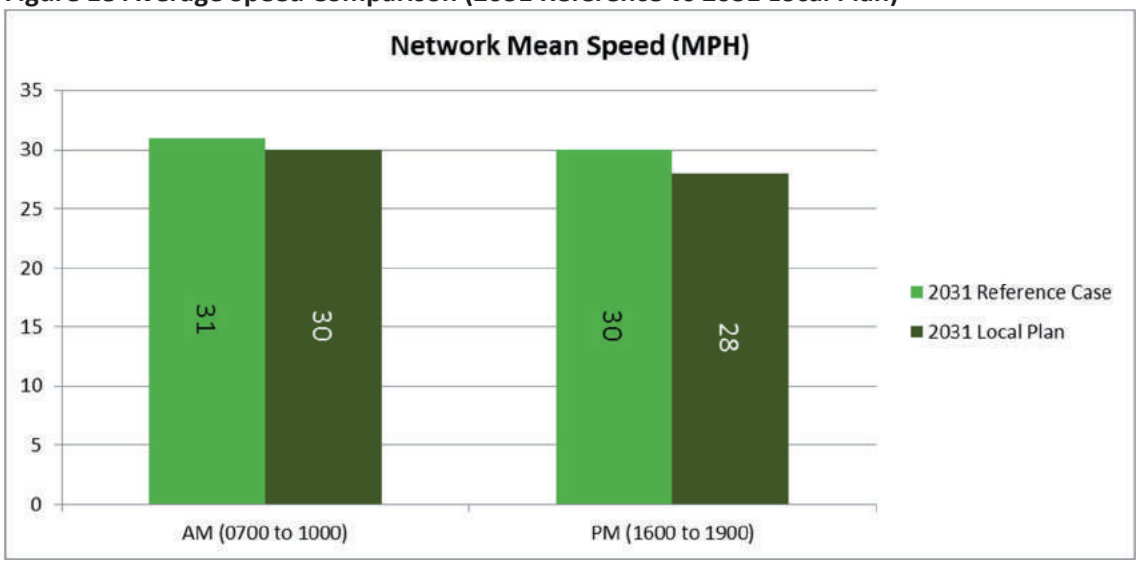
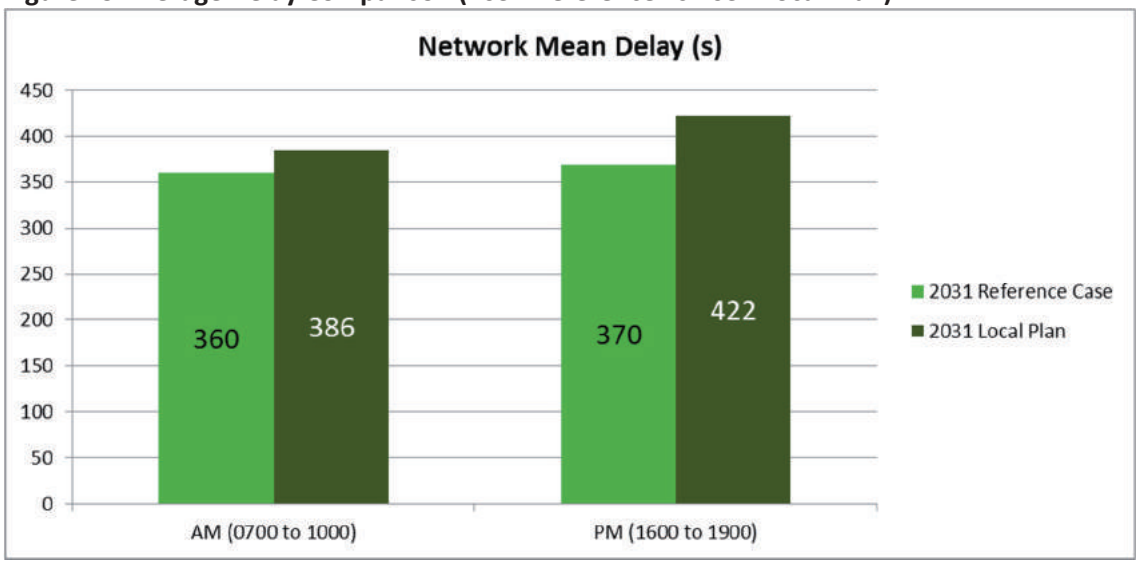


Figure 19 Average Delay Comparison (2031 Reference vs 2031 Local Plan)



5.29 Analysis of the results presented within the previous tables and figures reveals that the inclusion of the Local Plan developments, results in an increase in journey times of around 7% in the AM and 14% in the PM, whilst speeds on the network reduce by between 2% and 7%. Whilst some reductions in speeds and increases in delay are inevitable as a result of the inclusion of additional traffic on the network, the impacts identified here are likely to be symptomatic of residual issues on the network which occur in spite of the mitigation measures identified thus far, with the impacts particularly noticeable during the PM period.

Maximum Queue Length Analysis

5.30 The following sets out some initial observations based on the differences in queue lengths between the Reference Case and the Do Something scenario. The comparison between

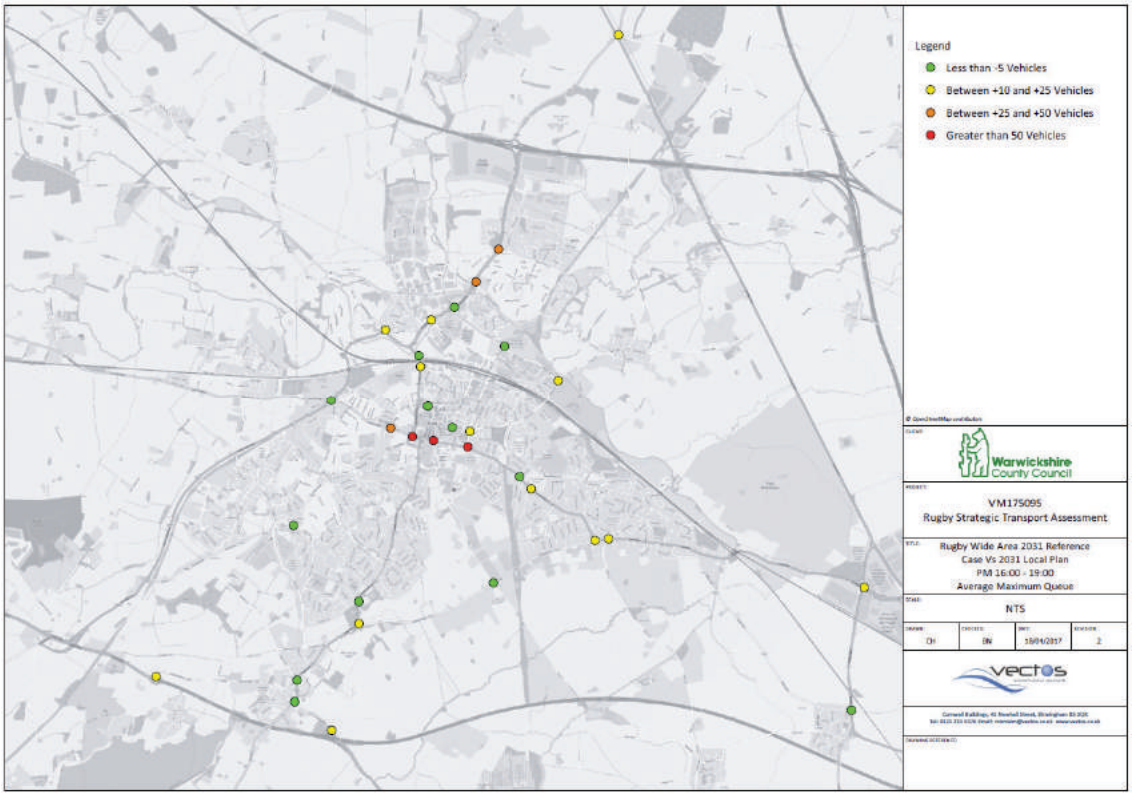
queuing levels in the Reference Case and Do Something scenario have been illustrated for the AM and PM time periods within **Figure 20** and **Figure 21** respectively.

Figure 20 AM Period Maximum Queue Length Comparisons (Ref vs. Local Plan)

5.31 Analysis of the difference in queuing levels recorded within the two scenarios across the AM period reveals the following:

- The inclusion of the mitigation measures results in a significant number of instances of queue reductions across the network.
- The AM network does however experience increases in queuing to the east of Rugby, on the A428 Hillmorton Road corridor.
- There are also a number of instances of queue increases along Leicester Road.
- During the AM there are no very significant increases in queue lengths, and three instances of significant increases.

Figure 21 PM Period Maximum Queue Length Comparisons (Ref vs. Local Plan)



5.32 Analysis of the difference in queuing levels recorded within the two scenarios across the PM period reveals the following:

- The inclusion of the mitigation measures results in a significant number of instances of queue reductions across the network.
- The PM network does however experience significant increases in queuing around the Rugby Gyratory, on Hillmorton Road and Lawford Road. Particular issues are observed on the Lawrence Sherriff Street approach to the Gyratory, which impacts upon the A428 Hillmorton Road/Whitehall Road roundabout.
- There are also a number of instances of queue increases along Leicester Road.

Journey Time Analysis

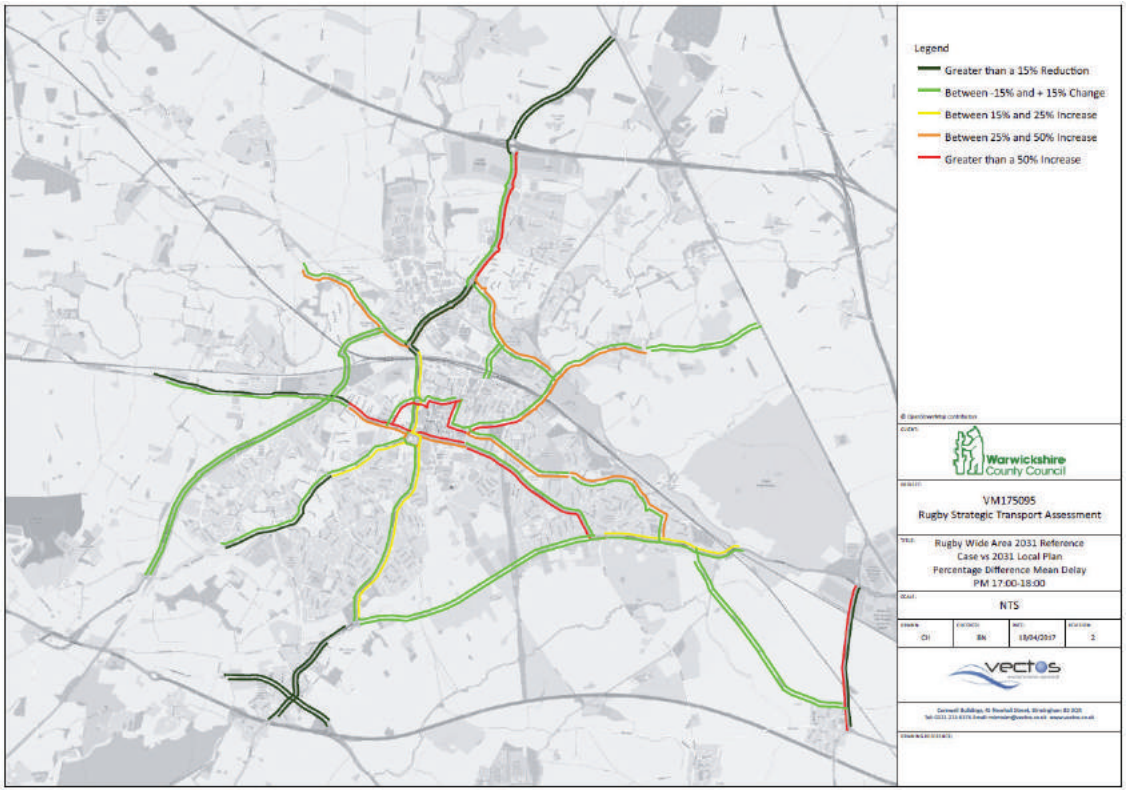
5.33 The following sets out some initial observations of journey time impacts identified when comparing the time it takes, between scenarios, to traverse a series of pre-defined routes within the model network. The comparison between journey times in the Reference Case and Local Plan scenario have been illustrated for the AM and PM time periods within **Figure 22** and **Figure 23** respectively.

Figure 22 AM Peak Average Journey Time Analysis (Ref Case vs. Local Plan)

5.34 Analysis of AM journey time results presented previously reveals the following:

- During the AM there are significant issues arising on Leicester Road in a northbound direction. Additionally, journey times on the A4071 to the west of Rugby increase. The increases in these locations are most likely due to additional traffic travelling towards the M6 from the housing located in the Southwest.
- There are also issues at the Butler's Leap/Rugby Road junction. It is unclear whether there are any other options for mitigation in this area that could be delivered due to the physical constraints in the area as well as land availability.
- There are also increases in journey times on Rugby Road SB through Kilsby on approach to the A5, and on the A5 NB on approach to the junction with the A428.

Figure 23 AM Peak Average Journey Time Analysis (Ref Case vs. Local Plan)



5.35 Analysis of PM peak journey times results presented reveals the following:

- During the PM the Gyratory appears to induce a significant level of constraint on the network. Journey time impacts are worse on the westbound route on Hillmorton Road/Lawrence Sheriff Street, and eastbound routes from Lawford Road to the Clifton Road/Whitehall Road roundabout. These impacts are directly attributable to the performance of the Gyratory, the Clifton Road/Whitehall Road roundabout as well as the Hillmorton Road/Whitehall Road roundabout.
- Journey times increase on the southbound section of the A426 between the M6 and A426/Brownsover Road roundabout. It is likely that journey times increase significantly here as large volumes of traffic travel from the M6 to Local Plan residential developments in the South West and RRM areas of the model. This section of the A426 represents the primary route between Rugby and the M6. Beyond this section of the A426, there are a number of routes that vehicles can choose (via A426, via Clifton Road/Butlers Leap, via the new RRM link road and via the RWRR and Brownsover Road) which means the effects are dissipated south of this section.

2031 Local Plan Assessment - Summary of Findings

5.36 The following findings have been determined as a result of the completion of the Stage 1 testing.

5.37 When reviewing network stability it is apparent that the mitigation measures identified are essential to accommodate the level of development identified and, even then, there is likely to be some residual impacts retained on the network, particularly in the PM period.

5.38 It is likely that the PM network performance is worse because of the constant loading pattern with regards trip profiling. During the AM there is a noticeable peak of traffic within the peak hour which then dissipates, during the PM the trip loading pattern is more constant between the 16:30 to 18:30 period, meaning the network is under stress for a much longer period.

5.39 When mitigated, the PM network performance improves substantially, when compared to a Local Plan Do Nothing scenario, and the mitigation ensures the PM network is stable. However, the journey time and queuing analysis has indicated that, in spite of the apparent stability, significant increases in both queuing and delay are prevalent across the network when compared to the Reference Case.

5.40 In spite of the additional mitigation, there are a number of areas which appear to suffer from congestion and delays as a result of the inclusion of the additional housing, these include:

- The Rugby Gyratory
- Hillmorton Road/Whitehall Road roundabout
- The A426 between the A426/Brownsover Road roundabout and the M6
- Clifton Road and specifically the junction with Butlers Leap to the north and Whitehall Road to the south.

2031 Local Plan Assessment – Conclusions

5.41 Based on the analysis completed through Stage 1, the following conclusions were identified.

- To deliver the level of housing identified within the Rugby Housing Trajectory, the provision of the South West Link Road should be considered as critical and should be provided in full.

- In spite of the mitigation that has been proposed, there are still likely to be a number of residual impacts which occur on the network. Some of these impacts, such as the congestion levels around the Gyratory, along Clifton Road and along the A426 are likely to mean that network operation in these areas is poor.

5.42 The analysis indicates that the level of housing that has been tested in Stage 1 is likely to generate traffic levels which lead to the network approaching capacity even once mitigation measures have been assigned. The analysis has resulted in a number of mitigation schemes being identified, the most critical of which are considered to be the following:

- Dunchurch Road/Bawnmore Road Roundabout
- A426 Rugby Road/Ashlawn Road Roundabout
- Dunchurch Crossroads
- SWLR

5.43 Having successfully determined an appropriate mitigation strategy for the 2031 development strategy, it was determined that the next stage of the assessment should focus specifically on the phasing of the mitigation measures implemented within the network, as a response to the RBC Housing Trajectory build out rate information. This work comprised the Stage 2 and 3 assessment and is presented within the subsequent chapters of this report.

6 STAGE 2 – 2021 PHASING ASSESSMENT

Overview

6.1 This stage of the assessment was intended to assess the implications of allocating the first 5 years' worth of development identified through the Local Plan as a means of identifying an appropriate, initial, highway infrastructure strategy. The assessment considered the impacts of development in the first 5 years which was then considered to be reflective of the first phase of the Local Plan.

Objectives

6.2 The objectives of this stage of the assessment have been summarised as follows:

- To identify the network infrastructure improvements required to facilitate the first 5 years of development identified within the Plan period.
- To identify whether the quantum of development by 2021 triggers the requirement for the South West Link Road.

2021 Local Plan Model Overview

6.3 The inclusion of sites, within the assessment, was informed via the RBC Housing Trajectory, and the RBC Local Plan Publication Draft Employment Land Background Paper.

6.4 The sites included along with the quantum of development in 2021 are outlined in **Table 21**:

Table 21 2021 Local Plan Scenario – Development Assumptions

Site	Dwellings
Coton Park East Expansion	180
Coton House Expansion	65
Bilton Fields, Ashlawn Road (MP)	130
Homestead Farm (WCC)	70
Land South Of Dunkleys Farm	70
Land south of Montague Rd (TW)	10
Land south of Montague Rd (RE & Sworders)	70
Cawston Spinney	70
Land North of Coventry Road Long Lawford	100
RRM Expansion	760
Total	**1525**

6.5 The dwellings listed above have been identified for assignment within the model, and adjustments have been made to the TEMPRO database to account for these additional houses and, where appropriate, jobs. The resultant level of growth in the 2021 Local Plan scenarios has been summarised within the following **Table 22**:

Table 22 Adjusted TEMPRO Assumptions

Housing Assumptions	2021 Reference Case		2021 Local Plan	
	AM	PM	AM	PM
Committed Housing Numbers	2869		2869	
Local Plan Housing Numbers	-		1525	
Total	2869		4394	
Committed Jobs Created	3986		3986	
Local Plan Jobs Created	-		-	
Total	3986		3986	
TEMPRO	**AM**	**PM**	**AM**	**PM**
Growth Factor	1.076	1.076	1.093	1.094
Diff (%)	-	-	1.7%	1.8%

6.6 **Table 22** reveals that the houses and jobs identified for inclusion within the 2021 Local Plan model are predicted to result in an additional increase in traffic volumes of between 1.7% and 1.8% when compared to the 2021 Reference Case. This is on top of the traffic growth already predicted to occur within the Reference Case meaning that, overall, growth within these scenarios is predicted to be close to 9.5% from 2016 levels, once all identified sites are included.

Test Scenarios

6.7 Inclusion of the development sites and associated traffic growth, resulted in the following model scenarios being assessed as part of the 2021 Assessment:

- **Scenario 01: 2021 RWA Reference Case –** The Rugby Wide Area model forecast to 2021 with growth aligned to the TEMPRO predictions post-adjustment for the committed housing and employment numbers. This scenario is inclusive of committed infrastructure schemes and developments, set to be delivered by 2021.
- **Scenario 02: 2021 RWA Local Plan Do Nothing**- The previous scenario inclusive of the housing sites and employment sites outlined by RBC comprising an additional 1,525 dwellings.

- **Scenario 03: 2021 RWA Local Plan Do Something**- The 2021 previous scenario with identified mitigation schemes included in response to congestion observed within the model.

2021 Results Analysis

6.8 The assignment of the Local Plan development demands onto the model network, without any additional infrastructure resulted in parts of the network beginning to approach capacity. These issues were observed in the form of queuing impacts which manifest within the model network and a mitigation package derived in response. This formed the 2021 RWA Local Plan Do Something scenario. On this basis the following scenarios have been assessed:

- 2021 Reference vs the 2021 Local Plan Do Minimum
- 2021 Reference vs 2021 Local Plan Do Something

Network Wide Statistics

6.9 The network wide statistics were assessed for both the 2021 RWA Reference Case and the 2021 RWA Local Plan Do Nothing scenario. A summary of these values is presented within the following **Table 23** and **Table 24** for the AM and PM respectively.

Table 23 Network Stats 2021 Ref Case vs. 2021 Local Plan Do Nothing AM (07:00 to 10:00)

Scenario	Completed Trips (veh.)	Average Speed (mph)	Average Delay (s)
Reference	108696	33	331
Local Plan DN	110558	31	353
Diff (%)	1.7%	-6.0%	6.6%

Table 24 Network Stats 2021 Ref Case vs. 2021 Local Plan Do Nothing PM (16:00 to 19:00)

Scenario	Completed Trips (veh.)	Average Speed (mph)	Average Delay (s)
Reference	115001	31	356
Local Plan DN	116592	30	366
Diff (%)	1.4%	-3.2%	2.8%

6.10 Analysis of the results presented within the previous tables reveals that the inclusion of the Local Plan developments, results in an increase in journey times of around 7% in the AM and 3% in the PM, whilst speeds on the network reduce by between 3% and 6%.

6.11 The tables also reveal that the number of trips which complete within the model periods increases by 1.7% and 1.4% in the AM and PM periods respectively.

Maximum Queue Length Analysis

6.12 The following sets out some initial observations based on the differences in queue lengths between the Reference Case and the Do Nothing scenario. The comparisons have been illustrated for the AM and PM time periods within **Figure 24** and **Figure 25** respectively.

Figure 24 AM Period Maximum Queue Length Comparisons (Ref vs. Local Plan Do Nothing)

Figure 25 PM Period Maximum Queue Length Comparisons (Ref vs. Local Plan Do Nothing)

6.13 Analysis of the 2021 Reference vs 2021 Local Plan Do Nothing queue lengths indicates the following patterns:

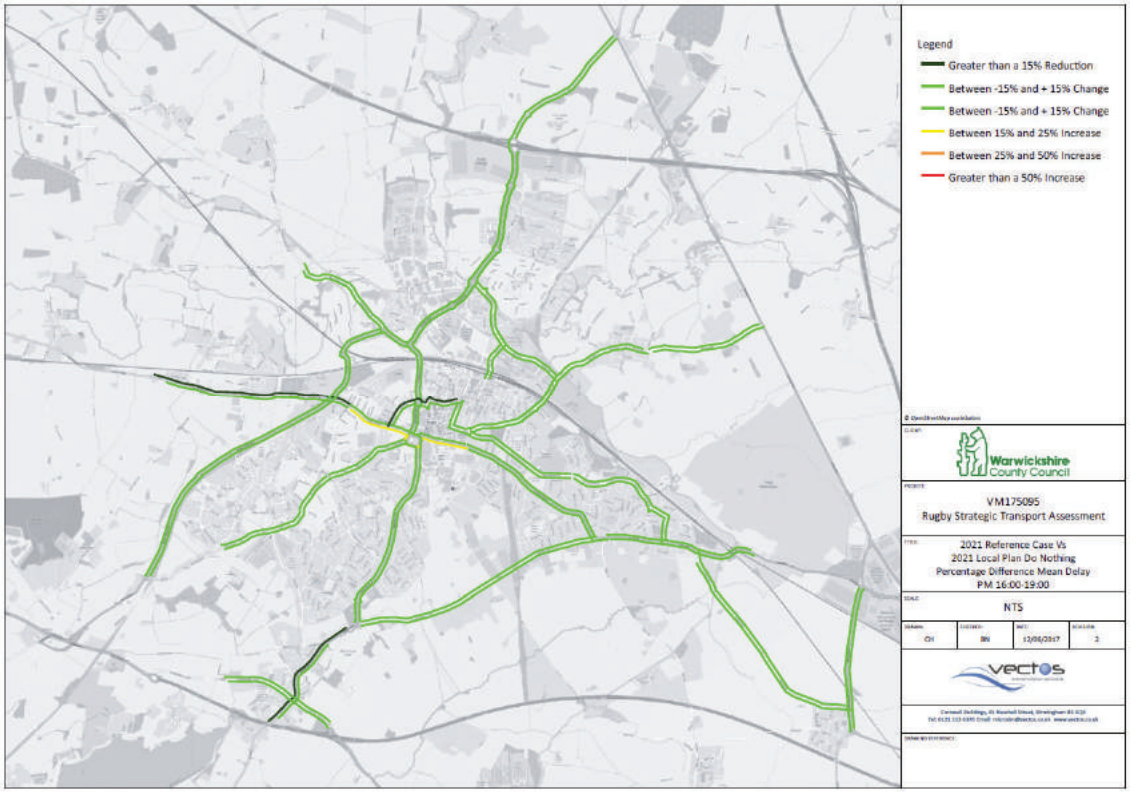
- During the AM and PM periods, queue lengths increase at the A426/A5 roundabout (Gibbet Hill roundabout)
- Queue lengths also increase at the Dunchurch Crossroads and upstream junction of the A426/Cawston Lane (as a result of queues extending back from the Dunchurch Crossroads), in both model periods.

Journey Time Analysis

6.14 The following sets out the identified journey time impacts when comparing the time it takes, between the 2021 Reference and 2021 Local Plan Do Nothing scenarios, to traverse a series of pre-defined routes within the model network. The comparisons between journey times have been illustrated for the AM and PM time periods within **Figure 26** and **Figure 27** respectively.

Figure 26 - AM Period Journey Time Comparisons (Ref vs. Local Plan Do Nothing)

Figure 27 - PM Period Journey Time Comparisons (Ref vs. Local Plan Do Nothing)



6.15 Analysis of the 2021 Reference vs 2021 Local Plan Do Nothing journey time comparisons indicates the following patterns:

- During the AM journey times increase on approach to Dunchurch Crossroads and on A426 SB approach to M6 Junction 1
- Journey times increase within the town centre in both the AM and PM period, with the PM showing an increase in journey times in an east to west direction through the gyratory.
- The journey time analysis reveals that the impact appears more noticeable in the AM than the PM with three instances in journey time increases in the AM as opposed to one instance in the PM.

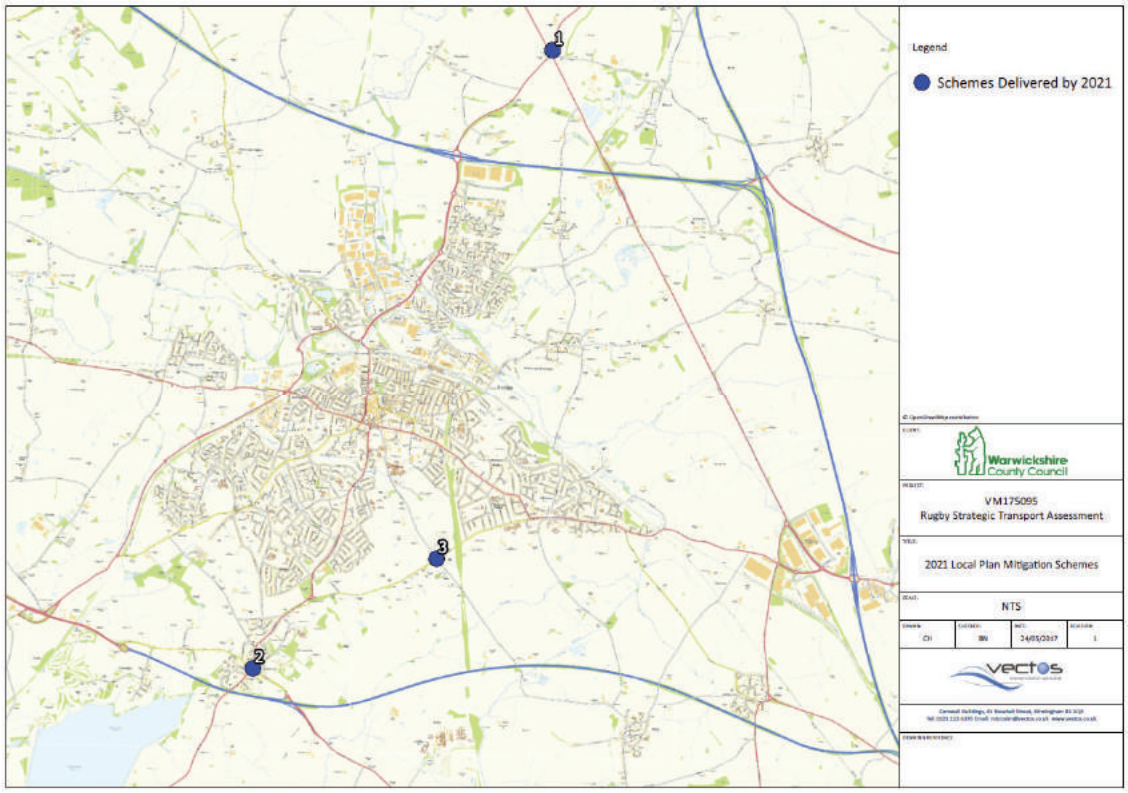
2021 Local Plan Do Something - Mitigation Strategy

6.16 Following the network statistics, queueing and journey time analysis presented previously, coupled with observations of the model operation, it was determined that mitigation would be required at three locations. In line with the 2031 Local Plan mitigation strategy, outlined in Section 6 of this report, the schemes identified for the following locations were included to form the 2021 Local Plan Do Something model scenario:

1. **A426/A5 Gibbet Hill roundabout** (signal optimisation and widening the A426 N, A426 S and A5 N approach arms and circulatory links)
2. **Dunchurch Crossroads** (widening and signal optimisation scheme)
3. **Ashlawn Road/Barby Road/Onley Lane** (right turn bay for movements into Barby Road and Onley Lane)

6.17 The location of these schemes are presented in the following figure:

Figure 28 – 2021 Local Plan Mitigation Strategy



6.18 Inclusion of these schemes within the 2021 Local Plan Do Nothing scenario resulted in the 2021 Local Plan Do Something model. This model was then compared to the 2021 Reference scenario, and the results presented as follows:

Network Wide Statistics

6.19 The network wide statistics were assessed for both the 2021 RWA Reference Case and the 2021 RWA Local Plan Do Nothing scenario. A summary of these values is presented within the following **Table 25** and **Table 26** for the AM and PM respectively.

Table 25 Network Stats 2021 Ref Case vs. 2021 Local Plan Do Something AM (07:00 to 10:00)

Scenario	Completed Trips (veh.)	Average Speed (mph)	Average Delay (s)
Reference	108696	33	331
Local Plan DN	*110558*	*31*	*353*
Local Plan DS	111079	34	328
Diff (%)	2.2%	3.0%	-0.9%

Table 26 Network Stats 2021 Ref Case vs. 2021 Local Plan Do Something PM (16:00 to 19:00)

Scenario	Completed Trips (veh.)	Average Speed (mph)	Average Delay (s)
Reference	115001	31	356
Local Plan DN	*116592*	*30*	*366*
Local Plan DS	116671	31	359
Diff (%)	1.6%	-0%	0.8%

6.20 Analysis of the results presented within the previous tables reveals that the inclusion of mitigation schemes in the Local Plan scenario, results in negligible differences in journey times when compared to the Reference Case, whilst speeds on the network improve by 3% in the AM and remain consistent with the Reference Case in the PM.

6.21 The tables also reveal that the number of trips which complete within the model periods increases to 2.2% and 1.6% in the AM and PM periods respectively (up from 1.7% and 1.4% in the Do Nothing scenario for the AM and PM respectively). This indicates that more trips assigned to the network complete within the model period suggesting that the mitigation strategy is improving the network capacity beyond just providing for the additional traffic on the network created by the allocated sites.

Maximum Queue Length Analysis

6.22 The following sets out observations based on the differences in queue lengths between the Reference Case and the Do Something scenario. The comparisons have been illustrated for the AM and PM time periods within **Figure 29** and **Figure 30** respectively.

Figure 29 AM Period Maximum Queue Length Comparisons (Ref vs. Local Plan Do Something)

Figure 30 PM Period Maximum Queue Length Comparisons (Ref vs. Local Plan Do Something)

6.23 Analysis of the 2021 Reference vs 2021 Local Plan Do Something queue lengths indicates the following patterns:

- During the AM queue lengths show no worsening at any junction across the network with the mitigation included within the network. Queue lengths reduce significantly at the area where mitigation have been included, at the Dunchurch Crossroads and at the A426/A5 Gibbet Hill roundabout.
- During the PM queue lengths also reduce network wide. There is however an increase in queue lengths modelled at the A426/A5 Gibbet Hill roundabout during this period. Upon closer inspection, it emerged that queues on all major arms of this roundabout reduce, with the only increase in queues occurring at the minor Gibbet Lane approach to the junction. This is as a direct result of giving greater priority to all other arms of the junction which see significant reductions in queue lengths.
- The queueing analysis results presented for the AM and PM suggests that the inclusion of the Dunchurch Crossroads scheme in the Local Plan Do Something scenario encourages traffic to stay on the Dunchurch Road route out of Rugby rather than re-route via the WRR, which appears to occur in the 2031 Reference Case, in response to extensive queueing at Dunchurch (the Dunchurch scheme is not included in the 2031 Reference Case). Accordingly queue lengths reduce on the Western Relief Road in the Local Plan scenario as less traffic re-routes to avoid Dunchurch in this scenario.
- It is important to highlight that the results presented do not suggest that the Dunchurch scheme attracts more traffic through the crossroads, it simply reduces re-assignment effects in response to predicted traffic conditions at the crossroads by 2031 without the scheme included.

Journey Time Analysis

6.24 The following sets out the identified journey time impacts when comparing the time it takes, between the 2021 Reference and 2021 Local Plan Do Something scenarios, to traverse a series of pre-defined routes within the model network. The comparisons between journey

times have been illustrated for the AM and PM time periods within **Figure 31** and **Figure 32** respectively.

Figure 31 - AM Period Journey Time Comparisons (Ref vs. Local Plan Do Something)

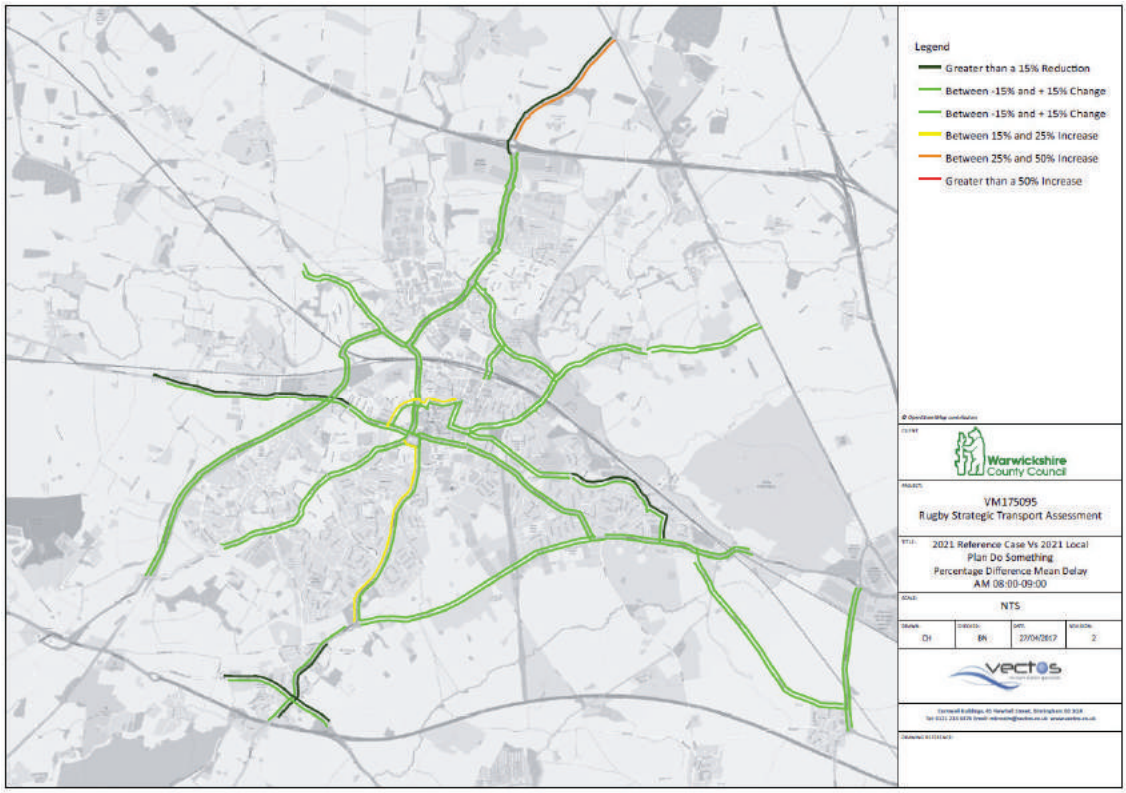
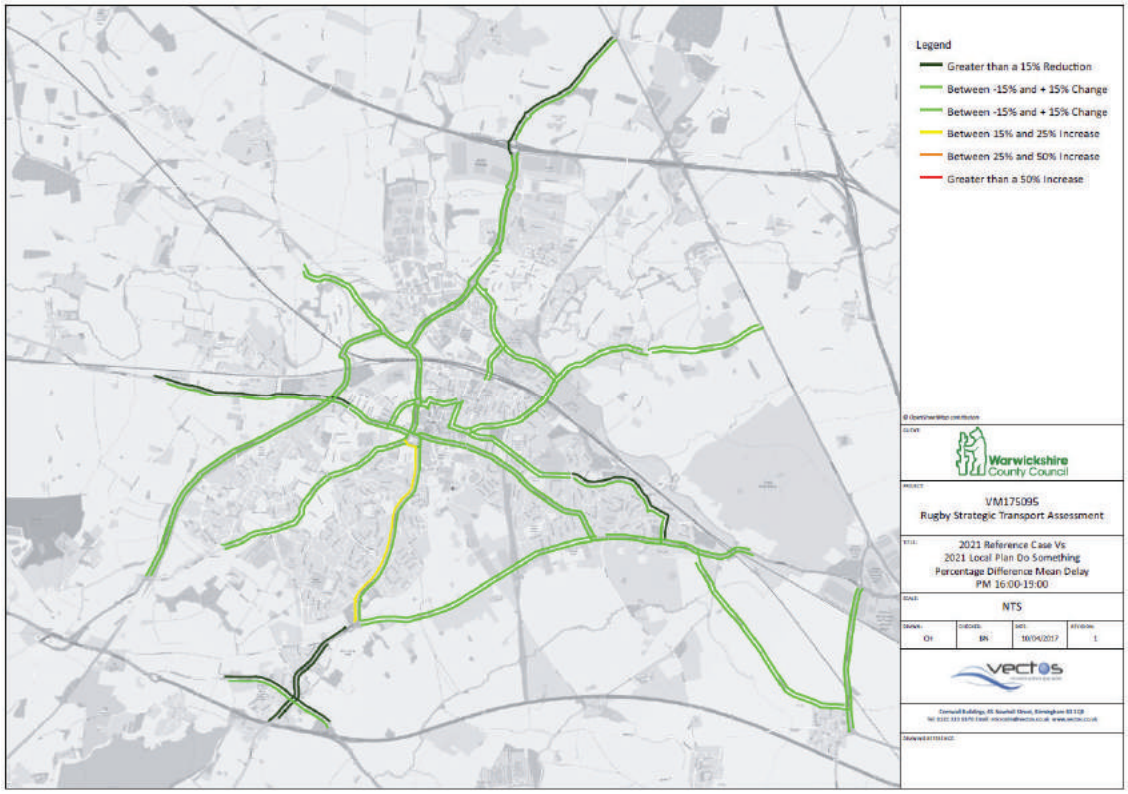


Figure 32 - PM Period Journey Time Comparisons (Ref vs. Local Plan Do Something)



6.25 Analysis of the 2021 Reference vs 2021 Local Plan Do Something journey time comparisons indicates the following patterns:

- During the AM and PM journey times increase on approach to Rugby Gyratory on the A426 Dunchurch Road. This occurs as the Dunchurch scheme begins to release traffic from this congested area, resulting in an increase in traffic travelling through the junction and northbound on the A426. Consequently, as a result of additional vehicles travelling through the network, journey times increase on this approach to the Gyratory.
- The AM period also shows an increase in journey times on the A426 SB approach to the M6 Junction 1. As described above, this is a result of the removal of significant queues at the upstream A426/A5 Gibbet Hill roundabout, and as a result of greater traffic flows on this part of the network which are no longer queueing at the Gibbet Hill junction, journey times increase.

2021 Local Plan – South West Link Road Assessment

6.26 Following the development and comparison of the network wide impacts of the 2021 Local Plan Do Nothing and 2021 Local Plan Do Something, it was necessary to ascertain whether the need for the inclusion of a South West Link Road is triggered by this assessment year.

6.27 In order to determine the requirement for the South West Link Road, the traffic flows at Dunchurch Crossroads have been compared between 2021 Reference and 2021 Local Plan scenarios. It is anticipated that a significant increase in flows in the Local Plan scenarios would indicate the need to deliver the link road, in order to alleviate pressure on the Dunchurch area although it should be noted that it is considered that the interim scheme proposed at the junction will go some way to alleviating the effects of congestion in the short term.

6.28 The AM and PM period traffic flows specifically through the Dunchurch Crossroads have been interrogated for each scenario, and presented in **Tables 27-28** and **Figures 33-34**.

6.29 The demand and modelled flows have been presented, which is intended to identify the volume of traffic which is choosing to route through the junction (demand flows) against the volume of traffic that actually travels through the junction in the modelled period (modelled flows).

6.30 The demand flows are considered to be a very useful indicator of the relative impact of the SWLR, since they indicate what the latent demand for the area may be. Junctions operating at or close to capacity will experience congestion impacts that may require mitigation. If the latent demand for these areas is high then improving the junction performance via mitigation may not necessarily improve conditions at the junction as it may draw more traffic, that otherwise was choosing alternative routes, to travel through the study area in response to the improved conditions.

6.31 The lower the modelled flows are when compared to the demands flows, the greater the level of congestion at the junction. Conversely, if modelled flows are higher than demands flows, then this indicates that the junction is performing without congestion and traffic from elsewhere on the network changes its route to travel through the junction as this now presents flowing more attractive route (most likely on the basis of time) than the original route intended to travel.

Table 27 Dunchurch Crossroads Traffic Volumes (Demand vs Modelled) AM Period (0700-1000)

	2021 Reference	2021 Local Plan DN	2021 Local Plan DS
Demand Flow	4596	4640	4644
Modelled Flow	4421	4478	4587
Difference (%)	96.18%	96.50%	98.78%

Figure 33 Dunchurch Modelled Flows AM Period (0700-1000)

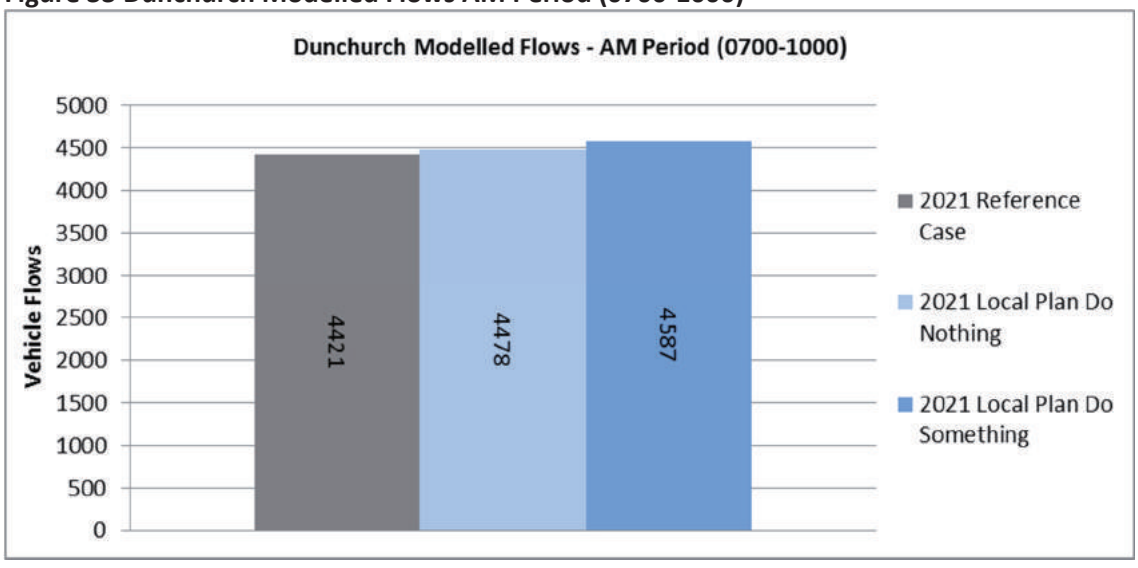
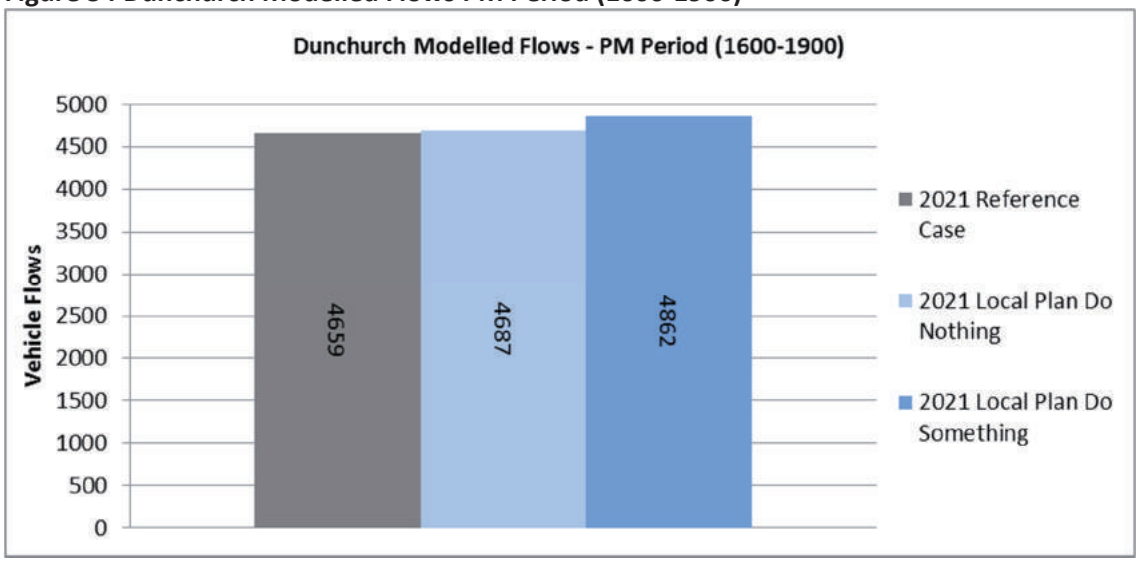


Table 28 Dunchurch Crossroads Traffic Volumes (Demand vs Modelled) PM Period (1600-1900)

	2021 Reference	2021 Local Plan DN	2021 Local Plan DS
Demand Flow	4818	4952	4990
Modelled Flow	4659	4687	4862
Difference (%)	96.70%	94.64%	97.43%

Figure 34 Dunchurch Modelled Flows PM Period (1600-1900)



6.32 The analysis of the Dunchurch Crossroads reveals that in both the AM and PM periods, the flows remain relatively consistent across all scenarios.

6.33 The demand flows through the junction remain consistent between the Local Plan Do Nothing and Local Plan Do Something scenarios. This would suggest that the inclusion of the scheme does not change the amount of traffic choosing to route through the crossroads, but does improve the amount of traffic that is able to get through, i.e. reduces congestion and delay.

6.34 This is supported by the comparison between demand and modelled flows, whereby in the Do Something scenario the difference between demand and modelled is smaller, suggesting the traffic choosing to route through the junction is more likely to be able to do so with the scheme in place.

6.35 The results suggest that the scheme delivers localised benefits without drawing traffic from elsewhere on the network through the junction; if it were drawing traffic from elsewhere on the network then this would be signified by an increase in the demand flows.

6.36 Due to the fact that, with the inclusion of the Local Plan demands in the model, the number of vehicles routing through the Dunchurch Crossroads is consistent with the 2021 Reference Case, and doesn't significantly change with the introduction of the scheme at this location, it is determined that by 2021, there is no explicit requirement for the South West Link Road to be delivered. As the 2021 Local Plan demands do not appear to worsen the performance of the junction compared to the 2021 Reference Case, the proposed scheme will have sufficient capacity, in the short term, to cater for the level of development being proposed by 2021.

2021 Assessment - Summary of Findings

6.37 The following findings have been determined as a result of the completion of the 2021 Local Plan testing.

6.38 The 2021 Local Plan Do Nothing scenario demonstrates a number of issues as being likely to occur on the network following the inclusion of the 2021 Local Plan sites. The capacity issues are most notable at the Dunchurch Crossroads and the A426/A5 Gibbet Hill roundabout.

6.39 Following the identification of the key problem areas, schemes have been included within the model to form the 2021 Local Plan Do Something model scenario. The results from this scenario have again been compared back to the Reference Case and are considered to demonstrate that the schemes enable a level of network performance to be achieved in the 2021 Do Something scenario that is comparable to, or an improvement on the 2021 Reference performance.

6.40 This stage of the assessment has also identified that the inclusion of the 2021 Local Plan demands do not trigger the need for the inclusion of the South West Link Road within the network. Therefore, at this stage, given the level of development proposed, the SWLR is not considered essential. This is entirely dependent upon the level of development being considered however and, as such, any changes to the development quantum by 2021 will trigger a need for this conclusion to be reviewed. Accordingly this stage of the work has identified that in order to achieve a level of network performance consistent with the Reference Case conditions, inclusive of development levels equal to the first 5 years of the Local Plan, the following mitigation schemes are required:

- Dunchurch Crossroads scheme - widening and signalisation
- A426/A5 (Gibbet Hill Roundabout) scheme – widening and signalisation

  Ashlawn Road/Barby Road/Onley Lane – right turn bays

7 STAGE 3 – 2026 PHASING ASSESSMENT

Overview

7.1 This stage of the assessment reviewed the network performance with the inclusion of proposed Local Plan developments equal to 10 years' delivery which comprised a 2026 scenario.

Objectives

7.2 The objectives of this stage of the assessment have been summarised as follows:

- To identify the network infrastructure improvements required to facilitate the first 10 years of development post-2016.
- To identify whether the quantum of development by 2026 triggers the requirement for the South West Link Road.

2026 Local Plan Model Overview

7.3 The delivery of sites to be assumed by 2026 was informed via the RBC Housing Trajectory, and the RBC Local Plan Publication Draft Employment Land Background Paper.

7.4 The sites included along with the quantum of development in 2026 are outlined in **Tables 29-30**:

Table 29 2026 Local Plan Scenario – Residential Development Assumptions

Site	Dwellings
Coton Park East Expansion	680
Coton House Expansion	100
Bilton Fields, Ashlawn Road (MP)	530
Homestead Farm (WCC)	270
Land South Of Dunkleys Farm	270
Land south of Montague Rd (TW)	40
Land south of Montague Rd (RE & Sworders)	260
Land W Cawston Lane (G)	70
Land South of Alwyn Road (TW)	170
Land North of Dunkleys Farm (WCC)	150
Deeley Land (dbs)	110
Land West of Cawston Lane (WCC)	110
Cawston Spinney (dbs)	325
Lodge Farm, A45	265
Land North of Coventry Road Long Lawford	100
RRM Expansion	1960
Total	**5410**

Table 30 2026 Local Plan Scenario – Employment Development Assumptions

Site	GFA (m^2)	Jobs Created
Coton Park East Employment (B2)	20,000m^2	**500**
Cawston Spinney (B8)	180,000m^2	**2250**
Total	203,000m^2	**2750**

7.5 The dwellings and jobs listed previously were converted into development specific vehicle demands for assignment within the model with accompanying adjustments to the TEMPRO database to ensure that the overall growth levels contained within the model accounted for the additional housing and employment figures. The resultant level of growth in the 2026 Local Plan scenarios has been summarised within the following **Table 31**:

Table 31 Adjusted TEMPRO Assumptions

Housing Assumptions	2026 Reference Case		2026 Local Plan	
	AM	PM	AM	PM
Committed Housing Numbers	4479		4479	
Local Plan Housing Numbers	-		5410	
Total	4479		9889	
Committed Jobs Created (inc. DIRFT III)	5014		5014	
Local Plan Jobs Created	-		2750	
Total	5014		7764	
TEMPRO	**AM**	**PM**	**AM**	**PM**
Growth Factor	1.113	1.112	1.199	1.202
Diff (%)	-	-	8.6%	9.0%

7.6 **Table 31** reveals that the houses and jobs identified for inclusion within the 2026 Local Plan model are predicted to result in an additional increase in traffic volumes of between 8% and 9% when compared to the 2026 Reference Case. This is in addition to the traffic growth already predicted to occur within the Reference Case meaning that, overall, growth within these scenarios is predicted to be close to 20% from 2016 levels, once all committed and allocated sites are included within the scenario.

Test Scenarios

7.7 Inclusion of the development sites and associated traffic growth, resulted in the following model scenarios being assessed as part of the 2026 Assessment:

- **Scenario 01: 2026 RWA Reference Case –** The Rugby Wide Area model forecast to 2026 with growth aligned to the TEMPRO predictions post-adjustment for the committed housing and employment numbers. This scenario is inclusive of committed infrastructure schemes and developments, set to be delivered by 2026 (not the mitigation schemes highlighted for inclusion in the 2021 Local Plan model).
- **Scenario 02: 2026 RWA Local Plan Do Nothing**- The previous scenario inclusive of the Local Plan housing sites and employment sites outlined by RBC comprising an additional 5,410 dwellings, along with the mitigation schemes highlighted in the 2021 Local Plan Do Something model.
- **Scenario 03: 2026 RWA Local Plan Do Something**- The 2026 previous scenario with identified mitigation schemes included in response to congestion observed within the model.

2026 Results Analysis

7.8 The assignment of the Local Plan development demands onto the model network without any additional infrastructure resulted in additional issues being identified within the scenario network. These issues were identified and, where possible, a mitigation package was derived in response. This formed the 2026 RWA Local Plan Do Something scenario. On this basis the following scenarios have been assessed:

- 2026 Reference vs the 2026 Local Plan Do Minimum
- 2026 Reference vs 2026 Local Plan Do Something

Network Wide Statistics

7.9 The network wide statistics were assessed for both the 2026 RWA Reference Case and the 2026 RWA Local Plan Do Minimum scenario. A summary of these values is presented within the following **Table 32** and **Table 33** for the AM and PM respectively.

Table 32 Network Stats 2026 Ref Case vs. 2026 Local Plan Do Minimum AM (07:00 to 10:00)

Scenario	Completed Trips (veh.)	Average Speed (mph)	Average Delay (s)
Reference	112605	32	343
Local Plan DM	122323	32	353
Diff (%)	8.6%	0.0%	2.9%

Table 33 Network Stats 2026 Ref Case vs. 2026 Local Plan Do Minimum PM (16:00 to 19:00)

Scenario	Completed Trips (veh.)	Average Speed (mph)	Average Delay (s)
Reference	119501	31	354
Local Plan DM	127170	27	418
Diff (%)	6.4%	-14.0%	18.1%

7.10 Analysis of the results presented within the previous tables reveals that the inclusion of the Local Plan developments, results in an increase in journey times of around 3% in the AM and 18% in the PM, whilst speeds on the network reduce by between 0% in the AM and 14% in the PM. These results suggest that the inclusion of the development traffic has a significant effect in the PM period, whilst the AM period demonstrates that the network is largely able to provide capacity for the additional trips.

7.11 The tables also reveal that the number of trips which complete within the model periods increases by 8.6% and 6.4% in the AM and PM periods respectively. As a result of the inclusion of the additional sites, traffic volumes within the 2026 Local Plan scenario are around 13% higher than the Reference Case. When considering the PM results in particular,

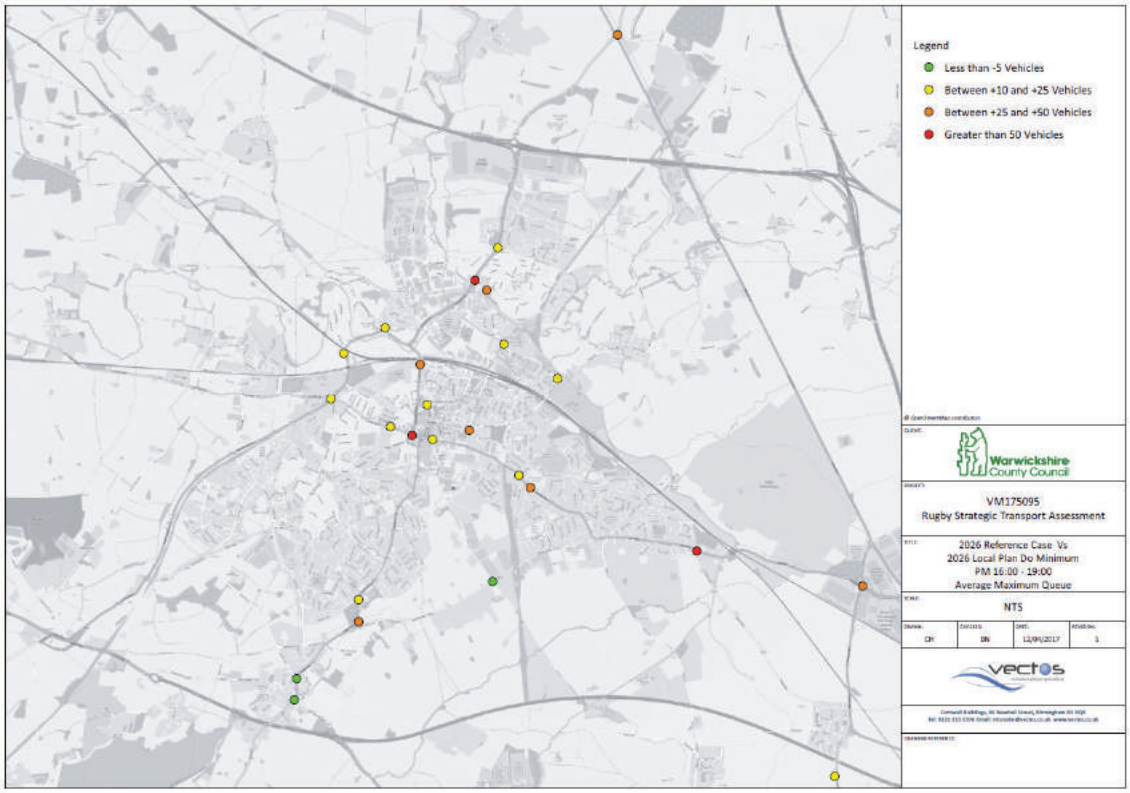
this indicates that around 7% of the additional trips assigned to the network do not complete within the model period meaning that additional mitigation will be required to minimise the effects of the development proposals on trip completions.

Maximum Queue Length Analysis

7.12 The following sets out some initial observations based on the differences in queue lengths between the Reference Case and the Do Minimum scenario. The comparisons have been illustrated for the AM and PM time periods within **Figure 35** and **Figure 36** respectively.

Figure 35 AM Period Maximum Queue Length Comparisons (Ref vs. Local Plan Do Minimum)

Figure 36 PM Period Maximum Queue Length Comparisons (Ref vs. Local Plan Do Minimum)



7.13 Analysis of the 2026 Reference vs 2026 Local Plan Do Minimum queue lengths indicates the following patterns:

- During the AM period, queue lengths increase on the corridor between Dunchurch and the Gyratory. This occurs as a result of the inclusion of a large quantum of development in the South West area of the model which generates a significant number of trips between the development area to the South West of Rugby and the town centre, and M6.
- Despite this the AM shows only minor increases in queue lengths with no instances of large or very large increases
- The PM results demonstrate that the network experiences problems in some areas with large or very large increases in queuing at junctions along Leicester Road, at the Gyratory and on Dunchurch Road.
- There is also a noticeable impact on queue lengths at junctions along A428 Hillmorton Road and A428 Crick Road

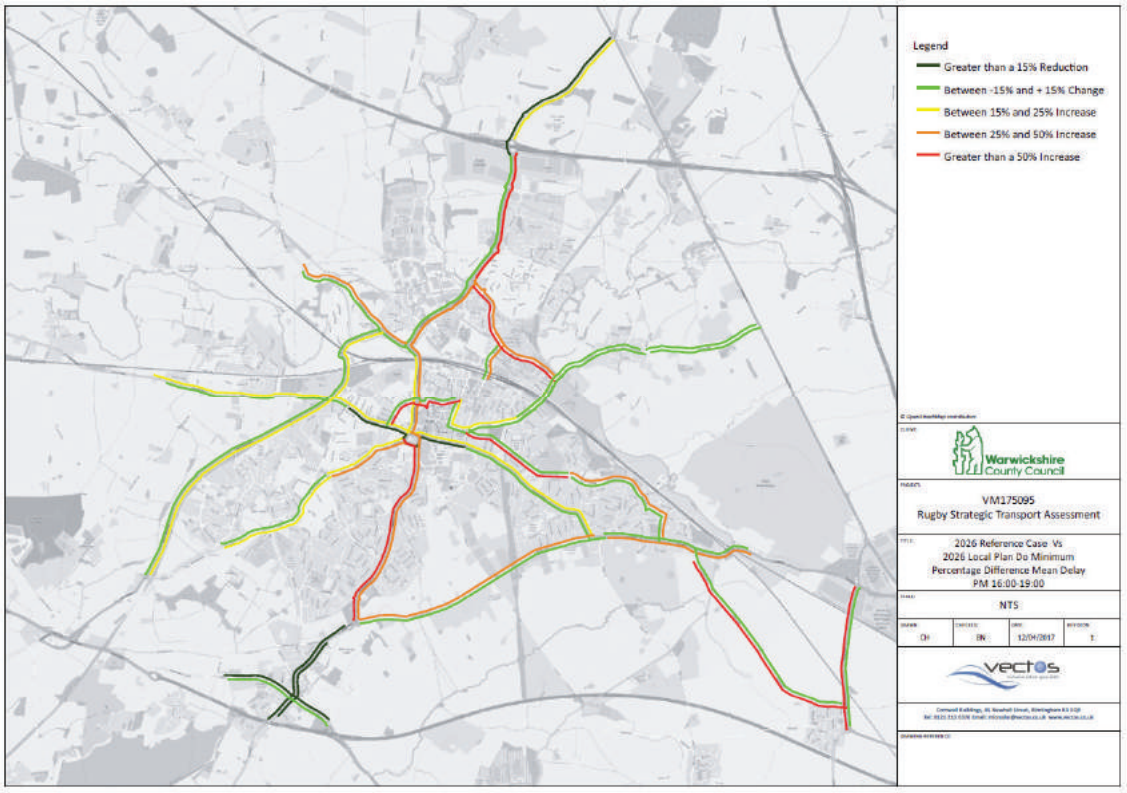
- The queue results also suggest that the inclusion of the Dunchurch signal scheme does not worsen queuing conditions at the junction when Local Plan trips are added, when compared to 2026 Reference conditions.
- The results also show minor increases in queues at a number of junctions in and around the town centre.

Journey Time Analysis

7.14 The following sets out the journey time impacts comparing the time it takes to traverse a series of pre-defined routes within the model network within the 2026 Reference and 2026 Local Plan Do Minimum scenarios. The comparisons between journey times have been illustrated for the AM and PM time periods within **Figure 37** and **Figure 38** respectively.

Figure 37 - AM Period Journey Time Comparisons (Ref vs. Local Plan Do Minimum)

Figure 38 - PM Period Journey Time Comparisons (Ref vs. Local Plan Do Minimum)



7.15 Analysis of the 2026 Reference vs 2026 Local Plan Do Minimum journey time comparisons indicates the following patterns:

- During the AM journey times show significant increases on the A426 NB approach to the A426/Ashlawn Road roundabout and on the A426 NB approach to M6 Junction 1. Aside from these two locations journey times remain consistent or slightly increase when compared with the 2026 Reference Case.
- During the PM period journey times increases are much more prevalent, with considerable increase in journey times on the A426 Dunchurch Road approach to the Gyratory, on the A426 SB between M6 Junction 1 and the A426/Brownsover Road roundabout, and on routes within the town centre
- The PM also shows considerable increases in journey times on the A5 NB approach to the A428/A5 roundabout, Kilsby Lane/Rugby Road, Butlers Leap and on the A426 SB approach to the gyratory.
- The journey time analysis reveals that the impacts appear more prominent in the PM than the AM period.

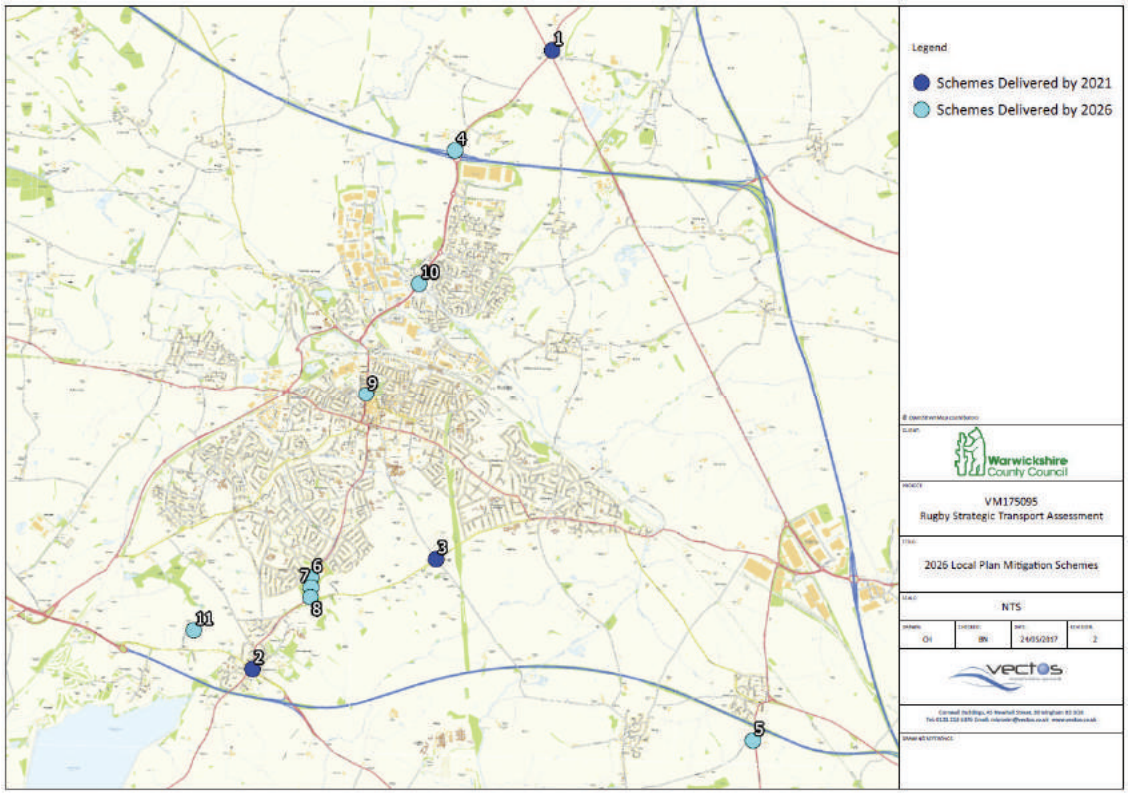
2026 Local Plan Do Something - Mitigation Strategy

7.16 Following the network statistics, queuing and journey time analysis presented previously, along with observations of the model operation, it was determined that mitigation would be required at a number of locations across the model network.

7.17 In line with the mitigation strategy outlined in Section 5 of this report, and in addition to the three schemes delivered in the 2021 Do Something scenario, the schemes identified for the following locations were included to form the 2026 Local Plan Do Something model scenario:

4. **M6 Junction 1** - Revised lane allocations and widening northern entry and exit (potential for signals to be included at a later date).
5. **Daventry Road/The Ridgeway -** Right turn bay for movement into The Ridgeway
6. **A426/Sainsbury Roundabout** - Widening of roundabout circulatory and entry/exits
7. **A426 (between Sainsbury Roundabout and Ashlawn Road)** - dualling SB to A426/Ashlawn roundabout
8. **A426/Ashlawn Road** - Widening on northern entry and exit arms and revised lane allocations
9. **A426/Evereux Way** - Widening on A426 northern exit to two lanes
10. **A426/Brownsover Roundabout** - Widening and signalisation
11. **South West Link Road** - Delivery of the Homestead Link only

Figure 39 – 2026 Local Plan Mitigation Strategy



7.18 As detailed previously, these schemes were included within the 2026 Local Plan Do Minimum scenario to create a 2026 Local Plan Do Something model. The 2026 Do Something model was then again compared to the 2026 Reference scenario, and the results from these comparisons are presented in the following section.

7.19 At this stage it was also determined that the South West Link Road should be included although constrained to the Homestead Link (A426 – B4429) only. This was in response to issues observed within the model, along with the impact at Dunchurch Crossroads, which is also summarised within the following results analysis. Further detail pertaining to the testing of the link road is also provided towards the end of this Chapter as well as within Chapter 8 of this Report.

Network Wide Statistics

7.20 The network wide statistics were assessed for both the 2026 RWA Reference Case and 2026 RWA Local Plan Do Something scenarios. A summary of these values is presented within **Table 34** and **Table 35** for the AM and PM respectively.

Table 34 Network Stats 2026 Ref Case vs. 2026 Local Plan Do Something AM (07:00 to 10:00)

Scenario	Completed Trips (veh.)	Average Speed (mph)	Average Delay (s)
Reference	112605	32	343
Local Plan DM	*122323*	*32*	*353*
Local Plan DS	122514	33	340
Diff (%)	8.8%	3.1%	-0.9%

Table 35 Network Stats 2026 Ref Case vs. 2026 Local Plan Do Something PM (16:00 to 19:00)

Scenario	Completed Trips (veh.)	Average Speed (mph)	Average Delay (s)
Reference	119501	31	354
Local Plan DN	*127170*	*27*	*418*
Local Plan DS	127679	29	387
Diff (%)	6.8%	-6.4%	9.3%

7.21 Analysis of the results presented within the previous tables reveals that the inclusion mitigation schemes in the Local Plan scenario, results in journey times savings of around 1% in the AM and an increase in journey times of around 9% in the PM, (compared to an increase of 18% in the Do Minimum scenario). Similarly, when compared to the 2026 Reference Case, speeds on the network improve by 3% in the AM and reduce by 6% in the PM, when compared to the 2026 Reference Case.

7.22 The tables also reveal that the number of trips which complete within the model periods increases to 8.8% and 6.8% in the AM and PM periods respectively (up from 8.6% and 6.4% in the Do Minimum scenario for the AM and PM respectively) suggesting that the mitigation strategy is improving the network capacity for the additional traffic on the network.

Maximum Queue Length Analysis

7.23 The following sets out observations based on the differences in queue lengths between the Reference Case and the Do Something scenarios. The comparisons have been illustrated for the AM and PM time periods within **Figure 40** and **Figure 41** respectively.

Figure 40 AM Period Maximum Queue Length Comparisons (Ref vs. Local Plan Do Something)

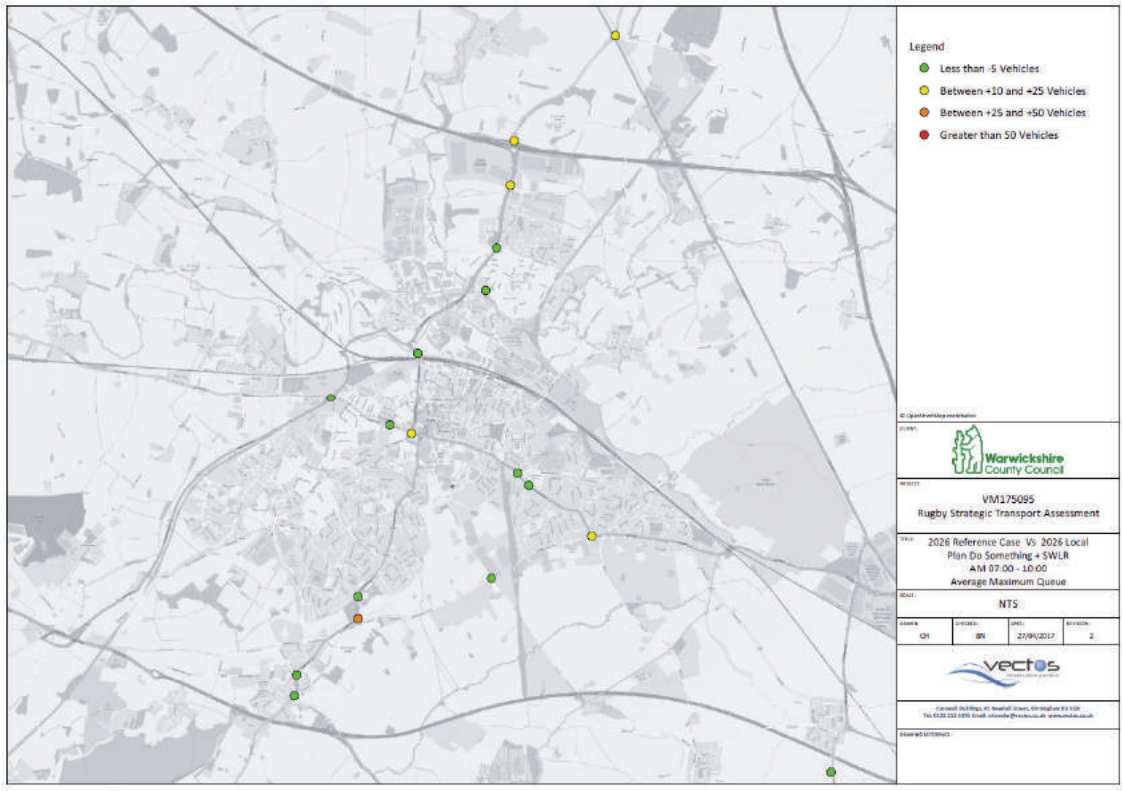


Figure 41 PM Period Maximum Queue Length Comparisons (Ref vs. Local Plan Do Something)

7.24 Analysis of the 2026 Reference vs 2026 Local Plan Do Something queue lengths indicates the following patterns:

- During the AM queue lengths show no significant worsening across the model network. Queue lengths increase at the A426/Ashlawn Road junction and minor increases are also modelled on the A426 corridor on or on approach to the M6 Junction1.
- During the PM queue lengths also show one instance of large increases, which occurs at the Gyratory. There are also instances of large increases in queue lengths on the A426 Leicester Road, and at the junction of the A428/A5.
- Despite these queue increases, there are a significant number of instances of reductions in queues across the model network, notably on routes between the south of the model and Rugby town centre, and along Hillmorton Road.

Journey Time Analysis

7.25 The following sets out the identified journey time impacts when comparing the time it takes, between the 2026 Reference and 2026 Local Plan Do Something scenarios, to traverse a series of pre-defined routes within the model network. The comparisons between journey times have been illustrated for the AM and PM time periods within **Figure 42** and **Figure 43** respectively.

Figure 42 - AM Period Journey Time Comparisons (Ref vs. Local Plan Do Something)

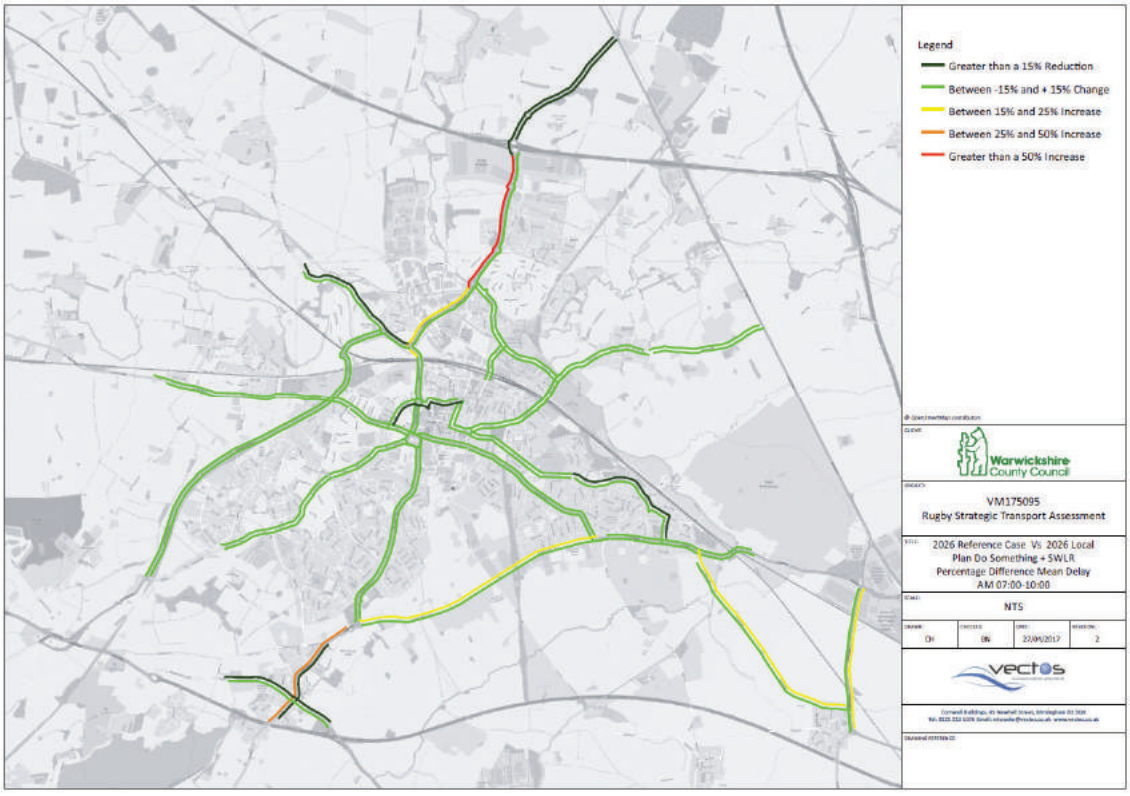
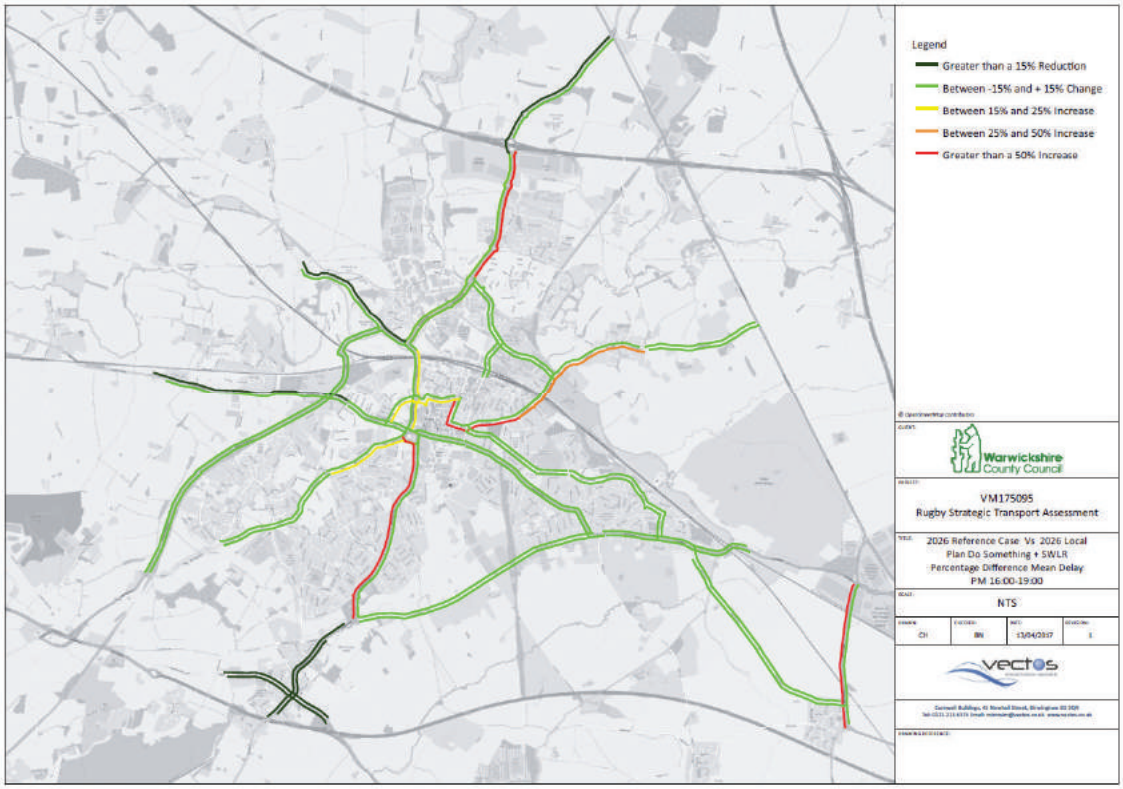


Figure 43 - PM Period Journey Time Comparisons (Ref vs. Local Plan Do Something)



7.26 Analysis of the 2026 Reference vs 2026 Local Plan Do Something journey time comparisons indicates the following patterns:

- During the AM and journey times show a notable increase on the A426 NB between the A426/Brownsover Road roundabout and M6 Junction 1. This is a result of the volume of development traffic using this section of the network to reach the M6. To the south of this section of the network the development traffic dissipates over a number of routes and as such the impact is not as apparent.
- Journey times also increase on the A426 NB approach to the A426/Ashlawn Road roundabout, which is a result of the revised junction configuration as part of the delivery of the South West Link Road, which results in the A426 giving way to the Link Road. This impact is considered beneficial as it will serve as a deterrent to traffic that wishes to travel through Dunchurch village.
- During the PM there are a number of instances of large increases in journey times, noticeably on the A426 Dunchurch Road approach to the Gyratory, and on the A426 SB between M6 Junction 1 and the A426/Brownsover Road roundabout. Journey times also increase on the A5 NB and on the Clifton Road approach to the

Clifton Road/Whitehall Road roundabout, which appears to become a constraint during this period.

2026 Local Plan – South West Link Road Assessment

7.27 Following the comparison of the network wide impacts identified within the 2026 Local Plan Do Minimum and 2026 Local Plan Do Something scenarios, it was necessary to ascertain whether the need for the inclusion of a South West Link Road is triggered by the 2026 development quantum. The observations from the model operation suggested that the link road would be necessary in a 2026 Local Plan scenario, and this is further supported by an analysis of the impact at the Dunchurch Crossroads.

7.28 In order to outline the requirement for the South West Link Road, the traffic flows at Dunchurch Crossroads have been compared between 2026 Reference and 2026 Local Plan scenarios. It is anticipated that a significant increase in flows in the Local Plan scenarios would indicate the need to deliver the link road, in order to alleviate pressure on the Dunchurch area.

7.29 The AM and PM period traffic flows specifically through the Dunchurch Crossroads have been interrogated for each scenario, and presented in **Tables 36-37** and **Figure 44** and **Figure 45**.

7.30 As in Section 6, the demand and modelled flows have been presented, which is intended to identify the volume of traffic which is choosing to route through the junction (demand flows) against the volume of traffic that actually travels through the junction in the modelled period (modelled flows).

Table 36 Dunchurch Crossroads Traffic Volumes (Demand vs Modelled) AM Period (0700-1000)

	2026 Reference	2026 Local Plan DM	2026 Local Plan DS
Demand Flow	4632	5256	3682
Modelled Flow	4535	5092	3662
Difference (%)	97.91%	96.89%	99.45%

Figure 44 Dunchurch Modelled Flows AM Period (0700-1000)

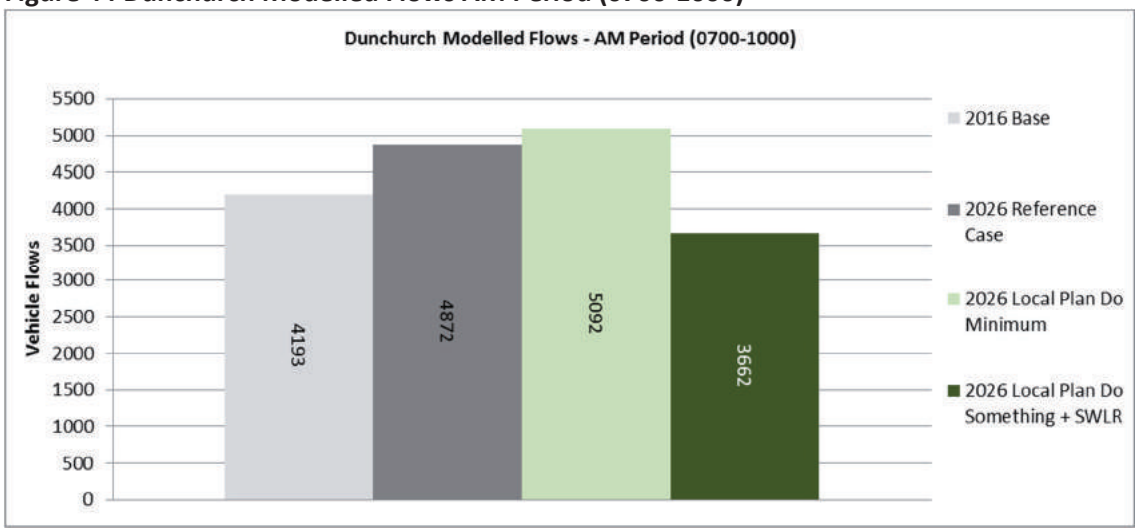
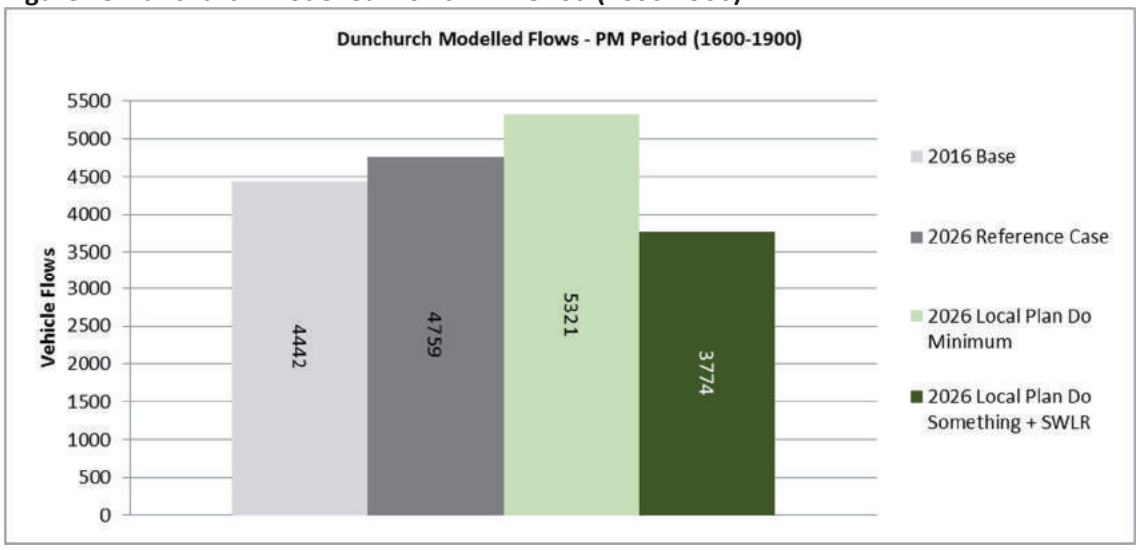


Table 37 Dunchurch Crossroads Traffic Volumes (Demand vs Modelled) PM Period (1600-1900)

	2026 Reference	2026 Local Plan DN	2026 Local Plan DS
Demand Flow	5038	5698	3754
Modelled Flow	4759	5321	3774
Difference (%)	94.45%	93.38%	100.52%

Figure 45 Dunchurch Modelled Flows PM Period (1600-1900)



7.31 The analysis of the traffic flows at the Dunchurch Crossroads reveals that in both the AM and PM periods, the flows through the junction increase significantly when the Local Plan development traffic is included (Local Plan Do Minimum scenario). There is a 200 vehicle increase in the AM and 600 vehicle increase in the PM period respectively. In the Local Plan Do Minimum scenario, the difference between demands and modelled flows also increases compared to the Reference Case, suggesting that, despite the inclusion of the Dunchurch

signal scheme, congestion is starting to form at the junction in the Local Plan Do Minimum scenario. This is most noticeable in the PM period when the difference between modelled and demand flows is 93.38%, compared to 94.45% in the Reference Case.

7.32 Following the inclusion of the South West Link Road (Homestead Link) within the 2026 model (Local Plan Do Something), flows through the junction reduce significantly, with a reduction of around 1000 achieved within the AM and 1200 vehicles within the PM compared to the Reference Case. The difference between modelled and demand flows is also much smaller, suggesting that congestion is greatly reduced at the junction as traffic volumes travelling through the junction are in line with the overall demand (i.e. traffic is not seeking alternative routes to avoid the junction).

7.33 The results suggest that the inclusion of the South West Link Road (Homestead Link) draws a significant number of trips away from the Dunchurch Crossroads, and that the traffic flows through the junction are significantly less than both the 2026 Reference and 2016 conditions.

2026 Assessment - Summary of Findings

7.34 The following section sets out the findings determined as a result of the 2026 Local Plan testing.

7.35 Analysis of the 2026 Local Plan Do Minimum scenario reveals that the network experiences a number of issues following the inclusion of the 2026 Local Plan sites. Impacts are most notable during the PM period, which demonstrates significant worsening in network wide delay and queuing conditions

7.36 Following the identification of a number of key, problematic, areas within the model network, seven schemes plus the delivery of the South West Link Road in the form of the Homestead Link only, were included within the model to create a 2026 Local Plan Do Something model.

7.37 The results arising from the assessment of the 2026 Do Something model indicate that the inclusion of the schemes enables an acceptable level of network performance to be achieved in the 2026 Do Something scenario. During the AM the network operational levels are broadly comparable to or better than the Reference Conditions. Within the PM period the schemes elicit a significant improvement compared to the 2026 Do Minimum scenario, but residual delay will continue to occur in the network by this stage, despite the inclusion of a

number of mitigations schemes. By 2026 it is beginning to emerge that the Rugby Gyratory and the roundabouts at Clifton Road/Whitehall Road, and Whitehall Road/Hillmorton Road are constraining the network.

7.38 This stage of the assessment has also identified that, in order to alleviate queues and significant increase in traffic flows at Dunchurch Crossroads predicted to occur once the Local Plan developments up to 2026 are included, the delivery of the South West Link Road (Homestead Link) is essential. The SWLR also improves network performance in the entire southern section of the model network once delivered.

7.39 The delivery of the SWLR (Homestead Link only) in a 2026 Local Plan scenario results in traffic flows through Dunchurch Crossroads being lower than 2016 Baseline conditions, despite the quantum of development included by this year. Thus it is considered that the delivery of this infrastructure, at this point, is both essential and likely to lead to an overall improvement in conditions, over those improvements delivered by the junction enhancements provided in 2021 and the 2016 network conditions.

7.40 This assessment has outlined that the delivery of the Homestead Link section of the SWLR is essential by 2026. This has been informed via the 5 year phasing assessments (2021, 2026), which in turn is linked to the number of dwellings and jobs delivered in the South-West Rugby Area. It has been determined that the quantum of development included within the South-West area of the model in the 2026 Local Plan scenario triggers the need for the link road, however, should the number of dwellings delivered before 2026 increase, it is likely that the link will be required before this point.

Phasing Assessment Summary

7.41 The phasing assessment undertaken in this section of the report has outlined the mitigation required at 5 and 10 year intervals of the Local Plan delivery in order to achieve a level of network performance that is considered satisfactory.

7.42 Despite the delivery of identified schemes, this section has highlighted that by 2026 residual delay will begin to occur within the model network, most notably during the PM period on approach to the Rugby Gyratory.

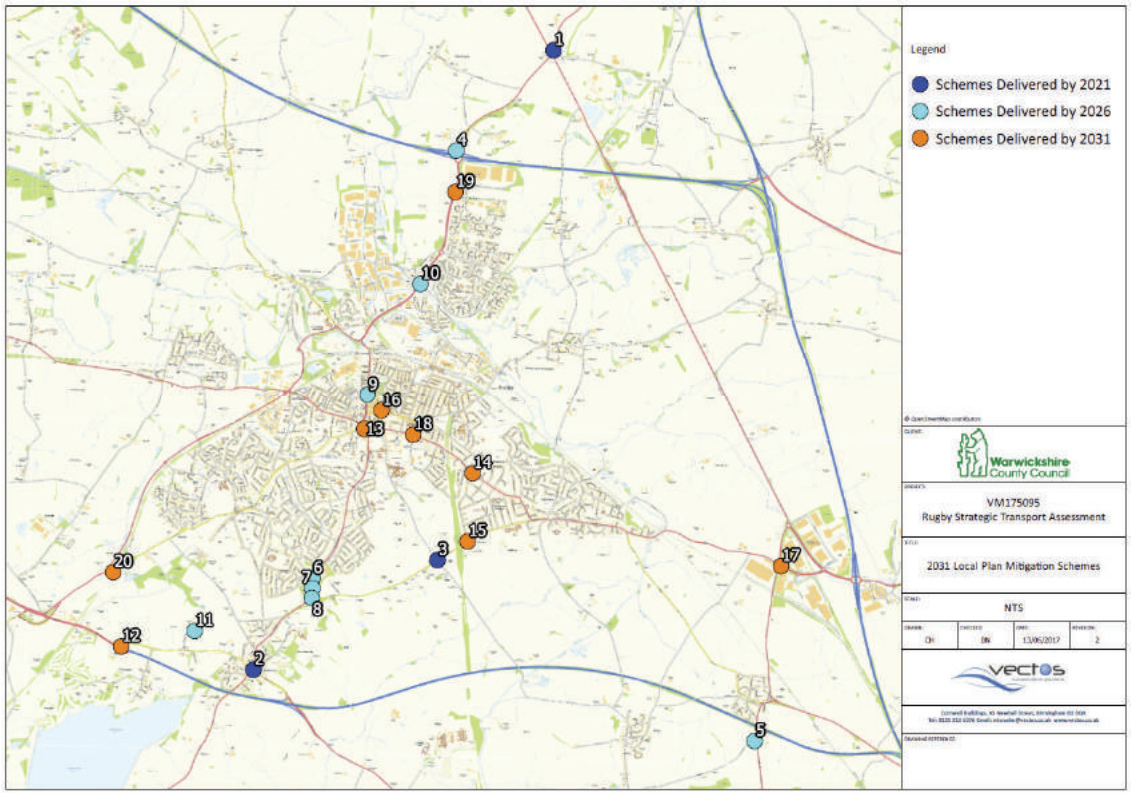
7.43 The mitigation schemes which have been identified, along with the associated phasing for 2021, 2026, and the remaining schemes (as identified in Section 6 of the report) to be delivered by 2031 are summarised in **Table 38** and **Figure 46,** along with **Appendix B**:

7.44 These schemes identified are considered to be essential for delivery alongside Local Plan growth. At this stage no further work has been undertaken to identify desirable schemes that can deliver benefits beyond those outlined in the essential schemes in this assessment.

Table 38 Local Plan Mitigation Scheme and Phasing

Scheme Locations	Details	Delivery
1 - Gibbet Hill Roundabout	Signal optimisation and widening	2021
2 - Dunchurch Crossroads	Widening and signal timing optimisation	2021
3 - Ashlawn Road/Barby Road	Right turn bays	2021
4 - M6 Junction 1	Revised lane allocations and widening	2026
5 -Daventry Road/The Ridgeway	Right turn bay for movement into The Ridgeway	2026
6/7 - A426/Sainsburys rbt	Widening of circulatory and entry/exits and dualling SB to A426/Ashlawn roundabout	2026
8 - A426/Ashlawn Road	Widening on northern entry and exit arms	2026
9 - A426/Evereux Way	Widening on A426 northern exit to two lanes	2026
10 - A426/Brownsover rbt	Widening and signalisation	2026
11 – SWLR	Homestead Link	2026
12 – A45/M45 rbt	Partial signalisation of rbt on A45/M45 entry arms	2031
13 – Rugby Gyratory	Alteration to existing signal configuration	2031
14 - A428/Percival Road	Right turn lane bay on A428	2031
15 – Ashlawn Rd/Percival Rd	Right turn lane bay on Ashlawn Road	2031
16 -B5414 (North St/Church St)	Downgrade route to minor	2031
17 - A5/A428 roundabout	Part-signalisation of the roundabout	2031
18- Hillmorton Rd/Whitehall Rd rbt	Widening and revised lane allocations	2031
19 – A426/Central Park Dr rbt	Widening and partial signalisation	2031
20 – Full SWLR	Homestead Link and A45/A4071 Link	2031

Figure 46 Local Plan Mitigation Schemes and Phasing



7.45 Following the identification of schemes outlined as essential for delivery alongside Local Plan growth, consideration has been given to the likely development trigger for each scheme, as a guide to inform infrastructure delivery planning, which is summarised in Table 39.

7.46 Although it is not possible to identify individual development sites as a trigger for schemes at this stage of the assessment, general development areas have been outlined, which in turn can be assumed to trigger the need for mitigation in that area. The development areas, and sites within each area are identified are as follows:

- North – (Coton Park East, Coton House)
- South-West – (residential and employment land in South-West Rugby area)
- New Settlement – (Lodge Farm)

7.47 Where possible, each scheme identified has been assigned to a development area. Where the scheme identified does not lie particularly near a development site, the requirement for the scheme is considered to be triggered by the cumulative impact of all development traffic.

Table 39 Identified Schemes and Development Trigger

Scheme Locations	Delivery	Likely Development Area Trigger
1 - Gibbet Hill Roundabout	2021	North
2 - Dunchurch Crossroads	2021	South-West + Lodge Farm
3 - Ashlawn Road/Barby Road	2021	South-West
4 - M6 Junction 1	2026	North
5 -Daventry Road/The Ridgeway	2026	Lodge Farm
6/7 - A426/Sainsburys rbt	2026	South-West + Lodge Farm
8 - A426/Ashlawn Road	2026	South-West + Lodge Farm
9 - A426/Evereux Way	2026	Cumulative
10 - A426/Brownsover rbt	2026	North
11 – SWLR (Homestead Link)	2026	South-West + Lodge Farm
12 – A45/M45/B4429 rbt	2031	South-West + Lodge Farm
13 – Rugby Gyratory	2031	Cumulative
14 - A428/Percival Road	2031	Cumulative
15 – Ashlawn Rd/Percival Rd	2031	Cumulative
16 -B5414 (North St/Church St)	2031	Cumulative
17 - A5/A428 roundabout	2031	Lodge Farm
18- Hillmorton Rd/Whitehall Rd rbt	2031	Cumulative
19 – A426/Central Park Dr rbt	2031	North
20 – SWLR (full extent of link road)	2031	South-West + Lodge Farm

8 STAGE 4 ASSESSMENT – SOUTH WEST LINK ROAD

Overview

8.1 The findings of the Stage 1, 2 and 3 of the assessment have identified that as a result of delivering housing and employment land in the South West Rugby area, a link road is required to relieve congestion pressures on the Dunchurch Crossroads and surrounding area.

8.2 The phasing assessment undertaken in Stage 3 has identified that by 2026, the Homestead Link part of the South West Link Road (SWLR) is required as a minimum.

8.3 It is understood that the options for link road alignments and junction forms have yet to be determined, and following discussions between VM, WCC and RBC, six options have been identified for assessment. The purpose of these options is to establish which elements of the SWLR are likely to be considered essential versus the elements which can be considered to be desirable and, additionally, what the effect will be if different sections of the link are designed to different speed limits.

8.4 This stage of the assessment presents the finding of this testing, with a specific focus on the impact at Dunchurch Crossroads and the Rugby Gyratory as these are two of the most congested parts of the network and it is considered, particularly in the Dunchurch area, that elements which limit or alleviate impacts in these areas should be prioritised.

Objectives

8.5 The objective of this stage of the assessment is to determine the significance of delivering the SWLR based on different alignment and configuration options and, in particular, identify which elements of the SWLR are considered essential and which are considered desirable.

SWLR Testing Methodology

8.6 A series of tests have been undertaken within the 2031 Local Plan model to identify the impact of delivering each of the different elements of the SWLR. The year 2031 was used for the testing on the basis that the local plan developments are included in full at this point. This is considered a robust methodology, as in reality it is unlikely that all Local Plan site allocations will be fully built out by 2031, however by including the full build out of sites in this assessment it enabled an effective infrastructure strategy to be identified.

8.7 Each of the six identified link road options have been included alongside the full Local Plan development allocation and associated infrastructure identified earlier within this Report.

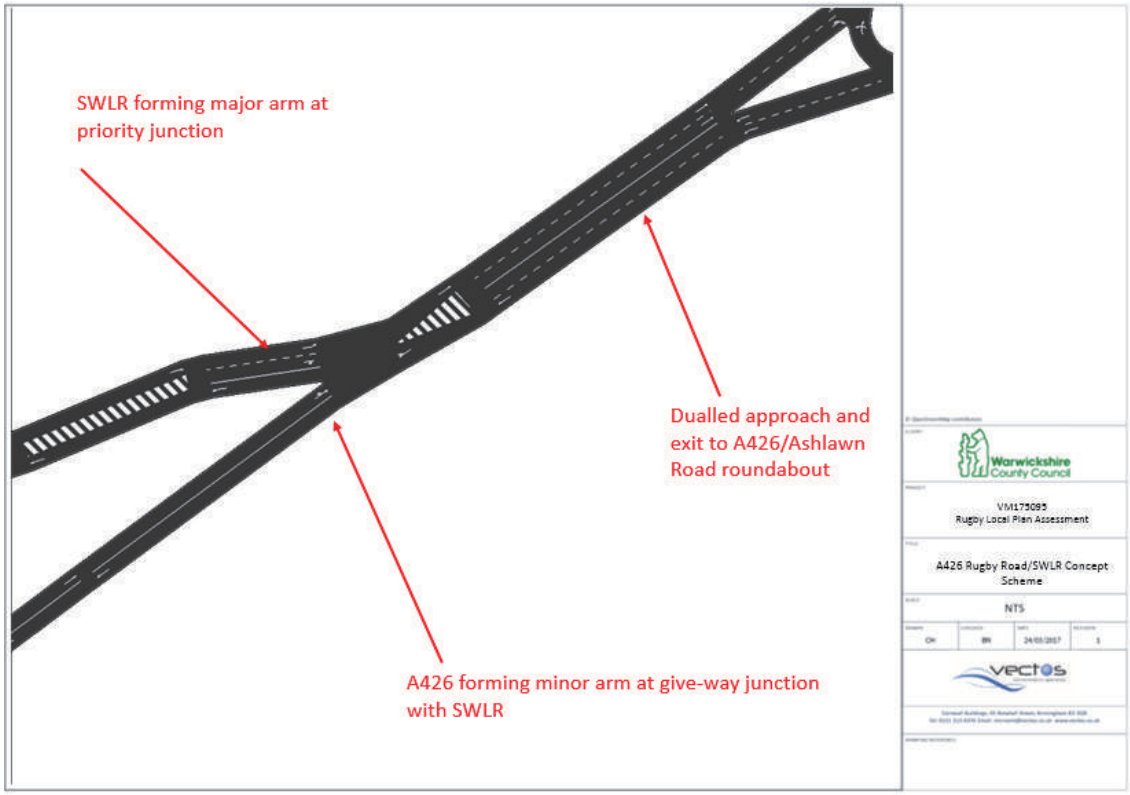
8.8 In order to determine the impact of each link road configuration, the traffic flows at the Dunchurch Crossroads and Rugby Gyratory have been compared, as a means of comparing the impact on two of the most congested parts of the network, particularly as one of the major benefits associated with the allocation of development in the southwest is the ability to deliver betterment in the Dunchurch area. .

South West Link Road Alignment Options

8.9 As detailed above, a number of options for the SWLR alignment have been considered in this assessment. These options were confirmed following discussions between VM, WCC and RBC.

8.10 In order to encourage the reassignment of traffic away from the Dunchurch area, each of the options include the delivery of the Homestead Link as a 40mph major route. Each option also includes the downgrading of the A426 through Dunchurch to a 'minor' route, and where the A426 Dunchurch Road meets the SWLR a priority junction is provided, with the A426 giving way to the SWLR, as demonstrated in **Figure 47**.

Figure 47 SWLR/A426 Concept Junction Arrangement



8.11 Each of these alignment options have been summarised in the following figures:

Figure 48 SWLR Option 1

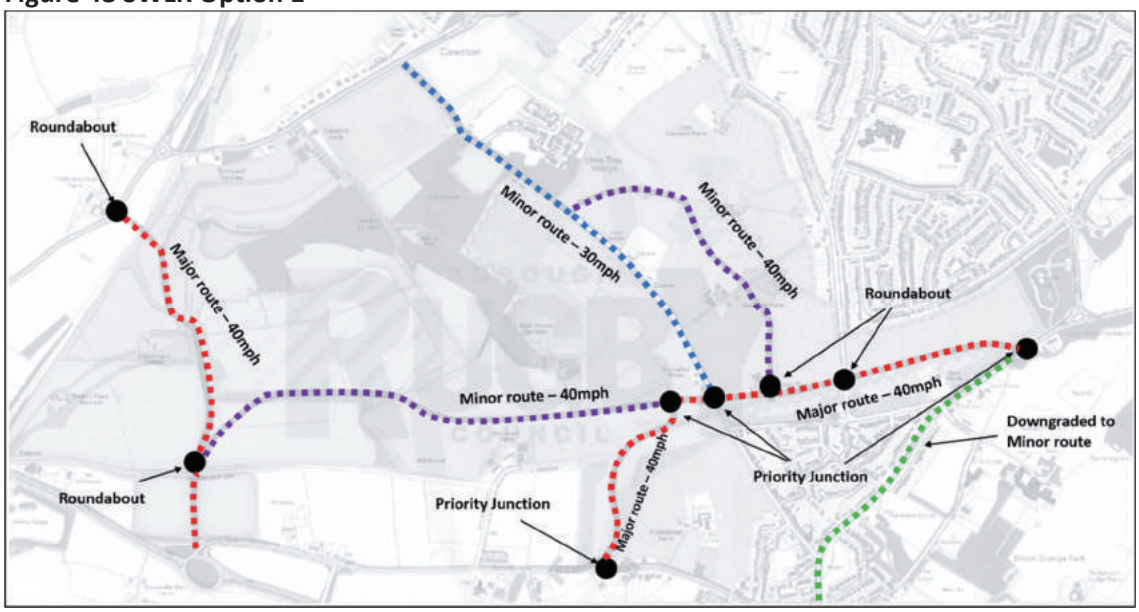
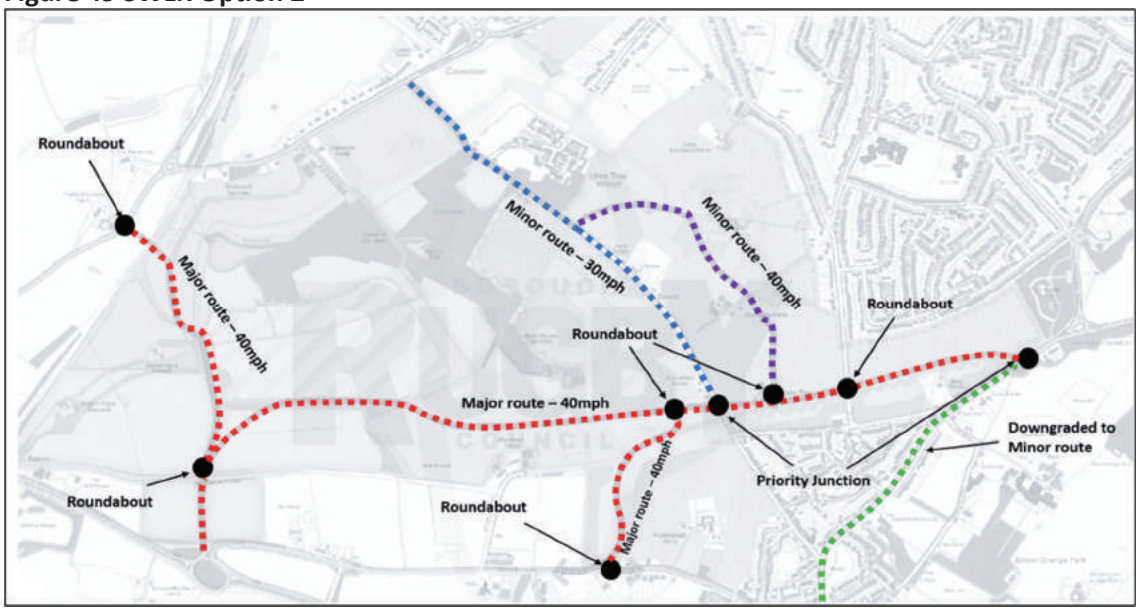
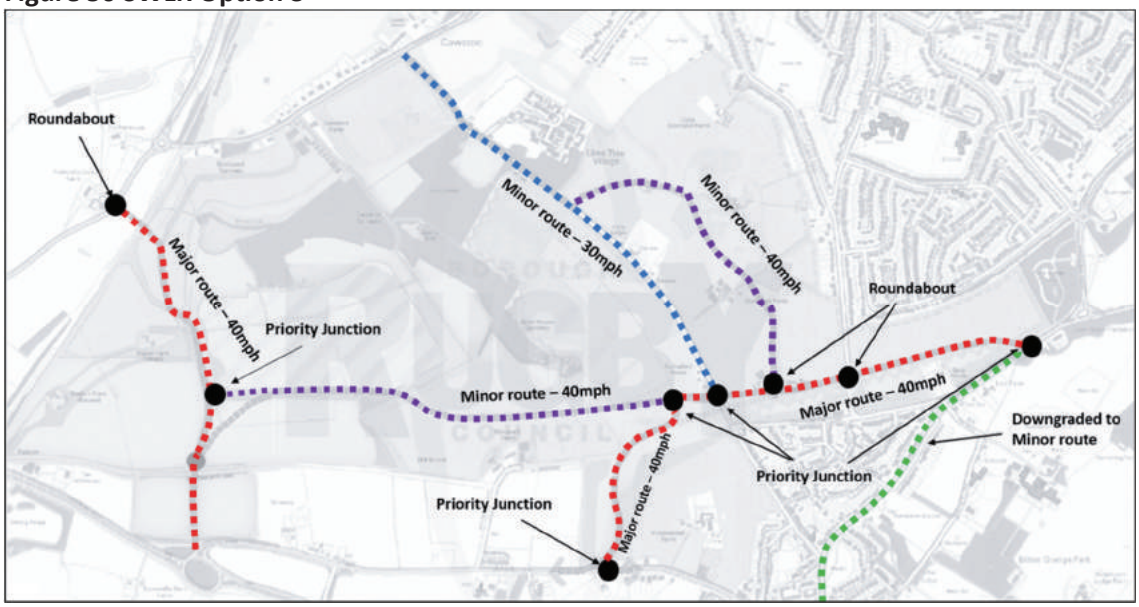


Figure 49 SWLR Option 2



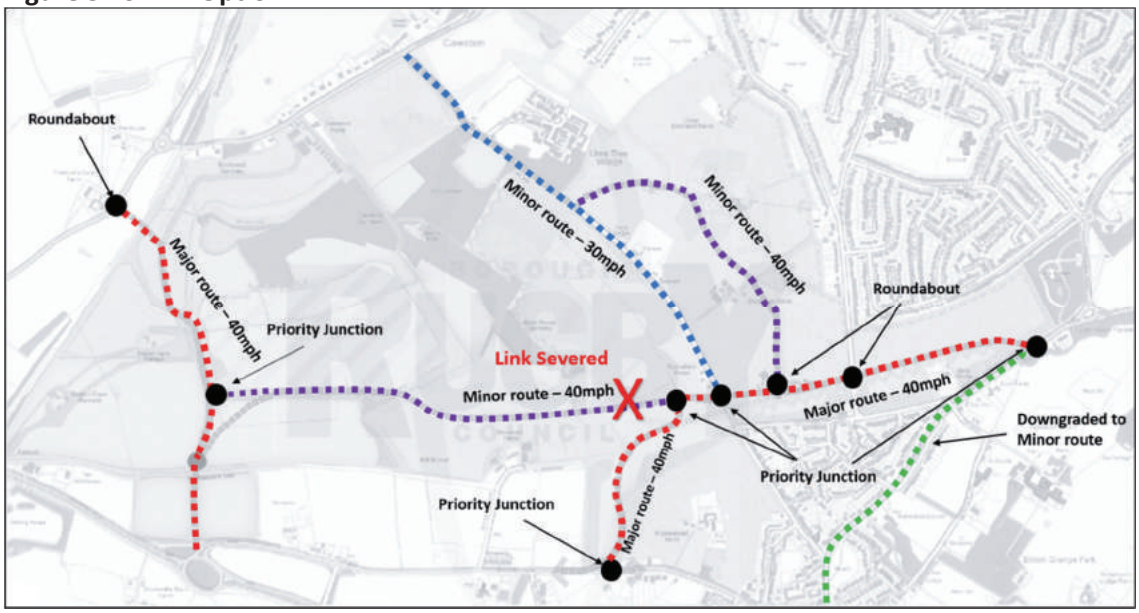
- East to west route upgraded to 'major' route through a signposting strategy and improved design standards which will, when combined, increase the attractiveness of the overall route.

Figure 50 SWLR Option 3



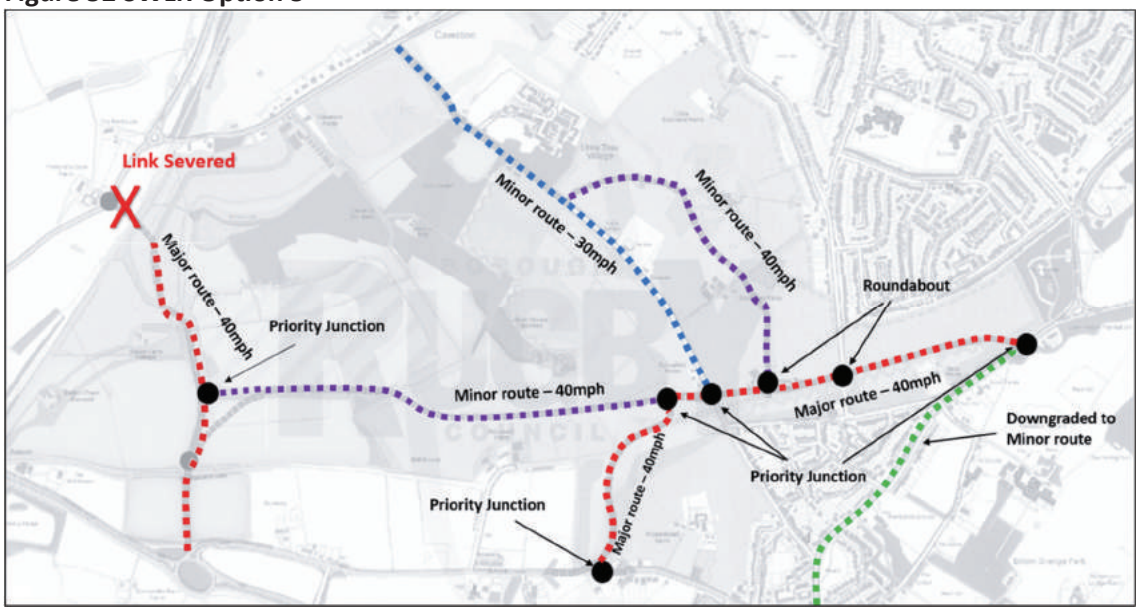
- East to west route downgraded to 'minor' route
- Junction of employment link and east to west link changed from roundabout to priority junction

Figure 51 SWLR Option 4



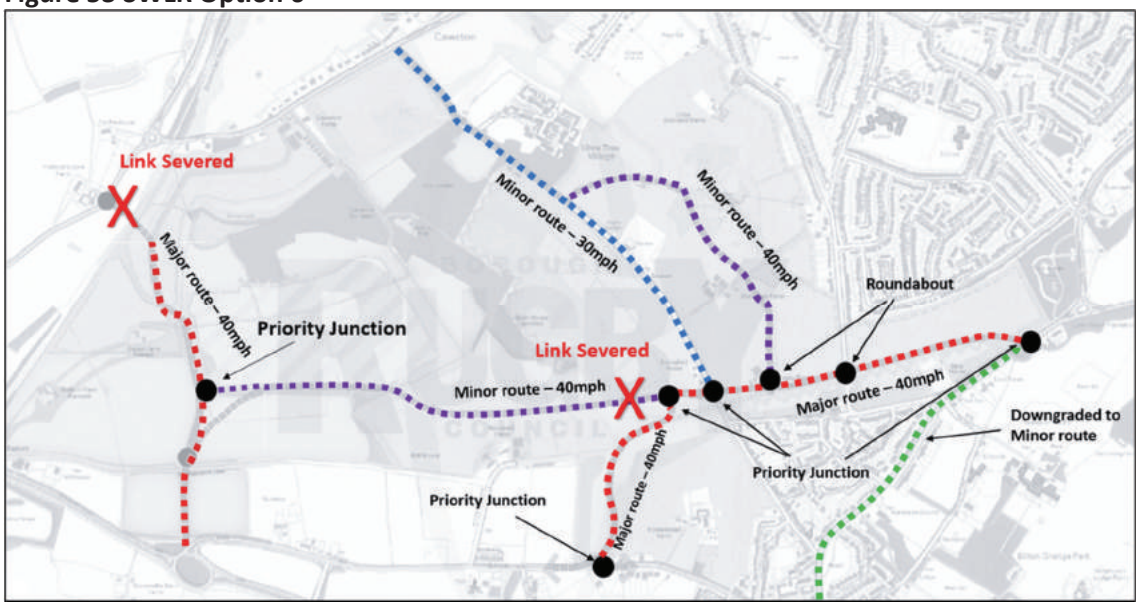
- East to west route downgraded to 'minor' route and severed at eastern end (effectively serves as site access only, and potential to become sustainable transport corridor)
- Junction of employment link and east to west link changed from roundabout to priority junction

Figure 52 SWLR Option 5



- East to west route downgraded to 'minor' route
- Junction of employment link and east to west link changed from roundabout to priority junction
- North to south route severed before roundabout with A4071

Figure 53 SWLR Option 6



- East to west route downgraded to 'minor' route and severed at eastern end (effectively serves as site access only)
- Junction of employment link and east to west link changed from roundabout to priority junction
- North to south route severed before roundabout with A4071

Results Analysis

8.12 As outlined previously, the performance of each of the SWLR options has been assessed in terms of the impact on Dunchurch Crossroads and Rugby Gyratory.

8.13 The following presents the difference in demands and modelled flows at these two locations between each link road option considered. The flows at each location in the 2016 Baseline and 2031 Reference scenarios are also provided as a means of comparison.

Dunchurch Crossroads Analysis

8.14 The Dunchurch Crossroads area represents one of the most constrained areas of the network. It is acknowledged that there is limited capacity in this area to provide additional improvements and there are also issues with air quality that make it highly undesirable for any traffic volume increase in this area.

8.15 The testing undertaken in this assessment has highlighted the need for an interim scheme at this location from the 2021 Local Plan scenario onwards. This has highlighted that the scheme delivers improvements in queueing levels, when compared to the 2016 Base, suggesting that for the first 10 years of Local Plan delivery the junction may operate at levels similar, or an improvement on current conditions, yet despite this, any opportunity to divert traffic away from this area is considered highly desirable. **Figures 54 and 55** present the queueing impacts at Dunchurch Crossroads in the 2021 and 2026 Local Plan scenarios (with Dunchurch scheme included) against current conditions.

Figure 54 Dunchurch Crossroads Queueing Conditions (AM Peak Hour)

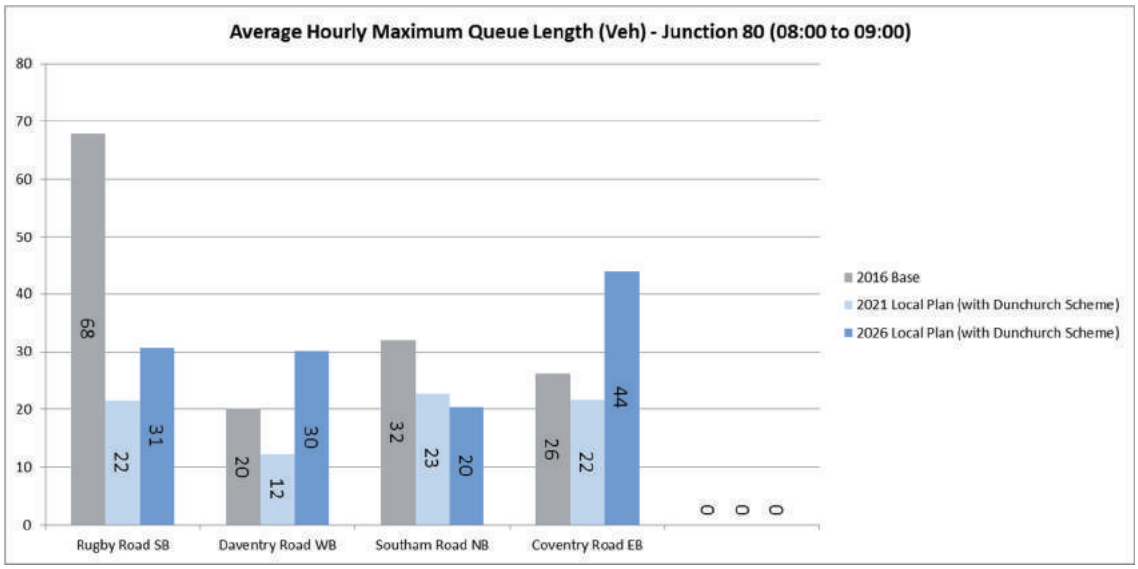
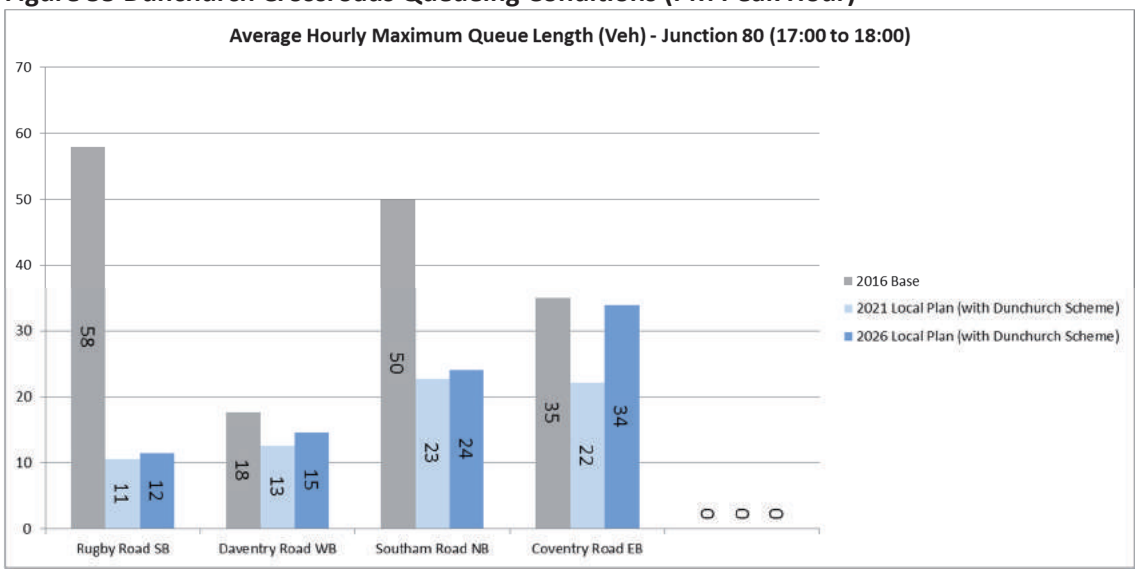


Figure 55 Dunchurch Crossroads Queueing Conditions (PM Peak Hour)



8.16 In current conditions Dunchurch Crossroads comes under a lot of pressure as the A426 is one of the main arterial routes into and out of Rugby. The current linkages between the B4642 and A426 are poor standard and unattractive to drivers which makes avoiding the crossroads very difficult. Therefore, many drivers wishing to travel to/from the south of Rugby towards Coventry, south Warwickshire and even the M45 EB, will travel via the Dunchurch Crossroads.

8.17 Furthermore, this junction is in close proximity to the SW development area and, therefore, represents the area of the network most likely to benefit from the various alignment options for the SWLR being delivered.

8.18 The traffic flows at the Dunchurch Crossroads across the entire AM and PM periods are provided for each option tested below:

Table 40 Dunchurch Crossroads Traffic Volumes (AM Period 0700-1000)

	2016 Base	2031 Ref	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Demand	4196	4904	4090	4160	4070	4084	4308	4354
Modelled	4193	4629	4188	4167	4143	4156	4268	4303
Difference	99.93%	94.39%	102.40%	100.17%	101.80%	101.76%	99.08%	98.84%

Figure 56 Dunchurch Crossroads Modelled Traffic Volumes (AM Period 0700-1000)

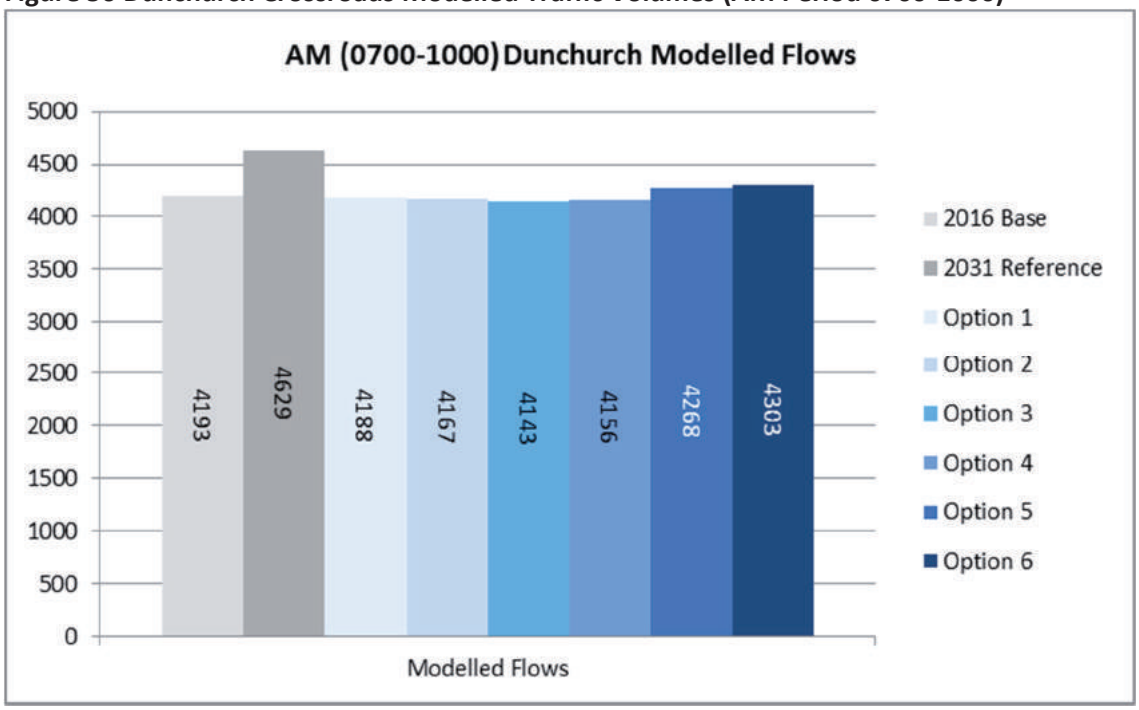
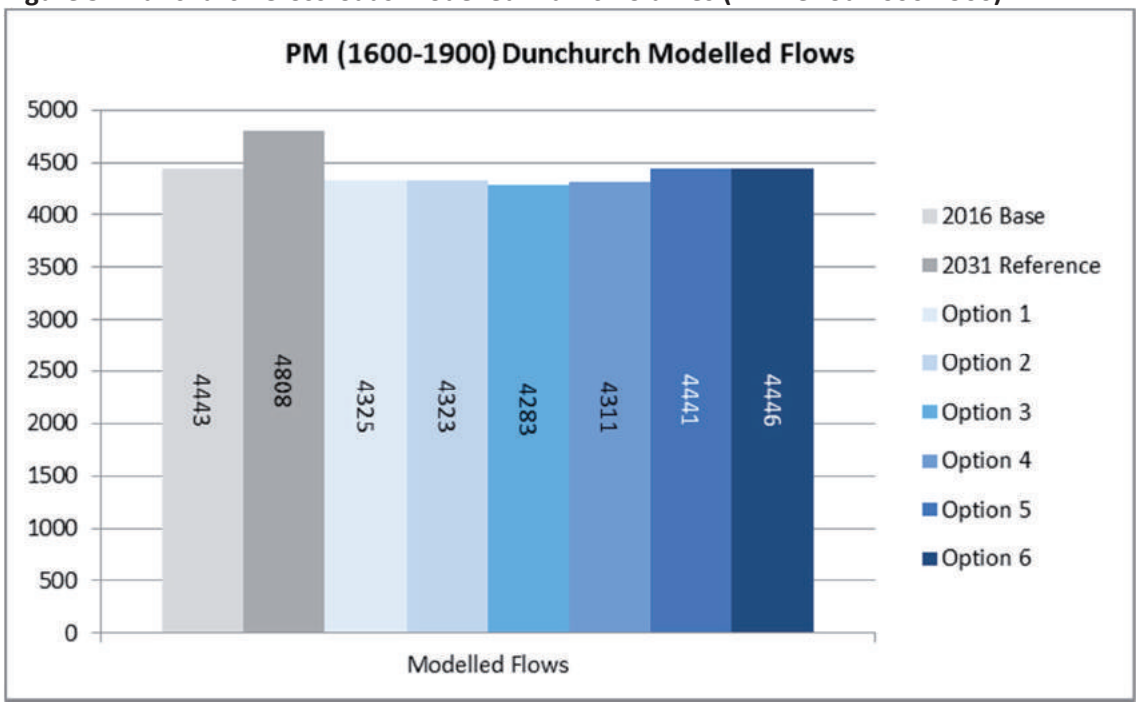


Table 41 Dunchurch Crossroads Traffic Volumes (PM Period 1600-1900)

	2016 Base	2031 Ref	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Demand	4558	5156	4452	4450	4320	4358	4444	4510
Modelled	4443	4808	4325	4323	4283	4311	4441	4446
Difference	97.47%	93.26%	97.15%	97.15%	99.14%	98.92%	99.94%	98.57%

Figure 57 Dunchurch Crossroads Modelled Traffic Volumes (PM Period 1600-1900)



8.19 The results presented above reveal the following:

- The AM and PM results show a similar pattern in terms of the volume of traffic travelling through the crossroads. In each of the SWLR options tested, the flows through the crossroads reduce compared to 2031 Reference levels and are similar to 2016 Baseline levels.
- Options 1-4 show very similar magnitudes of traffic flows through the junction. In each of these scenarios the flows are lower than 2016 Baseline flows in both the AM and PM. The difference between modelled and demands flows in these scenarios also suggest that the junction operates with spare capacity.
- Options 5 and 6 are the worst performing options, with an increase in traffic flows through the junction when compared to Option 1-4. The flows through the crossroads in these two scenarios are slightly higher than 2016 Baseline levels.
- Options 1 and 2 show slightly higher demand flows through the Dunchurch Crossroads when compared to Option 3 and 4. This is noticeable in the PM period which shows around 100 vehicles less at Dunchurch in Options 3 and 4 when compared to Options 1 and 2. Further analysis of the results for Options 1 and 2 along with a review of the model operation has revealed that some congestion begins to occur at the roundabout junction to the western end of the east-west link where this link meets the employment access link. Once this junction has been changed to a priority junction in Options 3 and 4 these congestion issues reduce, and thus this route becomes more attractive than in Options 1 and 2, resulting in less traffic through Dunchurch

8.20 On the basis of the analysis of the Dunchurch Crossroads flows, the results suggest that Options 1-4 have a similar magnitude of impact on the junction, each of which delivers a reduction in flows when compared to 2016 Baseline levels. Option 3 is the best performing in terms of the impact on Dunchurch, whilst Option 4 has a very similar magnitude of impact, with less infrastructure required for delivery.

Rugby Gyratory Analysis

8.21 The Rugby Gyratory is located in the centre of Rugby and, depending upon the link alignments, traffic may access the gyratory directly via the A428 and B4642 as both links lead into the gyratory and in some options are connected via the SWLR.

8.22 Additional access into the gyratory is provided indirectly via improving access to the A4071 which provides a route into Rugby town centre and the gyratory via Lawford Road.

8.23 Stage 1 and Stage 3 of this assessment have highlighted that the Rugby Gyratory is predicted to becoming heavily congested with the delivery of Local Plan development sites, particularly during the PM period by 2026.

8.24 The traffic flows at the Gyratory across the entire AM and PM periods are provided for each option tested below:

Table 42 Rugby Gyratory Traffic Volumes (AM Period 0700-1000)

	2016 Base	2031 Ref	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Demand	8044	9016	12032	12150	11862	11906	13054	12836
Modelled	7888	8589	10985	11147	11020	11059	11290	11188
Difference	98.07%	95.26%	91.30%	91.74%	92.90%	92.89%	86.48%	87.16%

Figure 58 Rugby Gyratory Modelled Traffic Volumes (AM Period 0700-1000)

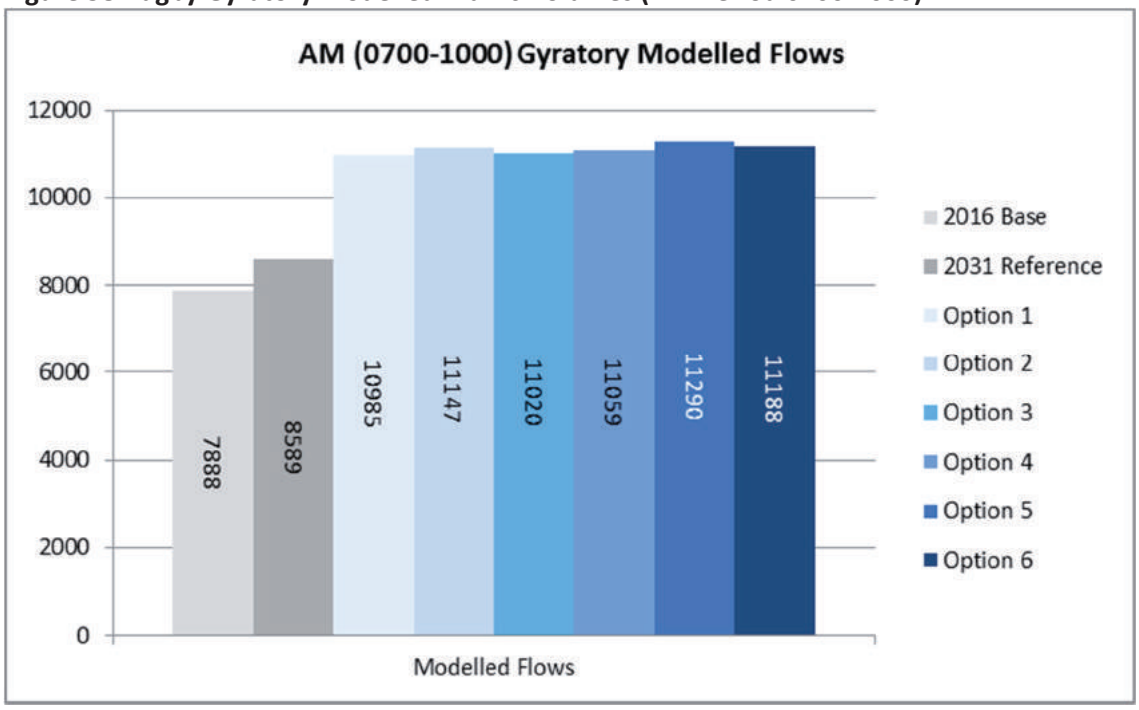
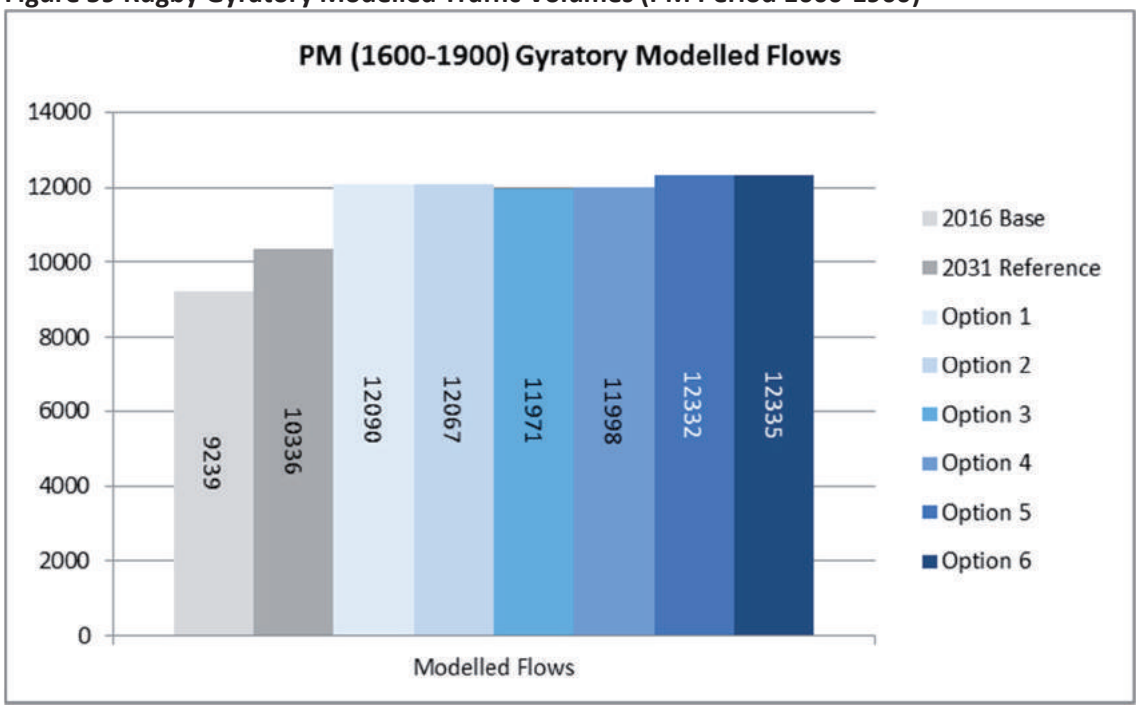


Table 43 Rugby Gyratory Traffic Volumes (PM Period 1600-1900)

	2016 Base	2031 Ref	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Demand	9420	10748	14368	14298	14146	14148	15382	15008
Modelled	9239	10336	12090	12067	11971	11998	12332	12335
Difference	98.08%	96.17%	84.15%	84.40%	84.62%	84.80%	80.17%	82.19%

Figure 59 Rugby Gyratory Modelled Traffic Volumes (PM Period 1600-1900)



8.25 The results presented above reveal the following:

- As identified in Stage 1 of the assessment, traffic flows, and accordingly delay at the Rugby Gyratory increase significantly with the addition of Local Plan traffic in both the AM and PM scenario when compared to 2016 Baseline and 2031 Reference Case conditions. This is reflected in **Table 42 and 43**, which demonstrate the additional traffic travelling throughout the Gyratory in all Local Plan options tested. The difference between demand and modelled flows for each option tested also suggests that congestion is significant at the junction, particularly during the PM.
- The results do however suggest that Options 1-4 all demonstrate a slight reduction in flows through the Gyratory when compared to Option 5 and 6. Options 1-4 also show a closer match between modelled and demand when compared with Options 5 and 6, suggesting that these options are less congested.

- Options 5 and 6 sever the assumed link between the A45 and the A4071 at the southern extent of the South West development area. The results for the Gyratory suggest that removing this link adds some pressure on to the gyratory. The demand flows for these two scenarios suggest over 1000 additional vehicles will choose to route through the Gyratory (upon reviewing the demands flows) when compared to Options 1-4.
- Of the Options 1-4 there is little difference between the flows, however, Options 3 and 4 show around 150 fewer vehicles through the Gyratory when comparing demand flows against Option 1 and 2. This suggests that the priority junction arrangement on the east to west link on the SWLR delivers more of a benefit for the Gyratory, compared to the roundabout arrangement at this location.

8.26 On the basis that Option 5 and 6 represent noticeable worsening of the flows and congestion at the Gyratory, it is recommended that these options are not considered further, and that the link between the A45 and A4071 is required to alleviate some pressure on the Gyratory.

South West Link Road Analysis Summary

8.27 The previous analysis has compared traffic flows at two of the most congested parts of the model network alongside a number of different configurations for the SWLR. The SWLR is required to enable the growth in housing and employment identified within the area to come forward with a reduced impact on the existing transport infrastructure network and, specifically, to alleviate congestion in the Dunchurch area.

8.28 The analysis has focused on the changes in traffic flows, both demand and actual, at the Dunchurch Crossroads and Rugby Gyratory.

8.29 The demand flows are considered to be a very useful indicator of the relative performance of each SWLR Option, since they indicate what the latent demand for the area may be. Junctions operating at or close to capacity will experience congestion impacts that may require mitigation. If the latent demand for these areas is high then improving the junction performance via mitigation may not necessarily improve conditions at the junction as it may draw more traffic, that otherwise was choosing alternative routes, to travel through the study area in response to the improved conditions.

8.30 Based on the assessment it is clear that the Options 5 and 6 perform worst overall as they return the highest traffic volumes at both Dunchurch Crossroads and the Rugby Gyratory of all the options tested. Neither of these option alignments contains a link connecting the A4071 and the A426 and therefore this element is considered essential.

8.31 The results also demonstrate that linking the A4071 and A426, by providing a direct link between the A426 and the M45/A45 that bypasses Dunchurch (included in Option 1-4) is essential to deliver significant traffic relief to the Dunchurch area of the model. Furthermore the delivery of a priority junction on the east-west link results in a greater benefit when compared to the roundabout option.

South West Link Road Analysis Conclusions

8.32 The results have outlined that there is very little difference in the model performance of Options 1-4 which all show significant improvements in traffic conditions at Dunchurch Crossroads, and minimise the worsening of conditions at the Rugby gyratory. Options 3 and 4 return the lowest traffic volumes around the Dunchurch Crossroads area which is considered a priority for the area.

8.33 Although Options 5 and 6 do show an improvement in traffic flows at Dunchurch Crossroads, compared to 2031 Reference conditions, the improvements are not as significant as those demonstrated by Options 1-4, and the impact of these two scenarios at the Gyratory are noticeably worse than those presented for Options 1-4, (approx. 1200 vehicles higher across the AM and similar volumes in the PM when considering demand flows).

8.34 Dunchurch Crossroads benefits significantly from the additional north/south capacity that is provided by the link between the A426 and the B4429 meaning that locally, if there is a desire to deliver growth in the area with minimum impacts on Dunchurch Crossroads both the link between the A426 and B4429 across Alwyn Road and the upgraded connection between the A426 and A4071 are essential.

8.35 Delivery of an additional link between the A45/M45 and the A4071 is also considered important as it has been proven to deliver relief to both the Dunchurch Crossroads and the Rugby Gyratory (see the impacts of Options 1-4 compared to Options 5 and 6). Given the limited opportunities to mitigate these areas directly all schemes which are likely to provide relief through the diversion of traffic flows are considered essential and a high priority.

8.36 On the basis of this analysis Option 3 represents the best performing option, and it therefore considered desirable for delivery.

8.37 Option 4 however presents one of the best performing alignments in terms of the impact on the Dunchurch Crossroads and at the Gyratory, along requiring the least amount of infrastructure. Accordingly this is option is considered the minimum SWLR infrastructure requiring delivery.

9 STAGE 5 ASSESSMENT – SOUTH WEST LINK ROAD SENSITIVITY TEST

Overview

9.1 The findings of the Stage 4 of this assessment have identified the impact on the most congested parts of the model network of the various alignment options for the SWLR. The assessment has identified that Option 3 is the best performing of the options tested, although Option 4 returns a similar magnitude of benefits, with less infrastructure required.

9.2 Following the identification of the optimum alignment, and discussions between VM, WCC and RBC, it was agreed that some further sensitivity testing would be undertaken. This would provide an overview of the impact on the network of some of the more detailed design features of the SWLR.

9.3 On the basis that Option 3 returned the most favourable results in terms of the reduction in flows across the network, it was determined that all sensitivity tests would be undertaken in a variation of this alignment.

SWLR Testing Methodology

9.4 A series of tests have been undertaken within the 2031 Local Plan + SWLR Option 3 model to identify the impact of delivering each of the different elements of the SWLR.

9.5 Three variations of the Option 3 alignment have been identified for this sensitivity testing, and have been included alongside the full Local Plan development allocation and associated infrastructure identified earlier within this Report.

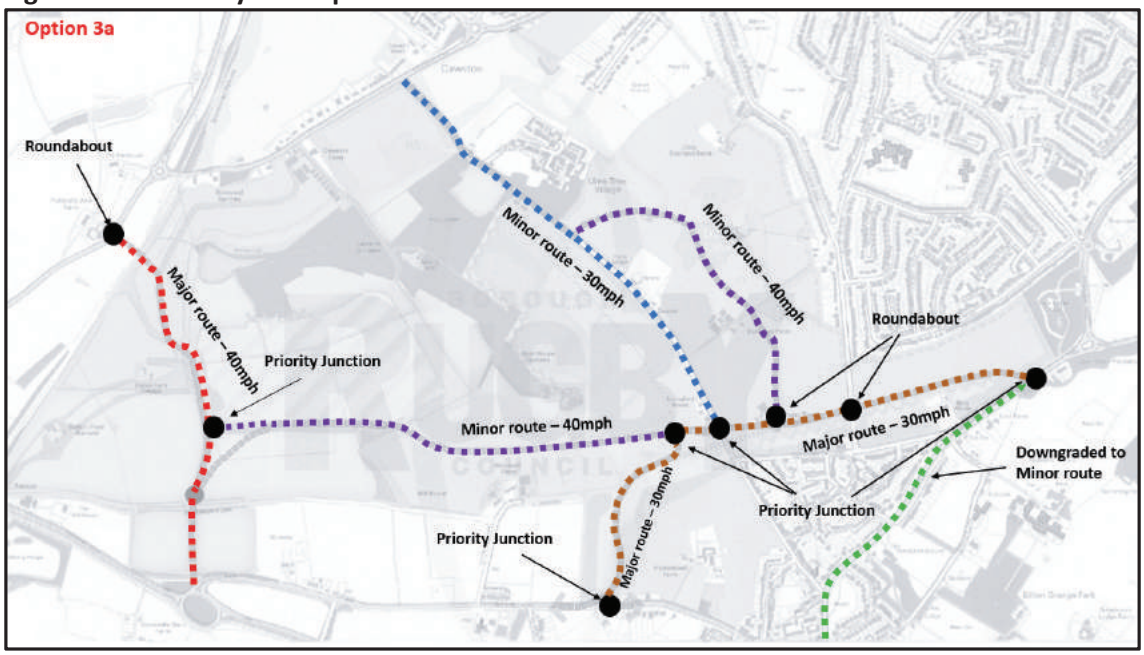
9.6 As per Stage 4 of the assessment, in order to determine the impact of each sensitivity test, the traffic flows at the Dunchurch Crossroads and Rugby Gyratory have been reviewed, as a means of comparing the impact on two of the most congested parts of the network.

Sensitivity Test Options

9.7 As detailed above, three variations to the Option 3 SWLR alignment have been considered in this assessment. These options were confirmed following discussions between VM, WCC and RBC.

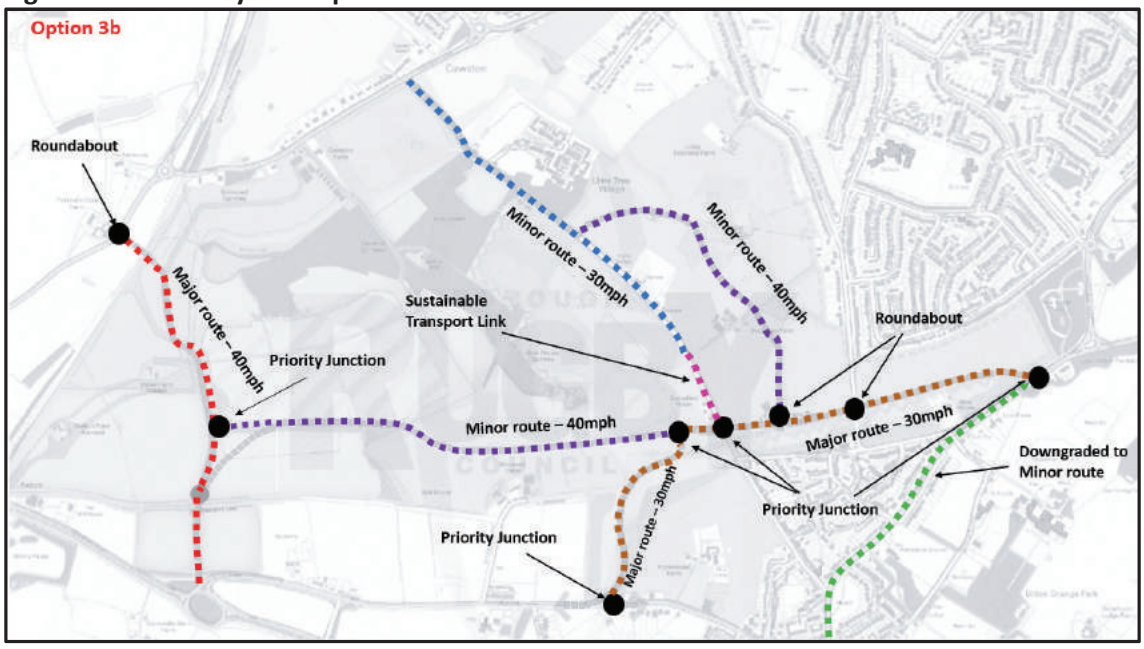
9.8 Each of these options have been summarised in the following figures:

Figure 60 Sensitivity Test Option 3a



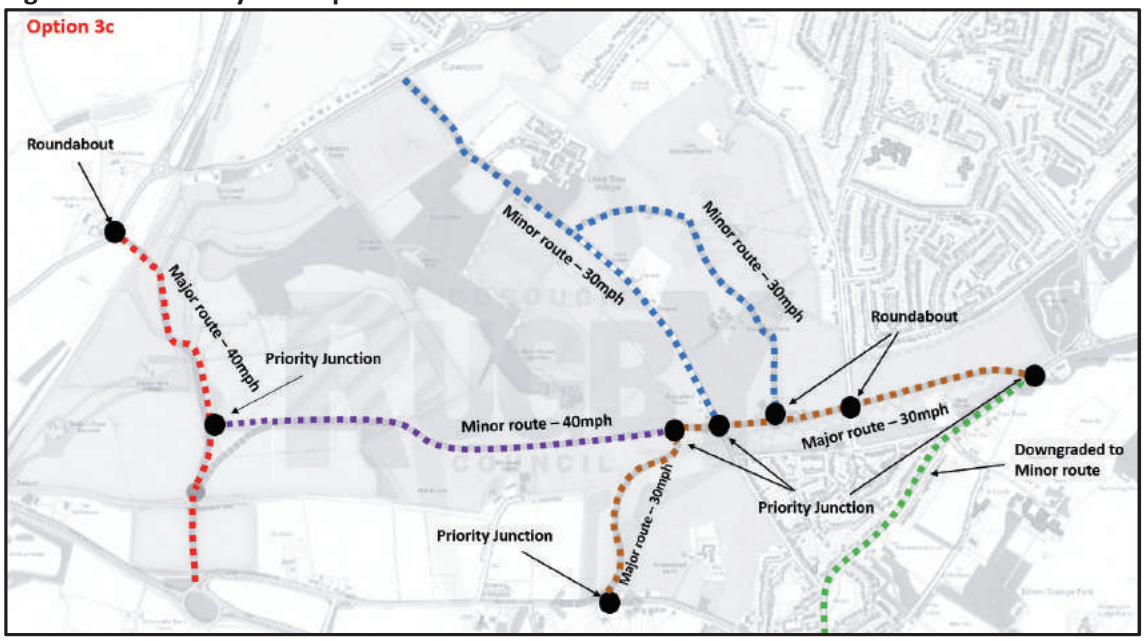
- SWLR Option 3 + downgrading of Homestead Link from 40mph to 30mph

Figure 61 Sensitivity Test Option 3b



- SWLR Option 3 + downgrading of Homestead Link from 40mph to 30mph + introduction of Sustainable Transport Link (bus only) on southern section of Cawston Lane

Figure 62 Sensitivity Test Option 3c



- SWLR Option 3 + downgrading of Homestead Link from 40mph to 30mph + downgrading of secondary link between the SWLR and the Coventry Road from 40mph to 30mph

Results Analysis

9.9 As outlined previously, the performance of each of the Sensitivity Test options has been assessed in terms of the impact on Dunchurch Crossroads and Rugby Gyratory.

9.10 The following presents the difference in demands and modelled flows at these two locations between Option 3 along with each of the Sensitivity Test options considered. The flows at each location in the 2016 Baseline and 2031 Reference scenarios are also provided as a means of comparison.

Dunchurch Crossroads Analysis

9.11 The traffic flows at the Dunchurch Crossroads across the entire AM and PM periods are provided for each option tested below:

Table 44 Dunchurch Crossroads Traffic Volumes (AM Period 0700-1000)

	2016 Base	2031 Ref	Option 3	Option 3a	Option 3b	Option 3c
Demand	4196	4904	4070	4230	4184	4174
Modelled	4193	4629	4143	4182	4164	4202
Difference	99.93%	94.39%	101.80%	98.86%	99.51%	100.67%

Figure 63 Dunchurch Crossroads Modelled Traffic Volumes (AM Period 0700-1000)

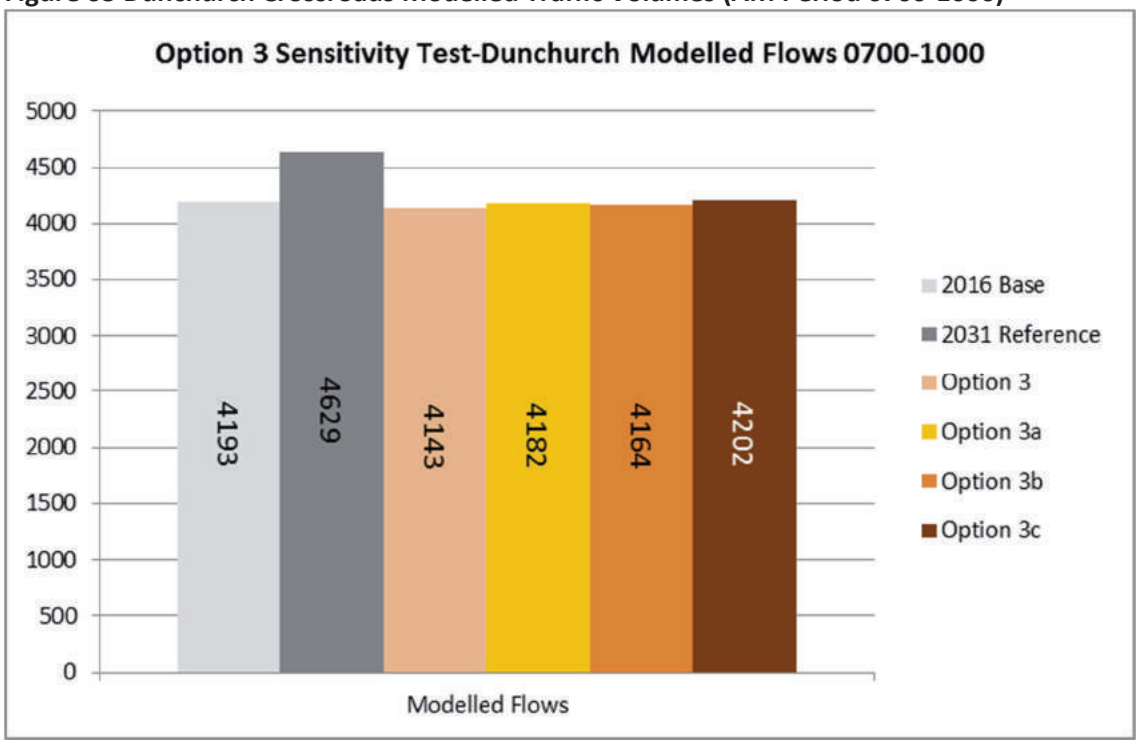
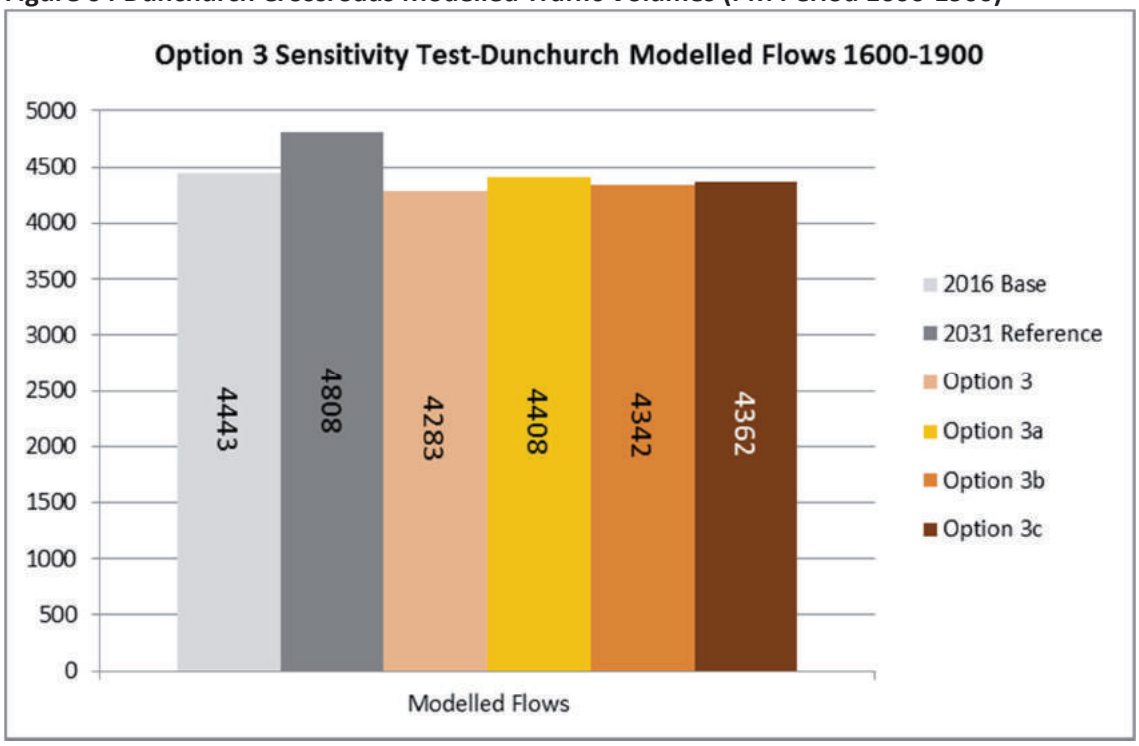


Table 45 Dunchurch Crossroads Traffic Volumes (PM Period 1600-1900)

	2016 Base	2031 Ref	Option 3	Option 3a	Option 3b	Option 3c
Demand	4558	5156	4320	4472	4474	4474
Modelled	4443	4808	4283	4408	4342	4362
Difference	97.47%	93.26%	99.14%	98.57%	97.05%	97.50%

Figure 64 Dunchurch Crossroads Modelled Traffic Volumes (PM Period 1600-1900)



9.12 The results presented above reveal the following:

- The AM and PM results show a similar pattern in terms of the volume of traffic travelling through the crossroads. In each of the options tested, the flows through the crossroads reduce compared to 2031 Reference levels and are similar to 2016 Baseline levels.
- Options 3a - 3c show an increase in traffic routing through the crossroads when compared to Option 3. This is most noticeable when comparing Option 3 with Option 3a, where demand flows through the crossroads are around 150 vehicles higher across the AM and PM.
- The magnitude of increase in flows through Dunchurch is similar between Options 3a, Option 3b and 3c, although Option 3b and Option 3c demonstrate slightly less traffic through Dunchurch than Option 3a in the AM period.

9.13 The results have demonstrated that the flows through Dunchurch between Option 3 and Option 3a increase by 150 vehicles, across both the AM and PM period. This suggests that downgrading the Homestead Link from 40mph to 30mph has an impact in terms of reducing traffic using the SWLR and increasing flows through Dunchurch, by making the SWLR slightly less attractive to drivers.

9.14 The results between Option 3a – 3c are consistent, with a similar level of flows for each option, which suggests that the introduction of the sustainable transport link, and the downgrading of the residential link from 40mph to 30mph does not have a noticeable impact on the model performance.

9.15 This stage of the analysis has demonstrated that of each of the sensitivity tests assessed, the downgrading of the Homestead Link from 40mph to 30mph has the most significant impact as it increases traffic flows at Dunchurch.

Rugby Gyratory Analysis

9.16 The traffic flows at the Gyratory across the entire AM and PM periods are provided for each sensitivity test option below:

Table 46 Rugby Gyratory Traffic Volumes (AM Period 0700-1000)

	2016 Base	2031 Ref	Option 3	Option 3a	Option 3b	Option 3c
Demand	8044	9016	11862	11986	12030	12096
Modelled	7888	8589	11020	11039	11031	10932
Difference	98.07%	95.26%	92.90%	92.10%	91.70%	90.38%

Figure 65 Rugby Gyratory Modelled Traffic Volumes (AM Period 0700-1000)

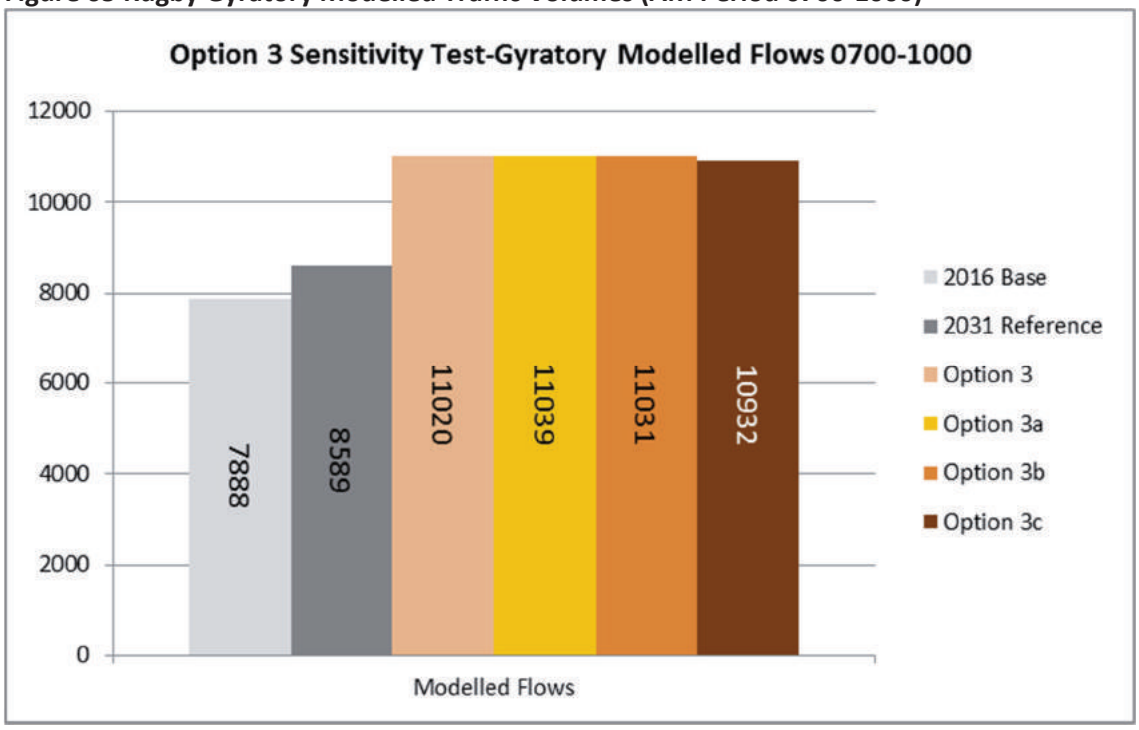
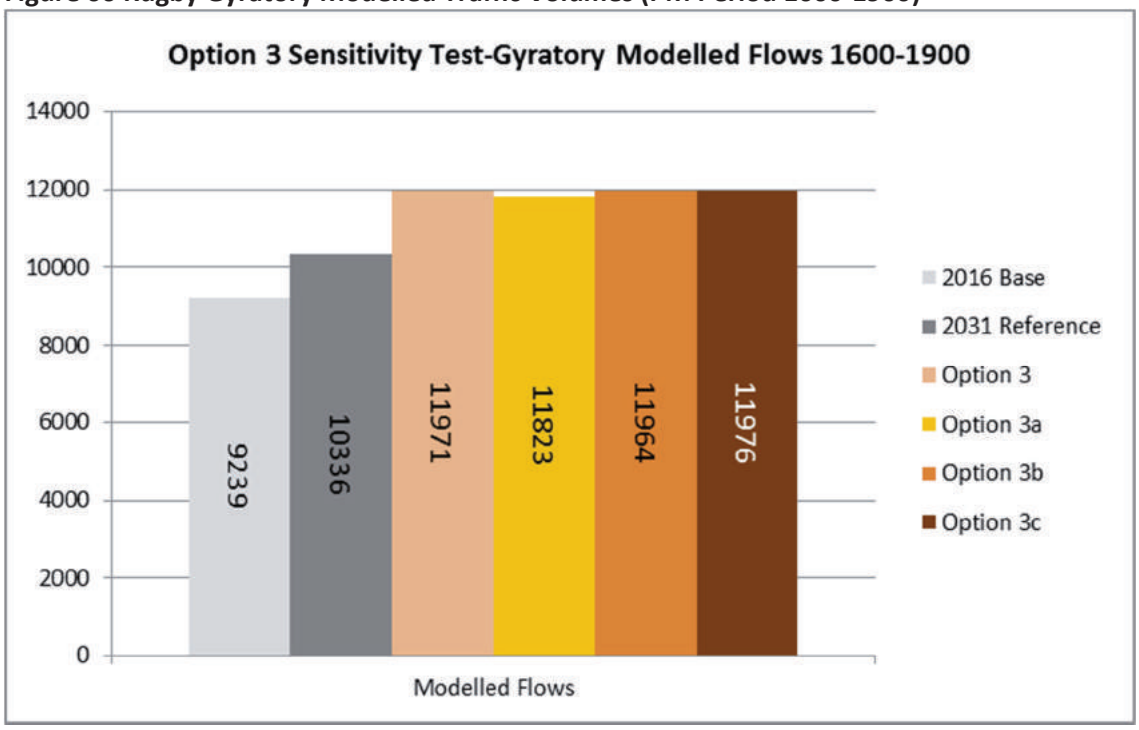


Table 47 Rugby Gyratory Traffic Volumes (PM Period 1600-1900)

	2016 Base	2031 Ref	Option 3	Option 3a	Option 3b	Option 3c
Demand	9420	10748	14146	14362	14320	14374
Modelled	9239	10336	11971	11823	11964	11976
Difference	98.08%	96.17%	84.62%	82.32%	83.55%	83.32%

Figure 66 Rugby Gyratory Modelled Traffic Volumes (PM Period 1600-1900)



9.17 The results presented above reveal the following:

- As identified in Stage 1 of the assessment, traffic flows, and accordingly delay at the Rugby Gyratory increase significantly with the addition of Local Plan traffic in both the AM and PM scenario when compared to 2016 Baseline and 2031 Reference Case conditions. The difference between demand and modelled flows for each option tested also suggests that congestion is significant at the junction, particularly during the PM.
- Upon comparing the demand flows between each of the options assessed in the sensitivity testing, the results suggest that Options 3a – 3c each increase flows through the Gyratory when compared to Option 3.
- The AM demand flows show an increase in flows of around 100 vehicles between Option 3 and 3a, and as high as 200 additional vehicles through the Gyratory in Option 3c (when compared to Option 3).
- The analysis of the PM period show a noticeable difference in demand flows through the Gyratory in the sensitivity test options, again with around 200 additional vehicle routing through the Gyratory in Options 3a – 3c when compared to Option 3.

9.18 The impact on the Gyratory of the sensitivity test scenarios presented above has revealed that there will be an impact on flows at this part of the network in each of the variations of Option 3. As demonstrated in the Dunchurch analysis, the flows at the Gyratory between each of the Options 3a – 3c are consistent between scenarios, yet are also all around 200 vehicles higher than Option 3.

9.19 On the basis that the constant between each of the Options 3a – 3c is the downgrading of the Homestead Link from 40mph to 30mph then it would appear that this has the most significant impact on flows at the Gyratory of each of the design variations considered in this sensitivity testing analysis.

South West Link Road Sensitivity Test Summary

9.20 The previous analysis has compared traffic flows at two of the most congested parts of the model network alongside a number of different design options for Option 3 of the SWLR alignment. The analysis has focused on the changes in traffic flows, both demand and actual, at the Dunchurch Crossroads and Rugby Gyratory.

9.21 As discussed in Stage 4, the demand flows are considered to be a very useful indicator of the relative performance of each SWLR Option, since they indicate what the latent demand for the area may be.

9.22 The demand flows have been assessed alongside the modelled flows for each of the Sensitivity Test scenarios, alongside the Option 3 results. The results demonstrate that between each of the sensitivity options 3a- 3c, there are very little difference in flows at both the Dunchurch Crossroads and Rugby Gyratory. This would suggest that the introduction of the sustainable transport link in Option 3b, and the downgrading of the residential link in Option 3c, does not impact on flows through the most congested parts of the network.

9.23 As the downgrading of the Homestead Link to 30mph is the one consistent factor between Options 3a – 3c, all of which show an increase in flows at Dunchurch and the Gyratory, it can be concluded that the reduction in speeds on this link is likely to have some impact on the network.

9.24 By making the link 30mph the modelling results suggest that fewer vehicles will chose to route along the SWLR than when the link has been coded as 40mph (as in Option 3). Vehicles appear to see the route at 30mph as less attractive, with some vehicles choosing to route via alternative options, which includes via the Dunchurch Crossroads. The increase in flows at

the Gyratory also suggests that some vehicles will re-route to avoid the SWLR, with a likely increase in flows on the A4071 and WRR as a result of lowering the speed limit along the SWLR.

9.25 The sensitivity testing outlined in this stage of the report has highlighted that in order to achieve maximum benefit in terms reducing the volume of traffic at Dunchurch Crossroads and Rugby Gyratory, the SWLR should be delivered as a 40mph link.

9.26 It is, however, recognised that, at this stage, the level of impact associated with the reduction is such that it is expected that arguments towards the 30mph link will be put forward by the site promoters. At this stage it is considered pertinent to highlight that there is a demonstrable link between the downgrading of multiple elements of the SWLR and the impacts on Dunchurch. Furthermore, a significant amount of growth is expected within the area that mean that, at this stage, it is considered prudent to support the delivery of the link at 40 mph both in the context of the known development impacts and the uncertainties around other aspects of growth in the area (which are not yet identified).

9.27 Furthermore, by retaining a design speed of 40mph it is considered that sufficient future proofing will be brought into the design that it is unlikely that Dunchurch will be seen as an alternative route whereas diminishing the attractiveness of the route by lowering the speeds obviously increases the risk of drivers diverting back to the original route through Dunchurch as the perceived benefits are diminished by the increased journey times induced by 30 mph over 40 mph.

9.28 Additionally, the introduction of a sustainable transport link and reduction of the speed limits on the secondary link from the SWLR to Coventry Road to 30mph, can be delivered without a noticeable impact on flows.

10 SUMMARY AND CONCLUSIONS

Summary

10.1 Vectos Microsim (VM) has been assisting Rugby Borough Council (RBC) and Warwickshire County Council (WCC) in the assessment of options pertaining to the delivery of the Rugby Borough Council Local Plan, through the use of the recently updated Rugby Wide Area (RWA) S-Paramics microsimulation model.

10.2 The objectives of this STA are summarised as follows:

- To assess the likely impact on the highway network of the emerging strategies concerning the delivery of housing and employment sites through the Rugby Borough Local Plan.
- To identify a mitigation package which may be deliverable to minimise the residual impacts on traffic likely to occur as a result of the Local Plan proposals
- To assess the impacts of a phasing strategy identified by RBC's housing trajectory, and outline the necessary highway mitigation at each stage of the delivery of the Local Plan
- To assess the impacts of various alignment and design options for the delivery of a South West Link Road

10.3 A series of key stages of the assessment were defined to address these objectives as follows:

Stage 1 – 2031 Local Plan Assessment

10.4 The first stage of the assessment work assessed the implications of allocating all identified Local Plan housing and employment sites within the study area. This amounted to the inclusion of an additional 10,179 houses and 2,750 jobs on top of the 2031 Reference Case. Using this 2031 Local Plan model, an appropriate highway infrastructure mitigation strategy has been created as well as the identification the residual impacts likely to occur as a result of the development strategy being tested.

Stage 2 – Phasing Assessment 2021 Local Plan Scenario

10.5 The second stage of the assessment work assessed the implications of allocating the identified Local Plan housing and employment sites to be delivered over the next 5 years.

This amounted to the inclusion of an additional 1,525 houses on top of the 2021 Reference Case. Using the 2021 Local Plan model the highway infrastructure mitigation schemes that require delivery by 2021 have been identified, along with an assessment of the requirement for the delivery of the South West Link Road, in order to develop a phasing strategy up to 2021.

Stage 3 – Phasing Assessment 2026 Local Plan Scenario

10.6 The third stage of the assessment work assessed the implications of allocating the identified Local Plan housing and employment sites to be delivered over the next 10 years. This amounted to the inclusion of an additional 5,410 houses and 2,750 jobs on top of the 2026 Reference Case. Using the 2026 Local Plan model, the highway infrastructure mitigation schemes that require delivery by 2026 have been identified, along with an assessment of the requirement for the delivery of the South West Link Road, in order to develop a phasing strategy up to 2026.

Stage 4 – South West Link Road Assessment

10.7 Stage 4 of the assessment provided a comparison of six different alignment and junction arrangement options for the proposed South West Link Road to be delivered within the study area. This stage compared the impact of each option on traffic flows at the most congested parts of the network, before identifying an optimum link road option for delivery.

Stage 5 – South West Link Road Sensitivity Testing

10.8 The final phase of the assessment provided a comparison of three different design elements for the proposed South West Link Road to be delivered within the study area. This stage compared the impact of each option on traffic flows at the most congested parts of the network.

Conclusions

10.9 At the end of each stage a series of conclusions have been identified, which are summarised as follows:

Stage 1 Conclusions

10.10 The main conclusions to draw from Stage 1 of the assessment are as follows:

- To deliver the level of housing identified within the Rugby Housing Trajectory, the provision of the South West Link Road should be considered as critical and should be provided in full, along with 16 additional mitigation schemes.
- In spite of the mitigation that has been proposed, there are still likely to be a number of residual impacts which occur on the network. Some of these impacts, such as the congestion levels around the Gyratory, along Clifton Road and along the A426 are likely to be poor. Separate to this STA, additional work is being undertaken to attempt to identify additional mitigation options for this area of the model.

10.11 The analysis indicates that the level of housing that has been tested in Stage 1 is likely to generate traffic levels which lead to the network approaching capacity even once mitigation measures have been assigned. The analysis has resulted in a number of mitigation schemes being identified, the most critical of which are considered to be the following:

- Dunchurch Road/Bawnmore Road Roundabout
- A426 Rugby Road/Ashlawn Road Roundabout
- Dunchurch Crossroads
- SWLR (delivered in full)

Stage 2 Conclusions

10.12 The following findings have been determined as a result of the completion of the 2021 Local Plan testing.

- The 2021 Local Plan Do Nothing scenario demonstrates a number of issues as being likely to occur on the network following the inclusion of the 2021 Local Plan sites. The capacity issues are most notable at the Dunchurch Crossroads and the A426/A5 Gibbet Hill roundabout.
- Following the identification of the key problem areas, schemes have been included within the model to form the 2021 Local Plan Do Something model scenario. The results from this scenario have again been compared back to the Reference Case and are considered to demonstrate that the schemes enable a level of network

performance to be achieved in the 2021 Do Something scenario that is comparable to, or an improvement on the 2021 Reference Case performance.

- This stage of the assessment has also identified that the inclusion of the 2021 Local Plan demands do not trigger the need for the inclusion of the South West Link Road within the network. Therefore, at this stage, given the level of development proposed, the SWLR is not considered essential. This is entirely dependent upon the level of development being considered however and, as such, any changes to the development quantum by 2021 will trigger a need for this conclusion to be reviewed.

10.13 Accordingly this stage of the work has identified that in order to achieve a level of network performance consistent with the Reference Case conditions, inclusive of development levels equal to the first 5 years of the Local Plan, the following mitigation schemes are required:

- Dunchurch Crossroads scheme - widening and signalisation
- A426/A5 (Gibbet Hill Roundabout) scheme – widening and signalisation
- Ashlawn Road/Barby Road/Onley Lane – right turn bays

Stage 3 Conclusions

10.14 The following findings have been determined as a result of the completion of the 2021 Local Plan testing.

- Analysis of the 2026 Local Plan Do Minimum scenario reveals that the network experiences a number of issues following the inclusion of the 2026 Local Plan sites. Impacts are most notable during the PM period, which demonstrates significant worsening in network wide delay and queuing conditions
- Following the identification of a number of key, problematic, areas within the model network, seven schemes plus the delivery of the South West Link Road in the form of the Homestead Link only, were included within the model to create a 2026 Local Plan Do Something model.
- The results arising from the assessment of the 2026 Do Something model indicate that the inclusion of the schemes enables an acceptable level of network performance to be achieved in the 2026 Do Something scenario. During the AM the

network operational levels are broadly comparable to or better than the Reference Conditions. . Within the PM period the schemes elicit a significant improvement compared to the 2026 Do Minimum scenario, but residual delay will continue to occur in the network by this stage, despite the inclusion of a number of mitigation schemes. By 2026 it is beginning to emerge that the Rugby Gyratory and the roundabouts at Clifton Road/Whitehall Road, and Whitehall Road/Hillmorton Road are constraining the network.

- This stage of the assessment has also identified that, in order to alleviate queues and significant increases in traffic flows at Dunchurch Crossroads predicted to occur once the Local Plan developments up to 2026 are included, the delivery of the South West Link Road (Homestead Link)is essential by 2026. The SWLR also improves network performance in the entire southern section of the model network once delivered.
- The delivery of the SWLR in a 2026 Local Plan scenario results in traffic flows through Dunchurch Crossroads being lower than 2016 Baseline conditions, despite the quantum of development included by this year. Thus it is considered that the delivery of this infrastructure, at this point, is both essential and likely to lead to an overall improvement in conditions, over those improvements delivered by the junction enhancements provided in 2021 and the 2016 network conditions.

10.15 This assessment has outlined that the delivery of the Homestead Link of the SWLR is essential by 2026. This has been informed via the 5 year phasing assessments (2021, 2026), which in turn is linked to the number of dwellings and jobs delivered in the South-West Rugby Area. It has been determined that the quantum of development included within the South-West area of the model in the 2026 Local Plan scenario triggers the need for the link road, however, should the number of dwellings delivered before 2026 increase, it is likely that the link will be required before this point.

Stage 4 Conclusions

10.16 The following findings have been determined as a result of the completion of the South West Link Road alignment testing:

- The results have outlined that there is very little difference in the model performance of Options 1-4 which all show significant improvements in traffic conditions at Dunchurch Crossroads, and minimise the worsening of conditions at the Rugby Gyratory. Option 3 and 4 return the lowest traffic volumes around the Dunchurch Crossroads area which is considered a priority for the area.
- Although Options 5 and 6 do show an improvement in traffic flows at Dunchurch Crossroads, compared to 2031 Reference conditions, the improvements are not as significant as those demonstrated by Options 1-4, and the impact of these two scenarios at the Gyratory are noticeably worse than those presented for Options 1-4, (approx. 1200 vehicles higher across the AM and similar volumes in the PM when considering demand flows).
- Dunchurch Crossroads benefits significantly from the additional north/south capacity that is provided by the link between the A426 and the B4429 meaning that locally, if there is a desire to deliver growth in the area with minimum impacts on Dunchurch Crossroads the link between the A426 and B4429 across Alwyn Road and the upgraded connection between the A45/M45 and A4071 are essential.
- Delivery of an additional link between the A45/M45 and the A4071 is also considered to be of key importance as it has been proven to deliver relief to both the Dunchurch Crossroads and the Rugby Gyratory (see the impacts of Options 1-4 compared to Options 5 and 6). Given the limited opportunities to mitigate these areas directly all schemes which are likely to provide relief through the diversion of traffic flows are considered essential and a high priority.

10.17 On the basis of this analysis Option 3 represents the best performing option, and it therefore considered desirable for delivery. Option 4 however presents one of the best performing alignments in terms of the impact on the Dunchurch Crossroads and at the Gyratory, along with the fact that this option requires the least amount of infrastructure, compared to each of the options, which indicates that this is likely to be the optimum scenario.

Stage 5 Conclusions

10.18 The following findings have been determined as a result of the completion of the South West Link Road Sensitivity Testing:

- Upon comparing each of the sensitivity Options 3a- 3c, little difference is shown in flows at both the Dunchurch Crossroads and Rugby Gyratory. This would suggest that the introduction of the sustainable transport link in Option 3b, and the downgrading of the residential link in Option 3c, does not impact on flows through the most congested parts of the network.
- However, the downgrading of the Homestead Link to 30mph is the one consistent factor between Options 3a – 3c, all of which show an increase in flows at Dunchurch and the Gyratory when compared to Option 3

10.19 By making the link 30mph the modelling results suggest that fewer vehicles will chose to route along the SWLR than when the link has been coded as 40mph (as in Option 3). Vehicles appear to see the route at 30mph as less attractive, with some vehicles choosing to route via alternative options, which includes via the Dunchurch Crossroads. The increase in flows at the Gyratory also suggests that some vehicles will re-route to avoid the SWLR, with a likely increase in flows on the A4071 and Western Relief Road (WRR) as a result of lowering the speed limit along the SWLR.

10.20 The sensitivity testing outlined in this stage of the report has highlighted that in order to achieve maximum benefit in terms of the volume of traffic at Dunchurch Crossroads and Rugby Gyratory, the SWLR should be delivered as a 40mph link. Additionally, the introduction of a sustainable transport link and reduction of the speed limits on the residential link to 30mph, can be delivered without a noticeable impact on flows.

Highway Infrastructure and SWLR Design Considerations

10.21 At this stage the infrastructure requirements have been identified to a relatively high level of detail and the principles of the schemes are considered to be sufficiently detailed to support the conclusion that the Local Plan allocation strategy can be accommodated within the highway network subject to the delivery of the infrastructure measures identified.

10.22 As sites come forward and the Local Plan is adopted it is recommended that further work will be required to ensure that the schemes identified thus far represent the optimum set of proposals and, if necessary, any changes necessary should be identified at that stage.

10.23 This subsequent testing will also serve to reconfirm the design principles of the SWLR although it is not expected that they would differ substantially from those assumed within the work to date.

Appendix A

Forecast and Local Plan Model Trip Rates

Rugby Wide Area STA Trip Rates

Summary of Trip Rates Applied in Assessment

13/06/2017

Introduction

1. The following note provides detail on the trip rates applied to the residential, employment and retail sites included within the 2021, 2026 and 2031 Rugby Wide Area Reference Case models and 2021, 2026 and 2031 Rugby Wide Area Local Plan models.

2. The trip rates highlighted in Tables 1 – 10 have been used in the development of the Reference Case models.

3. The trip rates highlighted in Tables 11 – 18 have been used in the development of the Local Plan models.

Table 1 WCC Standard Residential Vehicle Trip Rates

	Arrivals	Departures
0700-0800	0.078	0.329
0800-0900	0.120	0.480
0900-1000	0.122	0.221
1600-1700	0.348	0.116
1700-1800	0.480	0.120
1800-1900	0.365	0.117

Table 2 Rugby Gateway Residential Vehicle Trip Rates

	Arrivals	Departures
0700-0800	0.073	0.212
0800-0900	0.112	0.310
0900-1000	0.114	0.143
1600-1700	0.168	0.150
1700-1800	0.231	0.156
1800-1900	0.176	0.153

Table 3 Rugby Gateway Employment Land Use B2 Vehicle Trip Rates (per 100m^2)

	Arrivals	Departures
0700-0800	0.187	0.080
0800-0900	0.255	0.131
0900-1000	0.178	0.169
1600-1700	0.217	0.233
1700-1800	0.110	0.261
1800-1900	0.031	0.075

Table 4 Rugby Gateway Employment Land Use B8 Vehicle Trip Rates (per 100m^2)

	Arrivals	Departures
0700-0800	0.071	0.030
0800-0900	0.071	0.036
0900-1000	0.055	0.041
1600-1700	0.008	0.048
1700-1800	0.021	0.063
1800-1900	0.008	0.041

Table 5 Rugby Radio Mast Total Person Trip Rates (residential)

	Arrivals	Departures
0700-0800	0.150	0.531
0800-0900	0.230	0.775
0900-1000	0.234	0.357
1600-1700	0.440	0.378
1700-1800	0.606	0.392
1800-1900	0.461	0.384

Table 6 Rugby Radio Mast Employment Land Use B1 Vehicle Trip Rates (per 100m^2)

	Arrivals	Departures
0700-0800	0.878	0.171
0800-0900	1.978	0.200
0900-1000	1.260	0.371
1600-1700	0.203	1.302
1700-1800	0.164	1.754
1800-1900	0.055	0.466

Table 7 Rugby Radio Mast Employment Land Use B2 Vehicle Trip Rates (per 100m^2)

	Arrivals	Departures
0700-0800	1.110	0.202
0800-0900	1.515	0.331
0900-1000	1.055	0.428
1600-1700	0.438	1.156
1700-1800	0.222	1.296
1800-1900	0.062	0.372

Table 8 Rugby Radio Mast Employment Land Use B8 Vehicle Trip Rates (per 100m^2)

	Arrivals	Departures
0700-0800	0.569	0.305
0800-0900	0.569	0.252
0900-1000	0.441	0.285
1600-1700	0.405	0.598
1700-1800	0.161	0.460
1800-1900	0.063	0.302

Table 9 Elliott's Field Phase 2 Retail Vehicle Trip Rates (per 100m^2)

	Arrivals	Departures
0700-0800	0.058	0.023
0800-0900	0.600	0.313
0900-1000	1.270	0.813
1600-1700	1.261	1.299
1700-1800	0.951	0.916
1800-1900	1.141	1.167

Table 10 DIRFT III Warehousing Vehicle Trip Rates (per 100m^2)

	Arrivals	Departures
0700-0800	0.096	0.058
0800-0900	0.108	0.039
0900-1000	0.085	0.043
1600-1700	0.067	0.113
1700-1800	0.081	0.121
1800-1900	0.061	0.092

Table 11 Lodge Farm/Updated STA Vehicle Trip Rates

	Arrivals	Departures
0700-0800	0.070	0.445
0800-0900	0.158	0.552
0900-1000	0.121	0.197
1600-1700	0.326	0.170
1700-1800	0.484	0.182
1800-1900	0.39	0.197

Table 12 Coton Park East Expansion Vehicle Trip Rates

	Arrivals	Departures
0700-0800	0.072	0.345
0800-0900	0.091	0.481
0900-1000	0.126	0.134
1600-1700	0.253	0.145
1700-1800	0.362	0.155
1800-1900	0.402	0.168

Table 13 Coton House Vehicle Trip Rates

	Arrivals	Departures
0700-0800	0.088	0.321
0800-0900	0.165	0.445
0900-1000	0.160	0.195
1600-1700	0.332	0.213
1700-1800	0.397	0.227
1800-1900	0.265	0.205

Table 14 Bilton Fields, Ashlawn Road Vehicle Trip Rates

	Arrivals	Departures
0700-0800	0.070	0.294
0800-0900	0.122	0.403
0900-1000	0.196	0.259
1600-1700	0.346	0.226
1700-1800	0.421	0.239
1800-1900	0.237	0.214

Table 15 Land North of Coventry Road, Long Lawford Vehicle Trip Rates

	Arrivals	Departures
0700-0800	0.137	0.356
0800-0900	0.197	0.545
0900-1000	0.267	0.31
1600-1700	0.33	0.262
1700-1800	0.438	0.219
1800-1900	0.268	0.199

Table 16 Employment Land Use B1 Vehicle Trip Rates (per 100m^2)

	Arrivals	Departures
0700-0800	0.718	0.106
0800-0900	1.618	0.124
0900-1000	1.031	0.230
1600-1700	0.136	1.119
1700-1800	0.110	1.508
1800-1900	0.037	0.401

Table 17 Employment Land Use B2 Vehicle Trip Rates (per 100m^2)

	Arrivals	Departures
0700-0800	0.323	0.129
0800-0900	0.441	0.211
0900-1000	0.307	0.273
1600-1700	0.225	0.348
1700-1800	0.114	0.390
1800-1900	0.032	0.112

Table 18 Employment Land Use B8 Vehicle Trip Rates (per 100m^2)

	Arrivals	Departures
0700-0800	0.102	0.075
0800-0900	0.102	0.062
0900-1000	0.079	0.070
1600-1700	0.083	0.121
1700-1800	0.033	0.093
1800-1900	0.013	0.061

Appendix B

Local Plan Mitigation Schemes

Rugby Wide Area STA Mitigation Schemes

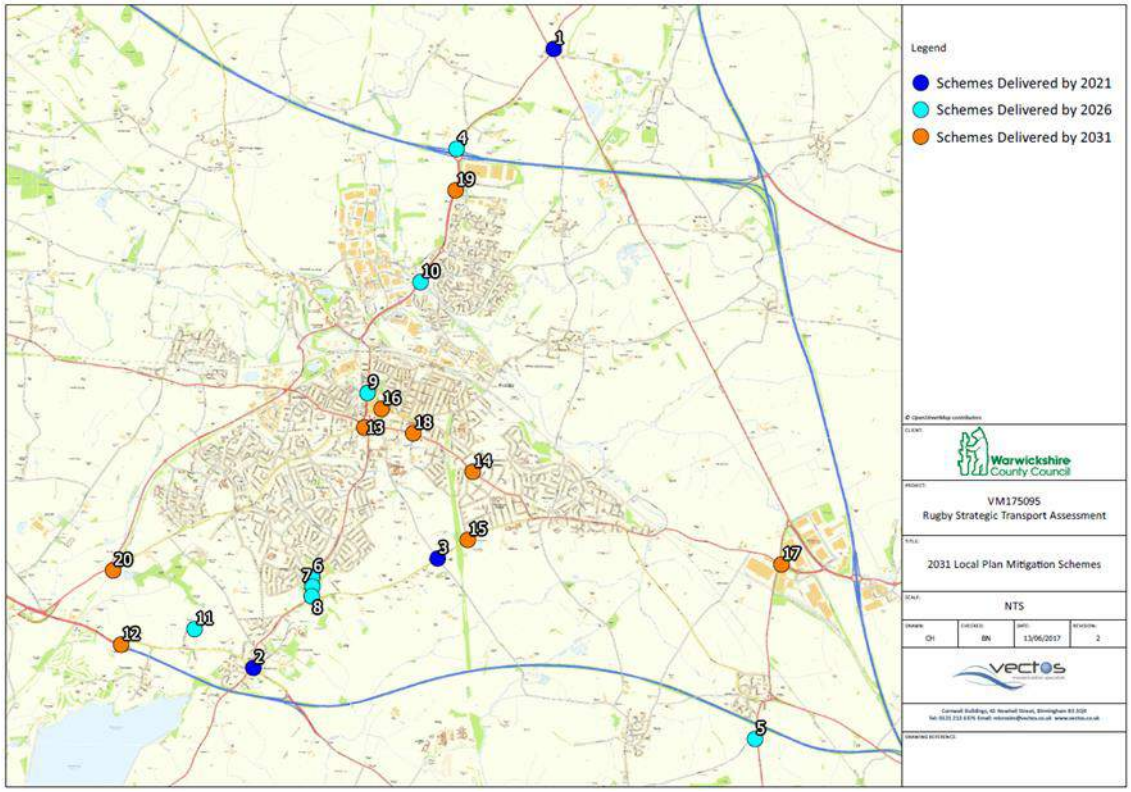
Summary of Mitigation Schemes

13/06/2017

Introduction

The following note provides detail on the mitigation schemes derived in the Local Plan testing and detailed within the STA report. The location of each of the schemes is demonstrated in the following figure.

Local Plan Mitigation Scheme Locations



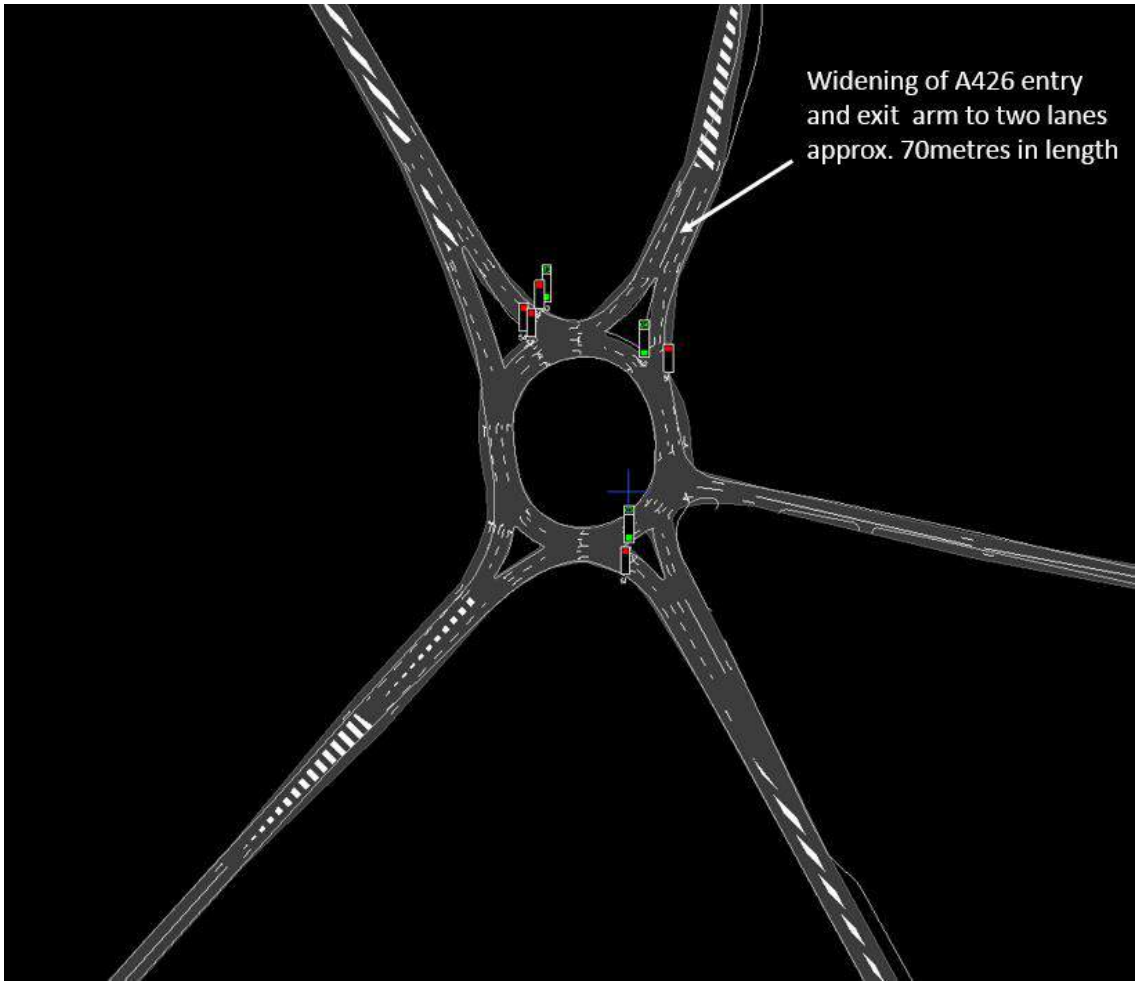
Cornwall Buildings, 45 Newhall Street, Birmingham B3 3QR
Tel: 0121 213 6376 www.vectos.co.uk

Company no. 9322829
Registered address: Vectos Microsim Limited, 82 St John Street, London EC1M 4JN

Scheme 1 – Gibbet Hill Roundabout

The scheme at this location involves the widening of A5 and A426 approach arms to the junction and circulatory, along with signal timing optimisation. The signalisation scheme is a DIRFT III scheme and assumed to be included in the Reference Case scenarios

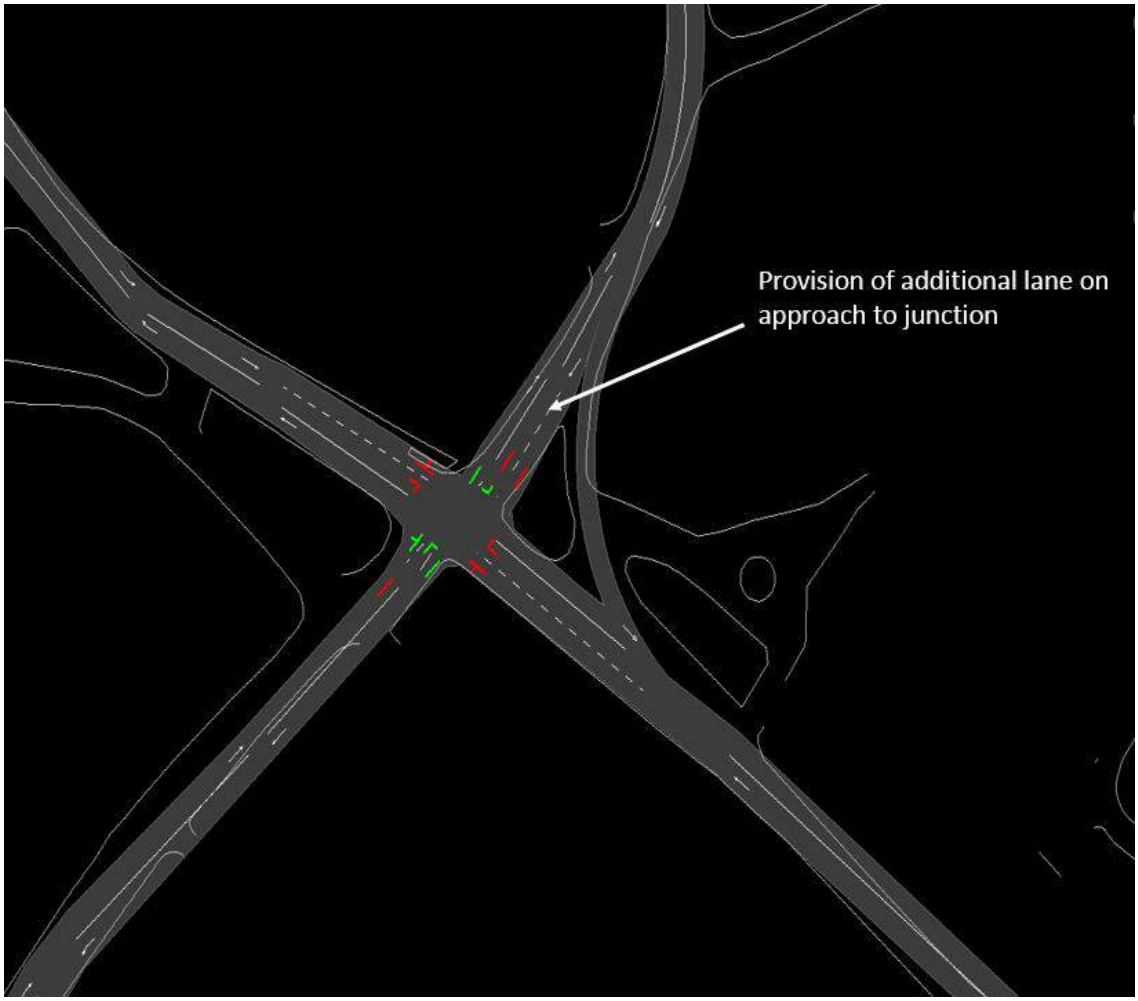
Scheme 1



Scheme 2 – Dunchurch Crossroads

The scheme at this locations involves the provision of an additional right turn lane on Rugby Road approach and Southam Road approach.

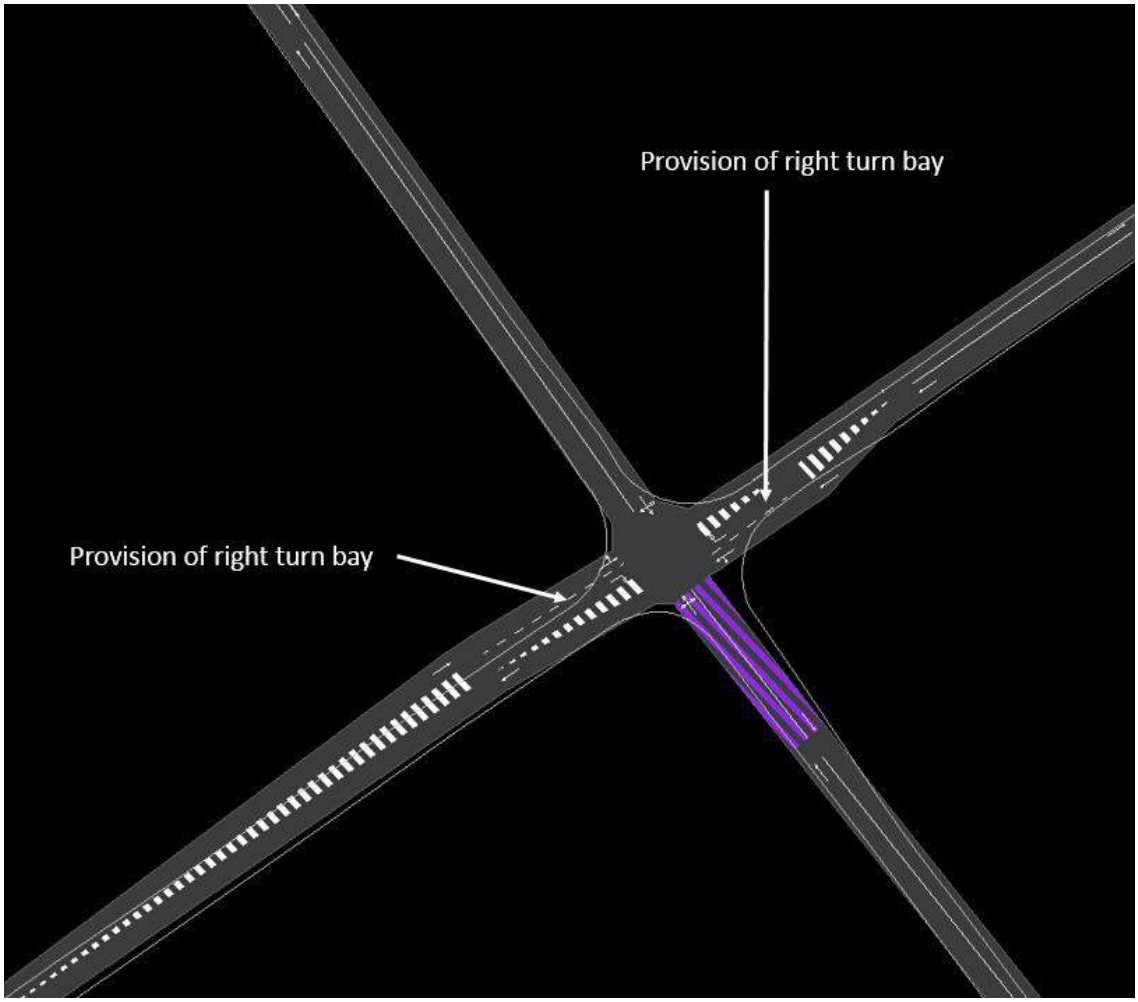
Scheme 2



Scheme 3 – Ashlawn Road/Barby Road

The scheme at this location includes the provision of right turn bays on Ashlawn Road, for the movements into both Barby Road and Onley Lane.

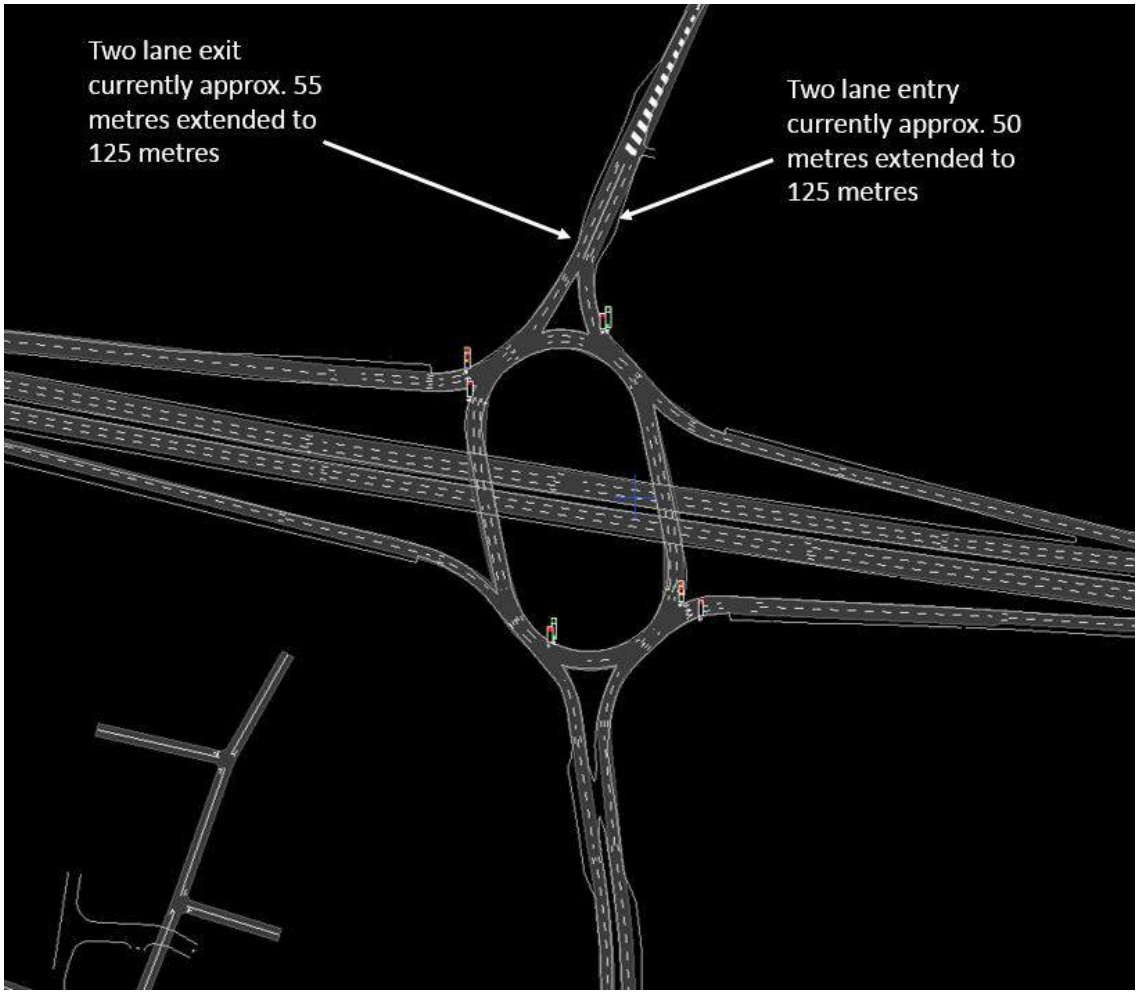
Scheme 3



Scheme 4 – M6 Junction 1

This scheme involves the signalisation of all entry arms to the junction, and widening on northern entry and exit, to allow vehicles to travel northbound through the junction in two lanes, whilst extending the two lane flare on the southbound approach to the junction.

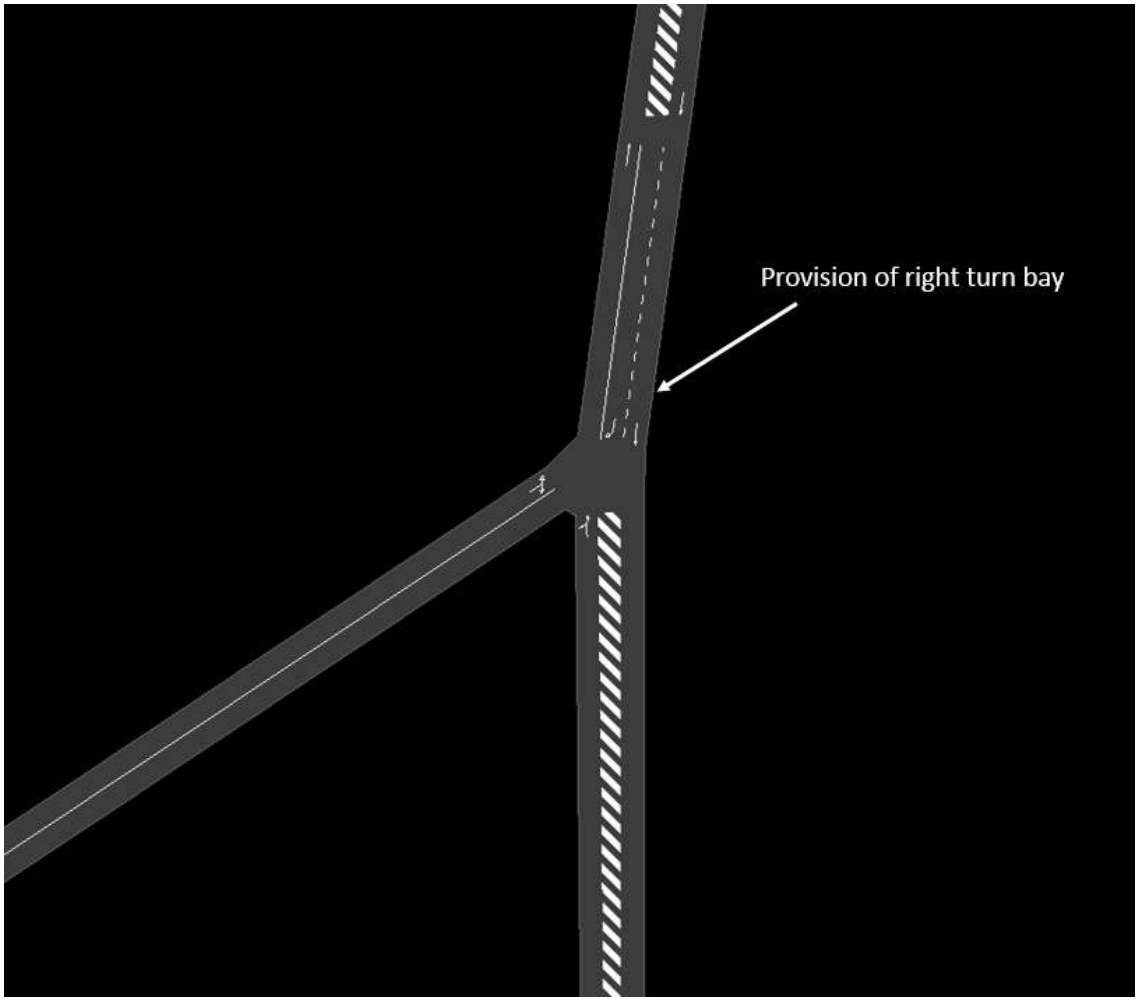
Scheme 4



Scheme 5 – Daventry Road/The Ridgeway

This scheme involves the provision of a right turn bay on Daventry Road southbound for vehicles turning right into The Ridgeway

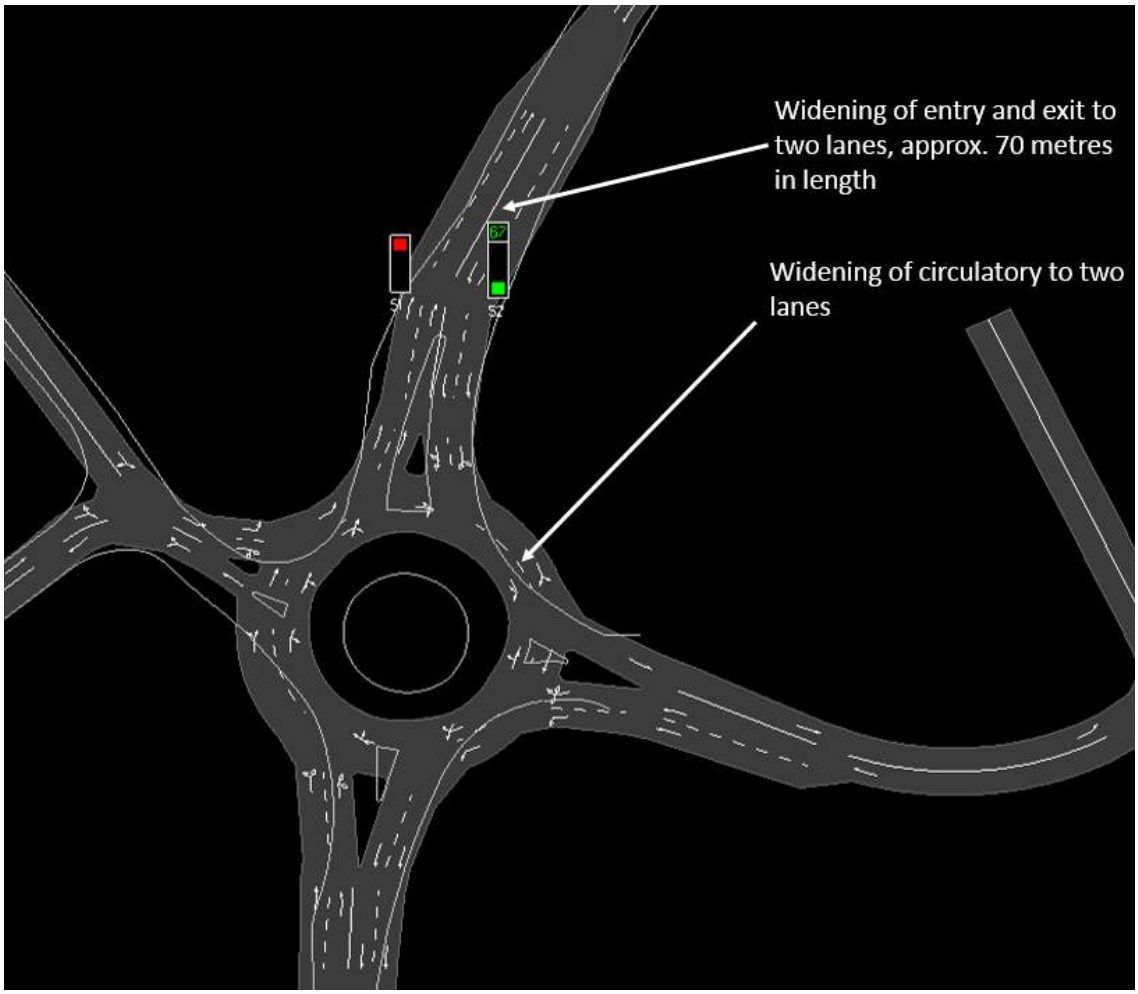
Scheme 5



Scheme 6 - A426/Bawnmore Road/Sainsburys Roundabout

The scheme at this location involves the widening of roundabout circulatory along with approach and exit lanes. The north to south movement and south to north movement through the roundabout is to be permitted in two lanes, with merging on exit. The southbound exit leads to Scheme 7.

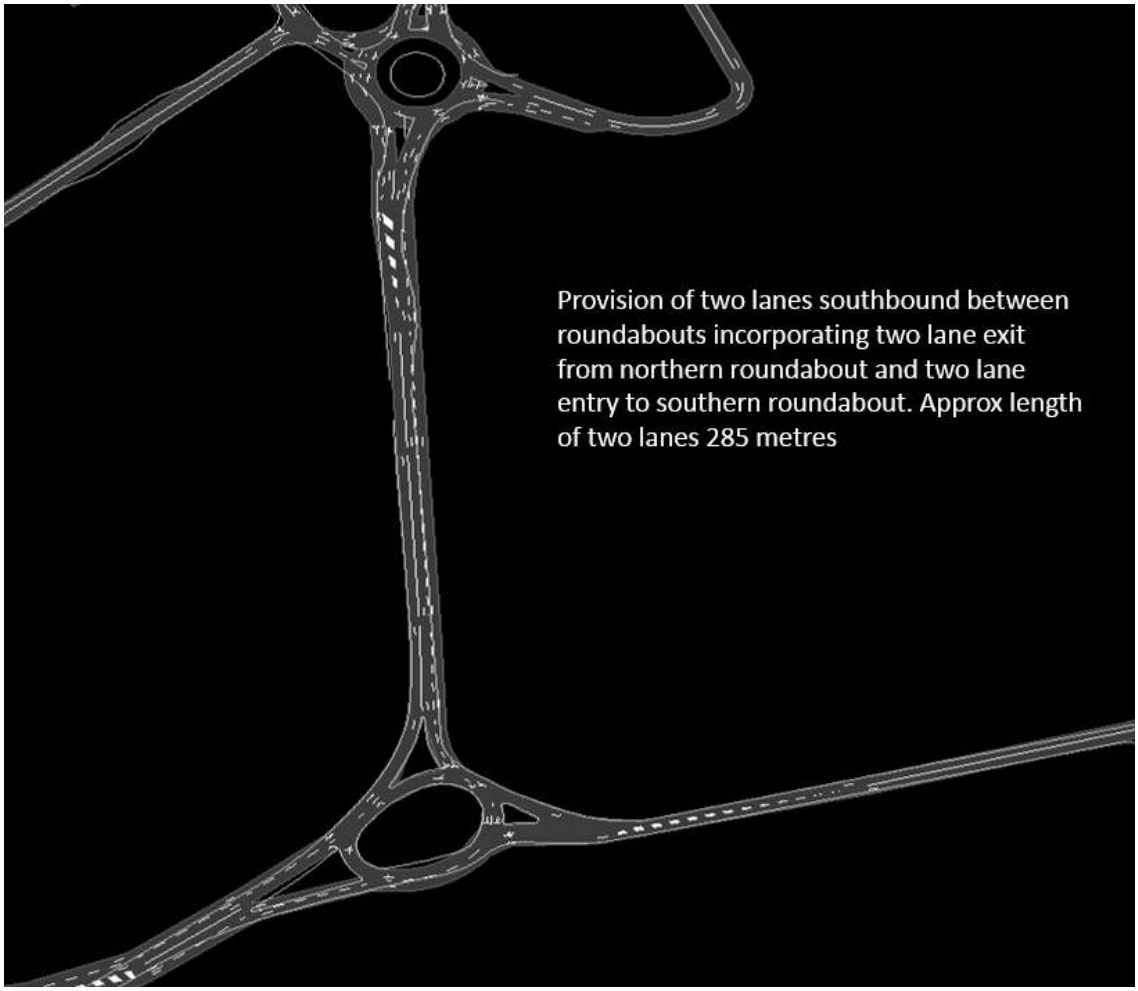
Scheme 6



Scheme 7 – A426 Rugby Road

Scheme 7 involves the provision of a two lane section of carriageway in a southbound direction between the A426/Bawnmore Road/Sainsbury roundabout and the A426/Ashlawn Road roundabout

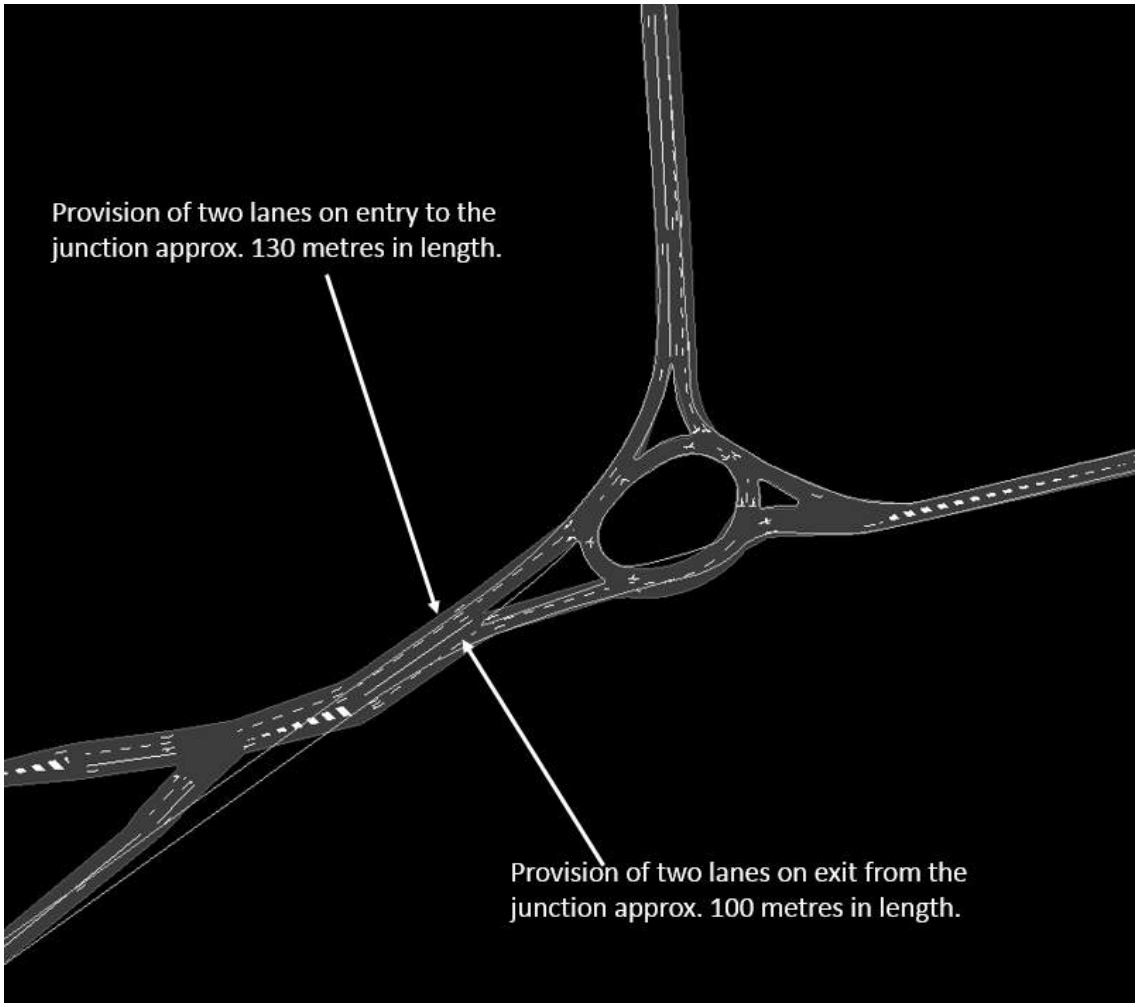
Scheme 7



Scheme 8 – A426/Ashlawn Road

The scheme at this location involves widening the western arm exit to two lanes to allow vehicles to travel through the junction in two lanes from the A426 N to A426 S. The scheme also involves revised priorities on the circulatory and widening the A426 S approach as part of the South West Link Road scheme

Scheme 8



Scheme 9 – A426/Evereux Way

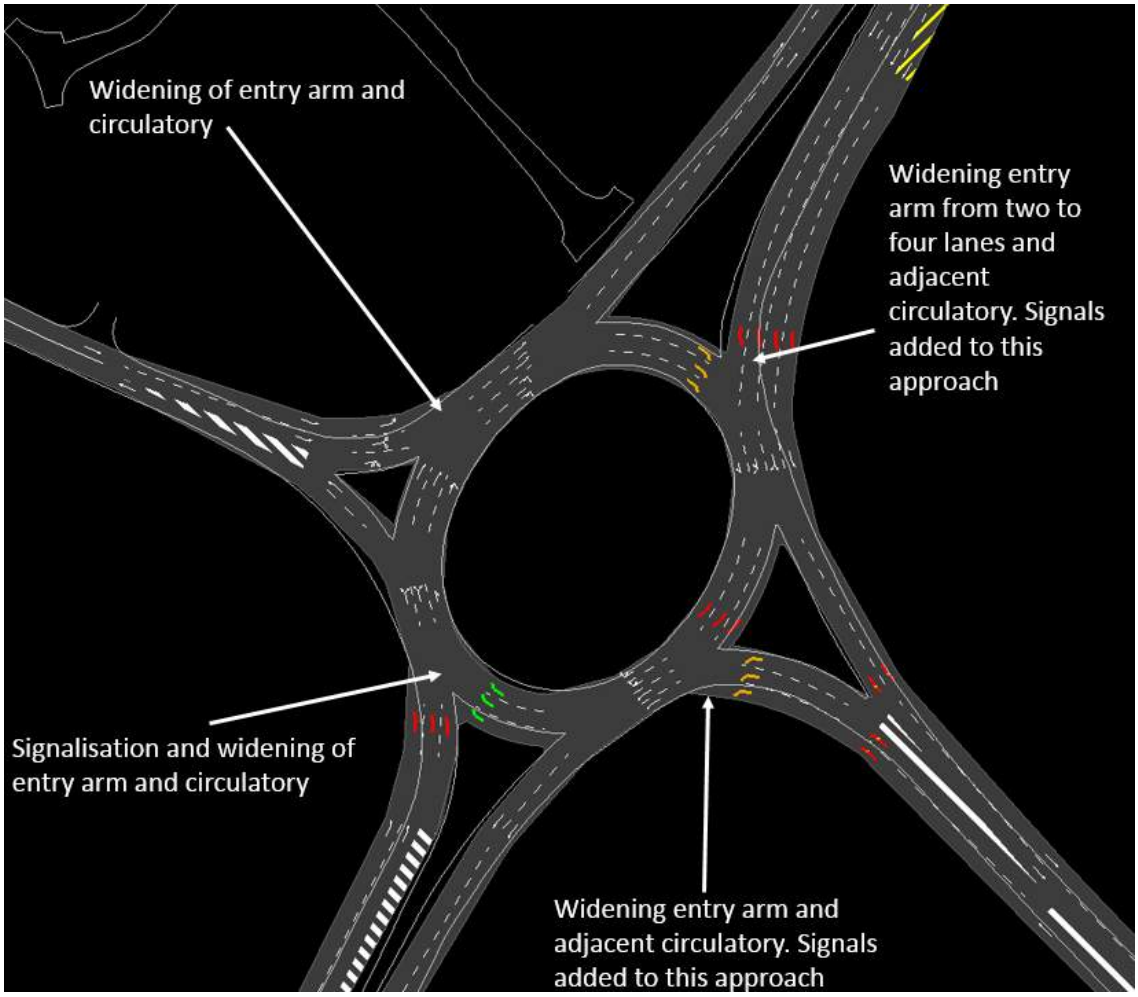
Scheme 9 involves widening of the northern exit to allow vehicles to travel south to north through the roundabout in two lanes and merge upon exit

Scheme 9

Scheme 10 – A426/Brownsover Road/Boughton Road Roundabout

This scheme involves the widening of all entry arms to the junction, along with link on the circulatory. The scheme also involves the partial signalisation of the roundabout, with signals added on the A426 NB, A426 SB and Boughton Road approach arms and adjacent circulatory links

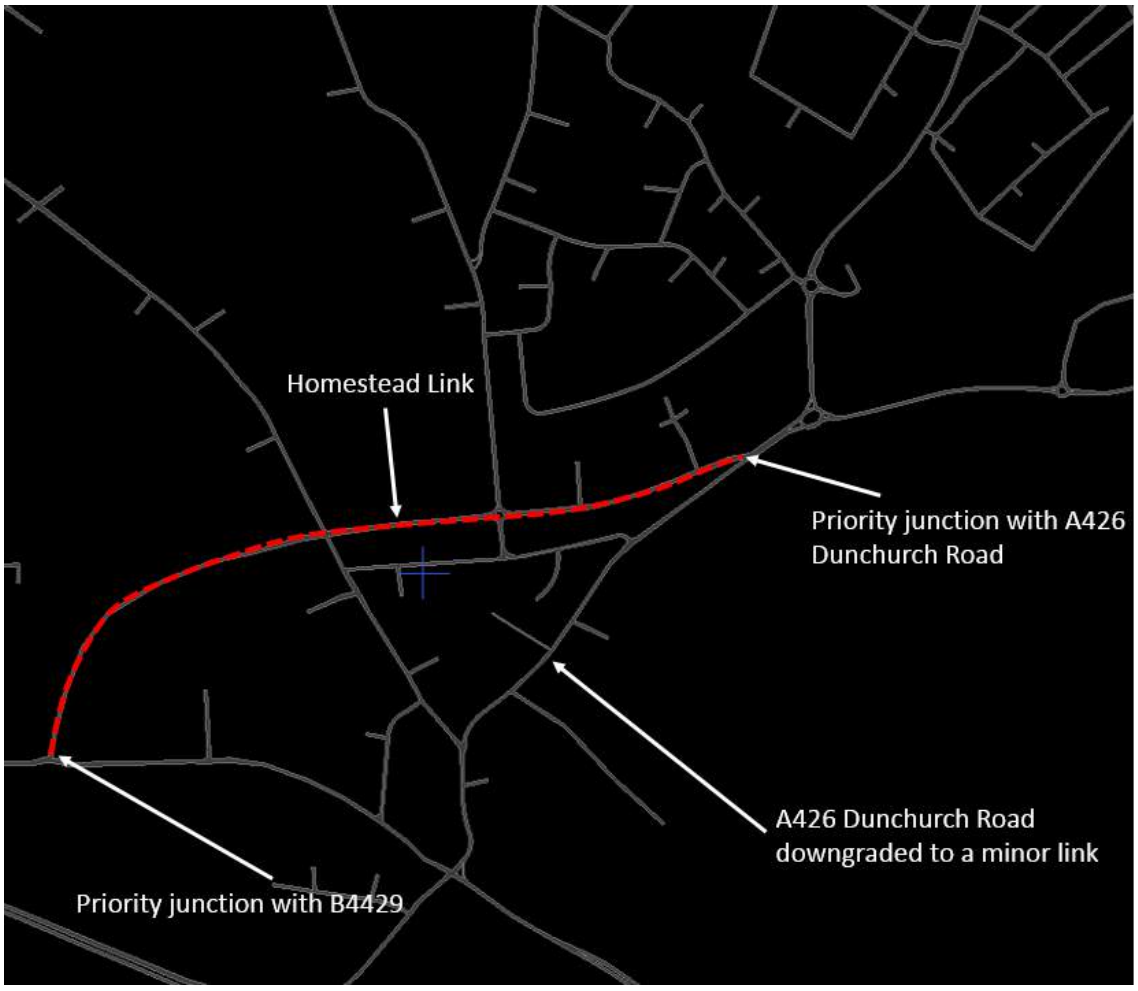
Scheme 10



Scheme 11 – SWLR (Homestead Link)

This scheme involves the Homestead Link section of the proposed SWLR. This amounts to the delivery of a 40mph link between the A426 Dunchurch Road and the B4429, as highlighted in the following figure. The junction of the A426/SWLR is a priority junction, with the SWLR forming the major priority, and A426 giving way to this link. Likewise where the SWLR meets the B4429 the SWLR forms the major arm and B4429 WB gives way at a priority junction. The A426 Dunchurch Road is downgraded to a minor route, with a signposting strategy, and traffic calming, to encourage vehicles to use the Homestead Link and avoid Dunchurch.

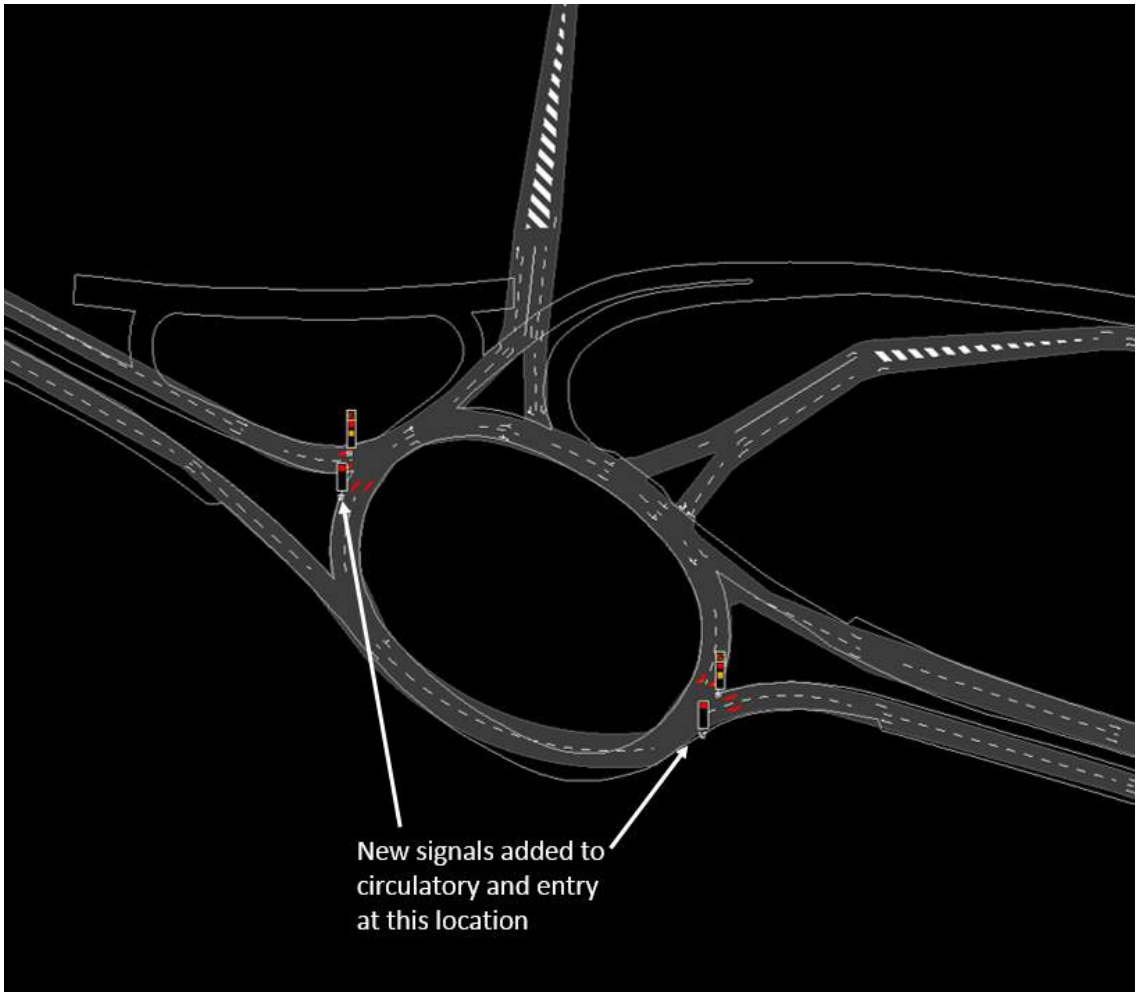
Scheme 11



Scheme 12 – A45/M45 Roundabout

Scheme 12 involves the signalisation of eastern and western A45 approaches with a new arm to the north forming the SWLR and the B4429 approach alignment revised

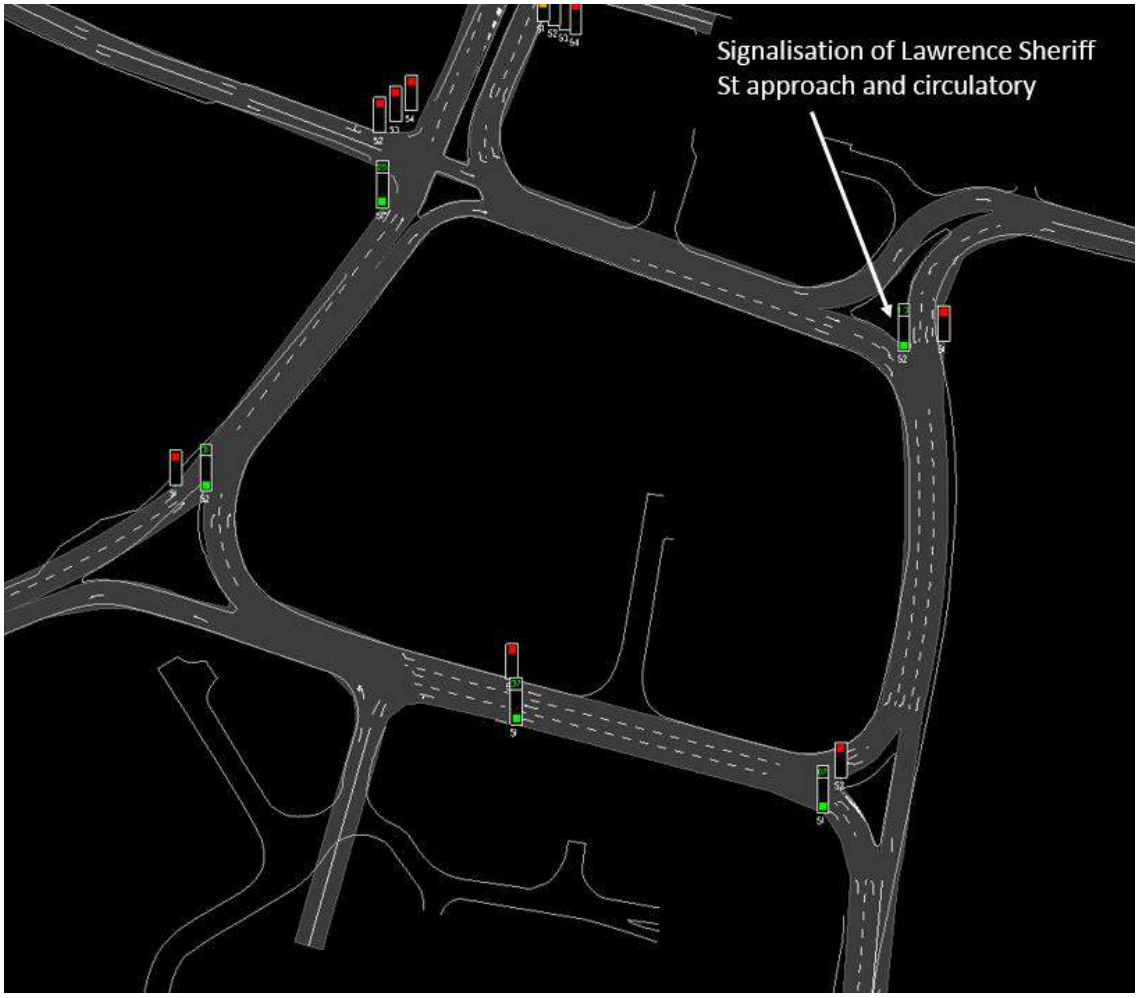
Scheme 12



Scheme 13 – Rugby Gyratory

The scheme at this location involves signalising the Lawrence Sherriff Street entry to the Gyratory along with the adjacent circulatory links on the Gyratory itself.

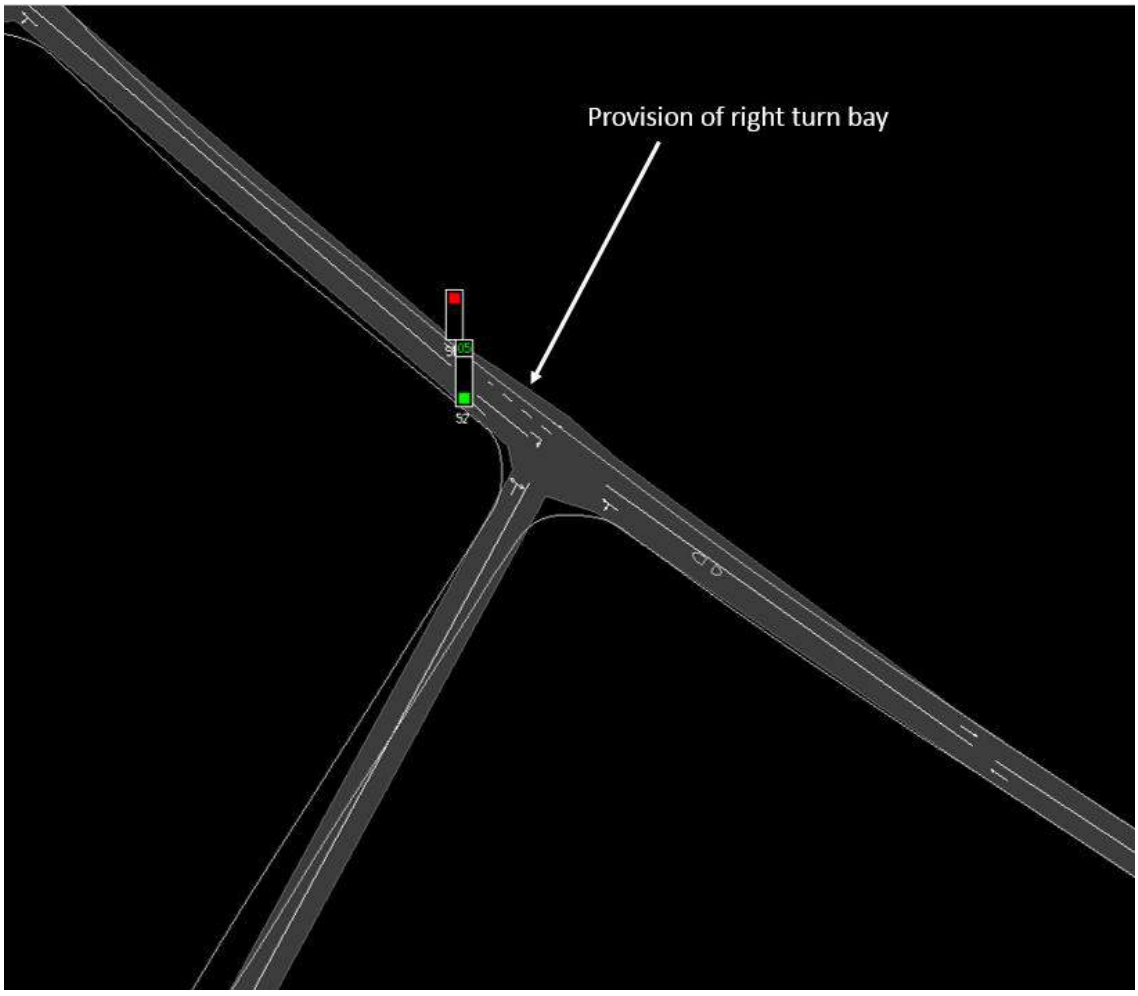
Scheme 13



Scheme 14 – A428/Percival Road

This scheme involves the provision of a right turn bay on the A428 Hillmorton Road for the right turn movement into Percival Road.

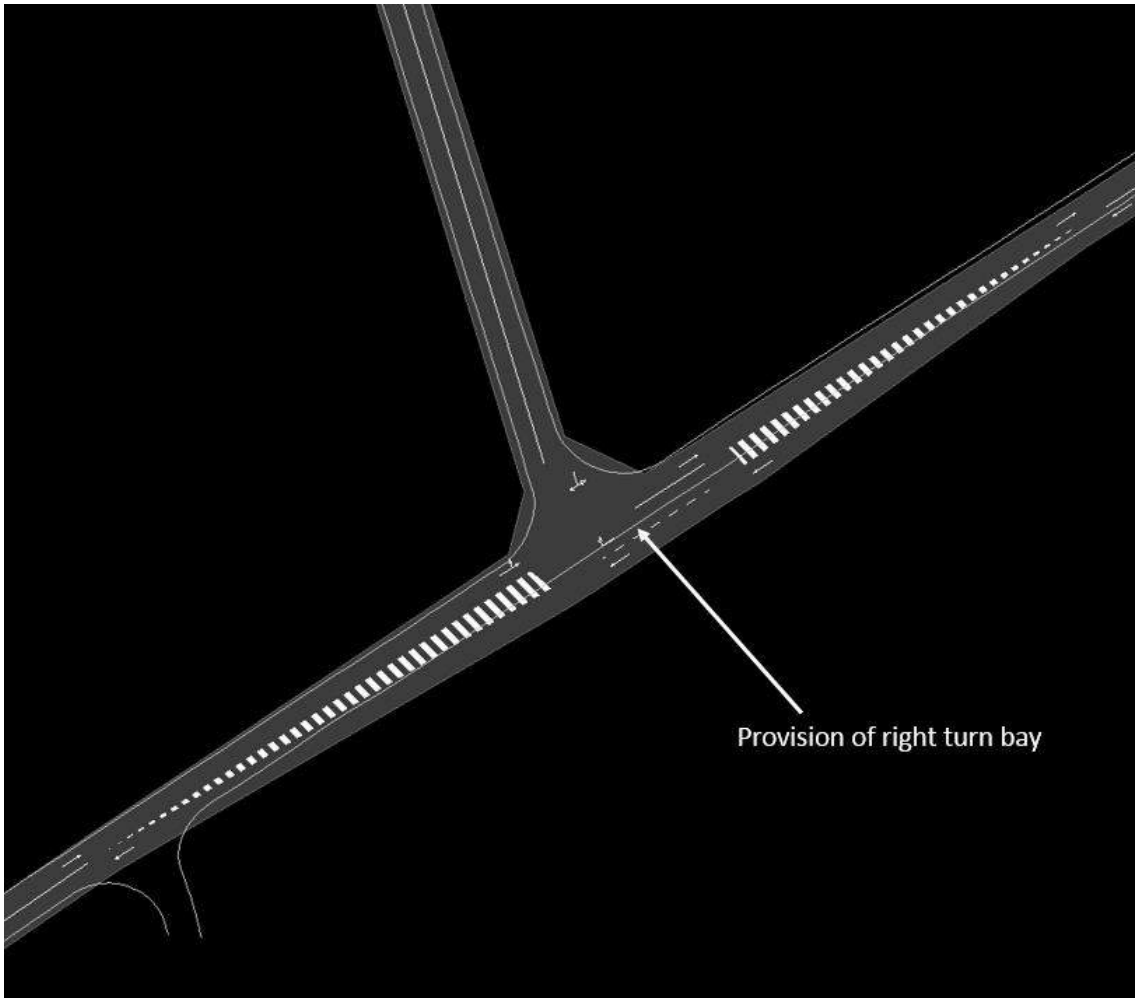
Scheme 14



Scheme 15 – Ashlawn Road/Percival Road

The scheme at this location involves the provision of a right turn bay on Ashlawn Road for the right turn movement into Percival Road.

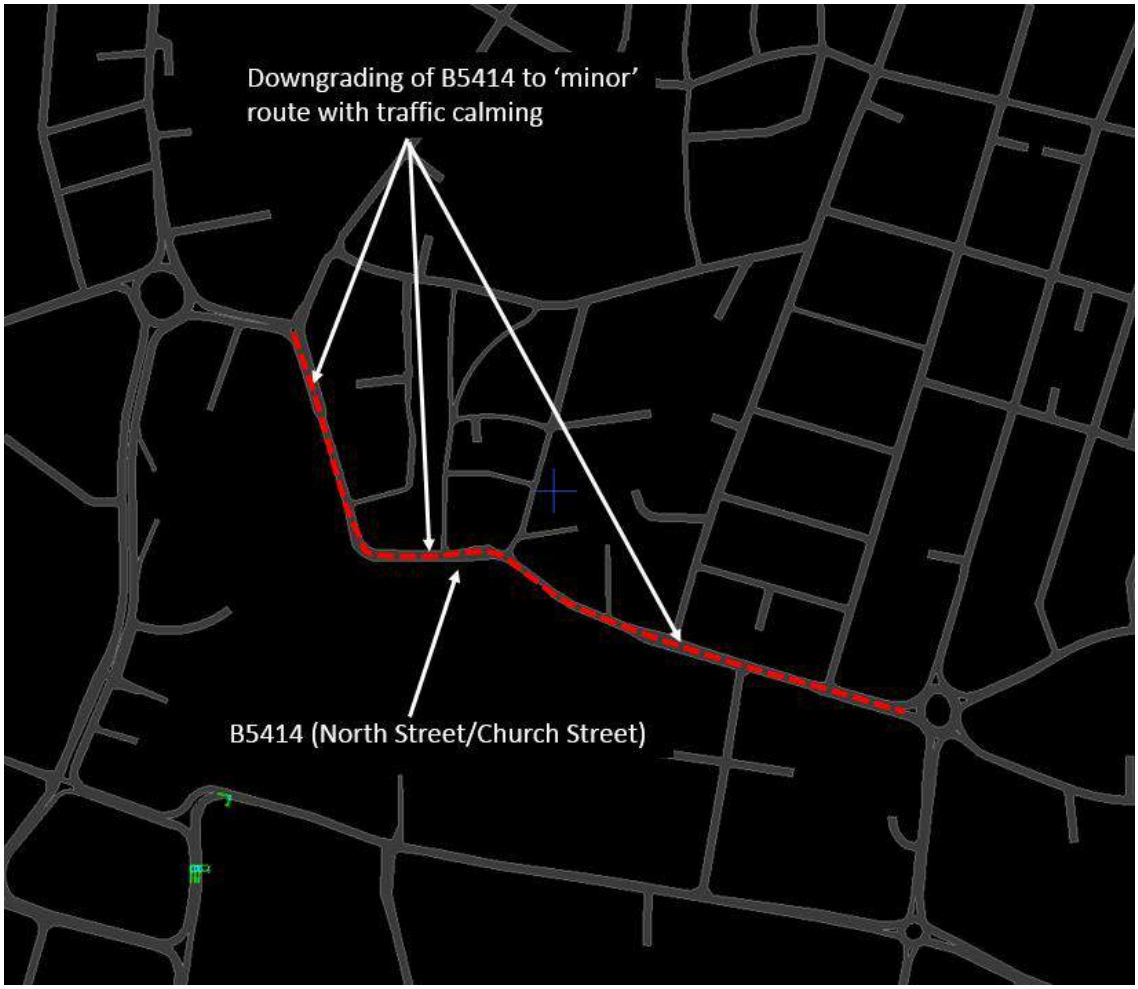
Scheme 15



Scheme 16 – B5414 (North Street/Church Street)

The scheme at this location involves the downgrading of the B5414 (North Street/Church Street) from the junction of the North Street/Park Road mini-roundabout to the Murray Road/Clifton Road/Whitehall Road roundabout. The downgrading involves a signposting strategy to divert traffic away from the route, along with traffic calming along the route.

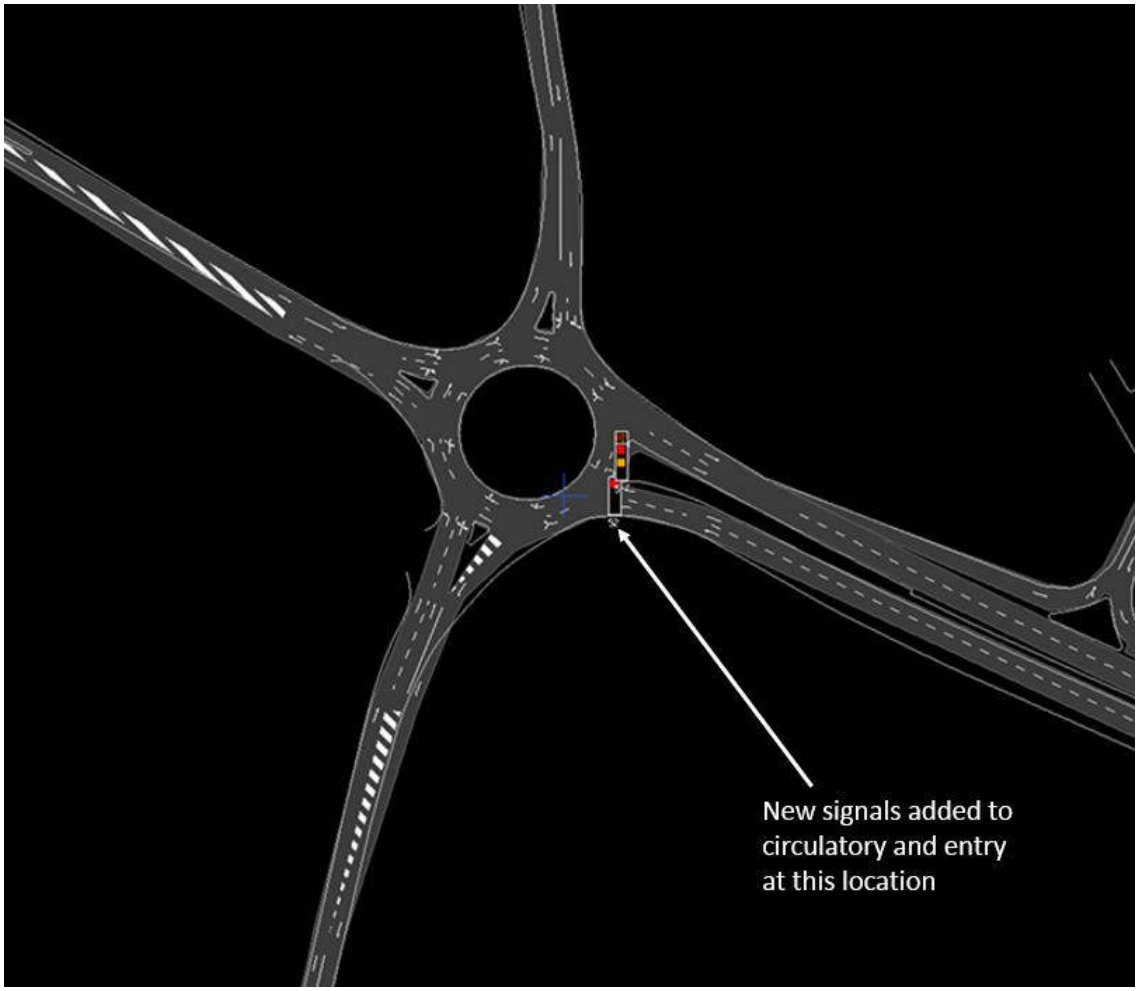
Scheme 16



Scheme 17 – A5/A428 Roundabout

The scheme at this location involves the signalisation of A428 eastbound approach to improve traffic flow from the A5 S approach. The scheme also involves widening of the western exit to allow movement east to west through the junction to be made in two lanes.

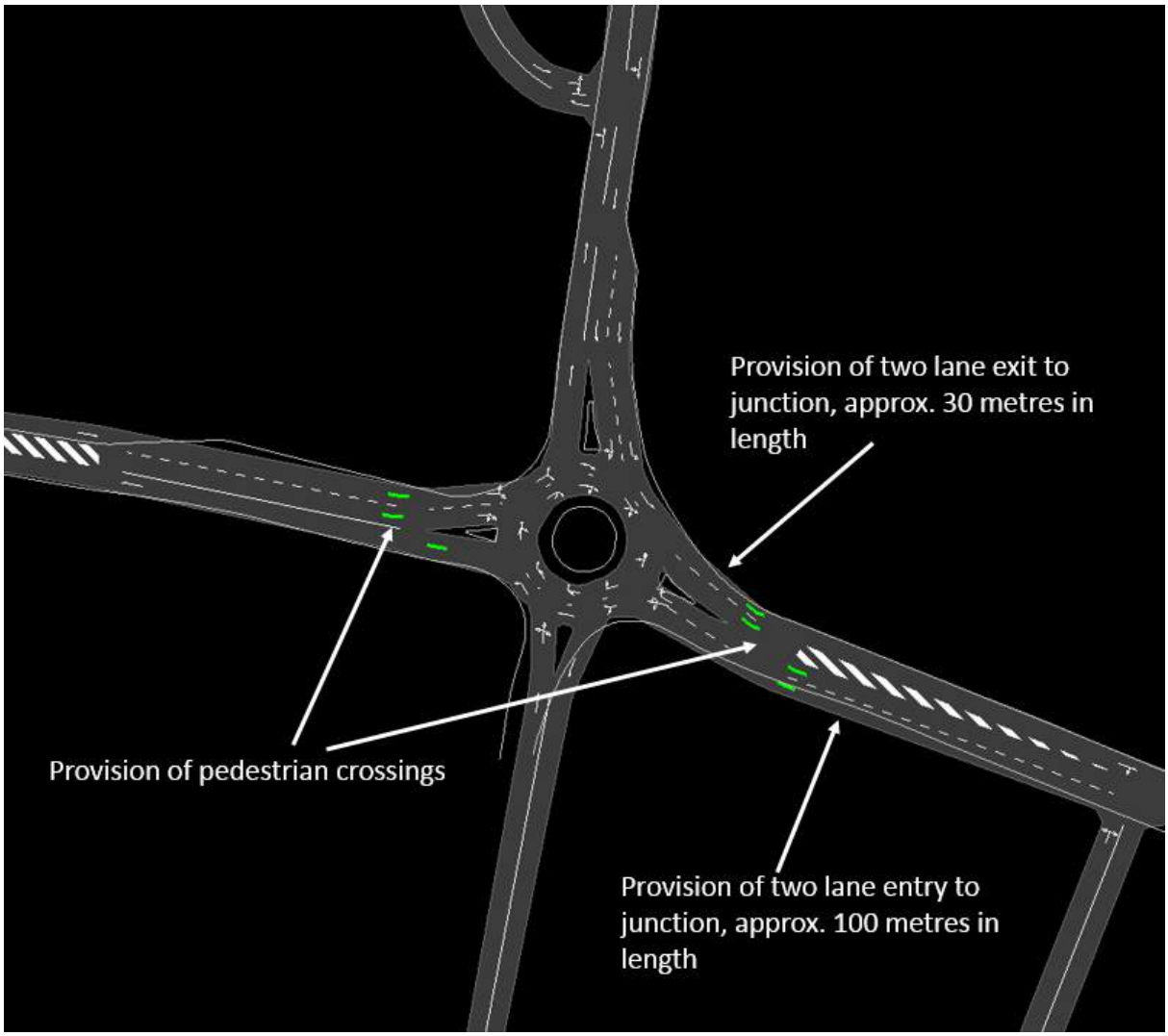
Scheme 17



Scheme 18 – Hillmorton Road/Whitehall Road Roundabout

The scheme at this junction involves the widening of Hillmorton Road/Whitehall Road roundabout with two lane entry on Hillmorton Road W and E approaches, along with two lane exit on Hillmorton E. Whitehall Road is also widened to two lanes on approach to the junction. Pedestrian crossings are added on Hillmorton Road E and W approaches

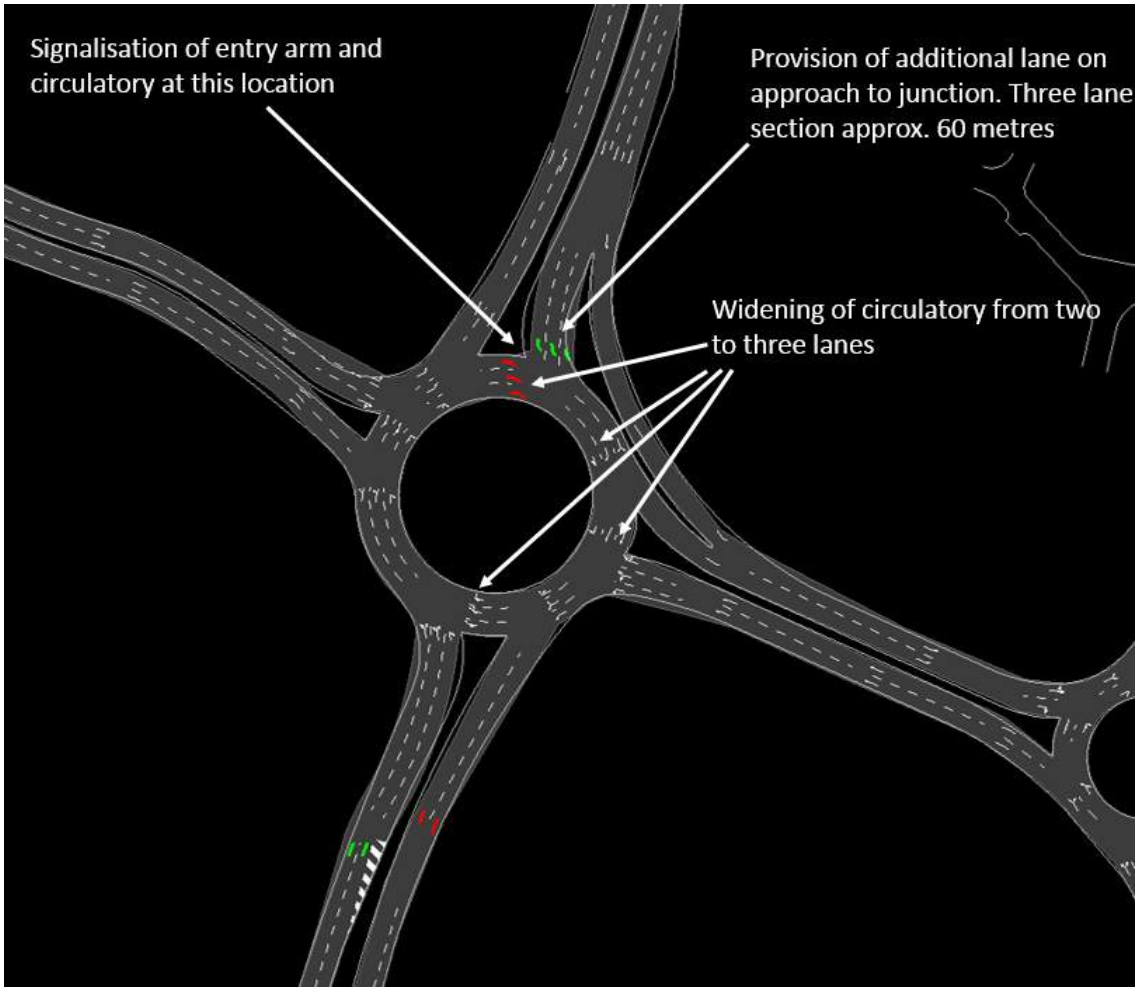
Scheme 18



Scheme 19 – A426/Central Park Drive

The scheme at this location involves an additional lane on the southbound entry to roundabout and widening of eastern circulatory from two to three lanes. Alongside this, a partial signalisation of the roundabout is implemented, on the A426 SB entry arm

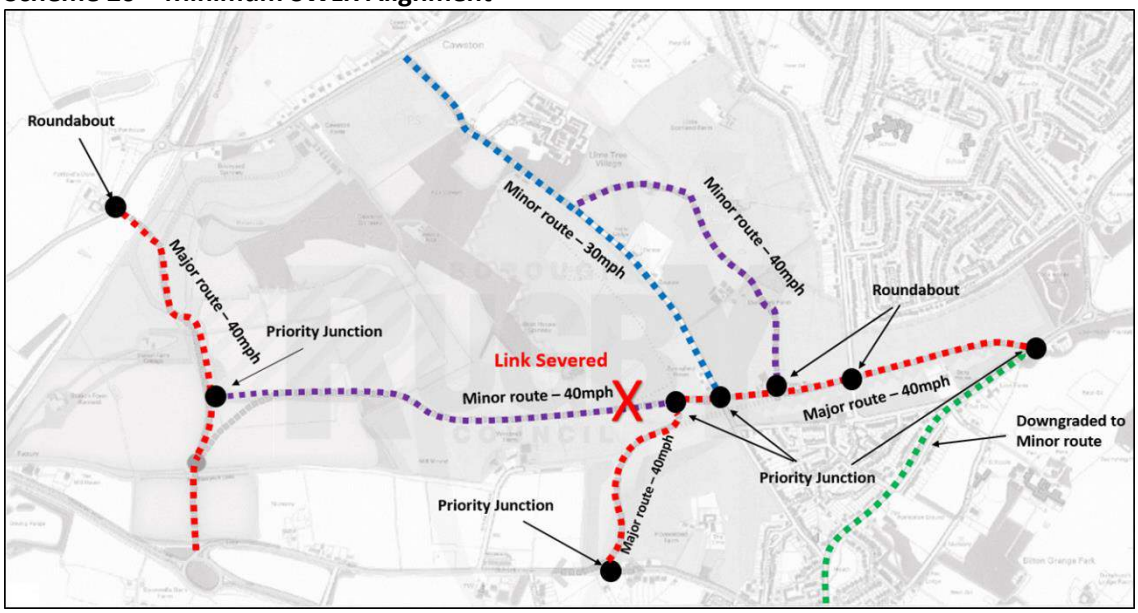
Scheme 19



Scheme 20 – SWLR (Full Build Out)

This scheme builds on Scheme 11 (Homestead Link) and involves the delivery of the SWLR in its entirety. Additional to the Homestead Link this involves the delivery of a link to access the employment land in the SW Rugby area, a secondary residential link, and a link from the A45/M45 to the A4071. The minimum SWLR alignment along with the optimum SWLR alignment options are provided below:

Scheme 20 – Minimum SWLR Alignment



Scheme 20 – Optimum SWLR Alignment