

**Stratford-on-Avon District Core Strategy
Strategic Transport Assessment:
Further Assessment of Traffic Implications in
Stratford-upon-Avon**

November 2015

Contents

1	INTRODUCTION.....	1
	Background.....	1
2	OBJECTIVE	3
	Scenarios.....	4
3	BASE MODEL DEVELOPMENT.....	5
	Stage One	5
	Stage Two.....	7
4	MATRIX DEVELOPMENT METHODOLOGY	10
	2031 Forecast Model Derivation	10
	Cordoned Demand Matrices	10
	Impact of South Western Relief Road	12
	External Growth	16
	Stage One Reference Case Demand Summary.....	17
	Stage Two Reference Case Demand Summary	18
5	SCHEME PROPOSALS	20
	Stage One	20
	Stage Two	22
6	RESULTS ANALYSIS	24
	Introduction.....	24
	Stage One	24
	Average Maximum Queue Lengths.....	27
	Stage Two	33
	Base Network.....	33
	Signalised Clifford Lane Junction Network	37
	Proposed Mitigation	41
	Network Comparison Summary.....	44
7	SUMMARY	46
	Stage One Summary	47
	Stage Two Summary.....	48
8	CONCLUSION	50
	Stage One Conclusions	50
	Stage Two Conclusions	50

Figures

Figure 1 – Stage One Cordon Model Extent	5
Figure 2 – Stage Two Cordon Model Extent	8
Figure 3 – SWRR location and unaffected westbound trips	13
Figure 4 – SWRR location and unaffected northbound trips	14
Figure 5 – Clopton Bridge/Bridgefoot Scheme proposals	21
Figure 6 – Clopton Bridge/Tiddington Road Scheme Proposals	21
Figure 7 – Layout of Proposed Signalised Waitrose Junction	22
Figure 8 – Average Network Journey Times (Seconds)	25
Figure 9 – Average Journey Speeds (KpH).....	26
Figure 10 – Average Maximum Queue Length (m) SB Clopton Bridge AM.....	27
Figure 11 – Average Maximum Queue Length (m) SB Clopton Bridge PM	28
Figure 12 – AM Shipston Road approach queues (veh)	29
Figure 13 – PM Shipston Road approach queues (veh).....	29
Figure 14 – AM Banbury Road approach queues (veh).....	30
Figure 15 – PM Banbury Road approach queues (veh)	30
Figure 16 – AM Warwick Road SB queues (veh).....	31
Figure 17 – Average Network Journey Times (Seconds), Base Network	33
Figure 18 – Average Maximum Clifford Lane AM Queues.....	34
Figure 19 – Average Maximum Trinity Way PM Queues.....	35
Figure 20 – Conflicted PM Atherstone Airfield traffic movements	36
Figure 21 – Network comparison, 2031 Reference Case	38
Figure 22 – Average Network Journey Times (Seconds), Signalised Network	39
Figure 23 – Average Maximum Shipston Road South PM Queues	40
Figure 24 – Shipston Road/Trinity Way/Clifford Lane Potential Layout	41
Figure 25 – Average Network Journey Times (Seconds), Mitigated Network.....	42
Figure 26 – Network Comparison, Clifford Lane AM Queues	44
Figure 27 – Network Comparison, Seven Meadows Road PM Queues	45

Tables

Table 1: 2015 to 2031 Tiddington Road/Gyratory Model – Forecasting	17
Table 2: Modelled Demand Summary	17
Table 3: 2015 to 2031 Trinity Way/Clifford Lane Roundabouts – Forecasting.....	18
Table 4: Modelled Demand Summary	19

1 INTRODUCTION

1.1 Warwickshire County Council (WCC) and Stratford District Council (SDC) have requested Vectos Microsim (VM) undertake a threshold assessment, focussing across two distinct areas to the south of Stratford-upon-Avon, to determine impacts of various housing and employment developments around Stratford-upon-Avon that can likely be delivered within the confines of:

- Clopton Bridge and Gyratory scheme proposals
- Trinity Way and Clifford Lane roundabouts.

1.2 This work is intended to build upon the recently completed Strategic Transport Assessment (STA) which looked at the potential impacts of various options for the delivery of housing within the Stratford-on-Avon District area¹.

1.3 A staged approach to the assessment was adopted whereby each area and the impacts therein was assessed separately. Stage One comprised testing of the Clopton Bridge proposals whilst Stage Two comprised the Trinity Way/Clifford Lane area assessment.

Background

1.4 The original STA work involved a threshold assessment of the likely lifespan of the Gyratory area within Stratford-upon-Avon based on assumptions pertaining to the allocation of housing within the immediate area of the town. It was intended that Stage One of this study would revisit that work, using the same model network, by undertaking an updated assessment which takes into account current housing and planning assumptions explicitly avoiding the use of generalised growth as much as possible, to better assess the likely lifespan of the scheme proposals for Clopton Bridge and the Gyratory.

1.5 The 2031 Reference Case model network, to which demands relating to these various developments will be added, includes these current scheme proposals.

1.6 The housing and planning assumptions adopted in this assessment have been developed through dialogue with WCC and SDC, who have provided a list of developments to include in the studies. These developments are at various stages within the planning process and

¹ Stratford-on-Avon Strategic Transport Assessment: Further Focussed Assessment of Development Options in the Stratford-upon-Avon and Southam Areas, Vectos Microsim, July 2015

comprise mainly residential developments around the Stratford area. The process through which demand matrices are developed for each of these developments is discussed later in the report.

- 1.7 For Stage Two, a new micro-simulation model of the Trinity Way and Clifford Lane roundabouts has been developed based on 2015 count data which provides a model network which is representative of on-site conditions. The purposes of the assessment are to consider the same housing and planning assumptions as in Stage One, but to assess the impact on Trinity Way and Clifford Lane roundabouts, which lie to the south of Clopton Bridge.
- 1.8 The proposed signalised 4-arm junction scheme at Clifford Lane roundabout which accompanies the delivery of the Meon Vale residential development was also tested to establish if there is a point at which this scheme will no longer mitigate the impacts of all local developments included within this assessment. An additional sensitivity test has also been undertaken which is intended to ascertain the relative difference in scheme performance between the scheme proposals in this area put forward to support the planning application and the proposals which are now understood to be intended for delivery.

2 OBJECTIVE

2.1 The objective of this assessment is to use the model, inclusive of the updated and refined forecast and demand assumptions, to assess the implications on the scheme proposals and general network operation of delivering various housing and employment developments around the two study areas. The developments under review are as follows:

- Meon Vale (550 dwellings)
- Home Guard Club (32 dwellings)
- Milestone Road (126 dwellings [inclusive of both phases 1 and 2])
- Codex Sims Metals (380 dwellings)
- Long Marston Airfield (400/3500 dwellings [separate tests to be discussed later])
- Knights Lane (100 dwellings)
- Arden Heath Farm (270 dwellings)
- Oak Road (60 dwellings)
- Atherstone Airfield (10 hectares employment)

2.2 The locations of these developments are illustrated in **Appendix A**.

2.3 These developments were broken down into a series of tests aimed to demonstrate the relative impacts of the additional developments relative to their status within either the existing planning process or within the Core Strategy to determine the point at which the schemes at Clopton Bridge and Clifford Lane Roundabout are unable to cope with network demands.

Scenarios

2.4 The point at which a development was included in testing was based on an assumed hierarchy which considered the development's status within the planning process. This was confirmed with both WCC and SDC prior to model testing. The structure of the testing was as follows:

- Scenario 1 (Reference Case); Meon Vale, Home Guard Club, Milestone Road & Codex Sims Metals – all with planning permission but not commenced
- Scenario 2; as Scenario 1, plus Long Marston Airfield (400 dwellings) – current application
- Scenario 3; as Scenario 2, plus Knights Lane, Arden Heath Farm & Oak Road² - current cases (Knights Lane refused, Arden Heath Farm at appeal)
- Scenario 4; as Scenario 3, plus Atherstone Airfield
- Scenario 5; as Scenario 3 plus full Long Marston Airfield (400+3100 dwellings)
- Scenario 6; as Scenario 5, plus Atherstone Airfield

2.5 Scenarios 5 and 6 also include the anticipated effects of the South Western Relief Road (SWRR) on all demand matrix levels. 3500 dwellings at Long Marston necessitates its inclusion and therefore any scenarios considering this quantum of development also includes the SWRR.

2.6 In previous testing, Codex Sims Metals, Home Guard Club and Milestone Road developments were considered to have been dealt with via the application of TEMPRO growth factors. The reference case scenario derived for Stage One of this study includes a specific account of all of these sites within the modelling.

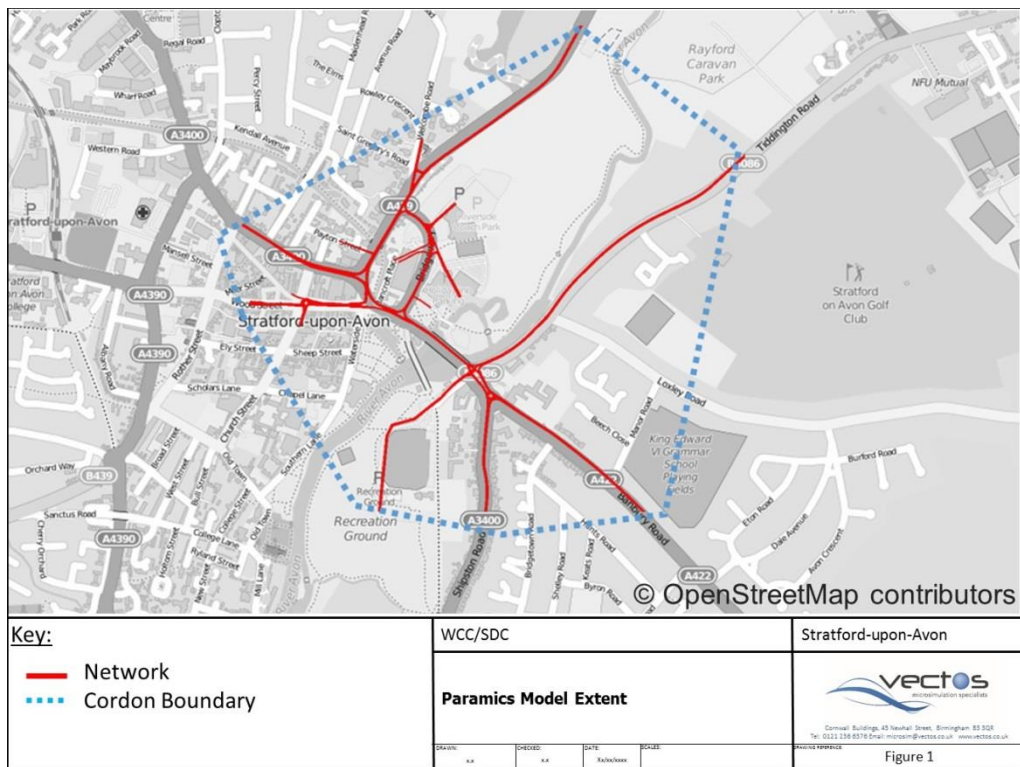
² As of 15/10/2015, Oak Road successfully received planning permission and therefore should have been included in the reference case scenario; unfortunately the modelling had already been undertaken

3 BASE MODEL DEVELOPMENT

Stage One

- 3.1 During early 2015 a cordon model of the Tiddington Road and Stratford Gyratory model was developed, based specifically on 2015 survey data. The objective of the development of this model was to ensure that the vehicular movements across the cordon area were modelled in as much detail as possible and that this modelling was based on current observations of traffic conditions rather than historic observations which have then been subject to a forecasting procedure. This model has been used for the purposes of Stage One of this assessment.
- 3.2 The coverage of the updated 2015 Tiddington Road and Stratford Gyratory model is illustrated within **Figure 1**.

Figure 1 – Stage One Cordon Model Extent



- 3.3 Updating a cordon model entails the revisiting of model assumptions in light of newly available traffic observations alongside a detailed review of how the model reflects the observed conditions as well as how the modelled flows, delays and queues match observations.
- 3.4 Thus, the production of cordon models can be both time consuming and costly. It is therefore only considered necessary to adopt such an approach in areas where the congestion effects are not fully understood within a wide area model or, alternatively, in areas where a clear answer cannot be obtained via an assessment undertaken only in a wide area traffic model.
- 3.5 Outputs and analysis from the cordon model were utilised to assess the implications of the Meon Vale proposals (i.e. Phase 2 comprising 550 dwellings and associated infrastructure) and concluded that the development impacts would likely be mitigated. This was based on the assumption that the scheme at Clopton Bridge and Tiddington Road is delivered in full.
- 3.6 The scheme proposals centre on the reconfiguration of the Tiddington Road/Clopton Bridge priority junction to a signalised arrangement. Introduction of the signals ensures that the right turn out of Tiddington Road towards Stratford-upon-Avon town centre can now be facilitated. By allowing this movement, the number of vehicles making a U-turn at the downstream Banbury Road/Shipston Road roundabout is reduced considerably.
- 3.7 The need for the U-turn is not removed completely since it is still not possible for vehicles travelling SB along Clopton Bridge to turn right into Swans Nest Lane and, therefore, these vehicles must continue south to the roundabout and complete the U-turn to access the car park.
- 3.8 The scheme proposals also include the reconfiguration of the northern end of Clopton Bridge to include signals and some widening so that traffic travelling SB along Bridgeway can be segregated based on whether the vehicles are intending to turn right either towards the town centre or along Guild Street.
- 3.9 Sketches of the proposals for the reconfiguration of the junctions to the north and south of Clopton Bridge have been provided within **Figure 6** and **Figure 6** later within this Report.
- 3.10 Subsequent work was undertaken, using this cordoned Tiddington model, to inform high level analysis of development thresholds for housing numbers to the east of Stratford-upon-

Avon. The work tested the impact of an incremental increase in housing numbers based on the assumption that the housing would be located in the area immediately to the southeast of Stratford-upon-Avon. This work identified an initial point at which it was perceived that the network (with the proposed mitigation layout in **Figures 5 and 6**) would cease to cope with the demands created by these developments. This work was based on an assumption of all housing being delivered within the south-eastern area of Stratford-upon-Avon and, furthermore, simplified background growth and housing delivery assumptions.

- 3.11 This study however, revisits these assumptions with particular emphasis on the inclusion of specific developments which are currently at various stages within the planning process. The purpose of this focus is to provide a more realistic forecast of how the network may perform in 2031 by ensuring that all developments which are considered important to the study are included, at various stages, explicitly and in full.

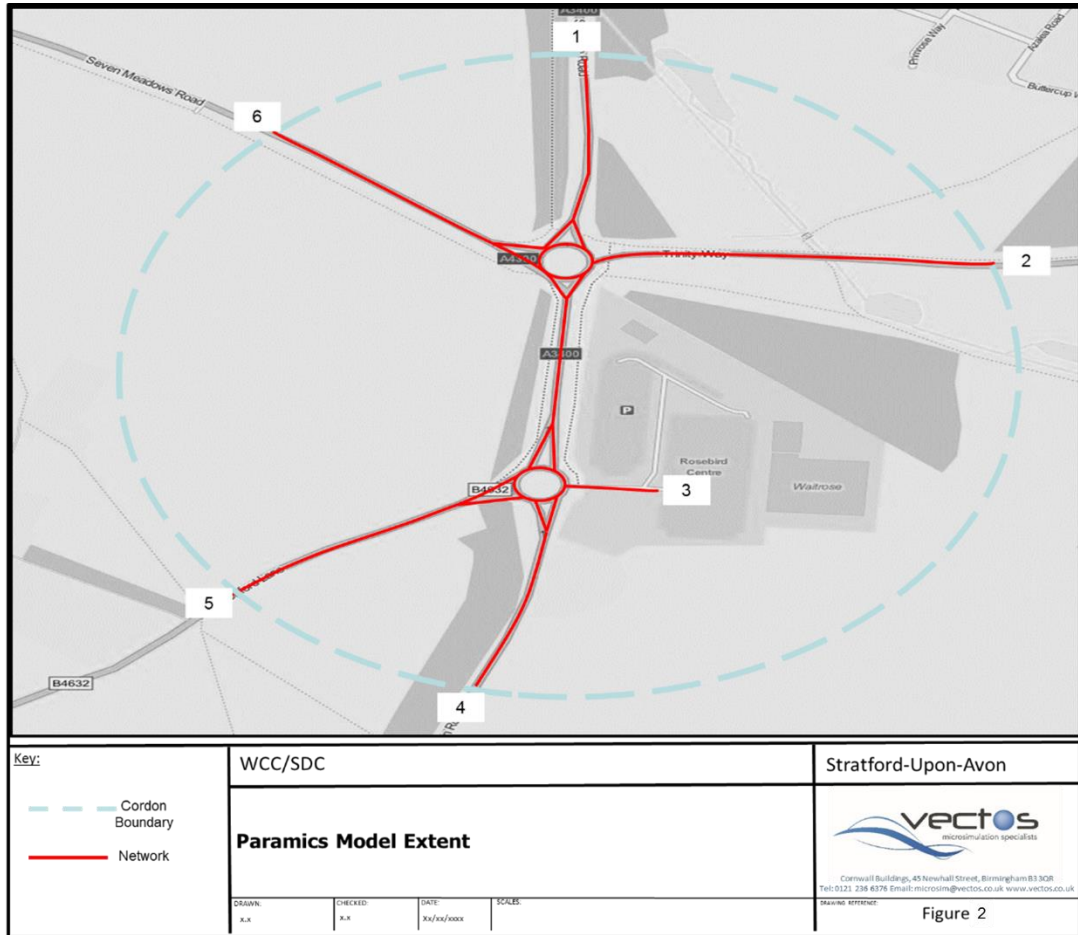
Stage Two

- 3.12 The Stage Two base model network was cordoned from the 2013 Stratford-upon-Avon Wide Area model (SuAWA), which included a network reflective of the current on-street arrangement.
- 3.13 A thorough network review was carried out, including network geometry, road speeds, pedestrian crossing locations etc. to ensure the cordoned network was a suitable representation of known conditions at the site.
- 3.14 Unlike the Stage One work for which a recently updated 2015 base model was already available, it was considered necessary to update the model with new 2015 turn counts at the two junctions. Counts and queue lengths were commissioned and conducted by Traffic Survey Partners on 01 October 2015. The model was subsequently calibrated and validated to this new data to provide an up-to-date 2015 base model with which to conduct this testing.
- 3.15 Full details of the process of base model development, along with calibration and validation statistics, can be found in the LMVR³

³ VM155038.R001 – Trinity Way/Clifford Lane Roundabouts LMVR

3.16 The coverage of the updated 2015 Tiddington Road/Stratford Gyratory model is illustrated within **Figure 2**.

Figure 2 – Stage Two Cordon Model Extent



3.17 The numbers at each arm represent the 6 zones that control the assignment of trips onto the model network:

- Shipston Road North
- Trinity Way
- Waitrose
- Shipston Road South
- Clifford Lane
- Seven Meadows Road

3.18 This 2015 model provided a sound base upon which to incrementally add the demands related to the developments contained within each scenario to determine how well the current network could cope with these demands. Furthermore, the proposed scheme involving signalising the Clifford Lane roundabout as part of the highway mitigation for Meon Vale could be coded into this new base model to ensure behaviours at approaches unaffected by the scheme remain as per the base, and the comparative merits of delivering the scheme can be understood.

4 MATRIX DEVELOPMENT METHODOLOGY

2031 Forecast Model Derivation

Cordoned Demand Matrices

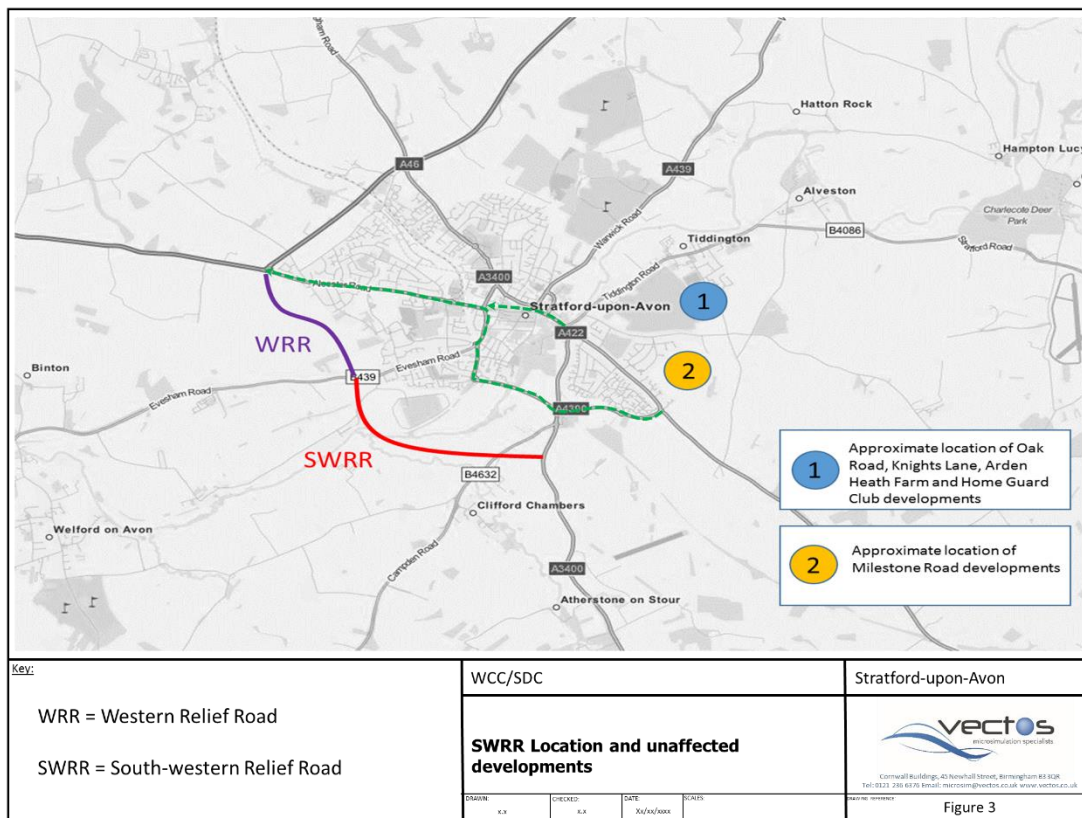
- 4.1 Previous Southeast Stratford Threshold Testing centred on the implications of delivering an additional quantum of housing to the east of Stratford (around the vicinity of Knights Lane/Loxley Road/Banbury Road). This testing included Meon Vale demands as committed, and therefore for the purposes of the Stage One study, the same demands were utilised (as the model networks for each test remained consistent). For Stage Two, Meon Vale demands were extracted via a new cordon directly from the Planning Application Model.
- 4.2 Long Marston Airfield and Arden Heath Farm demands were extracted, for each cordon study area, directly from the respective Planning Application Models for each Stage of the assessment.
- 4.3 Due to the proximity of some of the other sites in this study, Arden Heath Farm and Meon Vale distributions were applicable to a number of other residential developments. As a result, to derive matrices for Knights Lane and Oak Road, the dwelling numbers were compared to derive a factor with which to multiply Arden Heath Farm trips. For the Home Guard Club development, trips rates were provided directly from WCC which underlined the total trips to and from the site. Distributions from Arden Heath Farm matrices were again used due to the comparable location of both sites.
- 4.4 Similarly, for Codex Sims Metals, a factor comparing the quantum of dwellings was calculated and applied to the Meon Vale demand matrices since both sites would likely adopt the same trip distribution across both study areas due to the close proximity of the two developments.

- 4.5 The availability of wide area models of Stratford-upon-Avon proved useful in determining matrices for the two remaining development sites, Milestone Road and Atherstone Airfield, along with forecasting the impacts of including the SWRR upon background traffic. The three models used for cordoned demands were:
- SuA 2021 Reference Case
 - SDC 2031 Employment Option 03 Paramics model
 - SDC 2031 Strategic Option 03 (3500 at LMA + SWRR)
- 4.6 For Stage One Milestone Road demands, the SuA 2021 Reference Case model was used and a proxy zone identified. The zone related to the residential area around Dale Avenue/Avon Crescent as this is a zone of residential land use and so is directly comparable to the Milestone Road development, as well as being in a location very close to the proposed site. Trip rates were provided by WCC, and distribution out of the site was collected from the TA available online. This distribution was necessary to determine how many trips would be heading north towards the study area rather than heading to the south.
- 4.7 For Stage Two Milestone Road demands, the same process was followed except that only trips heading south were considered under the assumption that those heading south would then head westbound along Trinity Way towards the Stage Two study area. Although this may not be totally accurate in reality, it does however provide a robust test of forecast Milestone Road demands as it assumes that no vehicles continue southbound along Banbury Road. Considering the low volumes of traffic heading south from the development, analysis of expected distribution at the Banbury Road/Trinity Way roundabout would have been an onerous task which was deemed unnecessary.
- 4.8 For Atherstone Airfield, the SDC 2031 Employment Option 03 model, derived for the previous round of STA work, was used which included this site. This meant it was possible to cordon development specific demands across both study areas from this model and add them directly to the appropriate demand scenarios in this assessment.

Impact of South Western Relief Road

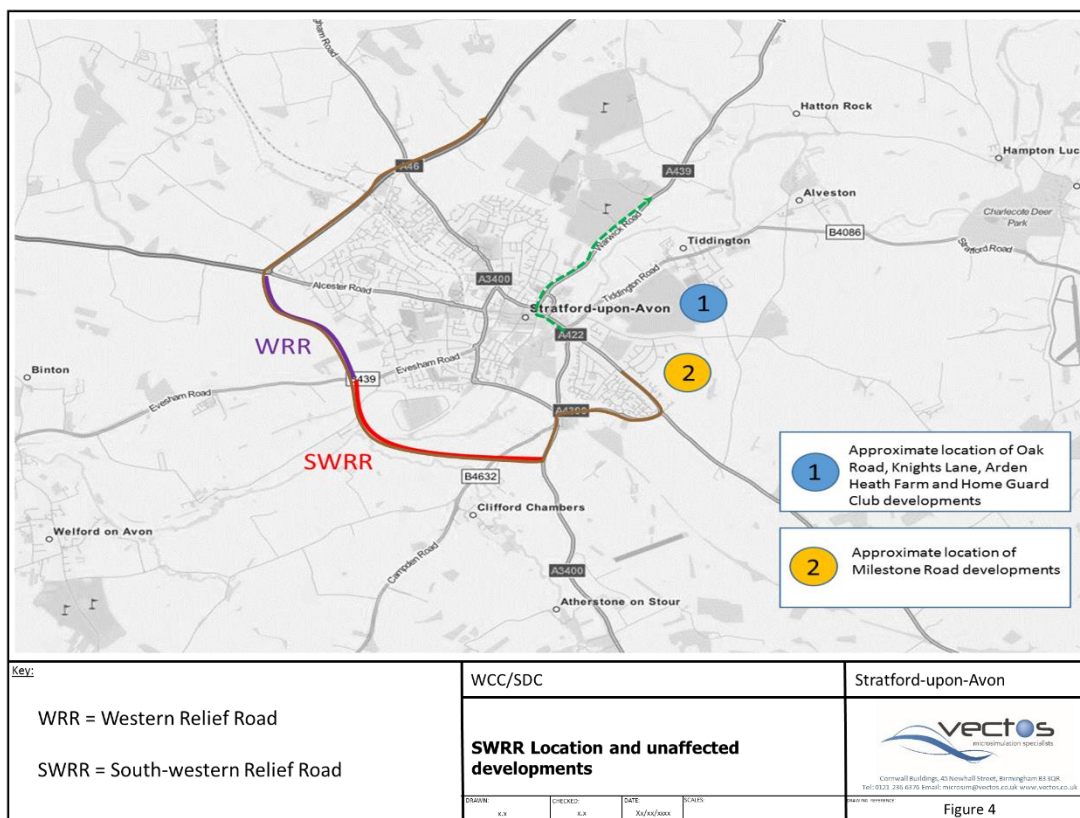
- 4.9 Many of the developments included in this study are located in an area to the southeast of Stratford-upon-Avon which is unlikely to be affected by delivery of the SWRR. All demand matrices relating to housing sites to the east of Stratford (Arden Heath Farm, Oak Road, Knights Lane and Home Guard Club) were unaffected by inclusion of the SWRR and demands for these developments was retained at a consistent level throughout all scenarios.
- 4.10 Likewise, Milestone Road demands were deemed to be unaffected by the SWRR. As well as these demands being relatively low, it is unlikely that any trips generated by this development would use the relief road due to the development's location to the north-east of the SWRR and the significant detour required to complete the route.
- 4.11 **Figure 3** overleaf shows the approximate locations of these unaffected developments (for an overview of the location of all developments included in this assessment, see **Appendix A**). As demonstrated, the SWRR would not likely impact upon routes to and from these developments. Vehicles travelling between these developments and the west of the study area would still be likely to either travel through Stratford, via Clopton Bridge/Alcester Road, or use the southern route along Seven Meadows Road, particularly considering this route is likely to be less congested following delivery of the South Western Relief Road due to the number of vehicles from the south who will use it. This is illustrated by the green routes in the Figure, which show the expected preferred routes from these eastern developments to the west side of Stratford (i.e. the A46 towards Alcester).
- 4.12 It is feasible that some vehicles travelling from Milestone Road towards Alcester may divert southwards along Evesham Road to join the Western Relief Road up to the A46 roundabout; however this would still lead to an unchanged number of trips across the Trinity Way roundabout following delivery of the SWRR and WRR, which results in a need to maintain consistent trip numbers from this development following inclusion of the SWRR.
- 4.13 In regards to trips from Arden Heath Farm, Knights Lane, Oak Road and Home Guard Club developments, it is unlikely these would ever need to use either relief road. It is expected these trips would continue to use Clopton Bridge to access the west side of Stratford, benefiting from the reduced trip numbers from the south which may otherwise also need to travel across the Bridge.

Figure 3 – SWRR location and unaffected westbound trips



4.14 For those trips from these developments heading north towards the M40, **Figure 4** illustrates the unlikely trip pattern that would be required for vehicles to need to use either Relief Road (highlighted in brown). The location of these developments dictates that drivers will almost certainly maintain their current trip pattern across Clopton Bridge and northbound along Warwick Road up to the A46. This is in contrast to those vehicles coming from developments to the south west of our study areas (i.e. Meon Vale, Codex Sims Metals), who may be expected to utilise the SWRR and WRR to join the A46 at the Alcester Road roundabout. This provides the basis for the assumptions regarding re-distribution of trips following delivery of the SWRR.

Figure 4 – SWRR location and unaffected northbound trips



- 4.15 The point at which the SWRR is tested includes the proposal for an additional 3100 dwellings at Long Marston Airfield, bringing the total housing numbers to 3500. This was tested previously in the SDC 2031 Strategic Option 03 model which was used to directly cordon out these demands for each respective study area.
- 4.16 This model also proved useful in determining the impacts of the SWRR on Atherstone Airfield. The demands relating to this development were extracted from the SDC 2031 Employment Option 03 model and assigned into the SDC 2031 Strategic Option 03 model (which includes the SWRR)⁴. The model was run and results extracted using separate cordons for each Stage of the assessment. This provided cordoned matrices of Atherstone Airfield trips going through each study area following inclusion of the SWRR.

⁴ The assumptions used in the STA modelling included 10 Ha of employment located in the area identified through policy SUA.2 (100% B1) plus 10 Ha of land located to the south of Stratford-upon-Avon, near Atherstone Airfield, to facilitate the relocation of employment from the CQ area (20% B1, 30% B2, 30% B8 and 20% sui generis) at an assumed land occupancy rate of 40%

- 4.17 As all of these models used for cordoning purposes were only developed for 2 hour periods, factors were required to provide the third hour demand matrices in each peak. In the case of Atherstone Airfield, trip generation for the third peak hour was calculated as per the trip rates adopted during the recent update to the Strategic Transport Assessment. For the remaining residential demands, a post-peak proxy was calculated based on the relationship between total post-peak demands and peak demands in the Meon Vale and Arden Heath Farm matrices (this was calculated for each Stage of the assessment separately).
- 4.18 In regards to representing the effects of the SWRR on background traffic, identical cordons of both SDC Strategic Option 03 and SDC 2031 Employment Option 03 were taken, with matrix levels 1-4 included (this included Baseline traffic, committed developments and background growth). The changes in distribution across each study area were then reflected in the base and growth matrix levels in the respective 2031 Reference Case models.
- 4.19 The purpose of using the Strategic Option 03 model to inform the redistribution of background traffic is that it also includes all of the developments which will likely contribute to the need for the SWRR. If the SWRR were coded within an alternative model network with lower demands it may not accurately represent the true impact of the SWRR as there may be less congestion in the network which contributes to the attractiveness of the SWRR as an alternative route from the south of Stratford to the A46.
- 4.20 It should also be acknowledged that this will likely present a worst case in terms of the demand levels since the flows have been extracted from an historic model which doesn't necessarily reflect the latest traffic levels across the study area.
- 4.21 Furthermore, by cordoning the demands they have become a fixed entity and therefore the model is not allowed to react to the formation of queuing within the study area by reassigning traffic away from the congested area. This will result in an allowance for greater queues to form within the model network than may occur in reality since no allowance for reassignment has been made at this stage.

External Growth

- 4.22 By assigning the demands associated with each of these developments explicitly it was considered that the application of additional growth across all demands, based on an interrogation of the TEMPRO database, would likely be over-estimating growth within the study area. Therefore only external trips, i.e. those without a trip origin or end within the Stratford-on-Avon area, were considered as appropriate to forecast via the application of TEMPRO growth factors.
- 4.23 By cordoning these demands from the SuAWA model, it was possible to calculate a percentage of all trips in each study area that are true external-to-external, and factor these demands by TEMPRO NTEM adjusted growth levels (17.92% for the AM and 19.10% for the PM). These growth factors were used for both study areas.

Stage One Reference Case Demand Summary

4.24 A summary of the growth levels that have been realised within the Stage One modelling as a result of the assignment of the Meon Vale, Home Guard Club, Milestone Road and Codex Sims Metals demands, along with External Growth, is provided within the following Table.

Table 1: 2015 to 2031 Tiddington Road/Gyratory Model – Forecasting

Period	Hour	2015	2031	New Dev	2031 Growth
AM	07:00-08:00	2498	2675	177	7.09%
	08:00-09:00	3370	3644	274	8.13%
	09:00-10:00	2800	2979	179	6.38%
PM	16:00-17:00	3258	3427	169	5.18%
	17:00-18:00	3525	3751	226	6.41%
	18:00-19:00	2928	3108	180	6.16%

4.25 The total quantum of trips in each scenario is summarised in **Table 2** below. Note that the total of demands in the 2031 Ref is equal to the total demands for all modelled hours within the 3 hour period (as presented in Table 1), plus buses which have been included as a separate matrix level in the model.

Table 2: Modelled Demand Summary

	AM		PM	
	Demands	% Increase	Demands	% Increase
2031 Ref	9456		10432	
Scenario 2	9623	1.77%	10592	1.53%
Scenario 3	9979	5.53%	10838	3.89%
Scenario 4	10468	10.70%	11408	9.36%
Scenario 5	10440	10.41%	11589	11.09%
Scenario 6	10815	14.37%	11828	13.38%

4.26 Analysis of the demands presented within the previous table reveals a significant increase in trips resulting in developments attributable to Scenario 4 in comparison with Scenario 3 which illustrates the effect that Atherstone Airfield is predicted to have on the study area.

4.27 Demands then continue to rise in the PM even within the SWRR scenarios (total AM demands between Scenario 4 and 5 remain at similar levels). One reason is that, at this stage, the model networks from which the demands were cordoned contain a high level of development which is itself necessary to justify the need for the SWRR. Thus whilst some traffic will likely be attracted to the SWRR there will also be a substantial amount of residual demand within the model network since a large quantum of development is assumed to accompany the SWRR. The percentage increase in demands however between Scenarios 4 and 5 is relatively modest given the scale of additional development in the latter, which suggests the SWRR does encourage the reassignment of some vehicles away from the study area.

Stage Two Reference Case Demand Summary

4.28 A summary of the growth levels that have been realised within the Stage Two modelling as a result of the assignment of the Reference Case developments is provided within the following Table.

Table 3: 2015 to 2031 Trinity Way/Clifford Lane Roundabouts – Forecasting

Period	Hour	2015	2031	New Dev	2031 Growth
AM	07:00-08:00	1675	2000	325	19.44%
	08:00-09:00	2637	3189	552	20.91%
	09:00-10:00	2118	2472	354	16.71%
PM	16:00-17:00	2685	3045	360	13.43%
	17:00-18:00	2971	3446	475	15.98%
	18:00-19:00	2079	2448	369	17.77%

4.29 As expected, the growth forecasts in terms of turn counts at Clifford Lane and Trinity Way roundabouts exceed those of the junctions further north contained in the Stage One assessment. This is due to the closer proximity of these junctions to the Meon Vale and Codex Sims Metals developments which are the predominant drivers of growth in the 2031 Reference Case scenario. There is less opportunity for trips associated with these developments to divert away from the study area prior to passing through the Clifford Lane/Shipston Road roundabout (as there is in the Stage One assessment) since vehicles will route through these two junctions irrespective of which river crossing they are destined for.

4.30 The total quantum of trips in each scenario is summarised in **Table 4** below.

Table 4: Modelled Demand Summary

	AM		PM	
	Demands	% Increase	Demands	% Increase
2031 Ref	7682		8957	
Scenario 2	8097	5.41%	9416	5.12%
Scenario 3	8285	7.85%	9578	6.93%
Scenario 4	9292	20.97%	10705	19.51%
Scenario 5	8652	12.64%	9306	3.90%
Scenario 6	9478	23.38%	9738	8.72%

4.31 While forecasting demonstrates that Meon Vale and Codex Sims Metals' proximity to the study area increases expected traffic flows, the closer proximity of the SWRR to this study area compared with the Stage One study area means that the reductions in background and development traffic levels, induced as a result of the inclusion of the SWRR, are also greater.

4.32 Analysis of the demands presented within the previous table reveals a significant increase in trips resulting in developments attributable to Scenario 4 in comparison with Scenario 3 which indicates the effect that Atherstone Airfield has on the study area.

4.33 Following adoption of the SWRR, demands then fall, despite the addition of 3500 dwellings at Long Marston Airfield, primarily as a result of the number of Meon Vale and Codex Sims Metals trips expected to use the SWRR rather than the Trinity Way and/or Clifford Lane junctions. This is due to the alternative route now available for trips from the west of Stratford heading to these residential developments, and other locations to the south. Interrogation of the background demand adjustments shows that following inclusion of the SWRR, trips from Seven Meadows Road to Clifford Lane reduce by approximately 74% in the AM and 77% in the PM, and trips to Shipston Road South from this origin zone reduce by 40% and 53% respectively. Meon Vale and Codex Sims Metals development trips from Seven Meadows Road to Clifford Lane also fall by 42% (AM) and 12% (PM).

5 SCHEME PROPOSALS

Stage One

- 5.1 In addition to the identification of the forecast demands, it was also necessary to include the scheme proposals as identified in the recent planning application for the Meon Vale proposed development.
- 5.2 The scheme proposals comprise reconfiguration of the Tiddington Road/Clopton Bridge junction to enable signal control and to facilitate the right turn movement out of Tiddington Road. In addition, the Bridgefoot/Clopton Bridge junction to the northwest of Clopton Bridge also comes under formal signal control.
- 5.3 The configuration of the proposals for both the north-western and south-eastern ends of Clopton Bridge are illustrated within **Figure 5** and **Figure 6** respectively:

Figure 5 – Clopton Bridge/Bridgefoot Scheme proposals

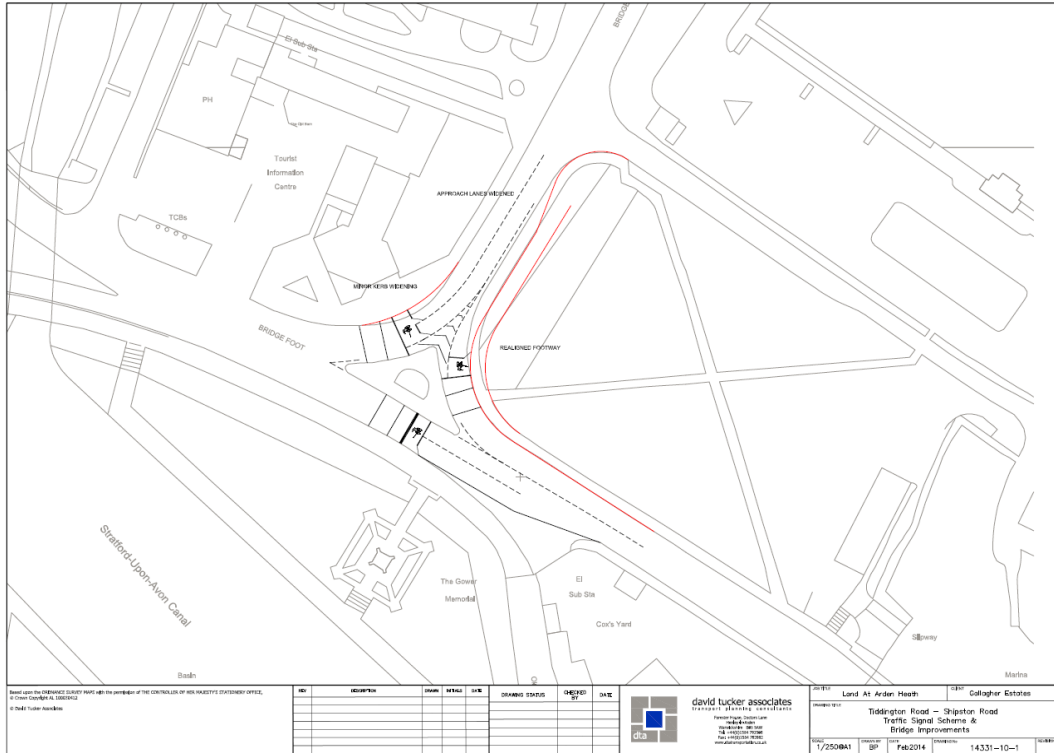
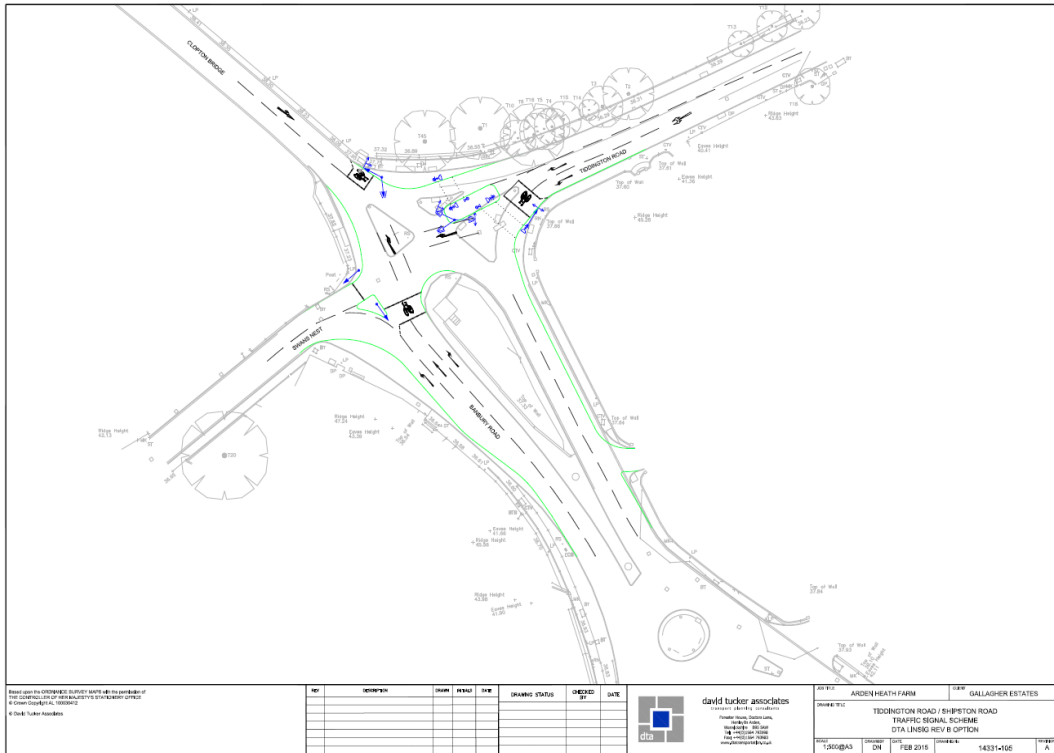


Figure 6 – Clopton Bridge/Tiddington Road Scheme Proposals



5.5 The primary objective of this assessment is to determine and quantify the impacts of the various developments highlighted earlier on the network within the confines of these existing scheme proposals.

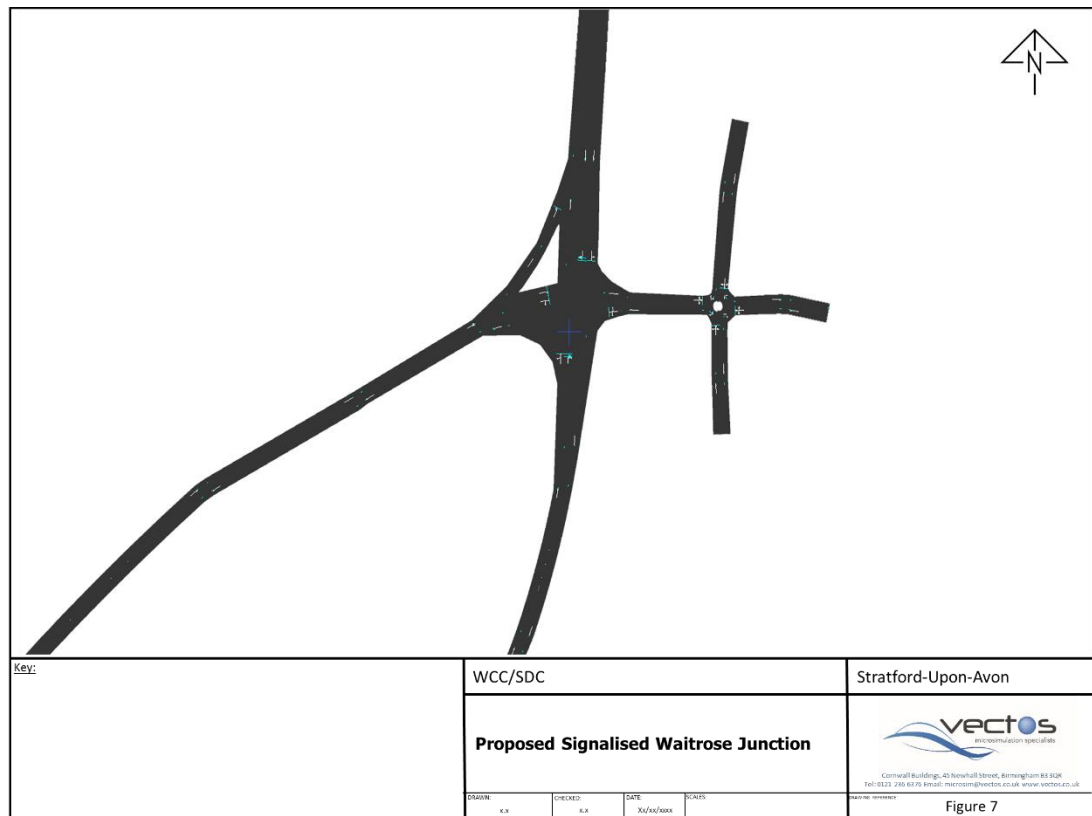
Stage Two

5.6 In addition to the identification of the forecast demands, it was also necessary to include the scheme proposals as identified in the recent planning application for the Meon Vale proposed development.

5.7 The scheme proposals comprise reconfiguration of the Shipston Road/Waitrose/Clifford Lane junction from a roundabout to a four-arm signalised arrangement.

5.8 A screenshot of this junction as coded into Paramics is shown below:

Figure 7 – Layout of Proposed Signalised Waitrose Junction



- 5.9 This scheme represents the most up-to-date drawing as provided by WCC in September 2015 (Drawing No. 1136-10 Rev B).
- 5.10 The primary objective of the Stage Two study is to further investigate the effectiveness of this scheme in comparison with the base to determine whether it provides benefit following the introduction of the development demands included in the various scenario runs, and if so at which point this scheme can no longer accommodate the forecast traffic growth.
- 5.11 Following on from this, VM sought to identify a scheme able to accommodate growth pertaining to all developments included in this assessment. The process through which this was achieved and the criteria used to inform the scheme proposals will be discussed further in the Results chapter.

6 RESULTS ANALYSIS

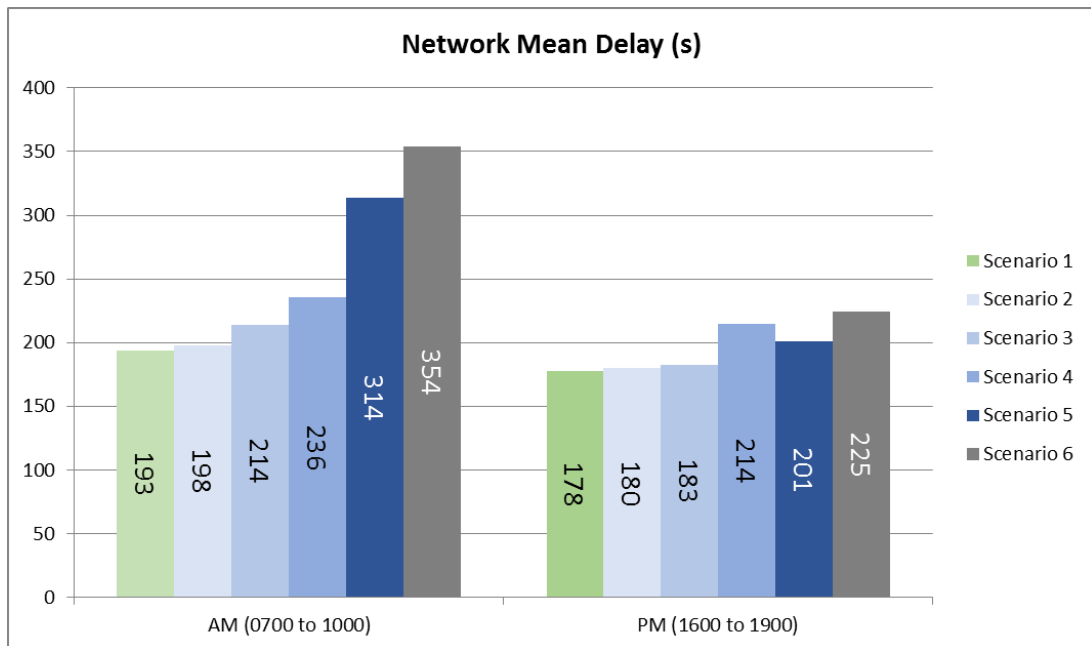
Introduction

- 6.1 The following section presents the findings from each respective Stage of the study. Stage One results are based on one network only, which is the 2031 Reference Case network inclusive of the proposed scheme at Tiddington Road and the Gyratory, as presented in **Figures 5 and 6**. Stage Two considers three separate network scenarios; Base, Proposed Signals and a mitigated network as suggested by VM through iterative testing of the forecasted demands.

Stage One

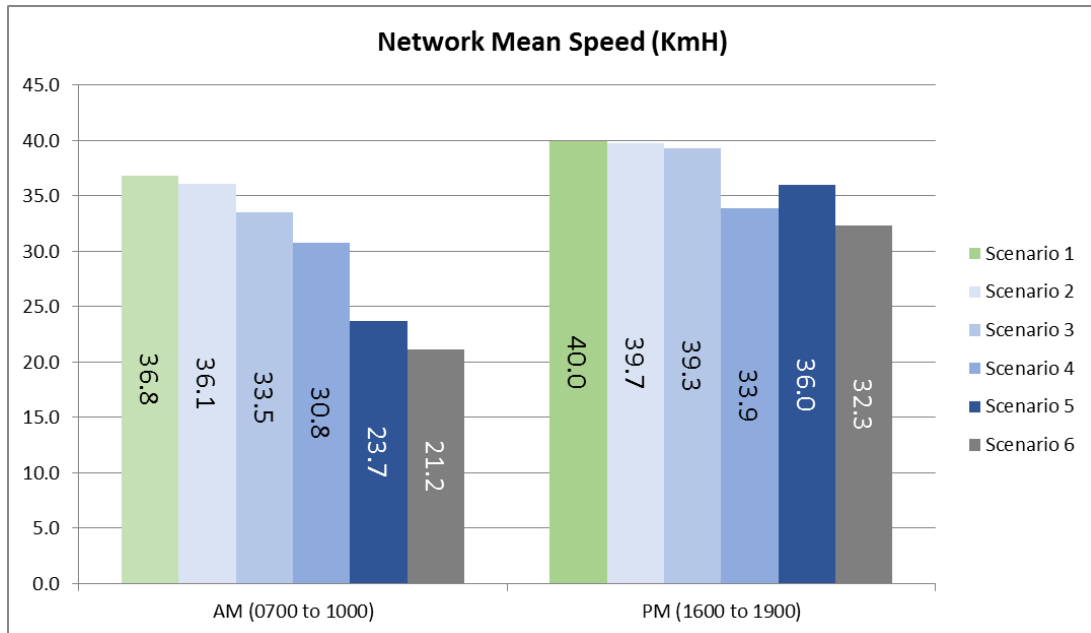
- 6.2 The initial results analysis has focussed on a high level review of the model network performance and the impacts that are forecast to occur as a result of the housing and employment developments around Stratford.
- 6.3 The results analysis has focussed on high level outputs extracted from each scenario including network-wide average journey times and network-wide mean speeds. In addition, the average peak hour maximum queue lengths have also been extracted for review.
- 6.4 Average journey time has been calculated as the average travel time of a completed trip during the model simulation period. This has been extracted for the AM (07:00 to 10:00) and PM (16:00 to 19:00) model periods in entirety and is presented within **Figure 8**.

Figure 8 – Average Network Journey Times (Seconds)



- 6.5 The results show that average journey times are subject to greater increases within the AM than the PM. When compared to the reference case the journey times increase by over 83% in Scenario 6 (inclusive of all tested developments) during the AM peak.
- 6.6 Journey time increases are less pronounced in the PM, with a delay increase of approximately 25% between Reference Case and Scenario 6.
- 6.7 The graphs suggest that the network is able to accommodate traffic produced by Scenarios 2 and 3 during both AM and PM periods. Increases in journey time are quite modest suggesting there is capacity in the network to cope with demand increases of this magnitude.
- 6.8 Scenario 4 shows a notable jump in delay in both peak periods, increasing from 214 seconds in Scenario 3 to 236 seconds in Scenario 4 (an AM increase of approximately 10%), and from 183 seconds to 214 seconds in the PM (approximately 17%).
- 6.9 Analysis of the average speeds that are achieved by vehicles travelling through the model network has also been undertaken and the outputs from this analysis have been presented within **Figure 9**.

Figure 9 – Average Journey Speeds (KpH)



6.10 The graph above provides a mirror image to the graph in **Figure 8**. As journey times increase, network mean speeds reduce.

6.11 Based on this it is reasonable to conclude that in regards to overall network delay, in addition to the developments included in the Reference Case scenario, further developments at Long Marston Airfield (400), Knights Lane, Arden Heath Farm and Oak Road can be accommodated within the model network. This conclusion also means that with Oak Road now committed, no significant detriment would be expected should this be added into the Reference Case.

6.12 A notable anomaly in the PM results shows that network mean delay reduces between scenarios 4 and 5, despite scenario 5 containing a greater total of demand. This appears to be primarily a result of higher demands from the Atherstone Airfield employment site which creates additional delay along Shipston Road towards Clopton Bridge.

6.13 Scenario 5 also includes the effects of the SWRR which reduces demands going through the study area from Meon Vale and Codex Sims Metals sites.

Average Maximum Queue Lengths

- 6.14 Whilst network conditions can provide an overview of the whole study area, one of the key findings from this study was to analyse the impacts of these various combinations of developments on Clopton Bridge and crucially, whether congestion leads to prolonged queuing across the length of the bridge. Furthermore, the study sought to analyse the threshold for development that can be accommodated by the proposed schemes for the Clopton Bridge/Tiddington Road/Bridgefoot/Warwick Road/Bridgeway Gyratory area.
- 6.15 The length of Clopton Bridge from the Bridgeway junction at the north western end to the Tiddington Road junction to the southeast is approximately 225m. By extracting maximum queue lengths along this route in both directions, averaged across the 10 seed runs for each scenario, an understanding of the expected queue lengths can be achieved.
- 6.16 The graphs below show expected queue lengths on the southbound carriageway of Clopton Bridge in both AM and PM scenarios:

Figure 10 – Average Maximum Queue Length (m) SB Clopton Bridge AM

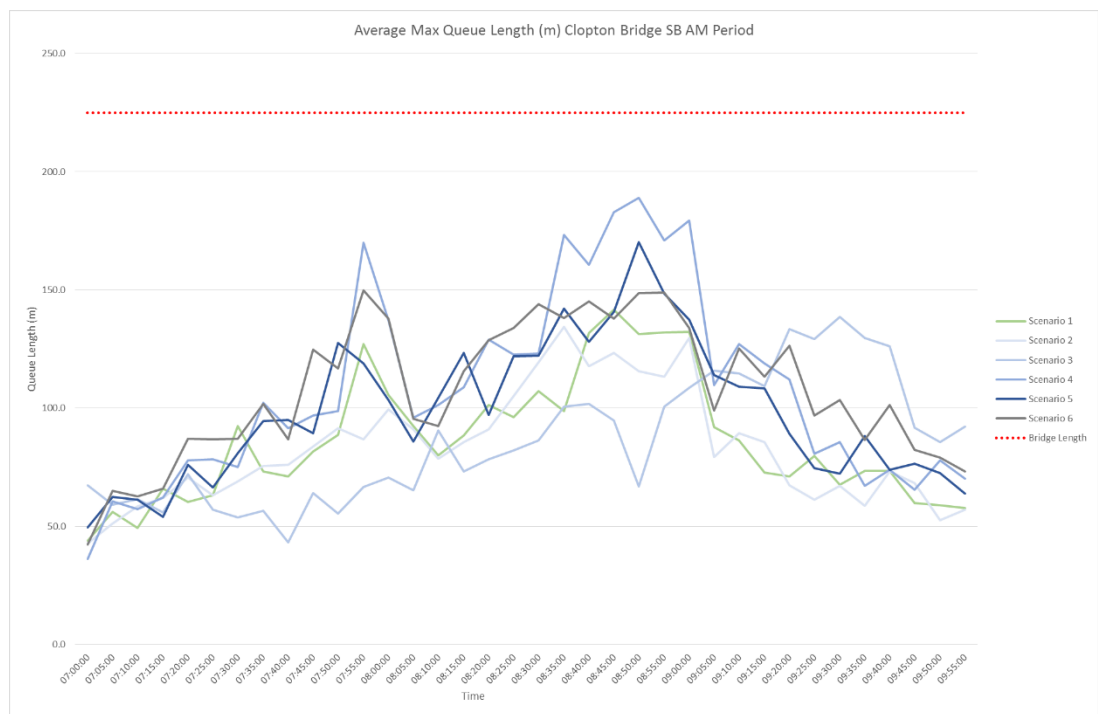
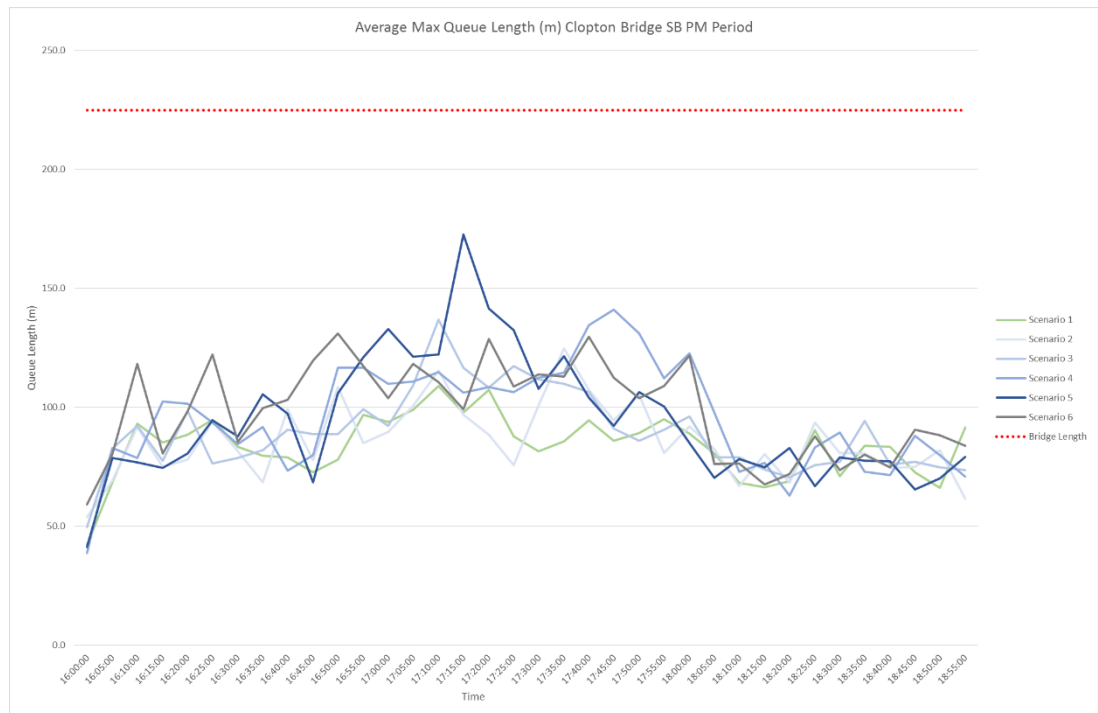


Figure 11 – Average Maximum Queue Length (m) SB Clopton Bridge PM



6.17 The red dotted line indicates the 225m of roadway between the two junctions that makes up Clopton Bridge. As shown in the graphs, neither the AM nor PM maximum queue lengths reach the maximum length that can be accommodated on the bridge.

6.18 This suggests that queuing on the bridge never significantly materialises in any of the modelled scenarios to the point where static queues are exhibited along the length of the bridge. This however can be misleading due to the nature of how Paramics and microsimulation models in general record vehicles in a queued state. As there are signals at either end of the bridge in the scheme proposals, vehicles are only queued during times when a red signal is showing. As the stage turns green, vehicles are allowed exit from the bridge and the vehicle leaves its queued state. As stated in the project scoping note:

“VM will review the signal times and model operation and make amendments to optimise where necessary. Optimisation will be undertaken with the objective of ensuring that the queuing on Clopton Bridge is minimised and, primarily, the propensity for queues on the SB section of the bridge to block back into the gyratory is minimised”

- 6.19 The resulting queue graphs show that queues do not increase at the same rate as demands through the scenario tests. This is because of the ability of the signals to gate traffic across the bridge and onto the exits of the network.
- 6.20 Combined with the increase in network delay we see in **Figure 8**, the implication is that delay is experienced elsewhere in the network.
- 6.21 Queue graphs for Shipston Road and Banbury Road for both peak periods are presented below:

Figure 12 – AM Shipston Road approach queues (veh)

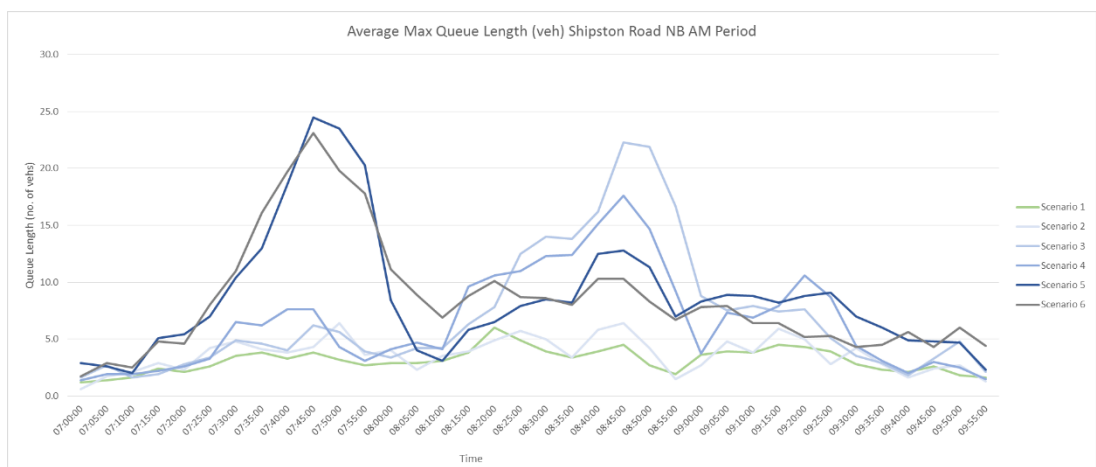


Figure 13 – PM Shipston Road approach queues (veh)

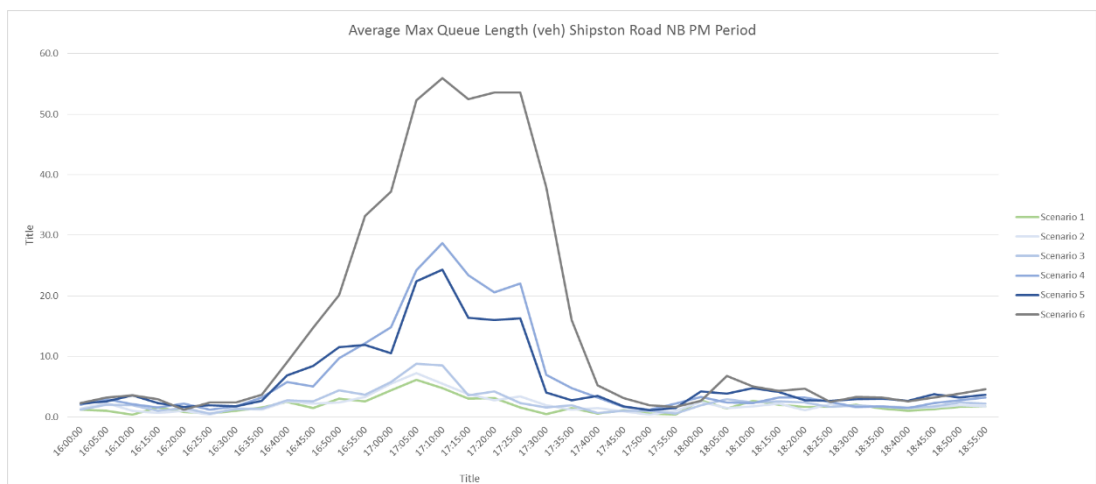


Figure 14 – AM Banbury Road approach queues (veh)

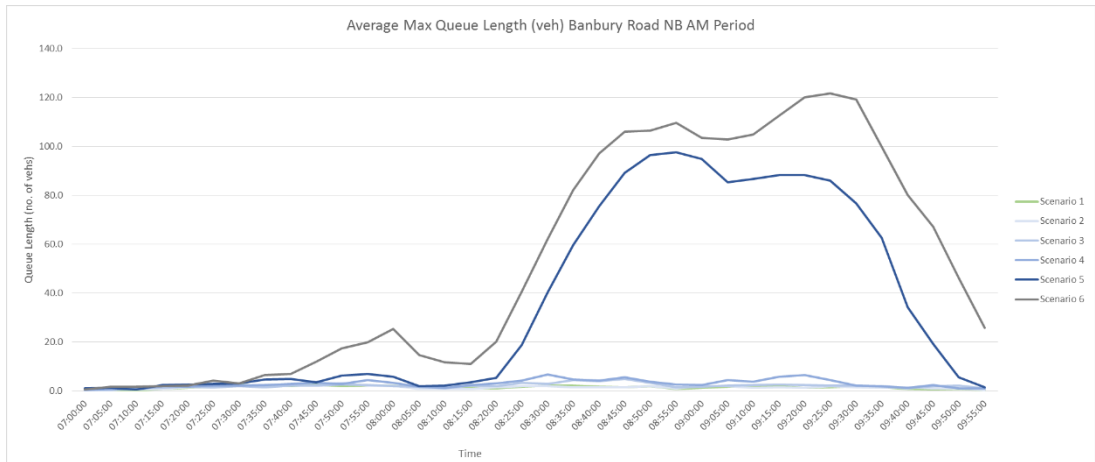
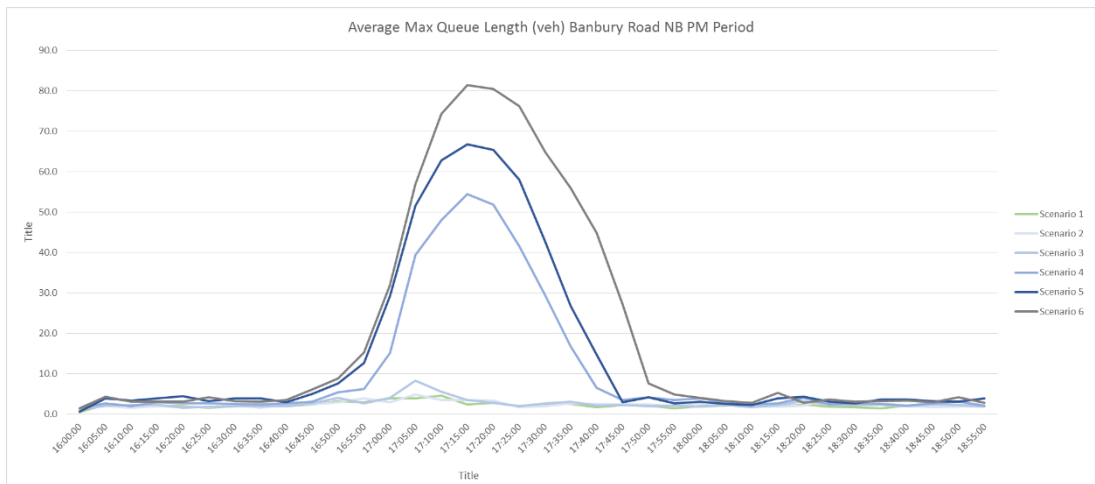


Figure 15 – PM Banbury Road approach queues (veh)

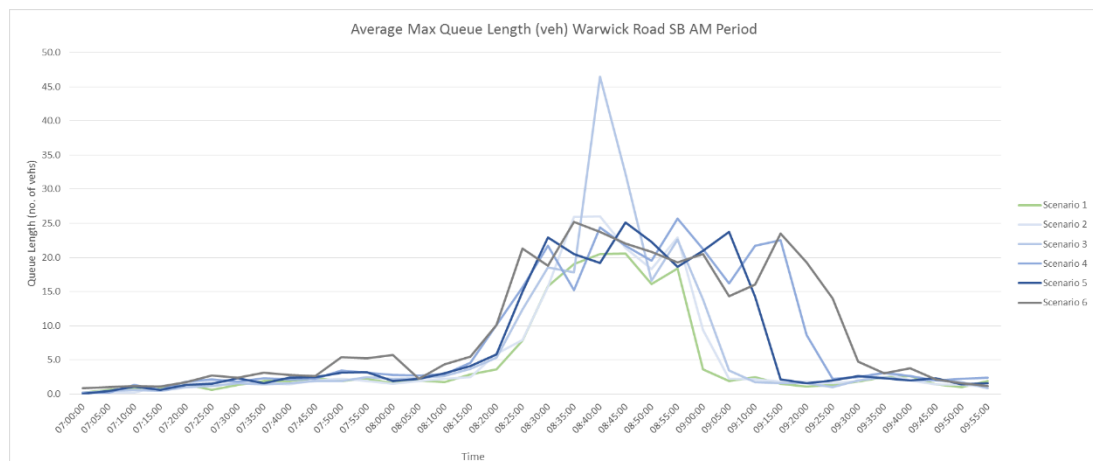


6.22 The results show that in the AM, queues along Shipston Road and Banbury Road increase significantly in Scenarios 5 and 6 resulting primarily from the large demand levels associated with the 3500 dwellings at Long Marston Airfield. This contributes heavily to the large increase in delay shown by the network statistics in **Figure 8**.

6.23 In the PM, the graphs show that queues along Shipston Road are greater in Scenario 4 than Scenario 5, due to the inclusion of Atherstone Airfield without the inclusion of the SWRR, which contributes to the increased network delay experienced in Scenario 4.

- 6.24 In order to keep queues along Clopton Bridge to a minimum, synchronisation between the signals at either end of the bridge has been optimised as best as possible. This means that the westbound approach at the Bridgeway signals has been prioritised to discourage vehicles from queuing along the bridge.
- 6.25 This has however led to additional queuing at the Bridge Street left turn exit (as these vehicles are required to give-way to a more steady flow of traffic) and at the Bridgeway southbound approach.
- 6.26 A side-effect of this Bridgeway queuing is that it further reduces the section of roadway where vehicles can merge into their appropriate lane depending on whether they are turning right towards the town centre or left onto the bridge. This creates a secondary ‘gating’ effect which prevents a constant stream of traffic from entering the bridge in an eastbound direction, and further contributes to the relatively short maximum queuing shown by the graphs in **Figures 10 and 11**.
- 6.27 This slow-moving traffic caused by the weave-section southbound along Bridgeway can on occasion propagate back towards the Warwick Road southbound approach, which shows fairly significant AM queuing resulting primarily from the Atherstone Airfield and Long Marston 3500 developments, as shown in the following graph.

Figure 16 – AM Warwick Road SB queues (veh)



- 6.28 Once again scenario 4 shows a notable spike in queues as a result of the Atherstone Airfield southbound traffic entering a network that does not benefit from the demand-reducing effects of the SWRR.

- 6.29 It should be noted that a number of these queue lengths are actually likely to be comparable to the conditions observed on the network today, before the scheme proposals are in place. Thus it should also be acknowledged that the presence of these proposals will be essential prior to any significant build out of the developments that have been considered within the assessment and, thus, any opportunity to secure early delivery of the scheme proposals should be investigated.
- 6.30 Furthermore, the extreme queue lengths observed in some scenarios will represent a worst case scenario on the basis that the cordon nature of the model does not allow for the reassignment effects of congestion within the model network meaning that vehicles will continue to assign onto the model network irrespective of the conditions whereas, in reality, drivers will inevitably reassign away from congested areas in response to the adverse conditions.

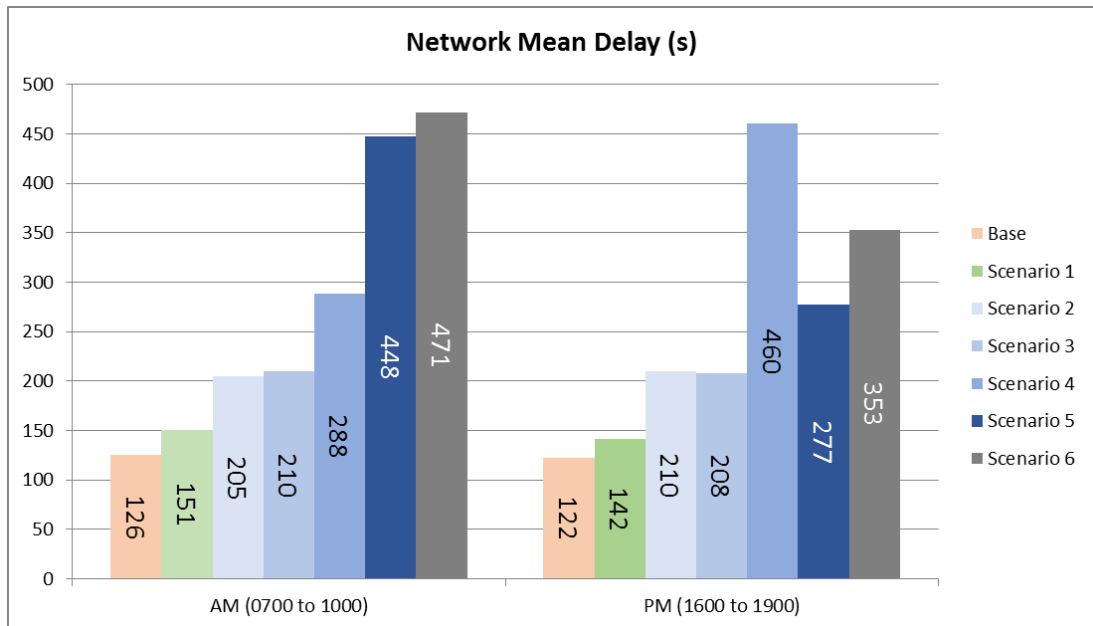
Stage Two

6.31 Again, initial results analysis focusses on a high level review of the model network based on network-wide average journey times and average peak period maximum queue lengths for each approach.

Base Network

6.32 Average journey time has been calculated as the average travel time of a completed trip during the model simulation period. This has been extracted for every scenario during the AM (07:00 to 10:00) and the PM (16:00 to 19:00) model periods using the Base network. Results are presented below in **Figure 17**.

Figure 17 – Average Network Journey Times (Seconds), Base Network

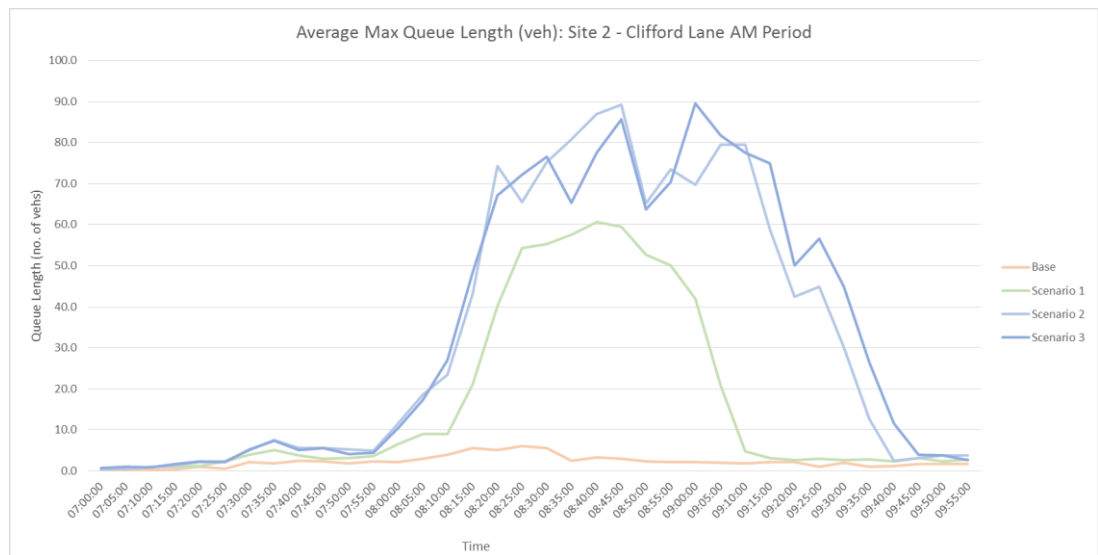


6.33 The results show that average journey times are again subject to greater increases within the AM than the PM. When compared to the Reference Case the journey times increase by over 200% in Scenario 6 (inclusive of all tested developments) during the AM peak.

6.34 Journey time increases are also extensive in the PM, with a delay increase of approximately 150% between Reference Case and Scenario 6.

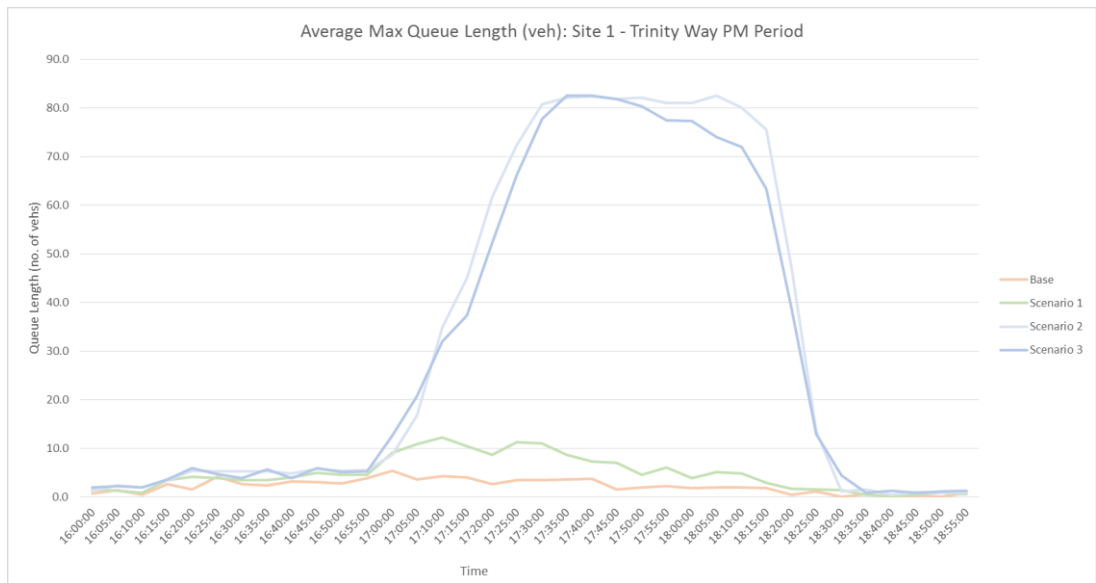
- 6.35 The graphs suggest that the base network is able to accommodate traffic produced by the 2031 Reference Case during both AM and PM, despite increases in delay during both periods.
- 6.36 The network however begins to exhibit queuing which may be considered unacceptable during Scenario 2 and, particularly, Scenario 3. Much of the delay in the AM is incurred along Clifford Lane due to an increase in traffic coming from Meon Vale and Codex Sims Metals housing developments to the south west of the study area. The AM queue comparison graph for all scenarios up to and including Scenario 3 is presented within the following figure.

Figure 18 – Average Maximum Clifford Lane AM Queues



- 6.37 The AM graph above shows queues developing on Clifford Lane during the Reference Case scenario; these are then exacerbated by the addition of 400 dwellings at Long Marston Airfield in Scenario 2.
- 6.38 The graph below presents queues on the Trinity Way approach in the PM which suffers the greatest delay due to the conflicting traffic from Seven Meadows Road and Shipston Road North which is heading south back towards the residential developments.

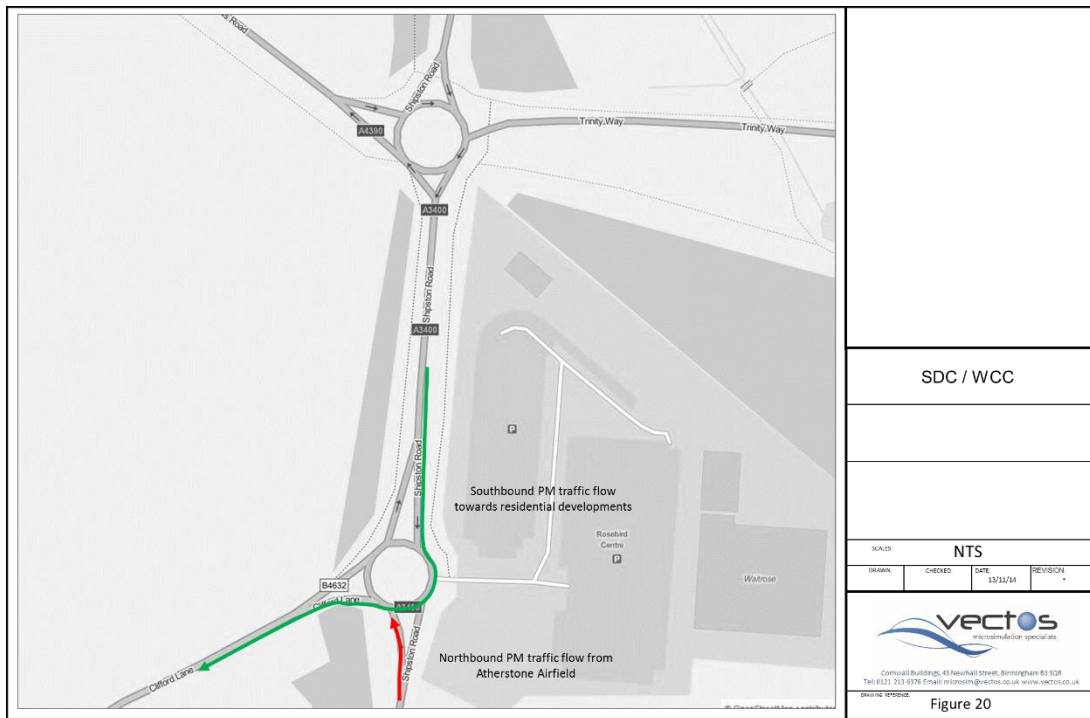
Figure 19 – Average Maximum Trinity Way PM Queues



- 6.39 The PM also shows extended queuing for vehicles leaving the Waitrose Retail site which contributes towards the overall network delay in **Figure 17**, again as a result of the extensive traffic numbers circulating the southern roundabout towards Clifford Lane.
- 6.40 Scenario 4 shows a notable jump in delay in both peak periods, increasing from 210 seconds in Scenario 3 to 288 seconds in Scenario 4 (an AM increase of approximately 37%), while delay more than doubles in the PM.
- 6.41 This is a result of the inclusion of Atherstone Airfield employment traffic which, in the PM, enters the study area from the Shipston Road South approach heading northbound. This is in contrast to the predominant flow of residential trips heading south to Clifford Lane which creates extensive queuing on Shipston Road.

6.42 The figure below illustrates this conflict in movements:

Figure 20 – Conflicted PM Atherstone Airfield traffic movements

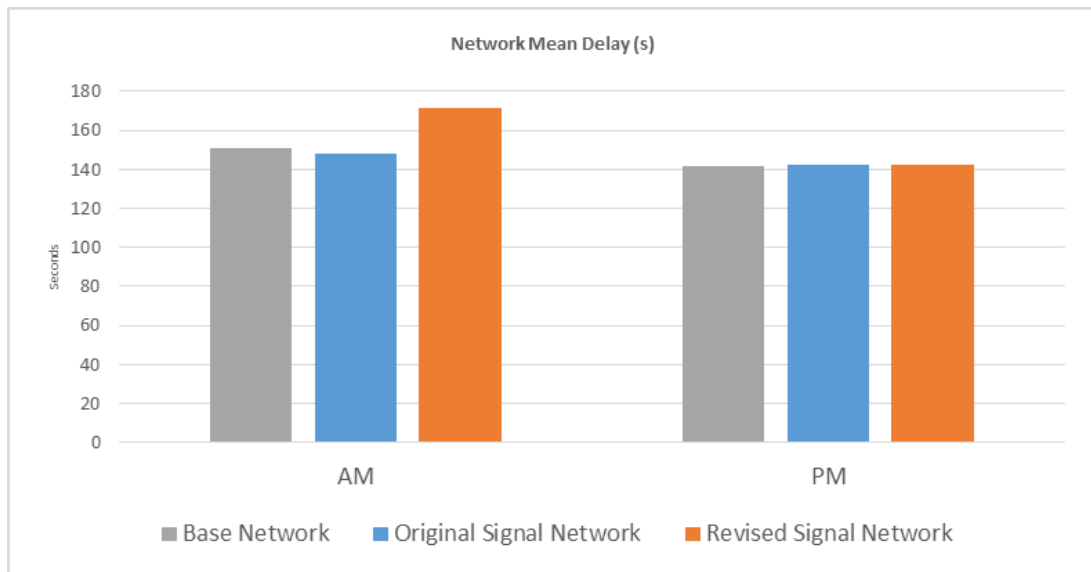


6.43 Based on the above it is reasonable to conclude that in regards to overall network delay, the base network is able to accommodate traffic relating to the developments considered within the 2031 Reference Case, including Meon Vale. However, analysis of each approach in turn demonstrates that extensive queuing is likely on Clifford Lane in the AM peak period. This supports previous analysis which concluded that a scheme at the Clifford Lane junction is required upon delivery of the Meon Vale development.

Signalised Clifford Lane Junction Network

- 6.44 VM received a drawing of the proposed signalisation scheme at Clifford Lane roundabout from WCC in September 2015 (Drawing No. 1136-10 Rev B).
- 6.45 It should be noted at this point that previous testing conducted on this junction concluded with a layout which showed a benefit in the Reference Case scenario when compared with the base network. The arrangement present in this drawing however has been altered as described below.
- 6.46 The scheme as coded into Paramics is presented in **Figure 7**.
- 6.47 The current scheme adopts a left turn filter lane from Clifford Lane which then gives way to the right, proceeding into a one-lane northbound approach to Trinity Way roundabout (before flaring out to two lanes at the roundabout stop line). Previous testing in support of the Meon Vale planning application was based on a design which allowed left turners from Clifford Lane to enter Shipston Road unopposed into a second lane, therefore removing the need to give-way, with two northbound lanes present between the two junctions.
- 6.48 For the purposes of comparison, the original scheme layout was coded into Paramics and tested with the revised traffic flows that have been developed for this assessment. The network mean delay for each network scenario with 2031 Reference Case demands is presented in **Figure 21** below:

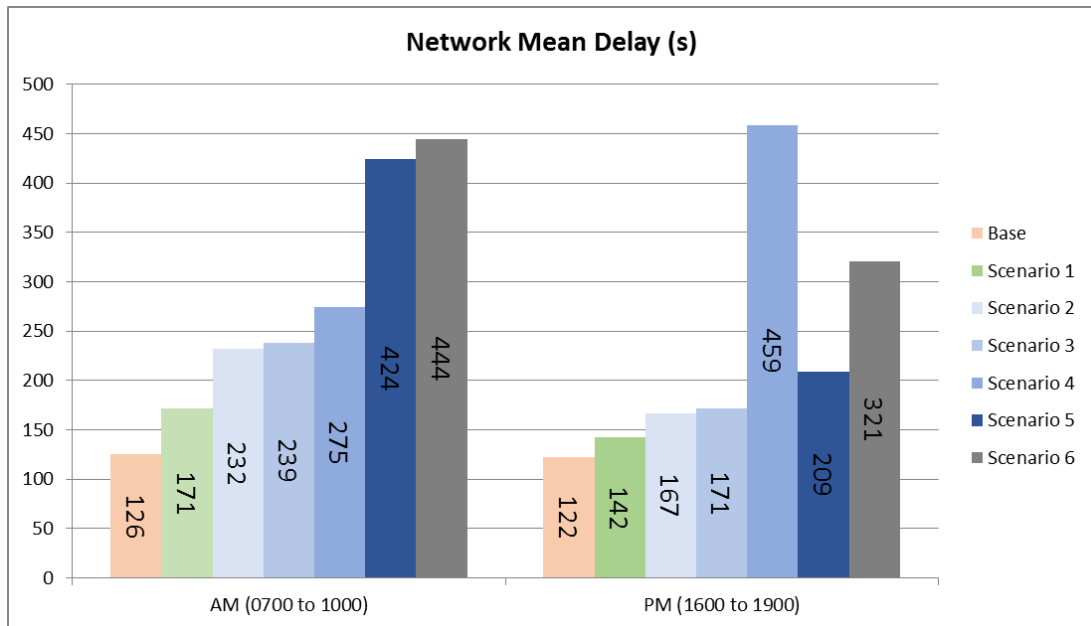
Figure 21 – Network comparison, 2031 Reference Case



- 6.49 The analysis presented reveals that the signal proposals in their current form may not deliver the same level of performance as that which is likely to occur as a result of the application of the originally proposed signalised layout.
- 6.50 Notwithstanding the outcome of this test, all testing hereon pertaining to the proposed signalisation of the Clifford Lane junction has been conducted based on the layout shown in Drawing No 1136-10 Rev B as received from WCC, and as presented in **Figure 7**.
- 6.51 Average journey times have again been collected for both AM and PM periods to provide network mean delay for each scenario.

6.52 The results are presented in the graph below:

Figure 22 – Average Network Journey Times (Seconds), Signalised Network

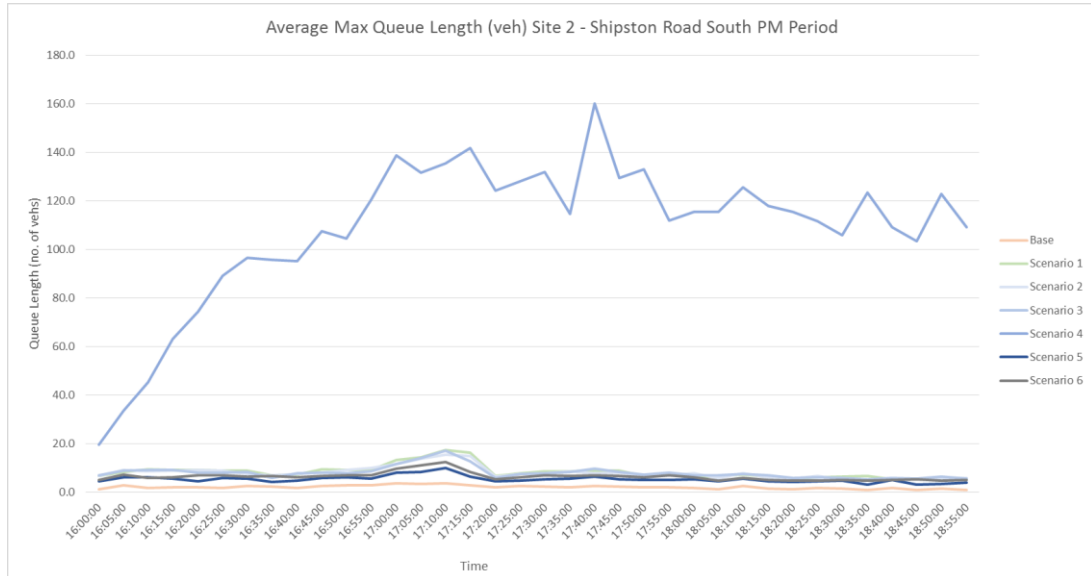


6.53 The results show a significant improvement in the PM when compared with the base network, as a result of the additional capacity provided to southbound traffic between the two junctions.

6.54 As in the base network there is a spike in delay during Scenario 4 in the PM. The roundabout arrangement means that northbound traffic is heavily conflicted by the dominant southbound tide of traffic. Although signals may be required to allow northbound Atherstone Airfield traffic to disperse from Shipston Road, it is likely that linked signals would be required at the Trinity Way junction as well. In this scenario, with the Trinity Way junction remaining as a roundabout, the southbound traffic cannot be permitted to queue back to the circulatory and so that movement is given priority; therefore the dis-benefits of the scheme are still felt on northbound traffic in the PM.

6.55 The queue graph below further demonstrates the issues experienced in the PM resulting from the inclusion of Atherstone Airfield demands:

Figure 23 – Average Maximum Shipston Road South PM Queues



6.56 The AM performs worse across all scenarios (bar Scenario 4, in which southbound Atherstone Airfield traffic benefits from the 2 southbound lanes between the two roundabouts).

6.57 *Based on the results of these network delay statistics, it is reasonable to conclude that the proposed signal arrangement in its current form does not provide enough capacity, particularly for northbound traffic. Although delivery of the Meon Vale development was predicated on delivery of a signal arrangement at Clifford Lane roundabout, the arrangement in its most recent form as shown in Drawing No 1136-10 Rev B provided by WCC appears to provide a detriment to AM network performance. It is suggested that further investigation of suitable mitigation is required and a scheme identified that can provide capacity benefits to both peak periods.*

Proposed Mitigation

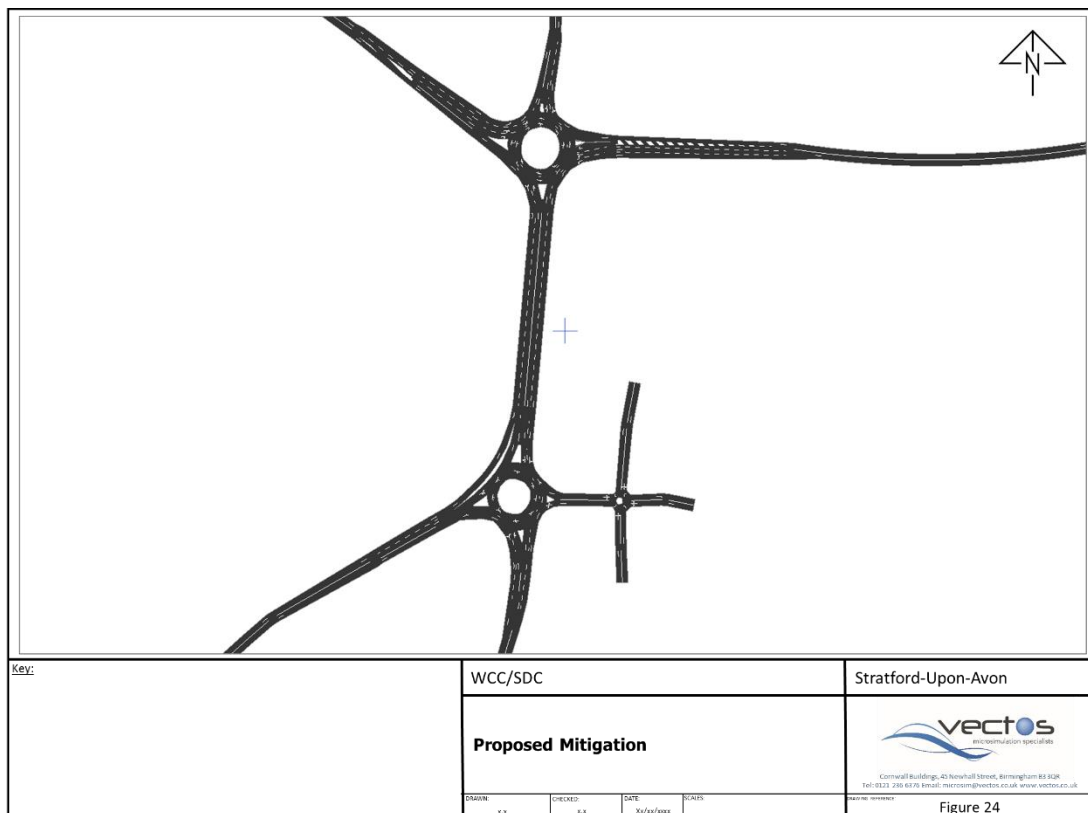
6.59 VM has developed a mitigation scenario through an iterative testing process which appears to create conditions which can accommodate growth forecasts beyond the limits of the proposed signal scheme.

6.60 As stated in the Scoping Note;

“It is considered pertinent to focus on the delivery of roundabouts as this is in keeping with the form for all junctions on the Shipston Road corridor out of Stratford-upon-Avon. The review will also allow for the scheme proposals to be considered which lie outside of the highway boundary in order that the optimum solution for the area can be determined.”

6.61 The resulting proposal is presented in **Figure 24** below, as coded in Paramics:

Figure 24 –Shipston Road/Trinity Way/Clifford Lane Potential Layout

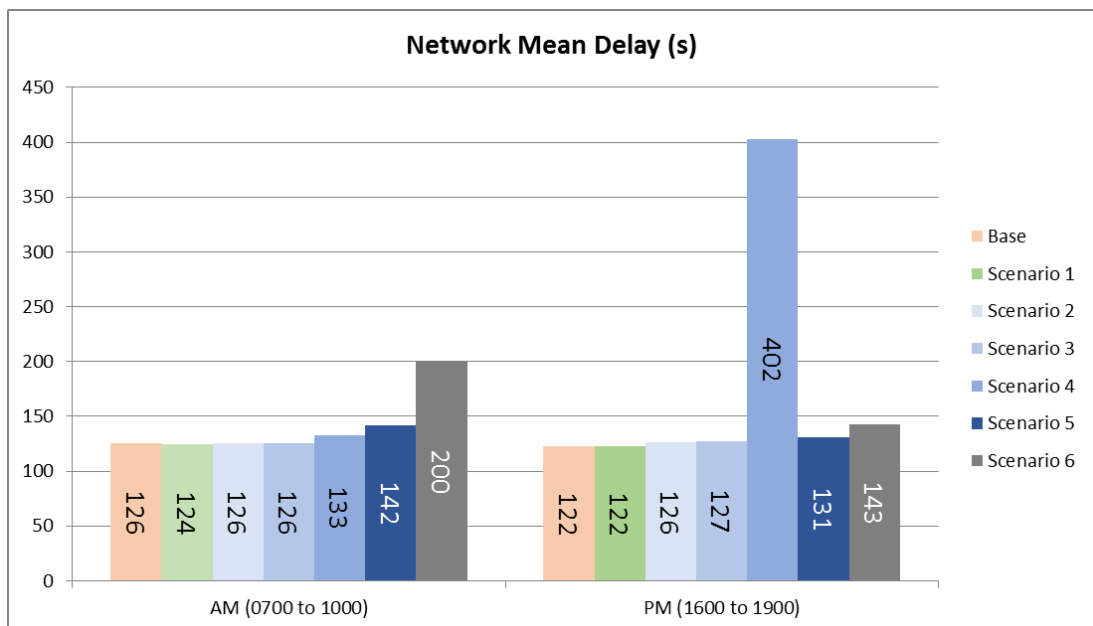


6.62 The scheme maintains the roundabout arrangement at both Trinity Way and Clifford Lane junctions, but enlarges them both to allow greater capacity on key approaches and on the circulatory. Capacity improvements include:

- Seven Meadows Road: extended 2-lane approach, flaring to three lanes on the immediate approach to the roundabout
- Shipston Road North: extended 2-lane flare on immediate approach to roundabout with short 2-lane exit merge
- Trinity Way: 3-lane section on approach to the roundabout
- Northern circulatory: 2 lane circulatory, with third lane for those turning immediately left
- 2 lane dualled section in both directions between the two junctions
- Shipston Road South: extended 2-lane approach to the roundabout with 2-lane exit merging into one lane south of the junction
- Clifford Lane: left turn filter lane merging into 2-lane northbound section between the two roundabouts
- Southern circulatory: 2-lane circulatory for those vehicles heading from north to south.

6.63 The network delay results for all junctions is provided in **Figure 25** below:

Figure 25 – Average Network Journey Times (Seconds), Mitigated Network

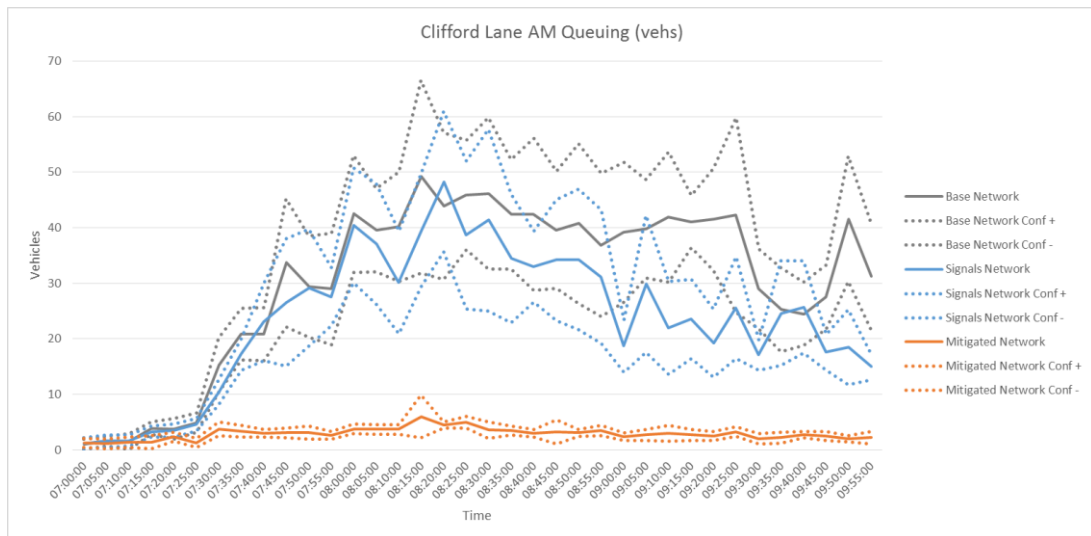


- 6.64 The network delay results show that the mitigation scheme proposal is able to accommodate forecast growth up to and including Scenario 3, as well as providing suitable capacity for Scenario 5 (which includes the full 3500 build out at Long Marston Airfield along with the effects of the South Western Relief Road).
- 6.65 The notable anomaly again appears in Scenario 4 during the PM period, which still shows excessive delay. As with previous network scenarios, the northbound traffic is heavily conflicted and unable to enter the network efficiently.
- 6.66 Following delivery of the South Western Relief Road, PM Scenarios 5 and 6 perform well within capacity. Much of the delay in the PM is a result of queues on Shipston Road North, which faces a greater frequency of conflicting traffic due to the efficiency with which the larger roundabouts are able to navigate trips through the network. This has the greatest impact on Scenario 4 which contains the greatest number of trips from this approach.

Network Comparison Summary

- 6.67 The focus of cross-network-scenario comparisons will be on how the network is able to accommodate demands relating to the full 3500 dwelling development at Long Marston Airfield.
- 6.68 The network delay statistics suggest that the PM in particular will be unable to contend with demands related to Atherstone Airfield due to the conflicting direction of travel from other proposed developments around the study area. It is suggested that signals would be required at both junctions to balance the priority of travel. However, based on the criteria established in the Scoping Note, roundabouts are the preferred arrangement at this location.
- 6.69 In the AM, it is clear from observing the model that the greatest flow of traffic is forecast to head northbound along Clifford Lane from the proposed residential developments at the south west of the study area. The graph below shows comparable AM queues on Clifford Lane approach across the base, proposed signals and fully mitigated network for Scenario 5 (inclusive of 3500 dwellings at Long Marston):

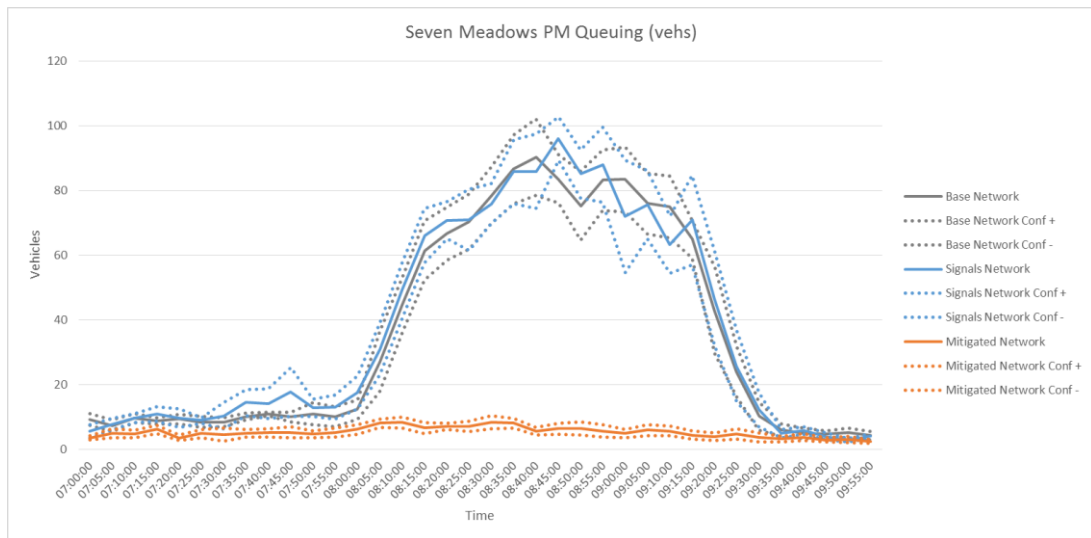
Figure 26 – Network Comparison, Clifford Lane AM Queues



- 6.70 The results show a significant reduction in queuing on Clifford Lane as a result of the proposed mitigation.
- 6.71 During the PM, the predominant flow of traffic is at the northern junction, predominantly from trips travelling from the north towards Clifford Lane in a reversal of AM conditions.

6.72 The greatest queues appear on the Seven Meadows Road approach to the roundabout (despite the inclusion of the SWRR reducing trips from this approach to exits at the south). The graph below presents a comparison of this approach between the three network scenarios during the PM peak.

Figure 27 – Network Comparison, Seven Meadows Road PM Queues



6.73 As a result of this reduction, some queuing is exhibited on Shipston Road North in the mitigated scenario as more traffic is conflicting this southbound approach.

6.74 However, overall network performance shows that the scheme provides significant benefits for both peak periods, and provides the necessary capacity to accommodate the increased demand resulting from 3500 dwellings at Long Marston (in addition to the developments included in the series of scenarios leading up to Scenario 5).

7 SUMMARY

- 7.1 VM were commissioned by Stratford District Council to provide evidence in support of the District's Core Strategy which helps in understanding the forecast impacts of local housing and employment developments on two key areas to the south-east of Stratford-upon-Avon.
- 7.2 The developments included in the assessment are as follows:
- Meon Vale (550 dwellings)
 - Home Guard Club (32 dwellings)
 - Milestone Road (126 dwellings [inclusive of both phases 1 and 2])
 - Codex Sims Metals (380 dwellings)
 - Long Marston Airfield (400/3500 dwellings)
 - Knights Lane (100 dwellings)
 - Arden Heath Farm (270 dwellings)
 - Oak Road (60 dwellings)
 - Atherstone Airfield (10 hectares employment)
- 7.3 This assessment was split into two Stages which analysed each location in turn; 1) Clopton Bridge/Tiddington Road/Bridgeway Gyratory, and 2) Trinity Way and Clifford Lane Roundabouts.
- 7.4 Each stage considered mitigation measures that have been developed as part of the planning application for the Meon Vale development, providing an understanding of the effectiveness and lifespan of these schemes in their current form. In the case of Stage Two, further mitigation concepts have been designed and are suggested to be capable of accommodating much of the forecast demands associated with the developments included in this assessment.
- 7.5 Each Stage of the assessment has been subject to a thorough and robust forecasting methodology which accounts specifically for each of the above developments in turn using a combination of available wide-area models, information provided by Warwickshire County Council, and data available online. Furthermore, external-to-external trips which pass through the study area have been uplifted to account for background delay to further enhance the forecasting procedure.

7.6 A summary of the results for both Stages of the assessment is presented below.

Stage One Summary

7.7 The congestion and network constraints at Clopton Bridge and the surrounding junctions are likely to be more prominent, and therefore more likely to constrain the level of growth that can be accommodated within the model network, during the AM period compared with the PM.

7.8 Network statistics in conjunction with approach queuing analysis suggests that the network inclusive of the proposed schemes at either end of Clopton Bridge is capable of satisfying the demand created by the developments up to and including Scenario 3. When loading traffic related to Atherstone Airfield onto the network, queues in both peak periods build beyond levels which may be considered reasonable.

7.9 The queues that contribute to the detriment shown in the Network Statistics are most prominent along Shipston Road and Banbury Road in both AM and PM peak periods, with additional queues shown on Tiddington Road, Warwick Road and Bridge Street.

7.10 The detailed queuing analysis indicates that Shipston Road and Banbury Road are likely to suffer the greatest impacts in queuing terms. However, the queuing levels do not, at times, appear dissimilar to the levels observed in the current day network conditions, prior to the allocation of the scheme proposals, albeit with queuing occurring over a longer period. Since these impacts are identified within the final development scenarios, which contain growth levels in excess of 10%, it is reasonable also to conclude that delivery of the scheme proposals will be essential prior to any significant build out of the developments that have been considered within the assessment.

7.11 The results suggest that, following inclusion of the scheme proposals, Clopton Bridge operates as a self-contained network which is largely unaffected by increases in demand. Through signal optimisation and synchronisation traffic is dispersed away from the bridge effectively in all scenarios. Increases in demand however do have significant detrimental effects on approaches, primarily from the south of the network.

7.12 This study has been conducted based on the desire to alleviate queuing on the bridge. As such, queues on Shipston Road and Banbury Road could potentially be improved at the expense of Tiddington Road through alterations to signal times and further bias given to the

east-west movement. However, to maintain the cohesion between the two sets of signals either side of the bridge, any such changes to reduce queuing at Shipston Road and Banbury Road would also likely lead to extensive queuing on Bridgeway due to the need to allow longer green times for westbound traffic at the northern end of Clopton Bridge.

- 7.13 The results indicate that the delivery of the SWRR or similar capacity enhancements are likely to become essential from Scenario 4 onwards.
- 7.14 Scenario 6 consistently performs worse than Scenario 5 as well which would substantiate the conclusions of the earlier STA work that the allocation of employment at Atherstone Airfield would serve to exacerbate the impacts that are observed to occur as a result of the allocation strategy pertaining to the delivery of housing sites identified within the Core Strategy.
- 7.15 Further work in the SuAWA model would be necessary to provide more accurate estimates of the likely levels of network performance post-delivery of the allocations and the accompanying SWRR. However, in spite of that, it is still considered reasonable to conclude that the SWRR will become a necessity from Scenario 4 onwards.

Stage Two Summary

- 7.16 In regards to overall network performance at Trinity Way and Clifford Lane roundabouts, the base network is able to accommodate forecast demand following inclusion of developments at Meon Vale, Home Guard Club, Milestone Road and Codex Sims Metals.
- 7.17 However, analysis of approach queuing suggests that queues of up to 60 vehicles may be expected on Clifford Lane in the AM peak, reinforcing the conclusion from previous studies that mitigation at this approach is required following delivery of Meon Vale.
- 7.18 The proposed signalisation of the Clifford Lane/Waitrose junction, as per Drawing No 1136-10 Rev B provided by WCC, provides dis-benefits to the AM peak due to the reduction of capacity northbound between the two junctions. The PM however benefits from the additional southbound lane and shows an improvement on base network results.

- 7.19 This drawing conflicts with previous testing which suggested a second northbound lane was required with vehicles from Clifford Lane able to proceed into this lane unopposed. The original scheme layout is likely to have delivered far greater benefits over time due to the two lane merge than is now predicted as a result of the single lane yield.
- 7.20 The scheme in its current arrangement therefore, is predicted to be unable to accommodate forecast demand following inclusion of developments at Meon Vale, Home Guard Club, Milestone Road and Codex Sims Metals due to the adverse impact on the AM peak.
- 7.21 The proposed conceptual mitigation scheme identified by VM appears to show significant improvement to both AM and PM conditions that enables the network to accommodate growth up to and including 3500 dwellings at Long Marston Airfield.
- 7.22 The scheme however cannot mitigate the impacts on the network following addition of traffic relating to the Atherstone Airfield employment development. This is due to the predominant flow of traffic heading southbound and across the Shipston Road North approach, from which the majority of Atherstone Airfield traffic originates, significant delay is expected on this arm.
- 7.23 It is suggested that in order to provide a suitable network for this traffic, linked signals may be required at both junctions to provide a balance to the priorities of these conflicting trip patterns.
- 7.24 The impact of Atherstone Airfield is more prominent in this study, compared with Stage One, due to the arrangement of the network and the close proximity of the Airfield site to the Clifford Lane/Shipston Road junction. At Tiddington Road junction, northbound and southbound traffic does not conflict at the Shipston Road/Banbury Road junction. At this location however, significant conflict exists between those vehicles coming from Atherstone Airfield and those going to Meon Vale/Code Sims Metals developments. This is the key issue which creates such significant delay in the PM results for Scenario 4.

8 CONCLUSION

- 8.1 Completion of the assessment as set out within this report and the analysis of the accompanying outputs has revealed the following conclusions:

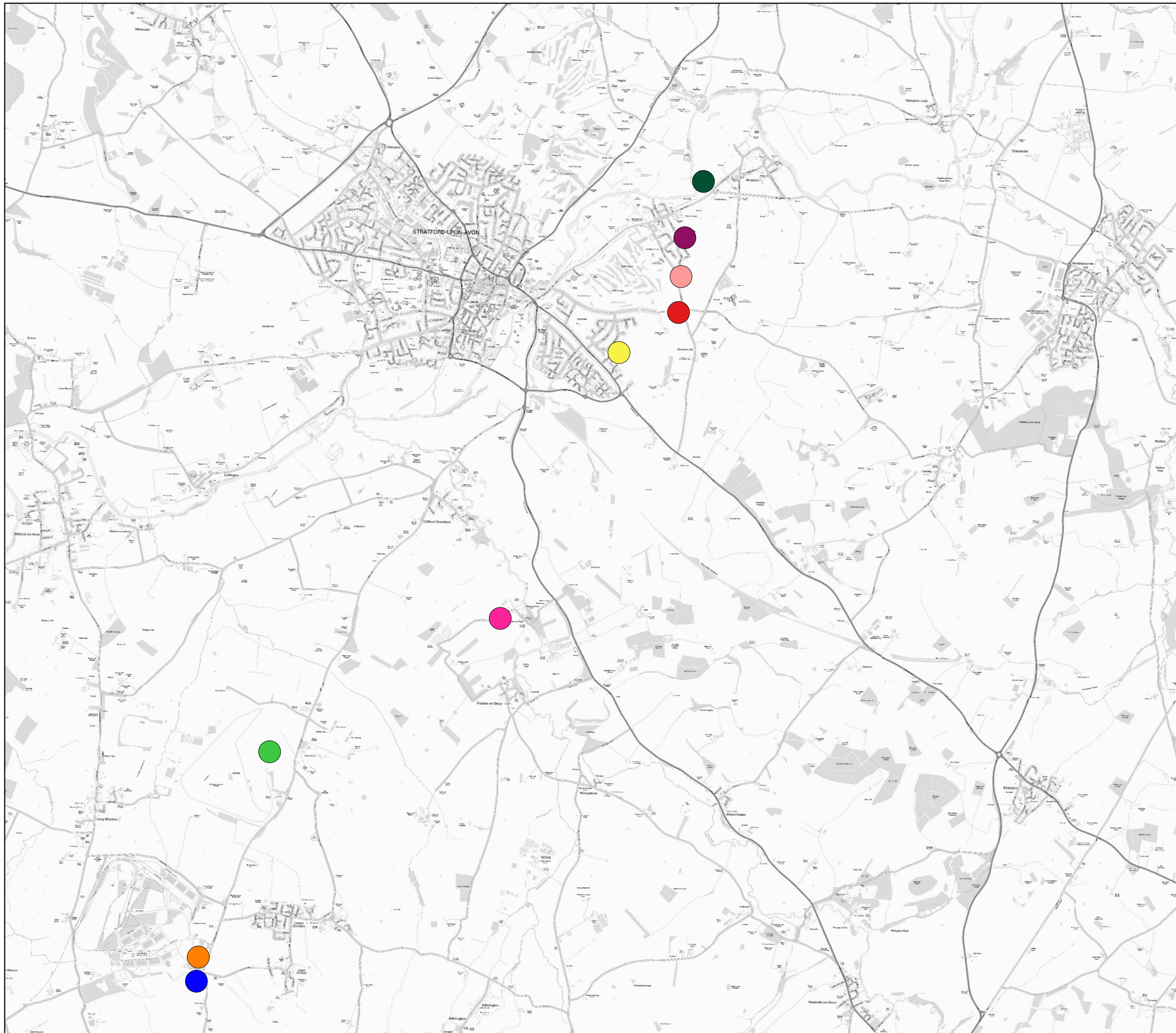
Stage One Conclusions

- 8.2 The current scheme proposals will likely accommodate all development traffic up to and including Scenario 3 but beyond that the delivery of the SWRR is likely to become critical.
- 8.3 Assignment of the demands associated with Atherstone Airfield in Scenario 4 results in the greatest impact on network performance indicating that further mitigation is likely to be essential if that site is progressed. Although the SWRR appears to encourage re-routing of trips associated with this development, the additional volume of traffic created adds to queuing on approaches to Clopton Bridge (i.e. Banbury Road and Shipston Road). It is these approaches that are likely to experience the greatest delay rather than Clopton Bridge itself, which following implementation of the scheme, is able to maintain throughput across the bridge efficiently.
- 8.4 Following the delivery of the SWRR, residual impacts will still occur as the SWRR will not encourage the reassignment of trips associated with the proposed developments on the eastern and south-eastern fringes of the town, as the alternative route to the A46 provided by the SWRR would likely be too onerous or inconvenient from those areas. This point is illustrated in **Figure 3** and **Figure 4**.

Stage Two Conclusions

- 8.5 Following testing of the existing signal proposals at Clifford Lane roundabout, and subsequent testing against base network and the scheme identified in support of the Meon Vale planning application, it is expected that this proposal will not sufficiently mitigate all of the development impacts following delivery of the Meon Vale site and beyond.
- 8.6 The enhanced roundabout proposals presented in this report provide an optimum solution for mitigating the impacts of growth identified in this assessment. There are however risks associated with the delivery of the schemes in the medium term that will likely require an interim solution to be delivered. It is recommended that this interim solution takes a form that does not prejudice the delivery of the wider proposals.

8.7 Again demands related to Atherstone Airfield appear to create the greatest network detriment due to the counter-flow against the predominant tidal peak movements. Combined with the desire to maintain a roundabout configuration at this location, it is suggested that further work is needed to fully understand how this traffic can be accommodated should the development progress.



Legend

- Meon Vale
- Home Guard Club
- Milestone Road
- Codex Sims Metals
- Long Marston Airfield
- Knights Lane
- Arden Heath Farm
- Oak Road
- Atherstone Airfield

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CLIENT:



PROJECT:

VM155038 SDCEIP
Further Assessment of Traffic Implications

TITLE:

Approximate Development
Locations

SCALE:

NTS

DRAWN:

DL

CHECKED:

JE

DATE:

10/11/2015

REVISION:

1



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DRAWING REFERENCE:

Appendix A