

Warwickshire
County Council



Warwick District Council Strategic Transport Assessment

WDC STA: Final Phase Assessment of Additional Housing Allocations

February 2016

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1 INTRODUCTION

1.1 Vectos Microsim (VM) has been commissioned by Warwickshire County Council (WCC) and Warwick District Council (WDC) to update the recently completed Strategic Transport Assessment (STA) work which looks at the impacts of the allocation of housing and employment sites across the district.

1.2 This report builds upon the evidence presented during previous stages of the STA analysis, completed in support of the Local Plan, and focusses on the impacts identified as a result of the allocation of new housing sites across the district which are in addition to those identified during the previous phase of the STA.

Objectives

1.3 One of the key goals of this work is to update the previous completed Local Plan (LP) STA work to account for the allocation of a number of housing sites across the District.

1.4 The impact of these sites needs to be assessed alongside the impacts that have been identified as a result of the original LP allocation strategy, herein referred to as the Revised Development Approach (RDA).

1.5 The objectives of this study are summarised as follows:

- To make use of the existing traffic models to assess the likely level of additional impact predicted to occur on the transport network as a result of the inclusion of development sites in addition to those identified within the RDA.
- To identify what, if any, additional mitigation measures can be delivered alongside the new housing to minimise any impacts identified.

1.6 The assessment has been focused across two core study areas, the extent of which has been determined by the coverage of the Warwick and Leamington and Kenilworth and Stoneleigh Wide area traffic models. As a result, the analysis of the allocation impacts has been split across the two areas accordingly.

Report Structure

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

- Chapter 2 – Documents the Study Background and Scope.
- Chapter 3 – Provides details regarding the derivation of the model scenario
- Chapter 4 – Details changes to the mitigation strategy, as well as detailing new scheme inclusions and other key considerations for the IDP.
- Chapter 5 – Presents the methods used to inform the impact analysis.
- Chapter 6 – Details the impacts on the WLWA study area.
- Chapter 7 – Details the impacts on the KSWA study area.
- Chapter 8 – Documents the Summary and Conclusions.

2 BACKGROUND

Scope

- 2.1 This work builds upon a series of STA studies which have been subject to continuous refinement as the options for the allocation of housing and employment across the area have emerged and been considered during the LP determination process.
- 2.2 An overview of the stages of assessment completed prior to this assessment has been summarised as follows:

WDC Strategic Transport Assessment – Phase 1

- 2.3 The first phase of the strategic transport assessment comprised three separate elements. Firstly, a strategic transport assessment was undertaken using Strategic modelling techniques. This formed a high level/low detail assessment which was intended to begin to inform WCC, WDC and the HA on the potential implications of a number of different allocation options. This work was then supplemented by an additional, more detailed, series of tests undertaken using the existing PARAMICS models of both Warwick & Leamington and Kenilworth and Stoneleigh. At this stage the assessments were based on four potential options and compared the differences between the Reference Case, Do Nothing (i.e. growth but no mitigation measures) and Do Something scenarios.
- 2.4 Finally, complementary technical assessments and key findings thereof were presented alongside a detailed review of additional mitigation measures that could be delivered alongside the proposed approach to the allocation of housing across the District. The principles regarding the implementation of sustainable modes set out within these assessments are still applicable today as they are valid irrespective of the allocation strategy adopted. However they cannot be determined further until a preferred option is identified as there is a need to tailor these measures specific to the sites proposed.

WDC Strategic Transport Phase 2

- 2.5 The second phase of the strategic transport assessment undertook a more detailed comparison of the potential impacts of two specific allocation strategies namely the Preferred Option and the Southern Focus. At this stage a more detailed review of the potential mitigation measures was undertaken and additional mitigation measures were

included within the assessment dependent upon the option being tested. A number of additional sensitivity tests were completed which focussed on a variety of issues such as the impact of the Coventry and Warwickshire Gateway development and the strategic significance of the Northern Relief Road.

WDC Strategic Transport Phase 3

- 2.6 The third phase of the strategic transport assessment undertook a more detailed comparison of the potential impacts of one specific approach to the allocation of development, namely the Revised Allocation. At this stage a more detailed review of the potential mitigation measures was undertaken and additional mitigation measures were included within the assessment dependent upon the option being tested. A number of additional sensitivity tests were completed which focussed on a variety of issues such as the potential impacts of education provision, the impacts of revising certain mitigation measures and the potential feasibility of amending the mitigation strategy in order that it can better accommodate public transport movements and, specifically, those associated with a Park and Ride site located south of Warwick and Leamington.

WDC Strategic Transport Phase 4

- 2.7 The fourth phase of the strategic transport assessment undertook a more detailed assessment of the potential impacts of the RDA on the Warwick and Leamington area road network. This stage of the work also refined the proposed Local Plan transport scheme assumptions, in light of the impacts of the RDA, and identified, where appropriate, areas of change compared to the previously proposed phase 3 mitigation strategy. This study also involved an assessment of the potential impacts of adopting alternative layouts for some of the originally proposed schemes within the area of Warwick Town Centre. As part of this fourth phase of the STA, the network interventions in some areas have been reviewed and, where possible, refined in response to the conditions that have been observed to occur as a result of the assignment of the RDA Demands within the model networks and the impacts thereof. In addition further amendments to the schemes have been made where concerns with regards to feasibility or deliverability have arisen.

Preferred Option Assessment – Supplementary Analysis

- 2.8 This work represents what is understood to be the final stage of the assessment as it seeks to determine the impacts associated with the allocation strategy which is to be put forward as

the Preferred Option (PO) for the allocation of housing and employment sites across the District.

Initial KSWA & WLWA Assessments

- 2.9 As part of this work a number of discrete assessments have been completed which have assessed the implications of multiple options for allocating housing across the District. This work looked at the impacts of allocating housing numbers on a cumulative basis whereby the number and spread of sites, and therefore the number of dwellings being considered within the area, was increased over a series of phased model scenarios. Each scenario experienced an increase in housing and the network was reviewed and an initial indication of the likely appropriate level of infrastructure identified at each stage.
- 2.10 These initial assessments looked at the impacts across the district using the available transport models and the results were presented within a series of supporting Technical Notes which are available upon request.

Westwood Heath – Site Specific Analysis

- 2.11 In addition to the review of the impacts within the existing suite of transport models a series of assessments were completed which reviewed the implications of the allocation of housing in the Westwood Heath area, which lies outside of the scope of the existing Paramics models. This analysis looked at the relative capacity of the routes between Westwood Heath and Kenilworth, Warwick, Leamington and the A46. The purpose of this assessment was to determine what an appropriate level of housing may be deliverable before the links in the area are likely to become 'over capacity'.
- 2.12 This work utilised baseline flow information, road capacity information and an assessment of the changes in flow significance to identify the threshold analysis. The findings of this work concluded that 425 dwellings could be delivered in the area prior to more significant mitigation being required. This work was summarised within a supporting Technical Note which has been made available within **Appendix A** of this report.

Study Area

- 2.13 The study area has primarily been determined by the availability of transport models to inform the assessment coupled with the location of the major sites being allocated. The study has made use of both the Warwick and Leamington Wide Area (WLWA) and

Kenilworth and Stoneleigh Wide Area (KSWA) models and the coverage of both has been illustrated within **Figure 1** and **Figure 2** respectively:

Figure 1: WLWA Model Coverage

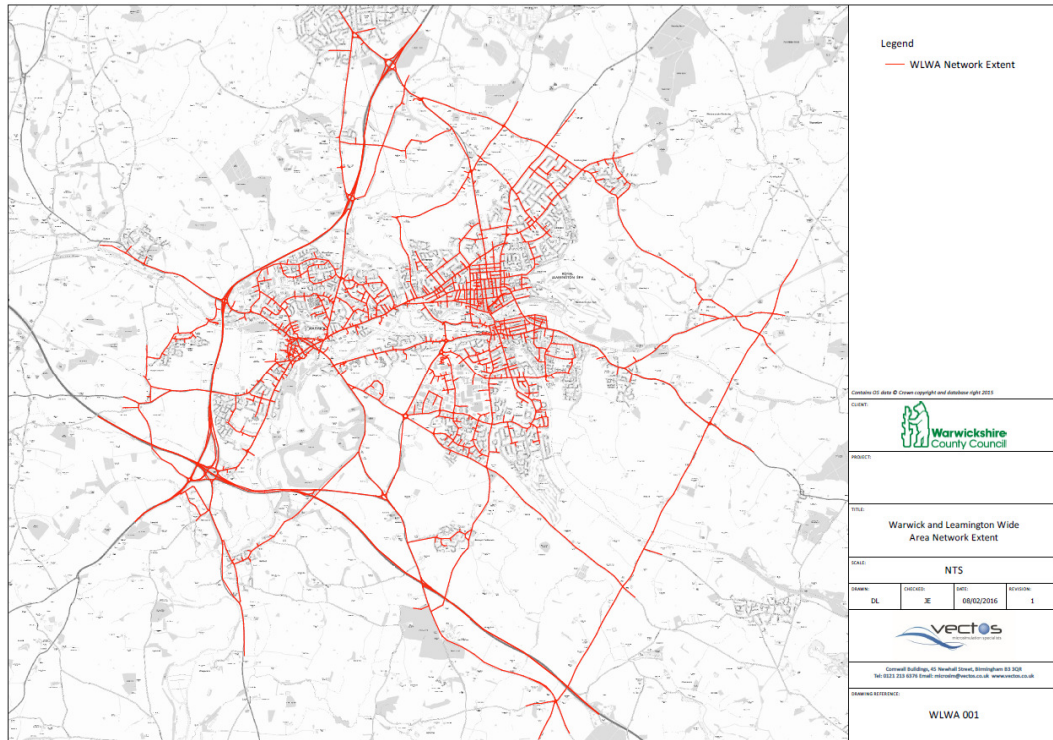
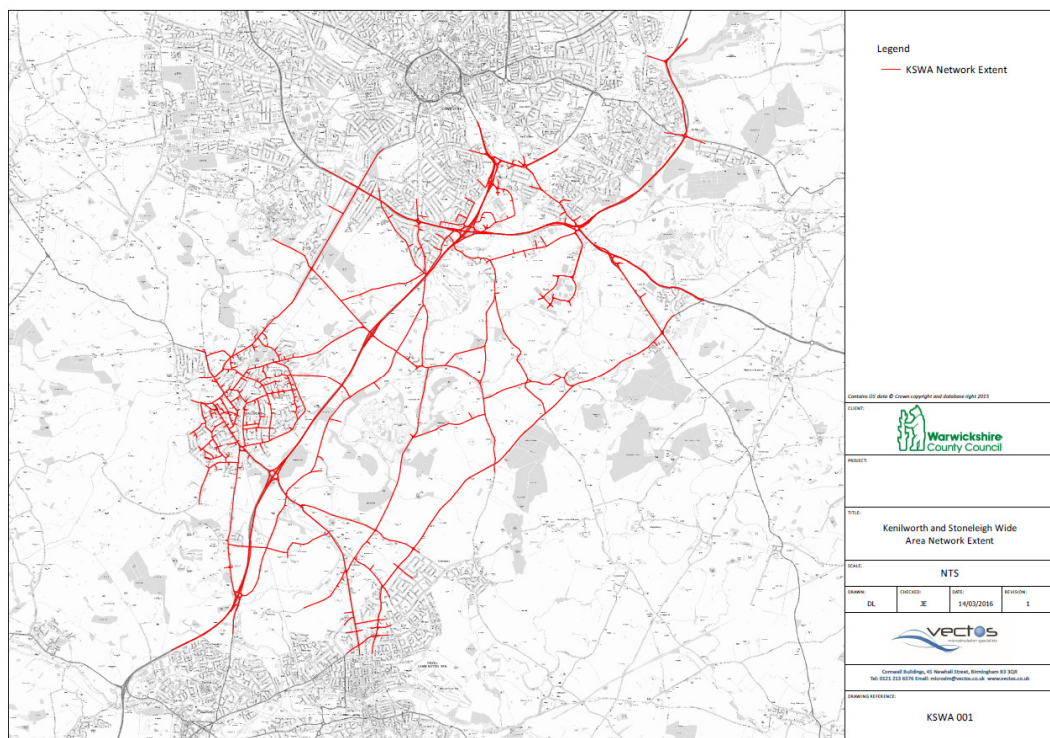


Figure 2: KSWA Model Coverage



3 SCENARIO DEVELOPMENT

3.1 The development of both the WLWA and KSWA scenario models was derived from the RDA scenarios which were reported upon within the Phase 4 STA work. As a result, the assumptions pertaining to trip rates, trip generation and trip distribution were retained in a manner consistent with those previous model scenarios.

Overview

3.2 The purpose of this assessment is to assess the impacts of allocating housing sites in addition to those identified within the previous stage of the WDC STA (the Revised Development Allocation).

3.3 Thus, the derivation of the new assessment scenarios was based on the following models which were originally reported upon during the fourth phase of the STA:

- 2029 WLWA Reference Case
- 2029 KSWA Reference Case
- 2029 WLWA + Revised Development Allocations
- 2029 KSWA + Revised Development Allocation

3.4 Full details pertaining to the derivation of and assumptions within the aforementioned scenarios are available within the previous STA Report¹.

Additional Housing Sites – New Demand Forecasting

3.5 The derivation of the demands, associated with the new housing sites, to be assigned within the updated model scenarios was also developed in a manner consistent with the previous stages of analysis. WDC provided information regarding additional housing sites but it was assumed that no changes to the employment assumptions were necessary in this phase of the assessment.

3.6 WDC provided VM with confirmation of all of the housing sites which were to be assessed in addition to the sites assumed in the previous Stage 4 RDA assessment. These were filtered so

¹ Strategic Transport Assessment Phase 4: Revised Development Allocation Testing, 232815-53.R001, April 2014, Arup, Chapter 3

that sites containing 10 or less dwellings were ignored and this resulted in the list of sites to be assessed summarised within **Table 1**. The number of dwellings assumed within each site are also documented within the Table alongside the study area focus.

Table 1: Additional Housing Sites

Development	LP Site Ref	Dwellings	Focused Study Area
North of Milverton	L03, L07	250	Both
Kings Hill	C06; C26	1800	KSWA
Westwood Heath (East of Bockendon Road)	C02; C05; C13	425	KSWA
East of Kenilworth (Crewe Lane, Southcrest Farm and Woodside Training Centre)	K17; K18; K19	640	KSWA
East of Warwick Road, Kenilworth	K25	100	KSWA
Woodcote House, Former Police HQ, Leek Wootton	R189	115	KSWA
Baginton – Land north of Rosswood Farm	H19	45	KSWA
Burton Green	H24	30	KSWA
Hazelmere and Little Acre, Whitnash	L55; L56	75	WLWA
Hampton Magna (Land South of Lloyd Close & South of Arras Boulevard)	H27; H28	145	WLWA
Land at Brownley Green Lane, Hatton Park	R187	55	KSWA
Land at Spring Lane, Radford Semele	R180	60	WLWA
Whitnash East	L39	200	WLWA
South of Harbury Lane	W44	105	WLWA
Land east of Cubbington	L17	95	WLWA
Gallows Hill	TBC	645	WLWA
The Asps	TBC	900	WLWA
Barford (S.of Wasperton Lane & Westham Lane, 2 sites)	R30 & R22	90	WLWA
Bishops Tachbrook - Seven Acre Close	H24	30	WLWA
Hatton Park	R187	40	WLWA

- 3.7 The majority of the additional housing sites listed are located in the WLWA study area or the KSWA study area, in some cases sites are included in both.
- 3.8 As per previous stages of the LP assessment, the number of trips associated with each of the sites that cross-over from one model boundary into the other has also been captured through the forecasting processes.
- 3.9 **Table 1** reveals that the impacts of an additional 5915 dwellings are to be assessed within the modelling. The housing sites are assigned across the two study areas based on the site

locations which results in 2705 dwellings being assigned explicitly within the WLWA model and a further 3460 within the KSWA model.

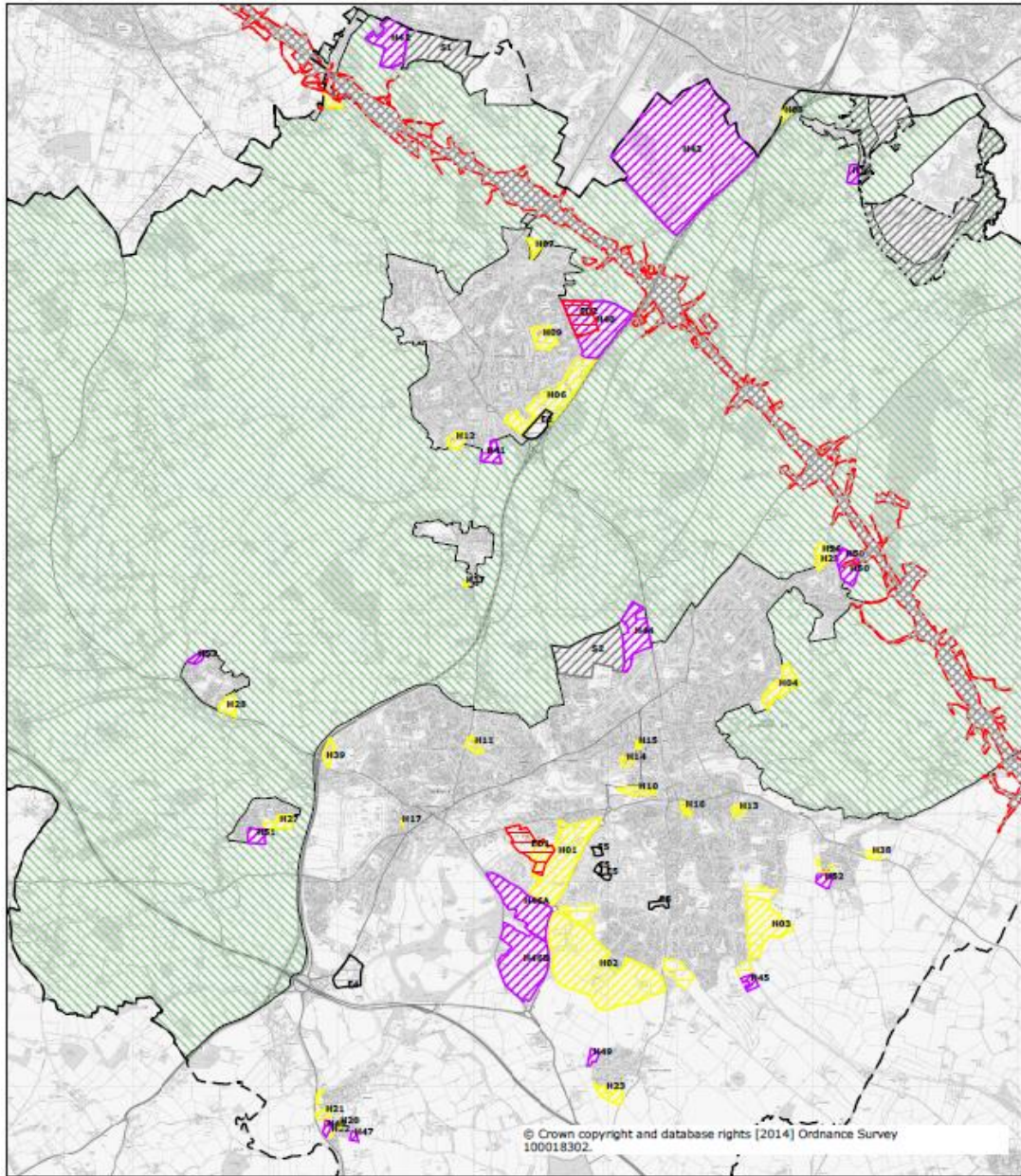
- 3.10 The location of these sites is illustrated within **Figure 3**. Each of the housing sites identified previously was assigned to a zone within either the WLWA, KSWA or both model networks and then trip generation totals were derived based on the number of dwellings assumed within each site. The trip generation was calculated in line with the previous stages of the STA insofar as the WCC standard residential trip rate was applied to the dwelling numbers, discounted to reflect a 15% shift to sustainable modes.
- 3.11 The WCC residential trip rates have been confirmed within the following **Table 2**:

Table 2: WCC Residential Trip Rates

Period	In	Out	Total
07:00 to 08:00	0.08	0.33	0.41
08:00 to 09:00	0.12	0.48	0.6
09:00 to 10:00	0.12	0.22	0.34
16:00 to 17:00	0.35	0.11	0.46
17:00 to 18:00	0.48	0.12	0.6
18:00 to 19:00	0.36	0.11	0.48

- 3.12 This process resulted in a set of discrete demands being created for each of the study areas based on the sites being assessed within either model.
- 3.13 The next stage of the scenario development involved the identification of the trips which crossed over between the two study areas. The methodology for calculating these crossover trips following that which was adopted during the Phase 4 STA work.
- 3.14 The resultant hourly demands calculated for each of the models, inclusive of the demands transferring between the two study areas, has been presented within **Table 3**.

Figure 3: Additional Housing Site Locations



Key				
WDLF - Major Housing Commitments (DS7)	WDLF - Safeguarded Land (DSNEW2)	WDLF - Green Belt (DS19)	WDLF - Housing Allocations (DS11)	WDLF - Major Education Allocations (DS12)
Site Ref.	Publication Draft	Proposed Modifications 2016	Site Ref.	
WDLF - Employment Allocations (DS9)	WDLF - Sub-Regional Employment Allocation (DS16)	H2S Safeguarding Directions (June 2014)	Areas of Surface Interest	
Site Ref.		Limits of Safeguarding Direction		

Key Plan - Local Plan Modifications 2016

Table 3: Additional Sites, Hourly demands by Study Area.

Model	07:00 to 08:00	08:00 to 09:00	09:00 to 10:00	16:00 to 17:00	17:00 to 18:00	18:00 to 19:00
WLWA	1029	1518	866	1160	1499	1205
KSWA	1125	1659	948	1277	1651	1327

Trip Redistribution

- 3.15 Once successfully derived, the hourly demands were then assigned to the model inclusive of an account of the potential for trip redistribution. This stage enabled the demands to be assigned to the model network, the demands were subject to the same redistribution procedure as has been adopted within previous stages of the STA work.
- 3.16 The purpose of the redistribution methodology is to ensure that the overall growth forecasts within the modelling were maintained at a level commensurate to the overall housing numbers being assessed and in cognisance of the overall adjusted TEMPRO growth projects.
- 3.17 The principles behind the redistribution procedure have been documented, in detail within the Phase 4 STA report and were adopted within the modelling in order that overall growth levels could be retained at around 19.19% and 19.92% for the AM and PM respectively.
- 3.18 These growth forecasts were demonstrated to accord closely with the delivery of the 12800 houses in total that were being assessed previously within STA Phase 4. However, the application of these factors to inform the cap assigned to the latest set of Local Plan scenarios was considered inappropriate for the following reasons:
- The purpose of this phase of STA work is to assess the additional impacts likely to arise as result of assigning additional housing over and above the 12800 tested previously, therefore it is reasonable to conclude a higher overall level of growth will occur.
 - The growth forecast to occur within the KSWA model, as a result of the assignment of the demands documented within Table 3, were actually lower than the NTEM projections (19 to 20%) within the AM and only 0.8% higher in the PM indicating that it was not necessary to consider the need for redistribution within the KSWA model on the basis of these inherent growth forecasts.

- 3.19 On that basis, it was decided that the KSWA model scenario would be created by assigning the demands outlined previously within **Table 3** into the 2029 KSWA + RDA model network, inclusive of the zones and access points intended to serve the newly sites.
- 3.20 Similarly, it was considered that the rate of redistribution of development site trips assigned within the WLWA model network should be capped at a value higher than the 19 to 20% adopted previously. This was achieved by reviewing the level of redistribution predicted to occur within the previous RDA scenario and calculating a redistribution value on a per dwelling basis.
- 3.21 This redistribution value was calculated as being the number of trips likely to divert away from an existing OD pattern and towards a new development area in response to the inclusion of that development.
- 3.22 Thus within the WLWA model, the following, per dwelling, redistribution factors were derived and applied to the WLWA model forecasting exercise:
- -0.129 trips per dwelling during the AM
 - -0.143 trips per dwelling during the PM
- 3.23 These redistribution rates were then assigned to the latest set of model forecast demands to enable the redistribution effects to be captured within the WLWA model whilst also ensuring traffic growth within the model networks was proportionate to the housing numbers being assigned and assessed.

Demand Summary

- 3.24 Upon completion of the demand forecasting and redistribution procedures, a revised set of model demands were available for both the WLWA and KSWA models to begin the testing.
- 3.25 The resultant demands, assigned by matrix level within the new WLWA LP Scenario have been presented, for all model hours, within the following **Table 5**.
- 3.26 Comparisons between the new demand levels, the previous 2029 Reference Case and WLWD + RDA scenarios as well as the 2011 Base model demands have been presented within **Table 6** and reveals that demands within the current WLWA + RDA + New Sites scenario network are, on average, approximately 2.3% higher than the demands in the previous WLWA

Scenario tests, 8.6% higher than the demands within the 2029 WLWA Reference Case and 21.5% higher than the 2011 base mode.

Table 4: WLWA + RDA + New Sites, Total Vehicle Demands

Demands	07:00 to 08:00	08:00 to 09:00	09:00 to 10:00	16:00 to 17:00	17:00 to 18:00	18:00 to 19:00
Background	33087	36417	29290	39311	41291	33510
HGV	1558	1330	1768	1155	682	851
Education	731	8114	1615	2347	1363	910
Com Dev	1845	1128	1807	2462	1913	2882
General Growth	3866	0	2081	1930	772	3731
RDA	3464	3527	2440	3083	4168	3127
<i>New Sites</i>	<i>1029</i>	<i>1518</i>	<i>866</i>	<i>1160</i>	<i>1499</i>	<i>1205</i>
Total	45579	52034	39866	51447	51688	46216

Table 5: WLWA + RDA + New Sites, Demand Summary (Periodic)

Demands	07:00 to 10:00	Diff from 2011	16:00 to 19:00	Diff from 2011
2011 Base	113915		122154	
2029 Ref	127250	11.71%	136667	11.88%
2029 RDA	134385	17.97%	145837	19.39%
2029 RDA + NS	137479	20.69%	149351	22.26%

3.27 The demands assigned within the KSWA model and the resultant growth levels forecast to occur have been presented within the following **Table 6** and **Table 7** respectively.

Information within Table 6 has been presented for the combined periods as, unlike the WLWA model that is how demands are assigned within the KSWA model.

3.28 Analysis of **Table 7** reveals that, even after the additional sites are included within the assessment, growth forecasts are marginally above 20% in the AM period and just over 1% lower again in the PM which underlines the reason why it was not necessary to apply any redistribution procedure as part of the KSWA forecasting process.

Table 6: KSWA + RDA + New Sites, Total Vehicle Demands (Periodic)

Demands	07:00 to 10:00	16:00 to 19:00
Background	73394	78532
HGV	5143	4029
Committed	5047	4470
Growth	3693	3788
RDA	2249	2344
New Sites	3732	4256
Total	93259	97420

Table 7: KSWA + RDA + New Sites, Demand Summary (Periodic)

Demands	07:00 to 10:00	Diff from 2011	16:00 to 19:00	Diff from 2011
2012 Base	77664		81877	
2029 Ref	87308	12.42%	91652	11.94%
2029 RDA	89557	15.31%	93967	14.77%
2029 RDA + NS	93259	20.08%	97420	18.98%

Scenario Summary

3.29 Following the successful derivation of the new model demands, this resulted in the following two new additional LP scenarios being created:

- **2029 WLWA RDA + NS** – the WLWA RDA LP model inclusive of the demands associated with the new sites as well as the mitigation strategy discussed within the following section of this report.
- **2029 KSWA RDA + NS** - the KSWA RDA LP model inclusive of the demands associated with the new sites as well as the mitigation strategy discussed within the following section of this report.

3.30 Results from these two scenarios are discussed and presented, alongside the results from the following model scenarios:

- **2029 WLWA Ref Case** – The WLWA forecast to a future year inclusive of committed developments and generalised growth assumptions but no LP sites
- **2029 WLWA RDA** – The previous WLWA scenario inclusive of the RDA sites and associated demands and infrastructure as documented within the previous Phase 4 STA report.
- **2029 KSWA Ref Case** – The KSWA forecast to a future year inclusive of committed developments and generalised growth assumptions but no LP sites
- **2029 KSWA RDA** – The previous KSWA scenario inclusive of the RDA sites and associated demands and infrastructure as documented within the previous Phase 4 STA report.

4 MITIGATION

Introduction

- 4.1 During each of the previous stages of the STA, a mitigation strategy has been identified as suitable to accommodate the additional demands associated with the LP sites.
- 4.2 In certain circumstances, the mitigation measures have been subject to a process of continuous review and refinement which has run in parallel to the STA and LP determination process.

Updated Infrastructure Requirements

- 4.3 The initial starting point for the assessment network included the 27 schemes identified during the previous stages of the STA. These schemes were then reviewed and refined as appropriate through the course of the latest round of testing and, where necessary, new schemes were proposed.

Scheme Amendments and Development Accesses

- 4.4 The following sets out the key changes in the status of or alterations to scheme that have been identified during previous stages of the STA work.

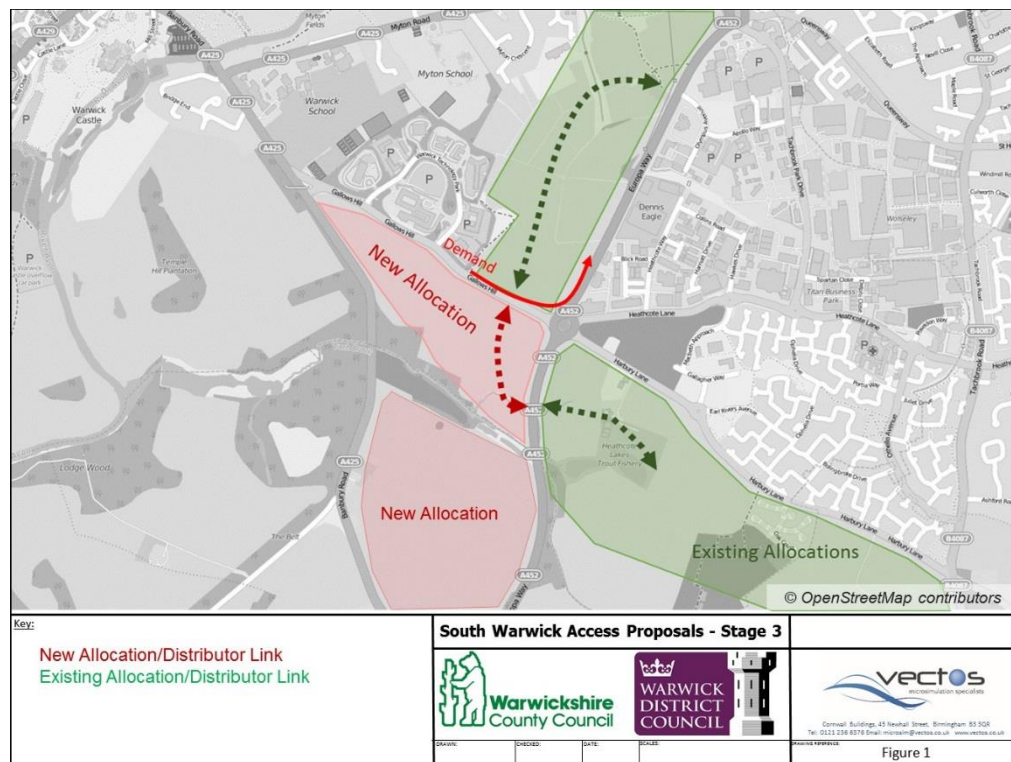
Site accesses and Europa Way/Gallows Hill Link

- 4.5 In order that the additional developments could be accommodated to the south of Warwick it was proposed that the link between Europa Way and Gallows Hill, that was previously identified through previous iterations of the STA. This was accompanied by the introduction of a segregated left slip from the Gallows Hill EB approach to the Europa Way/Gallows Hill Roundabout.
- 4.6 The purpose of this scheme alteration is that it enables traffic to utilise the new distributor link and Gallows Hill to access the Europa Way northbound. Without it, vehicles are likely to sit in heavy queues along both Europa Way and Gallows Hill. It is the housing to the South of Gallows Hill that generates the movement which, in turn, benefits from the scheme delivery.
- 4.7 The model network also includes a number of additional assumptions pertaining to the development accesses, in particular, the 600 dwellings at Gallows Hill are accessed via a distributor link which connects the Europa Way and Gallows Hill and makes use of junctions

already proposed within this area. The Gallows Hill junction also serves the Land at Myton whilst the Europa Way Junction already serves the sites allocated in the Harbury area.

- 4.8 A secondary access has been provided which would serve up to 200 dwellings via the inclusion of a fourth arm onto the Technology Park roundabout that was proposed during the previous round of STA testing.
- 4.9 The principles concerning the application of mitigation and access/distributor links to the south of Warwick, described previously, are illustrated within the Following **Figure 4**:

Figure 4: South Warwick Access Proposals



- 4.10 It is assumed that the left turn on the eastern approach to the new junction (i.e. the new allocation) is restricted to encourage vehicles wishing to travel NB along the Europa Way corridor to use Gallows Hill. Similarly the right turn from the link to the west is also restricted, this enables a simplified approach to the signal staging to be adopted and maximise the green time allocated to the Europa Way NB/SB movements.
- 4.11 Whilst including the links and junction in this way is observed to largely reflect the development accesses proposals, it should also be noted that the provision of the junction and links in this form would also serve as mitigation for the wider network impacts.

A4177/A425/A46

- 4.12 The signalisation and widening proposals at the A4177/A425/A46 junction is now assumed to be committed², funded by Growth Deal, County funding and S106 contributions which will in part be secured against sites being promoted through the LP.
- 4.13 Delivery of this scheme is no longer considered to be dependent upon the LP.

Existing Scheme amendments

- 4.14 As has been highlighted previously within this chapter, in a number of locations, alterations to scheme designs were necessary to accommodate the new development demands. This is indicative of the emerging nature of the schemes and also helps demonstrate that there are likely to be opportunities to further refine the scheme proposals post-adoption of the local plan.
- 4.15 Alterations in the form of revised scheme proposals and/or signal time optimisation where adopted for the following schemes/areas:
- Europa Way/Harbury Lane/Gallows Hill Roundabout – Revised junction arrangement and introduction of segregated left slip
 - Warwick Tech Park/Gallows Hill roundabout – Introduction of a fourth arm to serve the allocation to the south of Gallows Hill (consideration should also be given to the opportunities for widening Gallows Hill in response to the inclusion of the sites to the south).
 - Princes Drive/Old Warwick Road and Princes Drive/Park Drive – Alterations to the signal timings adopted at both junctions (consideration should also be given to the potential for an alternative, higher capacity, junction to be delivered in the Princes Drive/Park Drive area which may require land from WDC).
 - Myton Road/Europa Way/Old Warwick Road – Alterations to the signals has been included within the modelling, early indications regarding alternative schemes indicated that it may be possible to deliver a widened roundabout as opposed to

² Due to be confirmed by cabinet

the signal scheme that has currently been assigned within the modelling. Further analysis of the scheme proposals at this junction is recommended in due course.

- Reconfiguration of the scheme proposals for the B4100/Europa Way roundabout 'Grey's Mallory' in response to the extra development now located to the south of Warwick and Leamington.
- Additional widening of the A445/Sandy Lane roundabout required as a result of the additional traffic levels travelling between Warwick/Leamington and Kenilworth/Stoneliagh.

Newly Proposed Mitigation Measures

- 4.16 In addition to the scheme revisions outlined previously, in some instances, it was necessary to include additional scheme proposals in a number of areas. A summary of these scheme proposals is provided as follows:

A452 Dualling (WLWA & KSWA)

- 4.17 A common theme across both WLWA and KSWA networks was the potential for relief to be delivered via the inclusion of the wider dualling scheme along the A452 as listed within the Coventry and Warwickshire Strategic Economic Plan (CW-SEP). Introduction of these measures is intended to compliment the delivery of the signal proposals at the Thickthorn and Bericote junctions by dualling the A452 between the two as well as providing widening to the south of the Bericote roundabout.
- 4.18 In addition to mitigating the impacts of growth in the north of the WLWA study area, the inclusion of these measures is intended to increase the attractiveness of the route to the A46 via the A452 to the north which, in turn, will alleviate alternative routes to the A46 such as the Emscote Road Corridor and also the A452 south through Leamington towards the M40.
- 4.19 Delivery of this scheme, in full, will unlock additional capacity across the network by accommodating a greater number of trips to the north which alleviates problems elsewhere on the network. Thus, whilst there are a limited number of sites immediately adjacent to the area, the proposals add significant additional capacity to the highway network which, in turn, serves to mitigate growth related congestion issues elsewhere on the network.

4.20 In addition to the A452 dualling, which is considered a major scheme, the following, more minor, mitigation proposals have been identified as a result of this attest round of testing:

- **Sydenham Drive/Radford Road (WLWA)** - The scheme proposals in this area centre around the introduction of a short two lane WB section along Radford Road to enable vehicles to go straight on WB from two lanes, the right hand lane along Radford Road WB also caters for right turning traffic.
- **A445/Sandy Lane (WLWA)** - Widening of the junction approaches and, where possible, introduction of two lane exit capacity along the A445 exits.
- **A445/Westhill Road (WLWA)** - As per the Sandy Lane junction, the scheme comprises junction widening and introduction of two lane exit capacity along the A445.
- **A445/Lillington Avenue/Lillington Road (WLWA)** - Introduction of a segregated left turn from the A445 WB approach to, and general widening of the Lillington Avenue/Lillington Road roundabout.
- **A45/Kenilworth Road (KSWA)** - Widening of southern approach along with optimisation of signals.
- **A429 Kenilworth Road / Stoneleigh Road / Gibbet Hill Road (KSWA)** – Widening and further capacity improvements.
- **A452 / Birches Lane (Kenilworth Gyratory) (KSWA)** – Widening (including widened southern and western section of the gyratory and increase to 3 lanes on the A452 westbound approach)

Outline Infrastructure Schedule

4.21 The changes outlined previously demonstrate changes that have been applied or new schemes that have been identified to ensure that the predicted traffic flows across the study area can be accommodated in highway capacity terms whilst impacts are minimised.

4.22 Outside of the STA, a significant amount of additional work has been completed which assessed the broader transport implications, looking beyond simply highway capacity enhancements the identification of which has traditionally been the main focus of the STA work. All schemes identified through this work should be delivered in parallel to a comprehensive strategy for the encouragement of sustainable transport alternatives. An overview of some of these assumptions is provided within this section of the report whilst further details have also been provided within **Appendix E** of this report.

4.23 Since the last STA Report WCC and WDC, with assistance from Atkins transport consultants, have completed a thorough review of the sustainable transport alternatives which exist within the area and could be implemented to help deliver a shift in modes from car based trips to more sustainable methods of travel³. This review of sustainable transport alternatives set out a number of local transport objectives which would help address some of the current and forecast issues and challenges faced within Warwick District which will likely occur as a result of traffic growth. These objectives are summarised as follows⁴:

- LTO1: Reduce high car dependency for travel to work trips.
- LTO2: Reduce High Proportion of internal and short distance trips.
- LTO3: Reduce town centre through trips.
- LTO4: Reduce school travel as a contributor to local congestion.
- LTO5: Improve quality of sustainable travel alternatives that limits their use.
- LTO6: Ensure sustainable parking provision that encourages sustainable travel behaviours.
- LTO7: Increase the role of local trip generators/attractors in promoting sustainable travel behaviours.
- LTO8: Mitigate against the sensitive nature of the local network to disruption (roadworks, accidents).

4.24 There was also an update to the Infrastructure Delivery Plan (IDP) which was completed in January 2015. The update to the IDP focussed on the strategic approach to delivering the mitigation proposals across key corridors. This work was presented within the Draft Infrastructure Delivery Plan (January 2015) and focussed on presenting the combined mitigation strategies (highway and sustainable) in a series of focussed corridors and areas. In total, 11 areas were identified as follows:

- 1 – A452 Europa Way ‘sustainable Spine’ Corridor
- 2 – A452 Corridor (Leamington to Kenilworth)
- 3 – Warwick – Leamington – Lillington (via Emscote Road)

³ Warwick and Leamington Spa Transport Strategy, Review of Sustainable Transport Alternatives, Atkins, 27th January 2015.

⁴ Review of Sustainable Transport Alternatives, section 5.1, page 36.

- 4 - Leamington South (including Tachbrook Road)
- 5 - Warwick Town Centre to Heathcote via Gallows Hill
- 6 – Warwick Town Centre to Leamington (via Myton Road)
- 7 – A429 Coventry Road, Warwick
- 8 – A425 Birmingham Road, Warwick
- 9 – A429 Stratford Road, Warwick
- 10 – Strategic Corridor Improvements
- 11 – Kenilworth improvements

4.25 The initial, revised, infrastructure schedule has also been detailed within **Appendix B** of this report. The schedule outlines the areas where scheme proposals have been amended, relative to the original STA work, and also highlights the proposed changes with regards the grading of the schemes as well as initial commentary on when the schemes are likely to be required. A summary of the infrastructure identified thus far, and the currently attributed grade of importance, is provided within **Table 8**. An overview of the location of the originally identified scheme proposals, alongside the newly proposed schemes, is presented within **Figure 5** and **Figure 6** for the WLWA and KSWA study areas respectively. The grading structure is consistent with previous STA infrastructure schedules and is summarised as follows:

- **GRADE 1 - Strategically Essential** – A scheme identified at an early stage of the assessment that has been included within the modelling and is likely to be essential in maintaining network operation and conditions. Delivery of these schemes will serve a role of strategic importance in the context of maintaining overall network operation levels.
- **GRADE 2 - Strategically Desirable** - A scheme identified during the assessment that has been included within the modelling, implementation of the scheme is desirable to ensure maintenance of network operation and conditions. Further investigation may be required to determine whether the scheme is essential. Delivery of these schemes is likely serve a role of strategic importance in the context of maintaining overall network operation levels.
- **GRADE 3 –Locally Desirable** - A scheme identified during the assessment that has been included within the modelling, implementation of the scheme is desirable to ensure maintenance of network operation and conditions. Further investigation may be

required to determine whether the scheme is essential. Delivery of these schemes is will serve a role of local importance in the context of maintaining the operational levels in the areas of close proximity to the scheme.

Table 8: Highway Infrastructure Table

Reference	Scheme	Grade
1	Sustainable Travel Infrastructure	Grade 1
2	Virtual P&Rs	Grade 1
3	Europa Way Corridor – Part 1	Grade 1
4	Europa Way Corridor – Part 2	Grade 1
5	Europa Way/Myton Road Roundabout	Grade 1
6	Shires Retail Park Roundabout	Grade 1
7	Europa Way Roundabout	Grade 1
8	Grey's Mallory Roundabout	Grade 1
9	Thickthorn Roundabout	Grade 1
10	A452 Dualling	Grade 1
11	A452/Bericote Roundabout	Grade 1
12	A452/Blackdown Roundabout	Grade 1
13	Emscote Road/Greville Road	Grade 1
15	Princes Drive/Warwick New Road	Grade 1
16	A445/Lillington Avenue/Lillington Road	Grade 2
17	Princes Drive/Park Road	Grade 2
18	Bath Street/High Street	Grade 1
19	Adelaide Road/Avenue Road	Grade 2
20	Dormer Place/Adelaide Road	Grade 2
21	Sydenham Drive/Radford Road	Grade 1
22	Gallows Hill – 2 Lanes	Grade 1
23	Banbury Road – 2 Lanes	Grade 1
24	Myton Road Roundabout	Grade 1
25	Coventry Road/Spinney Hill Roundabout	Grade 2
26	A46/Birmingham Road 'Stanks Island'	n/a
27	M40 Capacity Enhancements	Grade 1
28	A46 Expressway upgrade	Grade 1
29	Kenilworth Gyratory	Grade 1
30	A45/Kenilworth Road	Grade 1
31	Stoneleigh Road/A46 Junction	Grade 1
32	Dalehouse Lane/Stoneliagh Road Junction	Grade 1
33	A429/Stoneliagh Road/Gibbet Hill Road	Grade 1
34	Town Centre Strategies	Grade 1
35	Priory Road/Smith Street/St Nicholas	Grade 1
36	Castle Hill Gyratory Signals	Grade 1
37	Bericote Road/Stoneleigh Road	Grade 2
38	Kenilworth Road/Westhill Road	Grade 2
39	A445/Sandy Lane	Grade 3

Figure 5: WLWA Scheme Locations

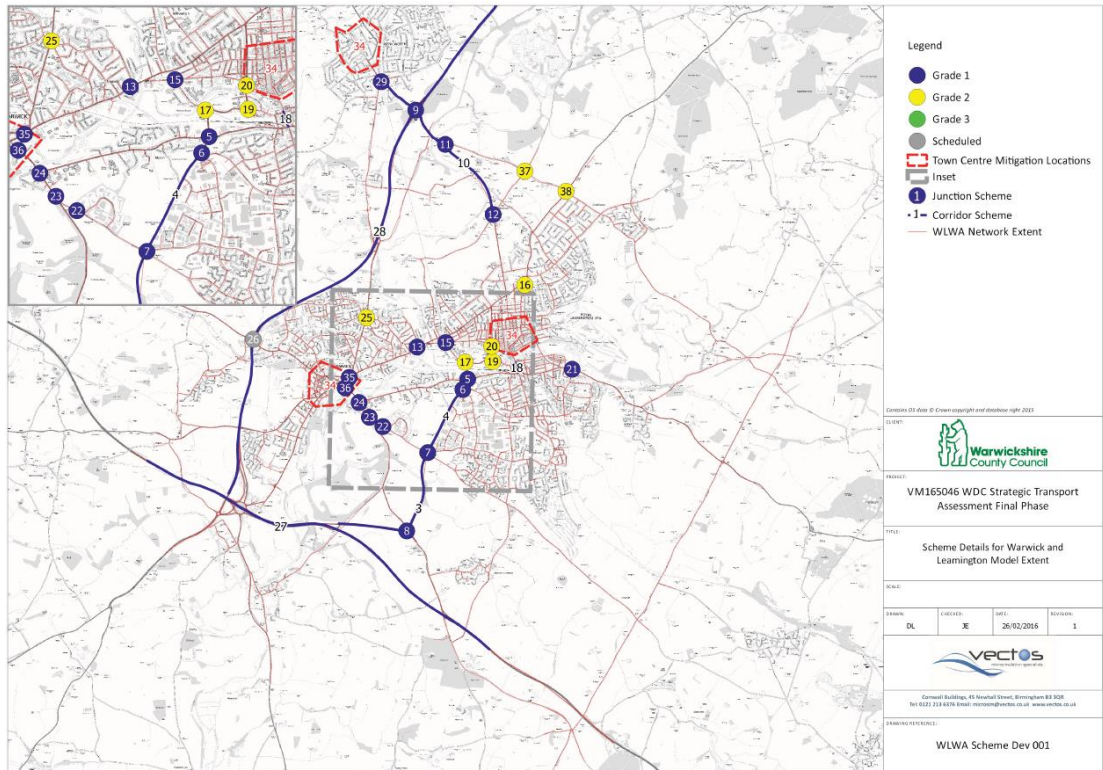
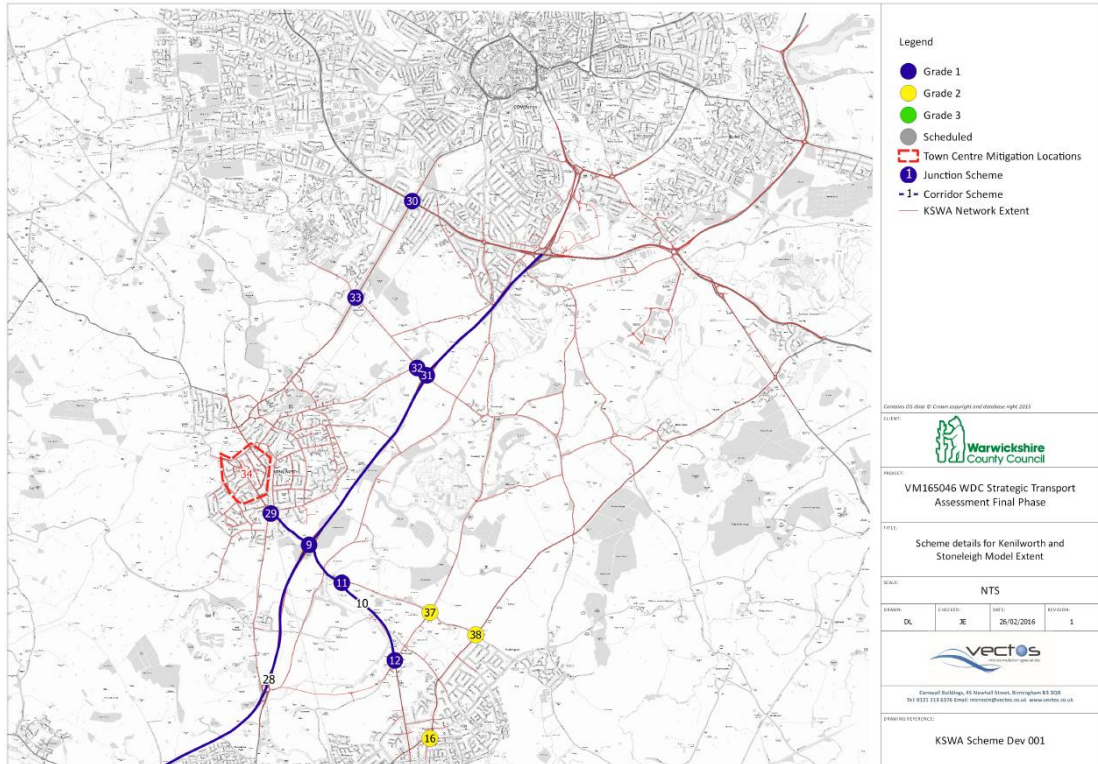


Figure 6: KSWA Scheme Locations



Emerging Infrastructure Needs

- 4.26 In the majority of instances the scheme proposals identified lie within one or more of the areas identified within the Transport Corridor Strategy⁵ which is documented within the draft IDP. It is recommended that the new and revised schemes are incorporated within the Transport Corridor Strategy document at an appropriate time.
- 4.27 There are some instances where the mitigation measures trigger the need for additional corridors to be defined. Similarly, there are areas within which it is considered beneficial for further schemes to be reviewed as an alternative mitigation strategy to current proposals, particularly when considering the potential to enhance the provision for non-motorised and sustainable transport modes.
- 4.28 An overview of the newly suggested corridor strategies, alongside key considerations for those mitigation areas that have already been identified is presented within the following section:

A46 to Cubbington

- 4.29 The schemes that have been identified to the north of Warwick between Thickthorn Roundabout and Cubbington have not currently been assigned to a specific area and therefore it may be considered pertinent to apply a new A46 to Cubbington corridor strategy which will primarily focus on highway infrastructure. Although the corridor runs east to west the primary trigger for the need to include the infrastructure is the increase in north/south traffic movements which occur as a result of the increased development quantum around Kenilworth and the drawn to/from these new sites and Warwick/Leamington.

Town Centre Transport Strategies

- 4.30 There are a number of mitigation measures identified within the area of Warwick Town which are attributable to corridor strategies which facilitate routes to/from Warwick town centre. Similar examples exist within Leamington, whilst the inclusion of the A542 scheme proposals into Kenilworth Town centre also reflect the emergence of a strategy in this area all of which are intrinsically linked to the operation of the town centre networks themselves.

⁵ Draft Infrastructure Delivery Plan, January 2015, Appendix A.

- 4.31 Assessment of these schemes thus far has been based upon a strategic assessment of the KSWA and WLWA models. Further refinement of schemes and a review of the town centre network operation (and corridor operation) will be required. Specific models which enable detailed optioneering analysis are being developed to serve this purpose and are currently being used to help secure funding contributions towards a number of schemes identified.⁶
- 4.32 The review of sustainable transport alternatives discussed earlier highlighted that there was a perception that trips travelling through the town centres of Warwick and Leamington were contributing to the traffic issues that already exist within the town. It was also acknowledged within that work that, across the wider study area, there appeared to be a prevalence of internal and short distance trips which contributed to the overall congestion issues in both Warwick and Leamington towns.
- 4.33 It is also recognised that within Warwick town centre, as well as the Bath street area of Leamington, there are already AQMAs in existence.
- 4.34 On that basis, it is considered desirable to progress work that focusses on an overall transport strategy for each town centre which manages the traffic volumes whilst helping to promote the Local Transport Objectives (LTO) that have been highlighted in the review of sustainable alternatives.
- 4.35 It is considered that the STA work completed to date demonstrates that there is likely to be a series of highway capacity improvements which can be delivered to enable the impacts of traffic growth to be minimised.
- 4.36 A 'Do Minimum' infrastructure strategy is presented for the town centres which means that the Core Strategy can be adopted with confidence regarding infrastructure proposals, but it should be recognised that there would be significant value attributable to the determination of an overall town centre transport strategy which would ideally occur during the initial years of the plan period post-adoption. It is not considered that the lack of a town centre strategy, at this stage, should preclude the plan progressing as it is anticipated that any strategy that is promoted would, ultimately, seek to reduce traffic levels compared to those reported within

⁶ As demonstrated by the work undertaken on the A4177/A425/A46 junction proposals as well as the recent round of EoIs submitted by WCC to CWLEP.

the following section of this report and, therefore, these impacts should be seen as a 'worst case'.

- 4.37 There will be sufficient time post core strategy adoption, to enable a more thorough strategy to be determined which maximises opportunities for sustainable transport measures and reduced car based trips across all town centres.
- 4.38 It is recommended that the potential need to retain some funding, 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 and also to ensure that the opportunities for encouraging a greater adoption of sustainable modes, and therefore discouraging car trips within the same areas, are maximised.

A46 to Westwood Heath (Via Stoneleigh Road/Gibbet Hill)

- 4.39 The inclusion of such a large quantum of housing to the north of Kenilworth (Kings Hill and Westwood Heath) in response to the need of WDC to assist Coventry City Councils need for housing is likely to lead to the need for an additional corridor/strategy to be defined.
- 4.40 As has been mentioned previously, there are known constraints to traffic growth in the area between Coventry and Kenilworth which have led to a restriction in the level of housing considered appropriate for delivery in the Kings Hill and Westwood Heath areas.
- 4.41 A separate assessment of traffic impacts in this area was undertaken using GIS modelling and census data, coupled with existing link flow levels and capacity to identify what the potential impacts of allocating additional housing to the north of Kenilworth, on the road network between Kenilworth and Coventry, would be. This work has been summarised within the supplementary analysis technical note presented within Appendix A of this report.
- 4.42 This work highlighted that the capacity of Gibbet Hill road, coupled with the rural nature of the surrounding roads, would restrict the delivery of housing within the area to around 425 dwellings at Westwood Heath, particularly in light of the desire to allocate housing at Kings Hill.
- 4.43 In addition to the allocated housing at Westwood Heath it is also understood that there are emerging plans for the University of Warwick and Westwood Business Park to grow whilst other employment sites may also come forward within the area. The area has also been

identified in the Coventry Local Plan proposed housing allocations, thus exacerbating the existing constraints posed by the A45, particularly in the area of the Kenilworth Road junction. It also highlights the potential benefits of linking Warwick University to the A45 and the wider UK Central proposals.

- 4.44 The initial work presented within this STA has focussed only on the benefits that can be obtained from the delivery of the enhanced junction proposals at the Stoneleigh Road/A46 junction.
- 4.45 It is recognised, however, that there are limitations set on the amount of development that can come forward within this area, particularly within the constraints of the existing transport network and limited road capacity.
- 4.46 It is recommended that the junction proposals for the Stoneleigh Road/A46 junction be seen as the starting point for delivering a wider strategy for improving connectivity between the A46, north Kenilworth, Warwick University and the Tile Hill/Westwood Heath housing areas south of Coventry. This could be in the form of capacity enhancements applied to the existing road network or, alternatively and longer term, provision of additional capacity in the form of a new link road which can connect some or all of the areas identified earlier.

M40/A46 SRN Capacity Enhancements

- 4.47 The results highlighted within the following section of this report highlight that there are impacts predicted around the M40 Junction 15 area that have worsened as a result of the additional housing numbers that have now been assigned to the network.
- 4.48 This does not alter the conclusion that works in this area will be required towards the end of the plan period to accommodate the predicted traffic levels. It does, however, indicate that the form of scheme proposals may need further refinement compared to that which has been assumed within the assessment thus far.
- 4.49 It should also be noted that the wide ranging implications of enhancing capacity in this area are such that they could encourage traffic to remain on the A46 and travel into Warwick via the south at much greater volumes than currently occur. They may also dissuade traffic from exiting the M40 at J15 travelling up the A46 to access Warwick and Leamington. Such changes in traffic flow across the study area could reduce the impacts being identified at

Longbridge Island and also other areas such as Warwick Town Centre, this could impact upon the mitigation strategy currently proposed in areas outside of the M40/A46 corridors.

- 4.50 It is considered pertinent to highlight the critical role of strategic and local importance that the A46 and M40 play in accommodating traffic flows. Further investigation of scheme proposals along both the A46 and the M40 will be critical to ensuring the overall resilience of the transport network is maintained.
- 4.51 Recent observations of the general operation of the M40 during early 2016 have revealed increasingly frequent numbers of incidents on the motorway (between J12 and M42) and the A46 (M40-A45), on occasions requiring closures. When such incidents occur the impacts on the local road network can be severe and wide ranging. This modelling assessment is based on “typical traffic conditions” and mitigation is defined on this basis. There could, justification for seeking to improve the operational capacity of the SRN in Warwick and Stratford districts sooner than the modelling indicates, on the basis that the current modelling does not account for events such as incidents and other operational issues that occur outside of the issues induced by general traffic growth.

Broader Transport Impact Strategy

- 4.52 The infrastructure identified previously has either been identified through the historic STA work or as a result of the various studies that have been undertaken regarding the Sustainable Transport Alternatives and overall composition of the transport strategies. In almost every instance, these studies are focused on the strategic impacts and associated mitigation or primary/strategic corridors and routes to/from each of the towns.
- 4.53 What the work does not identify, at this stage, are smaller, localised impacts that are not identifiable either due to the strategic focus of the work to date or the coverage of the model. For example, the work presented in **Appendix A** of this report highlights the potential for the areas of Gibbet Hill Road as well as Crackley lane to come under significant pressure and, at this stage, it is not possible to identify what additional impacts may occur in these areas or what an appropriate mitigation strategy could be. In this instance the KSWA model is being extended to cover this area and subsequent studies will likely be completed to assess the impacts in these areas. The model extension is underway at the time of completing this study and therefore was unavailable for this assessment.

4.54 Other areas where impacts may occur for which mitigation may be required include, but are not restricted to:

- Crewe Lane as traffic from north Kenilworth and the new sites seek alternative route to Leamington away from the A46.
- The Knowle Hill junction with Dalehouse Lane which may require signalisation for capacity/safety reasons once all of the sites to the east of Kenilworth come forward.
- The Woodcote Lane/Warwick Road/Hill Wooton Rd area in response to an increased prevalence of north/south trips across the study area.

5 RESULTS ANALYSIS

Overview

- 5.1 The following sections of the report are intended to present the results obtained from the detailed testing undertaken with both the WLWA and KSWA models.
- 5.2 A tiered assessment has been adopted; results analysis is focussed on a strategic level assessment at this stage similar to that adopted during earlier stages of the assessment.
- 5.3 All of the measures used to inform the assessment are outlined as follows:

Number of Runs

- 5.4 All analysis has been based, consistently, on a minimum of 10 and a maximum of 20 runs per scenario due to the method of production. 20 runs per period were undertaken and any 'failed' runs discounted.

Network Wide Statistics

- 5.5 A number of statistics used in the analysis have been obtained from analysing each individual trip that has occurred within the network. This information is collected within PARAMICS through the Trips-all file and contains information specific to each individual trip that has been completed within the model period. This information is then 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.

- 5.6 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.

- 5.7 The use of these statistics is in line with the methodology adopted during the previous Strategic Transport Assessment work.

Model Stability

- 5.8 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.
- 5.9 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.
- 5.10 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 prior to adoption, this allows the more localised impacts to be identified and mitigated through the developments detailed transport assessments. This level of detail cannot be achieved during 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 results and stability will be realised.

- 5.11 Twenty model runs were initially undertaken, 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.
- 5.12 Additional runs were then collected to ensure that, where practicable, model outputs were based on a minimum of twelve runs per time period.
- 5.13 Based on an initial review of the model performance it was decided that an AM model run could be considered as having locked up whenever more than 8,500 vehicles are observed to remain on the model network at the end of the AM simulation period and 9,500 vehicles are observed to remain on the model network at the end of the PM simulation period. A greater level of latent demand is deemed acceptable during the PM than the AM due to the inherently higher level of variability contained within the PM scenario between each of the individual runs which is largely related to the higher demand levels within the WLWA model.

Queue Lengths

- 5.14 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.
- 5.15 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.
- 5.16 The junctions for which average hourly maximum queue lengths have been calculated and compared are illustrated within **Figure 7** and **Figure 8** on the following page for the WLWA and KSWA model networks respectively.
- 5.17 Junctions where queue differences have not been plotted on the maps simply represent junctions which did not trigger any of the assessment criteria across any one approach.

- 5.18 Queue difference plots have been produced to compare the updated Local Plan model scenario queuing levels against the Reference queuing levels for both the KSWA and WLWA model networks. This information has been presented within **Appendix C** of this Report. Alongside the updated model scenario queues the comparisons against the queueing levels predicted to occur within the original RDA STA model scenarios are also presented within the same Appendix.
- 5.19 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, 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.
- 5.20 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)
 - **Severe Increase** (an increase in queue lengths of between 30 and 50 vehicles)
 - **Very Severe Increase** (an increase in queue length of over 50 vehicles)

Journey Time Analysis

- 5.21 During the first phase of STA analysis some 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.
- 5.22 A series of key routes were defined within the model network and these routes have been illustrated within **Figure 9** and **Figure 10** on the following pages for the WLWA and KSWA model networks respectively.

- 5.23 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.
- 5.24 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%
 - **Severe Increase** – An increase in journey times of more than 25% but less than 50%
 - **Very Severe Increase** – An increase in journey times, when compared to the Reference Case, of more than 50%
- 5.25 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 as it would be expected that the mitigation schemes are optimised in that regard.
- 5.26 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.

5.27 The results of the journey time comparisons for both the new and original RDA Local Plan scenarios are presented within **Appendix D** of this Report.

Figure 7: WLWA Junction Queue Locations

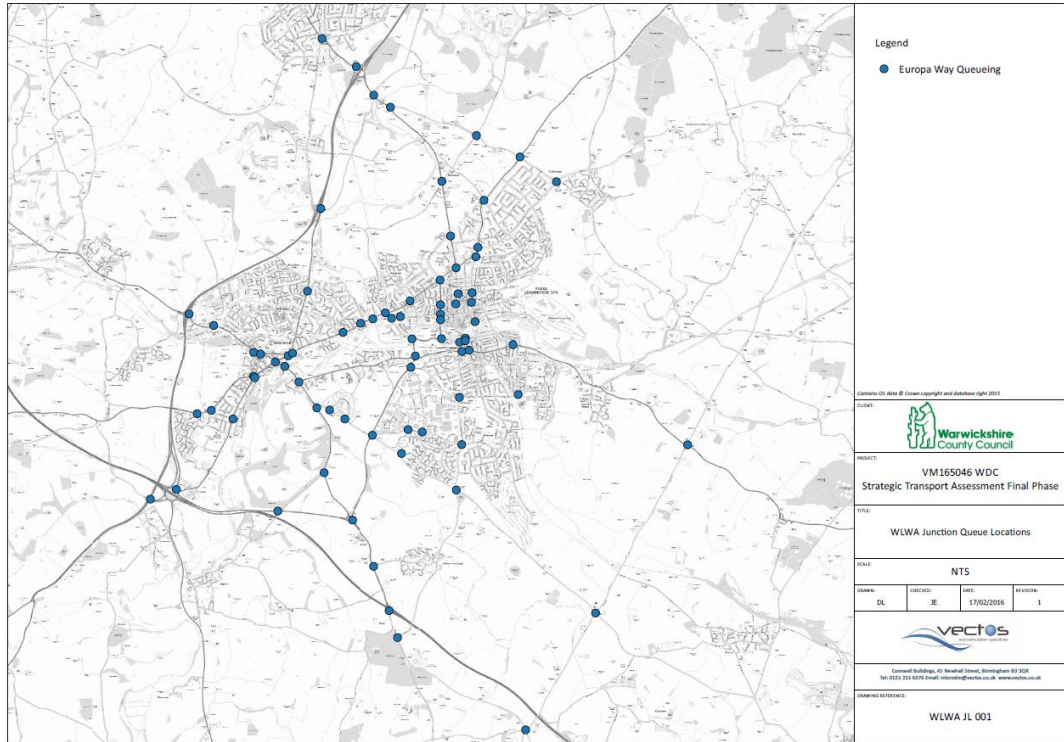


Figure 8: KSWA Junction Queue Locations



Figure 9: WLWA Journey Time Analysis Paths

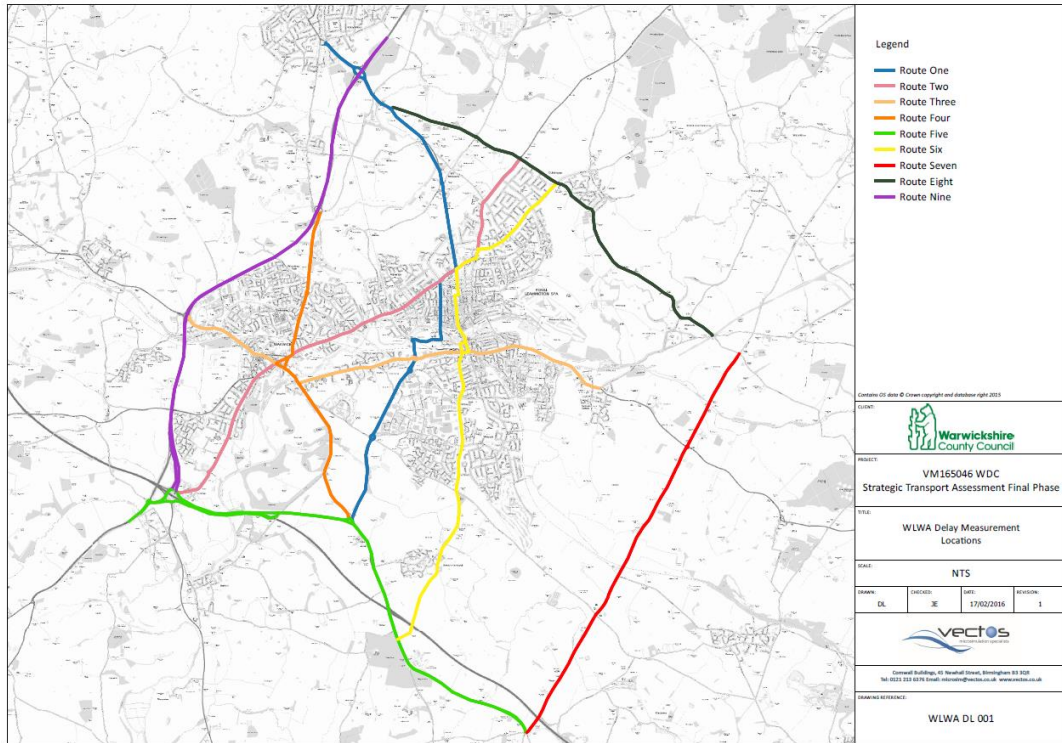
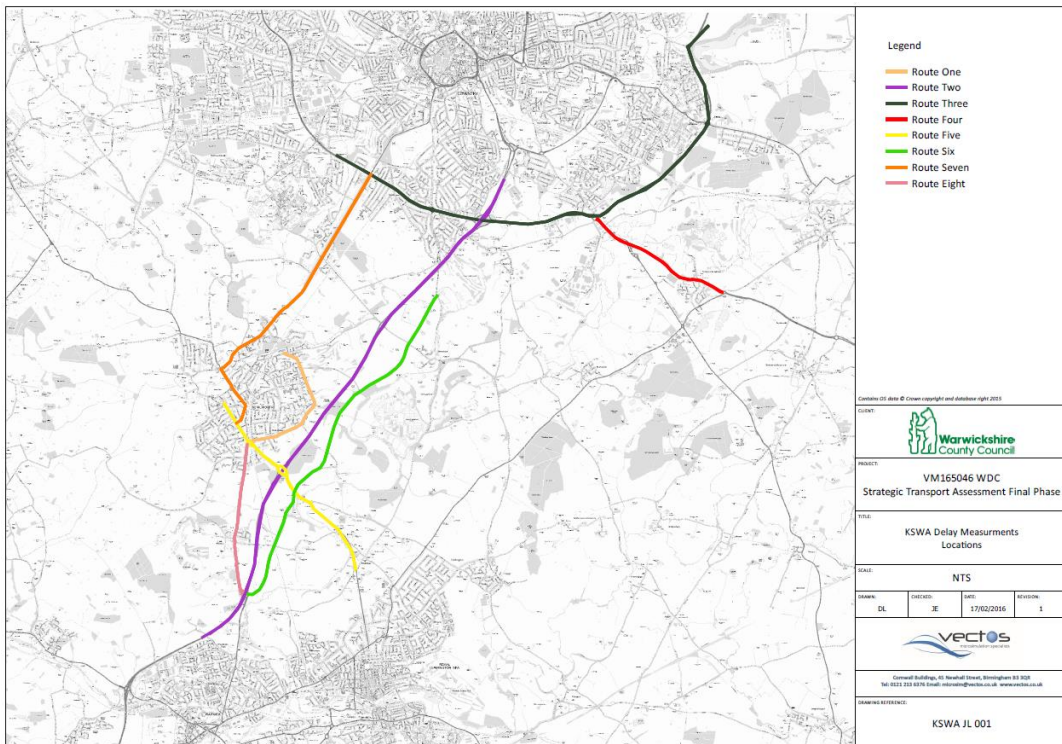


Figure 10: KSWA Journey Time Analysis Paths



Results overview

- 5.28 The results analysis that has been set out within the remaining sections of this report has been divided by area, with WLWA model outputs being analysed first and the KSWA model outputs have been presented subsequently.

6 WLWA RESULTS ANALYSIS

Overview

6.1 The following sections of the report are intended to present the results obtained from the detailed testing undertaken within the WLWA model study area based on the following scenarios:

- **2029 WLWA Ref Case** – The WLWA forecast to a future year inclusive of committed developments and generalised growth assumptions but no LP sites
- **2029 WLWA RDA + NS** – the WLWA RDA LP model inclusive of the demands associated with the new sites as well as the mitigation strategy discussed within the following section of this report.
- **2029 WLWA RDA** – The previous WLWA scenario inclusive of the RDA sites and associated demands and infrastructure as documented within the previous Phase 4 STA report.

Model Stability

6.2 An initial assessment of the level of model stability was undertaken by comparing the number of completed runs against the number of runs assumed to have failed, as outlined earlier within Chapter 5 of this report.

6.3 The apparent network stability exhibited within the AM and PM simulation runs across the two scenarios is illustrated within the following **Table 9**:

Table 9: Model Stability Assessment 2029 Reference vs. RDA + NS & RDA

	WLWA Ref Case	WLWA RDA + NS	WLWA RDA
AM	90%	85%	85%
PM	85%	90%	80%

6.4 Given the number of runs completed (20 runs per time period) it is reasonable to conclude, from the previous table, that there are no notable differences between the Reference Case and WLWA LP scenarios when considering network stability. The inclusion of the additional housing sites appears to result in a small reduction in model stability levels in the AM and PM time periods although the magnitude of difference is relatively limited and unlikely to be

considered significant, within the PM this could be indicative of potential additional issues although more runs would be necessary to confirm this.

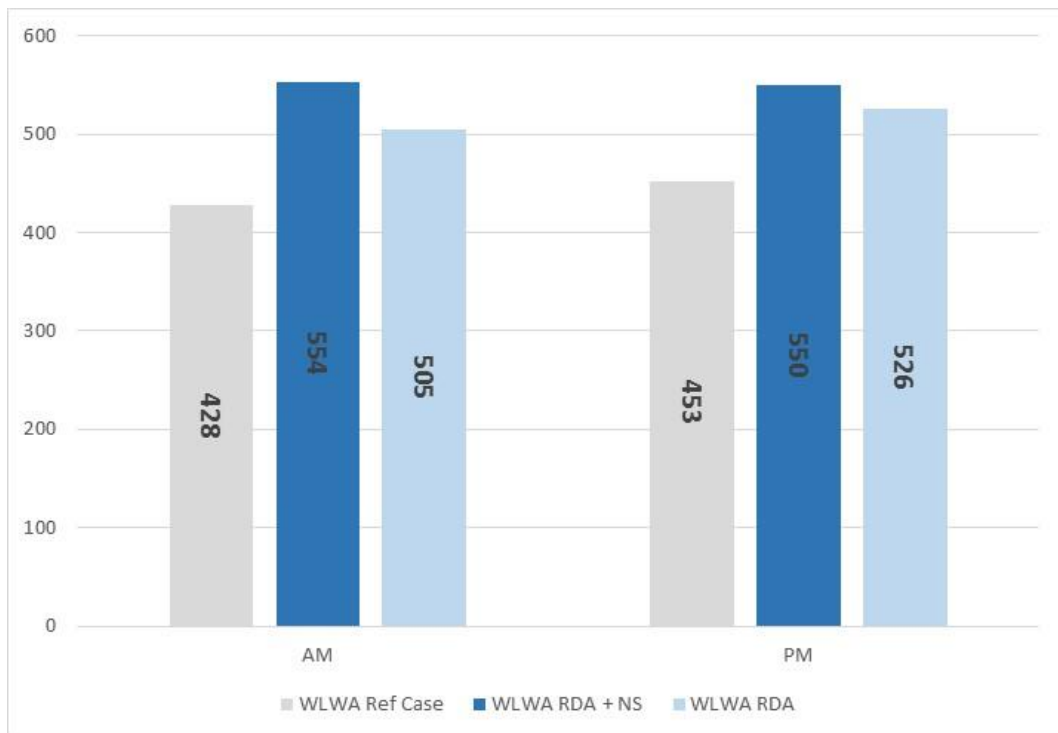
Network Wide Statistics

- 6.5 The following sets out the changes in network wide statistics between the Reference Case and the WLWA RDA scenarios.

Average Journey Time (Seconds)

- 6.6 Analysis of the average journey time, in seconds, within each scenario, across the entire AM and PM model periods, is presented within the following Figure:

Figure 11: WLWA Average Journey Time (s) Ref Case vs. RDA + NS & RDA



- 6.7 Analysis of the difference in average journey times indicates an increase in the time it takes to complete a journey when compared to the Reference Case conditions of around 30% during the AM and 22% during the PM as a result of the inclusion of the new sites.

- 6.8 Compared to the previous RDA scenario the new sites also appear to elicit an increase in journey times of around 10% in the AM and 5% in the PM. This indicates that, despite the level of increase being relatively modest, there is a noticeable increase in the modelled

journey times which occurs as a result of the inclusion of the new sites within the model network.

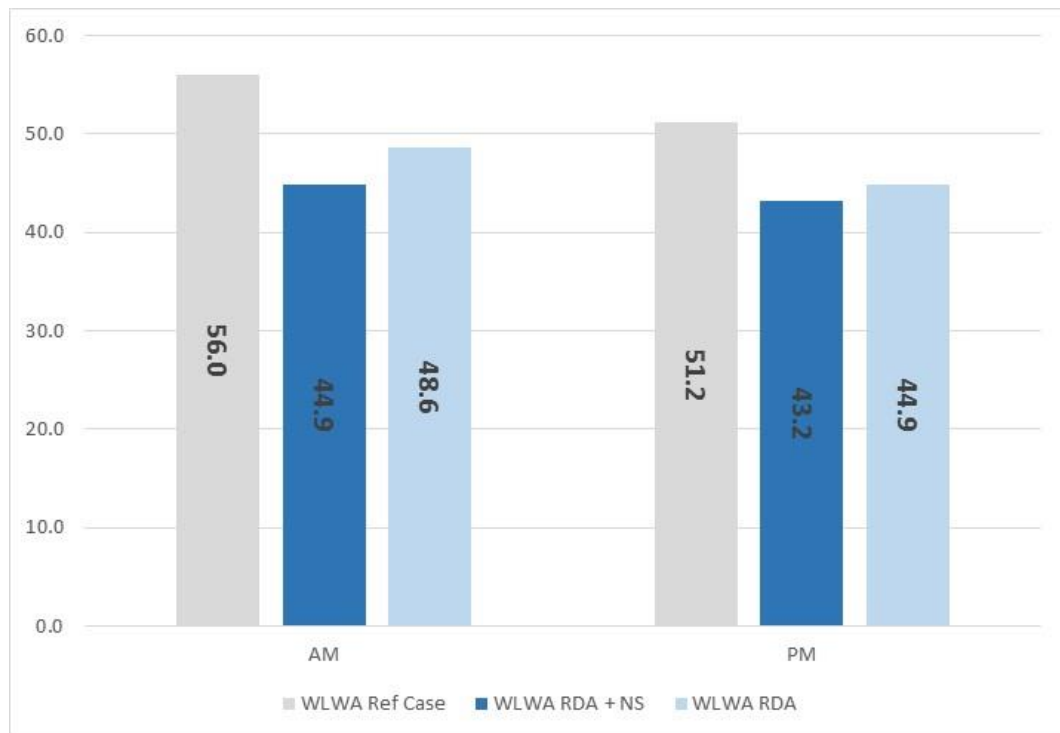
6.9 An incremental increase in delay is likely to be experienced as a result of these vehicles being added on to an already congested network. In some areas mitigation has been introduced to minimise these impacts and it is entirely possible that conditions in some areas will improve as a result of the schemes which accompany the allocated growth.

6.10 However, overall, it can be assumed that there will be a general increase in the average time spent travelling on the network once the allocated demand has been assigned to the network.

Average Journey Speed

6.11 Analysis of the average journey speed (km/h) within the three scenarios, across the entire AM and PM model periods, is presented within the following Figure:

Figure 12: WLWA Average Journey Speeds (Km/h) Ref vs. RDA + NS & RDA



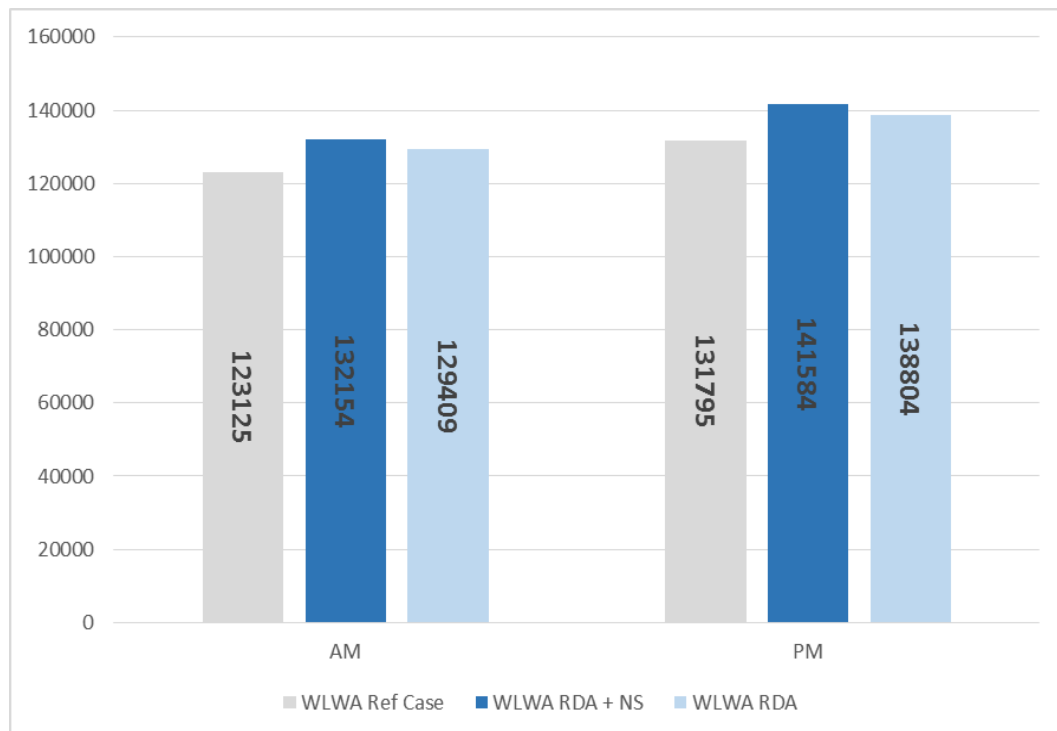
6.12 The previous Figure reveals that the allocation of the New Sites in conjunction with the RDA strategy results in a drop in the average speed of vehicles, on the network, of 20% and 15% in the AM and PM peak periods respectively when compared to the Reference Case. The

results also indicate that the introduction of the new sites induces a reduction in speeds of between 4 to 8% when compared to the original RDA scenario network performance.

Completed Trips

- 6.13 Analysis of the total number of completed trips within each scenario, across the entire AM and PM model periods, is presented within the following Figure:

Figure 13: WLWA Completed Trips (Veh.) Ref vs. RDA + NS & RDA



- 6.14 Analysis of the figure indicates that there is an increase in completed trips of around 7.5%, within the RDA + NS scenario in both the AM and PM periods respectively, when compared to the Reference Case. The number of trips completed in the RDA + NS scenario (which includes the additional housing a mitigation on top of the RDA) compared to the original RDA scenario also increases by around 2% across both the AM and the PM.
- 6.15 Notably, the level of demand assigned within the RDA + NS scenario network is around 8% to 9% higher than the Reference Case demands across the AM and PM time periods and around 2% to 2.5% higher than the original RDA demands. This indicates that, since the number of completed trips has increased by a comparable level to the overall increase in demands, the mitigation that has been assigned to the RDA + NS model network is at least in part able to accommodate the additional traffic volumes that have been assigned to the model network.

- 6.16 To understand how much demand is either unreleased or left on the network at the end of the simulation period the number of completed trips has been compared against the total demand levels assigned within the model. This information has been presented within the following **Table 10**:

Table 10: Completed Trip Analysis (Ref Case vs. RDA + NS & RDA)

Scenario	AM (07:00 to 10:00)			PM (16:00 to 19:00)		
	Demand	Completed Trips	Completed %	Demand	Completed Trips	Completed %
2028 Reference Demands	127250	123125	96.8%	136667	131795	96.4%
2028 WLWA RDA +NS	137479	132154	96.3%	149351	141584	94.8%
2028 WLWA RDA	134385	129409	96.3%	145837	138804	95.2%

- 6.17 The previous Table illustrates that, as a proportion of the demand assigned, the number of trips that are completed during the AM and PM model periods, is comparable across all scenarios during the AM period. Within the PM there is a slight drop between the WLWA RDA + NS scenario and the other scenarios that have been tested. Although the magnitude of difference is not sufficient to warrant further investigation.
- 6.18 Overall the analysis of the completed trips indicates that the additional mitigation measures, identified to accompany the additional housing sites, is sufficient to accommodate the additional traffic volumes albeit with residual impacts in the form of reduced journey speeds and increased journey times across the network.

Maximum Queue Length Analysis

- 6.19 The following sets out some initial observations based on the differences in queue lengths between the Reference Case and WLWA RDA scenarios (with and without the new sites).
- 6.20 The maps which are referred to within the following analysis are presented within **Appendix C** of this report.

AM Analysis (MQ001)

6.21 Analysis of the difference in queuing between the Reference and WLWA RDA + NS scenario, during the AM peak period, reveals the following:

- There are no instances of severe increases in queue lengths.
- The majority of junctions assessed that trigger the criteria experience a level between a reduction in queuing levels and a maximum increase of 30 vehicles.
- In almost all areas where an increase in queuing of greater than 30 vehicles is observed there are already infrastructure proposals in place, this indicates further work on these schemes is desirable.
- Conditions to the north of the study area appear to have improved significantly with a high number of locations within the model experiencing a reduction in queuing levels, this is indicative of the benefit that could be unlocked via the delivery of the wider A452 dualling scheme.

PM Analysis (MQ003)

6.22 Analysis of the difference in queuing between the Reference and WLWA RDA + NS scenario, during the PM period, reveals the following:

- There are four instances of severe increases in queuing levels, there are focussed around the area of Junction 15 of the M40 and also to the north of Warwick Town centre.
- Overall, the majority of junctions assessed that trigger the criteria experience a queue length increase of 15 to 30 vehicles.
- As with the AM, conditions to the north of the study area are seen to improve, most likely as a result of the inclusion of the wider A452 dualling in the area.

Queue Analysis Summary

6.23 Analysis of the difference in queuing levels, that occurs as a result of the inclusion of the RDA and new site allocations, reveals that, during the AM, the junctions either side of Myton Road are still likely to experience a relatively large increase in queuing levels. This is

because these junctions serve as constraints to the north/south movement of traffic between the allocated sites to the south and Warwick and Leamington town centres. Whilst it may be desirable to mitigate these junctions further it may also be desirable to use the signal configuration in these areas to 'gate' traffic and prevent the town centre areas from becoming too congested. Such an approach could be investigated further as part of the subsequent review of town centre strategies but, in the meantime, it should be recognised that a worsening of traffic conditions in these areas may be desirable in exchange for lower traffic levels with the town centres.

- 6.24 During the PM the problems occur to the north of Warwick Town Centre and also around M40 Junction 15. In both cases, it was highlighted within Chapter 4 of this report that these impacts could be further mitigated via a review of the proposals in these areas.
- 6.25 When considering the impacts around Warwick Town centre there are possibilities to deliver more schemes in these areas that have yet to be fully investigated. There are also opportunities to deliver the improvements to sustainable transport alternatives that would reduce dependency on car based trips and, therefore, reduce the overall impact as a matter of consequence.
- 6.26 The increases in queueing levels at Junction 15 will be intrinsically linked to the overall capacity in that area taking account of both the A46 and the M40. The signal configuration in this area is particularly complex and there would be little benefit in reviewing the configuration further at this time when the lane configuration both at the junction and between Junction 15 and Junction 14 could be subject to further change.
- 6.27 Furthermore, when considering the very severe increases in queueing within the PM period, these only occur as a result of the additional sites being included, queueing increases were not as substantial within the original RDA testing and it can therefore be interpreted that the issues that have been identified will occur towards the end of the plan period as the number of allocated sites that are assumed to be built out approaches 100%.

Journey Time Analysis

- 6.28 The following sets out some initial observations of journey time analysis plots for the WLWA RDA + NS scenario versus the Reference Case.

6.29 The comments in the remainder of this section are based on observations of the changes in predicted journey times across pre-defined routes within the model area during both AM (08:00 to 09:00) and PM (17:00 to 18:00) peak hours.

6.30 The maps which are referred to within the following analysis are presented within **Appendix D** of this report whilst the specific drawing number pertaining to each element of the analysis has been provided within the accompanying title brackets.

AM Analysis (MD001)

6.31 Analysis of the difference in journey times between the Reference and WDC RDA + NS scenarios, during the AM peak hour, reveals the following:

- There are no instances where very severe increases in journey times occur.
- There are a number of instances where the journey times increase by more than 25% and there is a focus of impacts along the A452 Europa Way corridor to the south, on the A452 travelling into Warwick/Leamington from the north and also on the Stratford Road to/from Junction 15.

PM Analysis (MD002)

6.32 Analysis of the difference in journey times between the Reference and WDC RDA + NS scenario, during the PM peak hour, reveals the following:

- As with the AM analysis, there are no instances of very severe increases in journey times identified.
- Similar to the AM, an increase in journey times of more than 25% occurs on the Stratford Rd SB approach to M40 J15. Increases of the same magnitude also occur on the A452 SB approach from the North into Warwick and Leamington which correlates again with an impact observed in the AM.
- Increases in journey times of over 25% also occur on the approaches to the Greys Mallory roundabout from the south and west which occur despite the additional scheme amendments in this area.

Delay Analysis Summary

- 6.33 Analysis of the difference in journey times between the Reference Case and the WLWA RDA + NS scenario network reveals that there is an increase in journey times which occurs during both the AM and PM peak hours along the A452 SB into Warwick/Leamington from the north. This is likely to be indicative of the additional delay introduced to the network as a result of signal proposals at key junctions on the corridor as opposed to a failure of the dualling scheme to improve the traffic conditions in the area. A detailed assessment of the scheme proposals is likely to be required to enable the determination of an optimum configuration for signal proposals in this area.
- 6.34 Within the AM there are increases in journey times approaching Warwick and Leamington from the south as well, these will in part be exacerbated by the constraint that is occurring as a result of the performance of the Myton Road/Europa Way Roundabout proposals. As yet it is unclear what the impact of further improvements in this area will be. At the moment the junction constrains traffic in a single location, it is likely to be desirable that this constraint is lessened but any refinements to the proposals in this area should take cognisance of the wider implications on Leamington Town Centre.
- 6.35 Within the AM and PM peak hours there are increases in delay experienced by vehicles exiting Warwick along the Stratford Road. This is likely to be as a result of entry capacity at J15 of the M40, particularly as the Stratford Road approach to Junction 15 is not under signal control. Signalisation of this approach may be desirable to minimise these impacts, provided they are deliverable. Similar issues are also observed around the Greys Mallory area which indicates that both Junction 15 and Greys Mallory, coupled with the wider A452 south of Warwick, would benefit from a detailed review of the scheme proposals and further, refinement and optimisation which would be undertaken at a more detailed level than has been undertaken for the strategic transport assessment.

WLWA Assessment Conclusions

- 6.36 Following the completion and analysis of the performance of the RDA + NS model network, in comparison to the Reference Case scenario, the following conclusions have been identified:

- The journey times and vehicle speeds across the network will worsen as a result of the allocation of the additional housing sites but, despite these impacts, it is likely that the additional mitigation measures identified will be able to, at least in part, accommodate the additional traffic volumes generated by the new sites.
- That the junctions on either end of Myton Road could potentially constrain traffic volumes in the area and further work to determine an optimum solution in this area should take account of the impacts on Warwick or Leamington Town Centres.
- Queueing issues are observed accessing Warwick Town Centre and also at M40 Junction 15 that merit further investigation. However, the issues are not likely to become severe until such time as the volume of housing that has been delivered approaches closer to 100% of the allocated housing numbers.
- Furthermore, issues in these areas will be dealt with further through the corridor strategies with the recommendation being that town centre strategies are added to the infrastructure delivery schedule whilst more work on the nature and form of the M40 capacity enhancements will also, inevitably, be completed earlier in the Local Plan delivery period than is predicted, within the modelling, to be an issue.
- That introducing signal proposals along the A452 to the north of Leamington may introduce additional delay in spite of the fact that a wider dualling strategy has been proposed for the same area and further work on these implications is recommended.

7 KSWA RESULTS ANALYSIS

7.1 The following sections of the report are intended to present the results obtained from the detailed testing undertaken within the WLWA model study area based on the following scenarios:

- **2029 KSWA Ref Case** – The forecast to a future year inclusive of committed developments and generalised growth assumptions but no LP sites as documented within the Phase 4 STA Report.
- **2029 KSWA RDA + NS** – the KSWA RDA LP model inclusive of the demands associated with the new sites as well as the mitigation strategy discussed within the following section of this report.
- **2029 KSWA RDA** – The previous KSWA scenario inclusive of the RDA sites and associated demands and infrastructure as documented within the previous Phase 4 STA report.

Model Stability

7.2 An initial assessment of the level of model stability was undertaken by comparing the number of completed runs against the number of runs assumed to have failed, as outlined earlier within Chapter 5 of this report.

7.3 The apparent network stability exhibited within the AM and PM simulation runs across the two scenarios is illustrated within the following **Table 11**:

Table 11: Model Stability Assessment 2029 Reference vs. RDA + NS & RDA

	KSWA Ref Case	KSWA RDA + NS	KSWA RDA
AM	100%	95%	100%
PM	100%	100%	100%

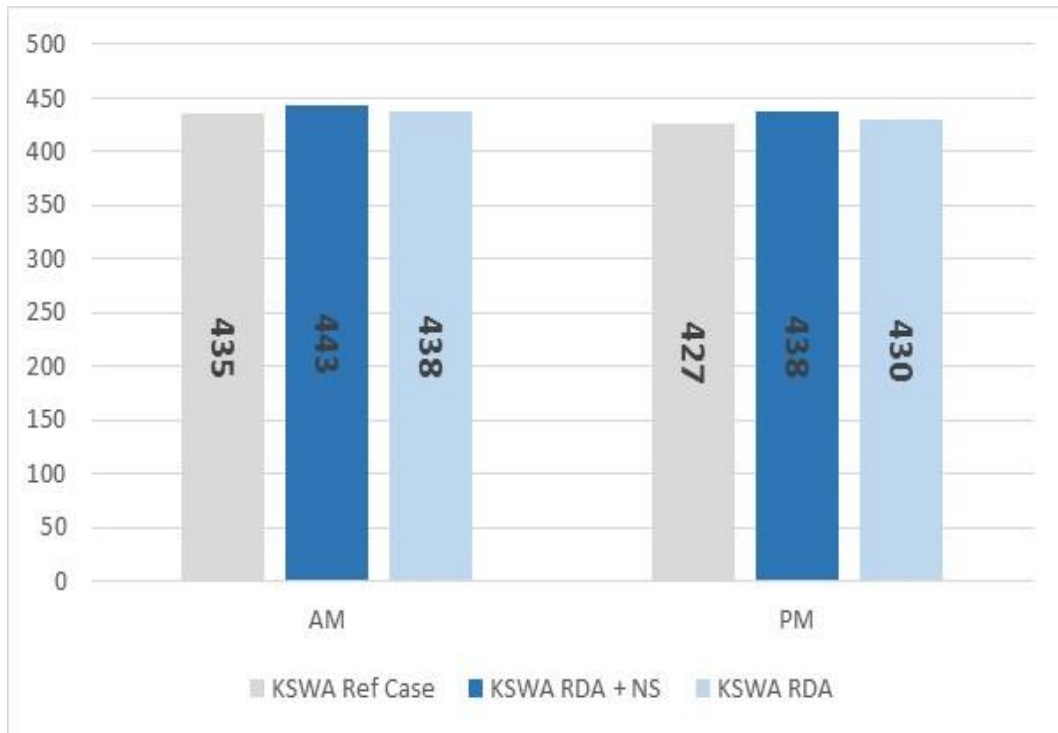
7.4 Given the number of runs completed (20 runs per time period) it is reasonable to conclude, from the previous table, that there are no notable differences between the Reference Case and KSWA LP scenarios when considering network stability.

7.5 A single failure appears to have occurred within the AM peak of the KSWA RDA + NS scenario which is not considered significant.

Average Journey Time (Seconds)

7.6 Analysis of the average journey time, in seconds, within each scenario, across the entire AM and PM model periods, is presented within the following Figure:

Figure 14: KSWA Average Journey Time (s) Ref Case vs. RDA + NS & RDA

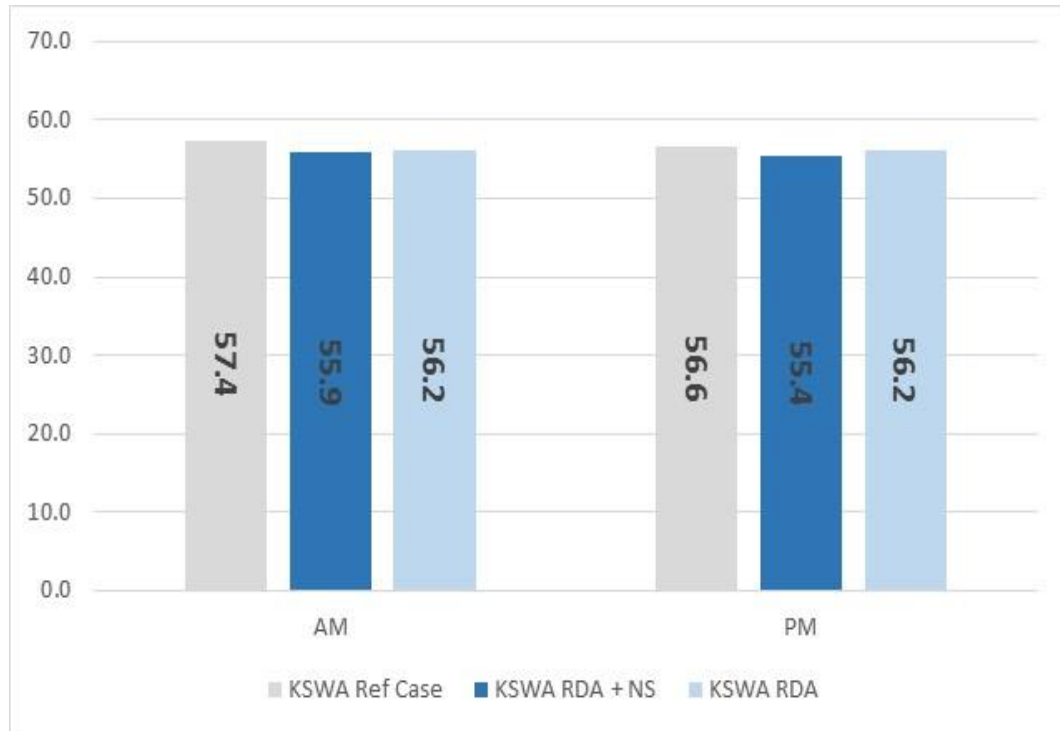


7.7 Analysis of the difference in average journey times indicates that, once the mitigation measures have been applied to the model network, only a very small increase in journey times is predicted to occur. Compared to the Reference Case the largest increase in journey times is still less than 3% which, given the amount of additional housing allocated in the area, is not considered significant.

Average Journey Speed

7.8 Analysis of the average journey speed (km/h) within the three scenarios, across the entire AM and PM model periods, is presented within the following Figure:

Figure 15: KSWA Average Journey Speeds (Km/h) Ref vs. RDA + NS & RDA



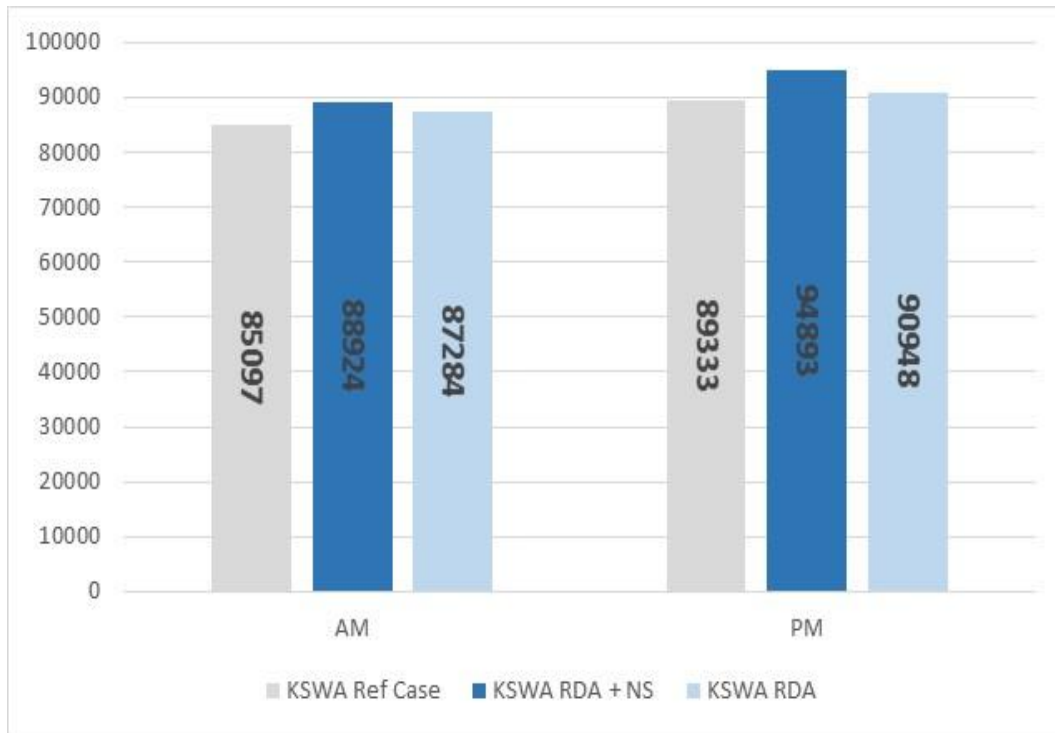
- 7.9 As with the analysis of the average journey times, analysis of the changes in average speeds across the model network reveals that there is very little residual impact on the network once the mitigation schemes have been applied.

Completed Trips

- 7.10 Analysis of the total number of completed trips within each scenario, across the entire AM and PM model periods, is presented within **Figure 16**.
- 7.11 Analysis of **Figure 16** reveals that there is an increase in completed trips of around 4.5 to 6.5% within the KSWA RDA + NS network compared to the Reference Case in both the AM and PM periods respectively.
- 7.12 The analysis of model demands presented within **Table 6** earlier in this report reveals that the increase in vehicle demands, compared to the Reference Case, is around 6 to 7% across both AM and PM time periods. Thus, the analysis indicates that within the PM, the mitigation measures accommodate a greater level of traffic than has been assigned to the network as a result of the New Sites. Within the PM nearly all of the additional demands are accommodated by the new mitigation measures. Certainly when considering the difference in demands between the RDA and RDA + NS model networks the additional demands

assigned as a result of the newly allocated sites are easily accommodated by the proposed mitigation measures.

Figure 16: KSWA Completed Trips (Veh.) Ref vs. RDA + NS & RDA



7.13 To understand how much demand is either unreleased or left on the network at the end of the simulation period the number of completed trips has been compared against the total demand levels assigned within the model. This information has been presented within the following **Table 12**:

Table 12: Completed Trip Analysis (Ref Case vs. RDA + NS & RDA)

Scenario	AM (07:00 to 10:00)			PM (16:00 to 19:00)		
	Demand	Completed Trips	Completed %	Demand	Completed Trips	Completed %
2028 Reference Demands	87277	85097	97.50%	91651	89333	97.47%
2028 KSWA RDA +NS	93259	88924	95.35%	97420	94893	97.41%
2028 KSWA RDA	89526	87284	97.50%	93163	90948	97.62%

7.14 The previous Table illustrates that, as a proportion of the demand assigned, the number of trips that are completed during the AM and PM model periods, is comparable across all scenarios during the PM period. Within the AM there is a slight drop between the KSWA RDA

+ NS scenario and the other scenarios that have been tested. Although the magnitude of difference is not sufficient to warrant further investigation as a trip completion level above 95% is considered to be very high.

Maximum Queue Length Analysis

- 7.15 As with the analysis of impacts within the WLWA, analysis of the differences in queue lengths between the Reference Case and WLWA RDA + NS scenario has also been undertaken. The maps which present the comparison of queueing levels between development scenarios and the Reference Case are presented within **Appendix C** of this report.

Queue Analysis Summary (MQ005 & MQ007)

- 7.16 As would be expected, given the relatively limited impacts observed through the network statistics, there are very few impacts predicted to occur as a result of the assignment of the new demands and associated mitigation strategy.
- 7.17 In a number of instances, across both the AM and PM, there are reductions in queueing levels experienced as a result of the inclusions. It is likely that these reductions are almost entirely related to the inclusion of the new junction between the A46 and Stoneleigh Road. Inclusion of this junction appears to improve the route into the Kenilworth area from the A46 and can draw traffic away from the A429 as a result.
- 7.18 This highlights the critical significance of delivering these junction proposals as well as the strategic benefits that these improvements could unlock.

Journey Time Analysis

- 7.19 As per the WLWA analysis, again journey time analysis comparing the KLWA RDA + NS journey times versus the Reference Case has been completed and the resultant plots illustrating this information have been provided within **Appendix D**.

Journey Time Analysis Summary

- 7.20 Analysis of the difference in journey times between the Reference and WDC RDA + NS scenarios reveals that the impacts, on journey times, are similar in both time periods and, largely, the impacts are either negligible or, in some instances, beneficial.

KSWA Assessment Conclusions

7.21 The initial analysis of the KSWA RDA + NS model scenario performance, compared to the Reference Case, has revealed the following conclusions:

- That the mitigation measures identified within the assessment are likely to be able to sufficiently mitigate the strategic level impacts that occur as a result of the allocation of the new housing sites.
- That the introduction of the reconfigured Stoneleigh Road/A46 junction proposals will potentially alleviate issues elsewhere on the network by providing a higher capacity alternative route to trips on the network.

8 SUMMARY AND CONCLUSIONS

Summary

- 8.1 Vectos Microsim (VM) has been commissioned by Warwickshire County Council (WCC) and Warwick District Council (WDC) to update the recently completed Strategic Transport Assessment (STA) work, which considers the impacts of the allocation of housing and employment sites across the district, to account for the allocation of new housing sites across the district which are in addition to those identified during the previous phase of the STA.
- 8.2 The objective of this work is to update the previous completed Local Plan (LP) STA work to account for the allocation of a number of housing sites across the District and;
- To make use of the existing traffic models to assess the likely level of additional impact predicted to occur on the transport network as a result of the inclusion of development sites in addition to those identified within the RDA.
 - To identify what, if any, additional mitigation measures can be delivered alongside the new housing to minimise any impacts identified.
- 8.3 Following the successful derivation of the new model demands, this resulted in the following two new additional LP scenarios being created:
- **2029 WLWA RDA + NS** – the WLWA RDA LP model inclusive of the demands associated with the new sites as well as the mitigation strategy discussed within the following section of this report.
 - **2029 KSWA RDA + NS** - the KSWA RDA LP model inclusive of the demands associated with the new sites as well as the mitigation strategy discussed within the following section of this report.
- 8.4 Outputs from these scenarios were compared to the Reference Case and, in the case of the network performance indicators, the original RDA scenarios for both WLWA and KSWA study areas.

- 8.5 As part of the assessment a series of mitigation measures have been included within the modelling. Some of the measures are consistent with those applied during the previous stage of STA work, some have been amended from the original modelling assessment and some schemes are entirely new. More detail on the scheme assumptions is provided within Appendix B of this report alongside Chapter 5.
- 8.6 In most instances the schemes have been developed in a manner which accords the transport corridor strategy identified within the Draft Infrastructure Delivery Plan. There are, however, some suggested amendments to the corridor strategies alongside some new additions to the strategies focussing on the following:
- A46 to Cubbington
 - Town Centre Transport Strategies (Kenilworth, Warwick, Leamington)
 - A46 to Westwood Heath (via Gibbet Hill)
 - M40/A46 SRN Capacity Enhancements
 - Broader Transport Impact Strategy

Conclusions

- 8.7 Following the completion and analysis of the performance of the WLWA RDA + NS model network, in comparison to the Reference Case scenario, the following conclusions have been identified:
- The journey times and vehicle speeds across the network will worsen as a result of the allocation of the additional housing sites but, despite these impacts, it is likely that the additional mitigation measures identified will be able to, at least in part, accommodate the additional traffic volumes generated by the new sites.
 - That the junctions on either end of Myton Road could potentially constrain traffic volumes in the area and further work to determine an optimum solution in this area should take account of the impacts on Warwick or Leamington Town Centres.
 - Queueing issues are observed accessing Warwick Town Centre and also at M40 Junction 15 that merit further investigation. However, the issues are not likely to

become severe until such time as the volume of housing that has been delivered approaches closer to 100% of the allocated housing numbers.

- Furthermore, issues in these areas will be dealt with further through the corridor strategies with the recommendation being that town centre strategies are added to the infrastructure delivery schedule whilst more work on the nature and form of the M40 capacity enhancements will also, inevitably, be completed earlier in the Local Plan delivery period than is predicted, within the modelling, to be an issue.
- That introducing signal proposals along the A452 to the north of Leamington may introduce additional delay in spite of the fact that a wider dualling strategy has been proposed for the same area and further work on these implications is recommended.

8.8 The initial analysis of the KSWA RDA + NS model scenario performance, compared to the Reference Case, has revealed the following conclusions:

- That the mitigation measures identified within the assessment are likely to be able to sufficiently mitigate the strategic level impacts that occur as a result of the allocation of the new housing sites.
- That the introduction of the reconfigured Stoneleigh Road/A46 junction proposals will potentially alleviate issues elsewhere on the network by providing a higher capacity alternative route to trips on the network.

APPENDIX A

Westwood Heath and Kings Hill

Supplementary Analysis

WDC STA Phase 5: Westwood Heath and Kings Hill Supplementary Analysis

Project title	WDC Strategic Transport Assessment	Job number	VM155037
cc	Warwickshire County Council	File reference	VM155037.TN002
Prepared by	Darren Lashford	Date	14 December 2015

Introduction

1. Vectos Microsim (VM) have been asked by Warwickshire County council (WCC) and Warwick District Council (WDC) to undertake an assessment of the likely impacts of assigning houses in the areas of Kings Hill and Westwood Heath as part of the review of the housing numbers put forward through the WDC Local Plan.
2. The majority of the analysis pertaining to the development impacts, identified as likely to occur as a result of the revised housing numbers, has been presented within separate Technical Notes which have focused on impacts across the Warwick/Leamington and Kenilworth/Stoneleigh Areas respectively.
3. It should be noted that some of the area of network which may be affected by the allocation of these sites is missing from the existing microsimulation models meaning it is not currently possible to fully assess impacts of these sites within those models within the current models.
4. It is understood that the Kenilworth and Stoneleigh Wide Area (KSWA) model is to be extended for this purpose, however, in order that some interim analysis pertaining to the site impacts can be provided in advance of that extension, supplementary analysis has been undertaken within GIS.

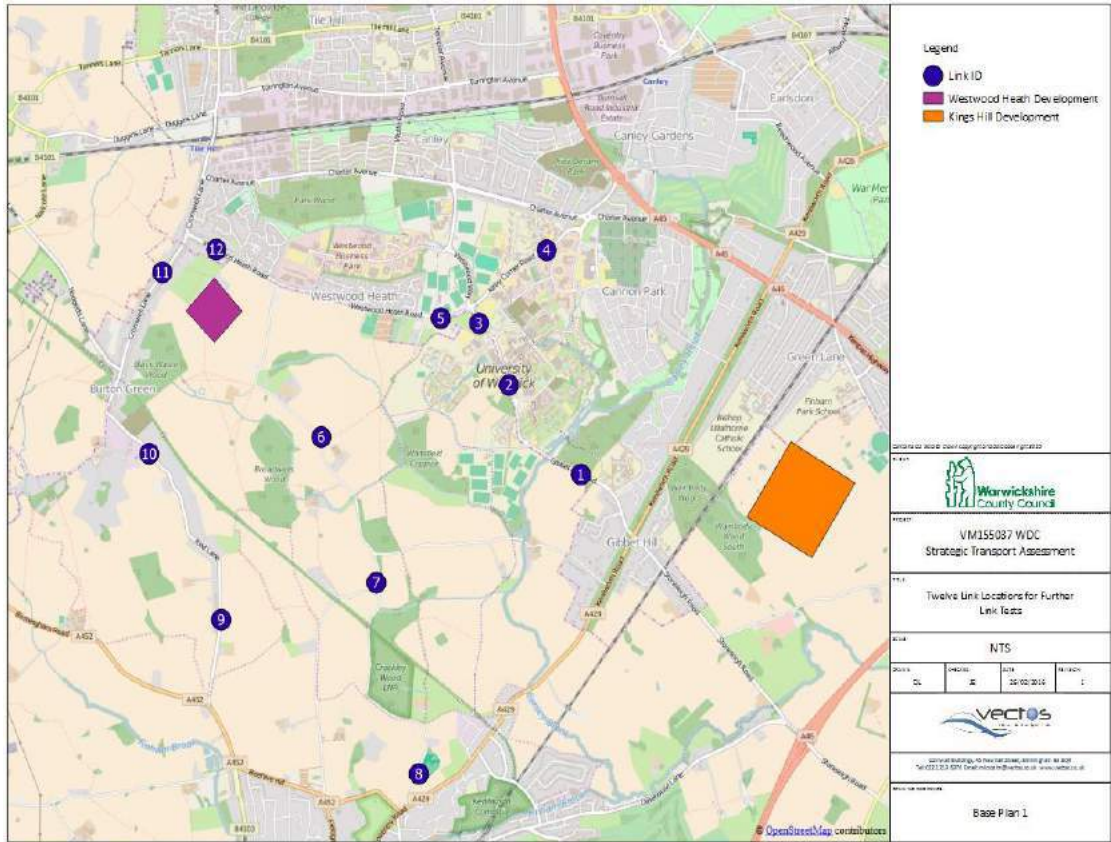
Purpose of this Note

5. This note has been produced to summarise the findings of that initial analysis and present any conclusions or recommendations therefrom.
6. The remainder of the document will outline the background of the two sites and the scenarios assessed for both, whilst also reviewing the effect on the local traffic network not included within the Paramics models.

Scope

The approximate locations of the two sites identified by WDC has been illustrated within the following **Figure 1**.

Figure1: Kings Hill and Westwood Heath total dwelling scenarios



- Twelve highway link locations, strategically placed on the network were chosen to offer direct comparisons of how the links may be affected as a result of the build out of these two sites. Geographically, the link locations selected cover Westwood Heath Road, Crackley and Cromwell Lane along with sites on Kirby Corner Road and Gibbet Hill Road to ensure maximum coverage across the area and can also be found on **Figure 1**.

Scenarios

- In order that the incremental impact of the development build outs could be assessed, it was considered pertinent to define four scenarios for the assessment, each with varying development quantum based on the proposed number of dwellings summarised in the following **Table 1**.

Table 1: Kings Hill and Westwood Heath total dwelling scenarios

	Scenario One	Scenario Two	Scenario Three	Scenario Four
Westwood Heath	425	850	1175	1500
Kings Hill	1050	2100	3050	4000

9. The housing numbers assessed were based on an understanding of the likely aspirations for the area. Scenario 2 represents the housing numbers assessed during the initial phases of the Paramics assessment work whilst Scenario 4 represents what VM understand to be a likely maximum housing level that could be delivered within the boundaries of both sites. Scenario 1 therefore represents the halfway point between no housing and the numbers identified in Scenario 2 whilst Scenario 3 represents the half way point between Scenarios 2 and 4.
10. To create total number of vehicles travelling from each site, the number of dwellings have been multiplied by the WCC standard trip generation factor, inclusive of a 15% mode share adjustment to replicate the switch to sustainable models that should be targeted by all new sites coming forward through the Local Plan.
11. The trip rates used for this analysis are summarised within the following **Table 2**:

Table 2: WCC Standard Residential Trip Rates

	In	Out	Total
0700 to 0800	0.07812	0.3288	0.40692
0800 to 0900	0.12	0.48	0.6
0900 to 1000	0.12228	0.22128	0.34356
1600 to 1700	0.34848	0.11568	0.46416
1700 to 1800	0.48	0.12	0.6
1800 to 1900	0.3648	0.11748	0.48228

12. The resultant demands, produced following the application of mode shift factor and residential trip rates, are summarised within the following **Table 3**:

Table 3: Development demands by Scenario

		Scenario 1		Scenario 2		Scenario 3		Scenario 4	
		In	Out	In	Out	In	Out	In	Out
AM	Westwood Heath	43	173	87	347	120	479	153	612
	Kings Hill	107	428	214	857	311	1244	1632	408
	Total	150	601	301	1204	431	1723	1785	1020
PM	Westwood Heath	173	43	347	87	479	120	612	153
	Kings Hill	428	107	857	241	1244	311	1632	408
	Total	601	150	1204	328	1723	431	2244	561

Objectives

13. The primary objective of this work is to utilise GIS analysis to assess the potential impacts of the Kings Hill and Westwood Heath developments and identify what, if any, traffic constraints are likely to exist which will serve to restrict the amount of housing that can be delivered without additional, more significant, infrastructure being required.
14. A number of measures have been adopted to inform the assessment and these have been detailed within the following section of this Note:

Methodology

15. The distribution of trips across the model network has been informed via an extraction of the likely routing, associated with both sites, using the CITEware strategic modelling tool.
16. Once distributed across the study area transport network, three methods of assessing the impact of traffic flows on the rural links, not included within the Paramics models, have been adopted as follows:

Absolute Values

17. An absolute increase in flows on the links has been identified for each of the Scenarios identified previously. Absolute values have been calculated and presented for each link on a two way basis. And illustrated, figuratively, within GIS plots which enable analysis of the route that traffic will take from the development sites and the relative network stresses to be undertaken.

GEH

18. The Geoffrey E. Havers (GEH) statistic is a standard way of comparing the observed and modelled flows, as defined in DMRB, Volume 12, Chapter 4. The GEH value is similar to a chi-squared test and also incorporates both relative and absolute errors in order to give an overall measure of the accuracy of the modelled flow.
19. The GEH statistic has the benefit of removing bias that exists when comparing flows of different magnitudes using percentages, such that a difference of 10 in a flow of 100 vehicles per hour (vph) is less significant than a difference of 100 in a flow of 1000 vph.
20. The GEH statistic is calculated by:

$$GEH = \sqrt{\frac{(M - C)^2}{(M + C)/2}}$$

Where:

- GEH = GEH statistic
M = Modelled flow
C = Observed flow

21. The DMRB guidance indicates that the GEH statistics should be less than 5.0 to be considered an acceptable level of variation between modelled and observed flows and the same principle has been applied to this analysis.

Link Capacity

22. For the creation of percentage link capacity based on Kings Hill and Westwood Heath, knowledge of one way hourly flow capacity is needed which is then multiplied by the number of lanes to create total road capacity. As such, each site was assessed as to follow the road classification based on the Design for Road and Bridges Manual for Urban all-purpose roads

(DMRM-UAP). Road width was estimated using Google Maps, 'Measure distance tool' as well as being cross referenced through GIS to ensure maximum accuracy.

23. If links do not fully fulfil the criteria in the DMRB-UAP, further assessment using Sweet (2012) 'Capacity of single track Rural Lanes' was used to get a more representative capacity value.
24. A summary table of the adjudged road classification as well as capacity derived from DMRB-UAP and Sweet (2012) can be found in Table 3. As the DMRB-UAP creates capacity boundaries based upon road width and lane number, measured road width was rounded to the nearest boundary.

Table 3 – Road capacity based upon standard classification methods

Map Id	Road Classification ^{1,2}	Approximate Road Width	One Way Hourly Flow Capacity	Hourly Road Capacity
1	UAP 3	6.75	1110	1850
2	UAP 3	6.75	1110	1850
3	UAP 3	7.3	1620	2700
4	UAP 3	7.3	1620	2700
5	UAP 3	7.3	1620	2700
6	Two Lane Rural	5.2	200	303
7	Two Lane Rural	5.2	200	303
8	Two Lane Rural	5.2	200	303
9	UAP 2	6.75	1260	2100
10	UAP 2	6.75	1260	2100
11	UAP 3	7.3	1620	2700
12	UAP 3	7.3	1620	2700

25. It should be noted that, whilst the links through Warwick University, specifically link id's 2 and 3, have been classified as UAP3 this is likely to over-estimate the road capacity in this area since the road surface is more comparable to a shared space surface with a large number of pedestrians in the area.
26. Furthermore, this methodology seeks to identify the impacts on theoretical link capacity, at this stage it is not assessing the junction performance and it should therefore be recognised that junction capacity will also play a role in constraining the flow of traffic within the study area, particularly at the junctions along Gibbet Hill which have already been identified as areas of traffic constraint.
27. Flow capacities in the Traffic Capacity of Urban Roads are based on a 60/40 directional split which relates to dynamics of tidal flow. Within this report, one way hourly flow capacities are assumed to be the busiest direction of flow. As such, the hourly road capacity equates for the remaining 40%. The 'Two Lane Rural' classification was taken from a different source so the

¹ Highways Agency, 'Traffic Capacity Of Urban Roads' (1999)

² Sweet R, 'The Capacity Of Single-Track Rural Lanes' (2012)

60/40 directional split cannot be assumed. Within this classification it suggests that tidal flow is of greater significance on rural roads and therefore it assume a 66/34 split with once again, the busiest direction of flow reported.

Absolute Difference analysis

28. All plots for Absolute difference analysis can be found within Appendix A. Plots have been produced to assess the increases in flows that are predicted to occur across all four model scenarios and for the AM and PM time periods respectively. As a result there are 8 plots illustrating the absolute increases in flows, across a number of ranges, for each scenario/time period.
29. Analysis of these plots, for each scenario/time period reveals the following:

Scenario One AM (WH + KH 1AM)

- The majority of increases in traffic levels on the network is less than 50 vehicles, except on the links located adjacent to an routes accessing the proposed developments.
- Kings Hill lane experiences a potential increase of between 300 – 600 vehicles with traffic then dispersing South East joining the A46 towards Warwick and B4113 towards Royal Leamington Spa.
- Similarly, large increases occur on Westwood Heath Road in both directions towards the A45 Fletchmanstead Highway and then A429 as well as Cromwell Lane which appears to be the preferred route for cars travelling through Tile Hill and towards the A45. Increases in vehicles are consistently between 50 – 150 with the expectation of Westwood Heath road between Cromwell Land and Bockendon Road where vehicular increases are greater at between 150 – 300 vehicles.

Scenario One PM (WH + KH 1 PM)

- During the PM, traffic flow increases along the A46 are much lower than the predicted increases within the AM.
- Traffic approaching Kings Hill Lane from the North via Howes Lane, Green Lane and St Martins Road has increased by 50 – 150 vehicles which would represent inbound trips to the proposed Kings Hill development.

Scenario Two AM (WH + KH 2 AM)

- Traffic at Westwood Heath and Kirby Corner Road increases significantly by between 150 – 300 vehicles.

- On the Western link of Westwood Heath Road between Bockendon and Cromwell Road, traffic proportions are much larger with an increase of between 300 – 600 additional vehicles in this area.
- Link flows are expected to increase by between 300 - 600 vehicles on the A46 however from the original CITEware distributions it appears that a greater proportion of vehicles will exit the A46 and travel into Warwick rather than carry on southwards along the A46.

Scenario Two PM (WH + KH 2 PM)

- Like the AM, the B4113 is predicted to experience substantial increases in traffic flows to the South of Coventry which suggests the return trips of people from Leamington Spa.
- The A46 experiences a smaller magnitude increase in traffic levels within the PM peak hour compared to the AM peak hour with a 150 – 300 vehicle increase occurring as a result of the new developments.
- Traffic flows to the East of Westwood Heath on the Fletchmenstead Highway are, again, greater in the PM than the AM with flow increases exceeding 50 vehicle.

Scenario Three AM (WH + KH 3 AM)

- Scenario Three experiences much greater traffic increases as a result of the cumulative housing totals from both sites. Parts of Westwood Heath Road experience increases of between 300 - 600 additional vehicles whilst at Kings Hill the increase is greater than 1000 with traffic distributing to the A46 resulting in an additional 600 – 1000 trip increases in this area.
- Flow increases of 150 – 300 vehicles occur along the B4113 towards Leamington Spa as a result of traffic travelling from Kings Hill with traffic joining from Westwood Heath via Stonleigh Road.
- Through Kenilworth town centre the A452 experiences increases in traffic of between 50 to 150 vehicles which will add additional strain to this area of the network on top of that which will occur as a result of the already allocated housing sites in the area.
- In the North of the study area, roads adjacent to Westwood Heath experience greater than 50 vehicle increases with some increases exceeding 150 vehicles.

Scenario Three PM (WH + KH 3 PM)

- Unlike the Scenario Two PM period, the Coventry Road from Warwick experiences a larger increase in flows of between 150 – 300 additional vehicles along this link.
- The A45 is estimated to experience increases over 150 vehicles during the PM.

Scenario Four AM (WH + KH 4 AM)

- There is a significant increase in traffic levels across the whole region as a result of the high level of housing assumed at both sites. Many of the major routes between Coventry, Warwick and Leamington Spa incur further increases in traffic flows which, in some cases, exceed over 600 additional trips (A46).
- Of development traffic leaving Westwood Heath eastbound, it is expected that the majority of vehicles (150 – 300) will travel to merge onto Kirby Corner Road then onto the A45. The remaining vehicles are expected to travel across Crackley Lane and Gibbet Hill Road.

Scenario Four PM (WH + KH 4 PM)

- Links to the north east of the model experience substantial increases in traffic flow. On Kings Hill Lane itself it is expected that the traffic increases, in the PM, will exceed 1000 vehicles in the peak hour whilst trips exiting from the north will add 150 – 300 vehicles to the network.
- The large housing numbers at both sites causes traffic increases on the A45 of between 300 - 600 additional vehicles which then disperse to Westwood Heath Road.

GEH Significance analysis

30. All plots outlining the GEH analysis can be found in Appendix B. Plots have been produced to assess the increases in GEH that are predicted to occur across all four model scenarios for the cumulative AM and PM time periods. As a result there are four plots illustrating the GEH for each scenario (AM & PM combined).

Scenario One

- Although relatively low levels of housing are assumed in Scenario 1 the sites located on Westwood Heath Road (Sites 5 and 12) still return a GEH value greater than 5 which indicates a potentially significant increase in flows in this area relative to the baseline conditions.
- Comparison of the flows at site 12 reveals a GEH of greater than 10 which suggests a very significant increase in traffic volumes in this area relative to the Baseline conditions.
- Conversely, sites 6 - 11 return a GEH value between 3 and 5 which suggests that there is no significant change in traffic flow in these areas within scenario 1
- The other sites return values of less than 3 and are therefore not considered significant.

Scenario Two

- The GEH at link location 5 has increased to return a value of greater than 10 and becomes, along with link location 12, which is also on Westwood Heath Road, one of the two points that have a GEH of greater than 10.
- GEH at both link locations 4 and 8 increase to between 5 – 7.5.
- During this scenario, only links 10 and 9 return values of < 3 as links located at 1, 2, 3, 6, 7 and 11 have increased to return a GEH value of within the region of 3 – 5.

Scenario Three

- Link locations 6 and 7 on Crackley Lane have increased to a value of between 5 – 7.5 linking to increased traffic dispersing south west from Westwood Heath.
- Additionally, link location 4 on Kirby Corner Road returns an increased value of between 7.5 - 10.
- Nevertheless, there is little change across the network as all other link locations remain unchanged from Scenario Two.

Scenario Four

- All link locations on Gibbet Hill Road increase in GEH value to between 5 – 7.5 whilst Kirby corner road increases to greater than 10.
- Link locations on Cromwell Road and Red Lane (9, 10 and 11) remain unchanged from previous Scenarios.

Link Capacity analysis

31. A summary table of the adjudged road classification as well as capacity derived from DMRB-UAP and Sweet (2012) can be found in Table 3. As the DMRB-UAP creates capacity boundaries based upon road width and lane number, measured road width was rounded to the nearest boundary. As a result there are eight plots illustrating the percentage link for each scenario (AM & PM) found in Appendix C.

Scenario One:

Analysis of the link capacities, when assessing the housing levels identified within Scenario 1 reveals the following:

- That, within the AM, links 6 and 7 which are the Crackley Lane route between Westwood Heath and Kenilworth are forecast, within scenario 01 to over capacity, whilst the links through the university are also approaching capacity.

- Within the PM, links 6 and 7 are again overcapacity.

Scenario Two:

Analysis of the link capacities, when assessing the housing levels identified within Scenario 2 reveals the following:

- Within the AM and PM, sites 6 and 7 remain over capacity indicating severe issues are likely in these areas, the routes through the university are still approaching capacity in the AM.

Scenario Three:

- Links 6 and 7 on Crackley Lane continue to remain over capacity in both the AM and PM with link 8 being at capacity as well as the links through the university. At this stage, it is reasonable to believe that those links will actually be overcapacity since the traffic using Crackley lane will reassign since that area is already over capacity.

Scenario Four:

- For the first time in the PM, link 8 on Crackley Lane is at capacity. Sites 6 and 7 on Crackley lane remains over capacity and will likely result in the Gibbet Hill route also becoming over capacity.

Summary

32. VM were tasked in assessing the impact of two new housing developments – Westwood Heath and Kings Hill on the future road network in the south west Coventry and north east Kenilworth area.
33. Four scenarios were assessed, based on likely development aspirations for the area, ranging from 425 to 1500 and 1050 to 4000 dwellings for Westwood Heath and Kings Hill respectively.
34. To create trip generation figures for the AM and PM, the dwelling numbers have been multiplied by the WCC standard residential trip rate factor and then adjusted to replicate a switch to sustainable modes.
35. Three methods were used to analyse future traffic issues which included and assessment of; absolute flow increases, GEH significance and link capacity which was based upon road capacities calculated from standard values.
36. Within Scenario One, the greatest traffic increase can be found along and Kings Hill Lane with an increase of between 300 – 600 additional trips.

37. Scenarios Two and Three show the incremental increases in traffic build up from the two sites. Increasingly, traffic greatly increases along the A46 towards Warwick with Scenario 3 in the AM increasing traffic along the B4115.
38. Further trip increases occur along major trunk routes with over 600 vehicles entering during Scenario Four outlined the extent of traffic deriving from both Westwood Heath and Kings Hill.
39. The GEH at link locations 1 – 8 and 12 display incremental increases throughout the four scenarios. Links along Red Lane (9 and 10) display no incremental category increase during any scenario which is indicative to the lack of vehicular trips along this link.
40. GEH only exceeds 5 on Gibbet Hill Road in Scenario Four.
41. During the AM, the most congested links are located adjacent to Westwood Heath Road at Crackley Lane or Gibbet Hill Road which is largely attributed to the small rural road classification of the former.
42. Critically, the testing indicates that by Scenario 1 the Crackley Lane route is approaching capacity as is the Gibbet Hill route. At Scenario 2, Crackley lane is overcapacity, because the modelling is not dynamic it cannot account for a switch in traffic from Crackley lane to Gibbet Hill Road which would inevitably occur and this effect, coupled with the road surface and characteristics of Gibbet Hill Road, would mean that area would also be pushed over capacity if the housing number identified in Scenario 2 are progressed.
43. Throughout Scenario Four, many links are either approaching or at capacity which outlines major congestion across the network and indicates a need for significant mitigation if the housing numbers identified in Scenario 4 are to be realised then significant additional infrastructure may be required.

Conclusions

44. The evidence presented suggests that by the addition of approximately 425 dwellings, the Crackley Lane route is likely to be nearly over capacity as are the links which comprise Gibbet Hill Road. Both of these routes will serve traffic wishing to travel between the proposed sites and Keilworth, Warwick and Leamington towns as well as the A46 south.
45. This lack of capacity indicates that the delivery of 425 dwellings in the Westwood Heath area, particularly when considered alongside Kings Hill, should be assumed to be the maximum development threshold unless more significant mitigation measures are delivered to provide further capacity in the area.
46. The flow increases and link capacities observed in Scenario Three are particularly poor and could be indicative of the need for significant mitigation to be delivered at this stage to alleviate the likely impacts that would occur on Gibbet Hill and Crackley Lane.
47. By Scenario 4, significant mitigation becomes essential and will be required to ensure that there are sufficient assignment options between the Westwood Heath area and the A46 to ensure that Gibbet Hill Road and Crackley Lane remain at or below capacity.

APPENDIX A

Absolute Values of Traffic flow



Legend

- 0 - 50
- 50 - 150
- 150 - 300
- 300 - 600
- 600 - 1000
- 1000 +

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CLIENT:



PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

Westwood Heath and Kings Hill
developments Option One Total
trips AM

SCALE:

NTS

DRAWN:

DL

CHECKED:

JE

DATE:

09/12/2015

REVISION:

1



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DRAWING REFERENCE:

WH + KH 1 AM



Legend

- 0 - 50
- 50 - 150
- 150 - 300
- 300 - 600
- 600 - 1000
- 1000 +

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CLIENT:



PROJECT:

**VM155037 WDC
Strategic Transport Assessment**

TITLE:

**Westwood Heath and Kings Hill
developments Option One Total
trips PM**

SCALE:

NTS

DRAWN:

DL

CHECKED:

JE

DATE:

09/12/2015

REVISION:

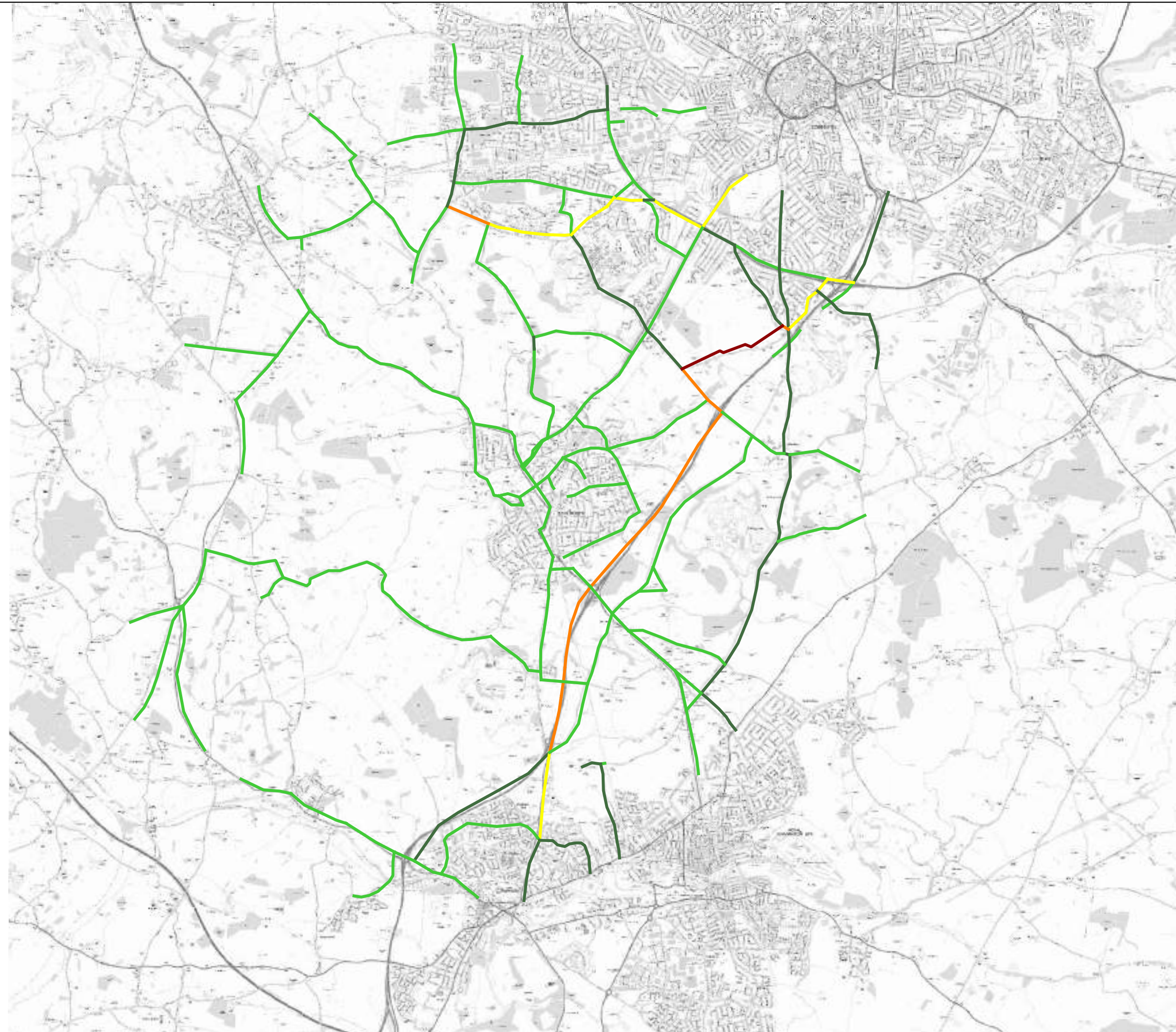
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DRAWING REFERENCE:

WH + KH 1 PM



Legend

- 0 - 50
- 50 - 150
- 150 - 300
- 300 - 600
- 600 - 1000
- 1000 +

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CLIENT:



PROJECT:

**VM155037 WDC
Strategic Transport Assessment**

TITLE:

**Westwood Heath and Kings Hill
developments Option Two Total
trips AM**

SCALE:

NTS

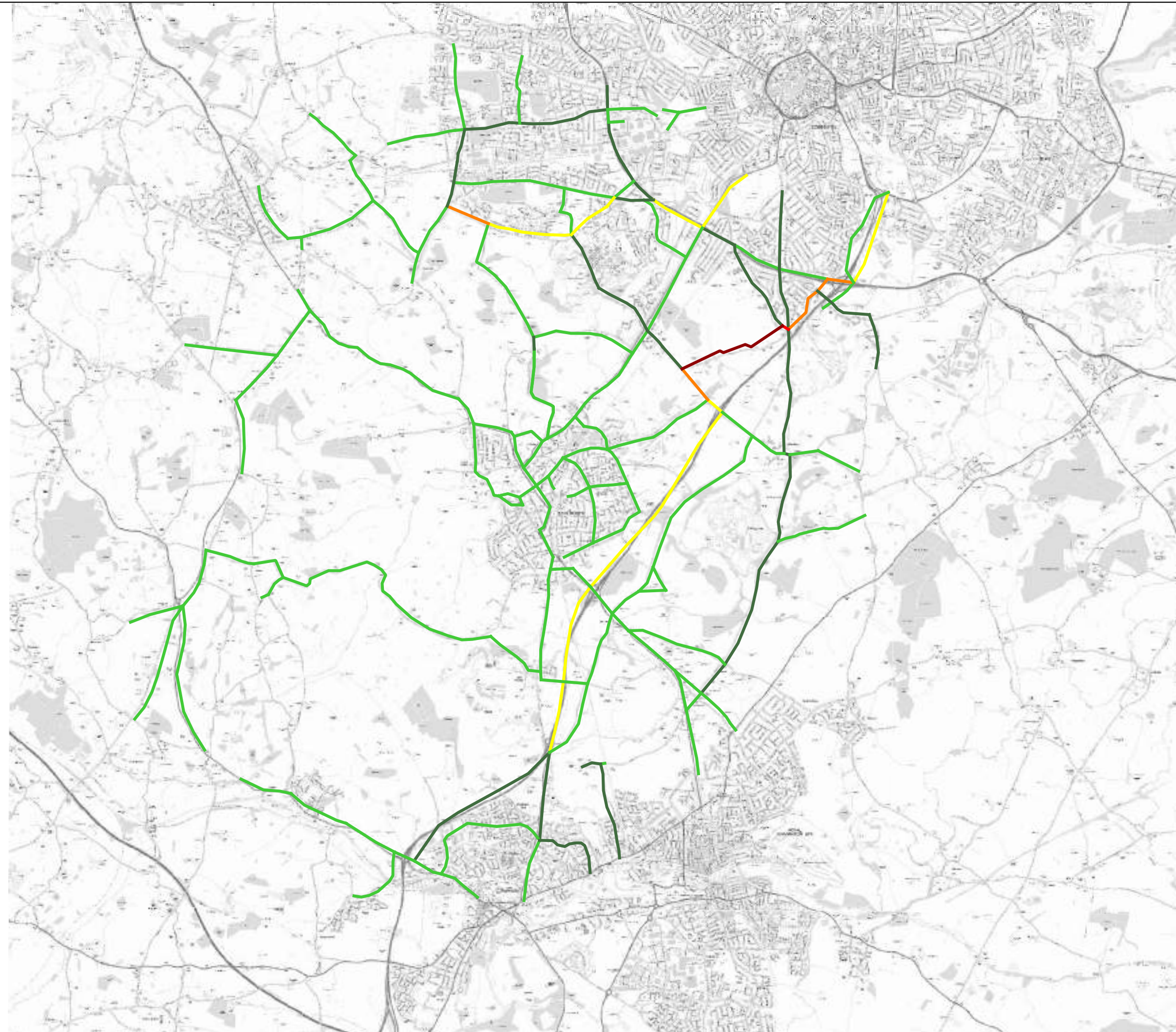
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DRAWING REFERENCE:

WH + KH 2 AM



Legend

- 0 - 50
- 50 - 150
- 150 - 300
- 300 - 600
- 600 - 1000
- 1000 +

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PROJECT:

**VM155037 WDC
Strategic Transport Assessment**

TITLE:

**Westwood Heath and Kings Hill
developments Option Two Total
trips PM**

SCALE:

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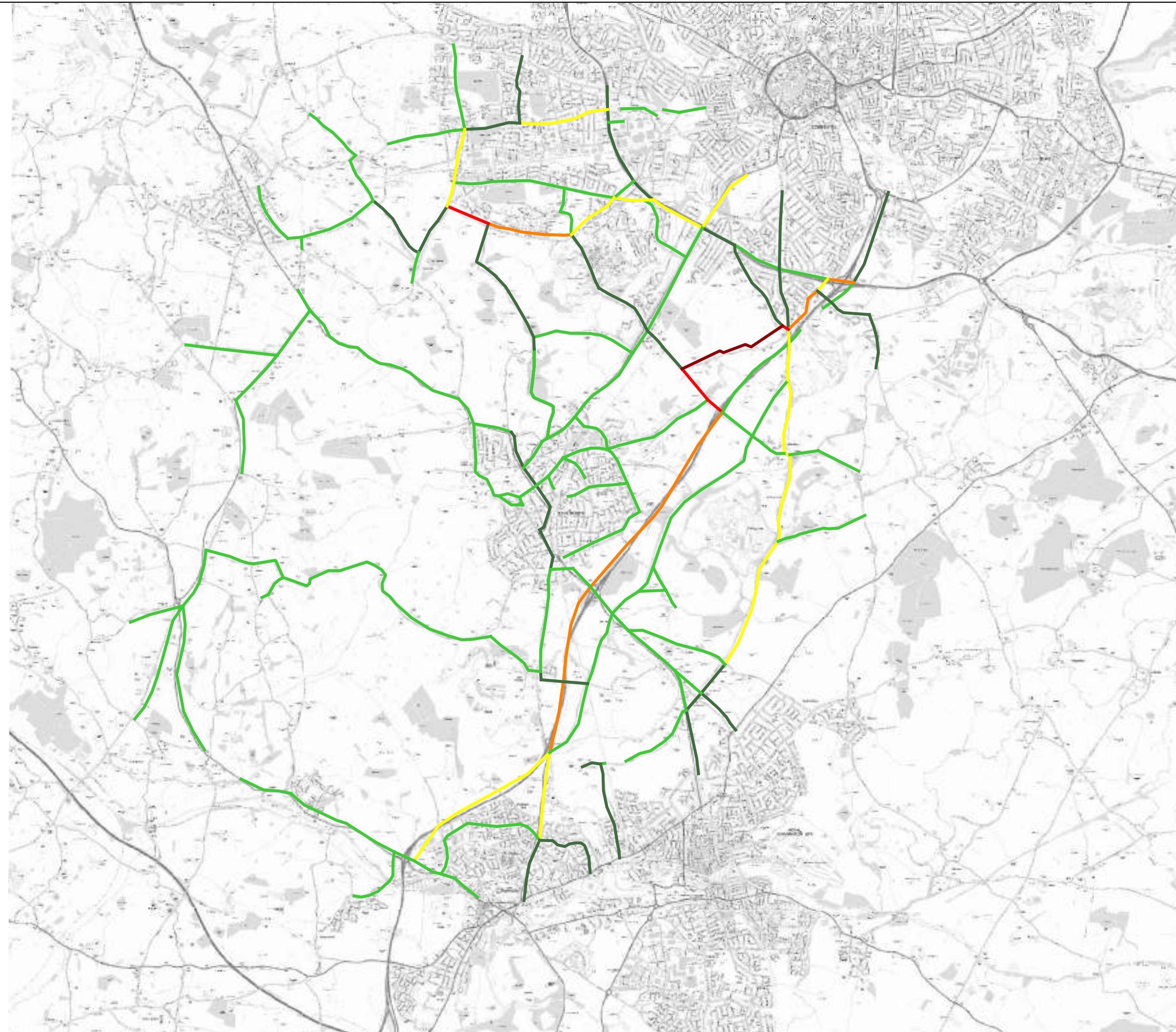
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WH + KH 2 PM



Legend

- 0 - 50
- 50 - 150
- 150 - 300
- 300 - 600
- 600 - 1000
- 1000 +

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PROJECT: VM155037 WDC
Strategic Transport Assessment

TITLE: Westwood Heath and Kings Hill
developments Option Three Total
trips AM

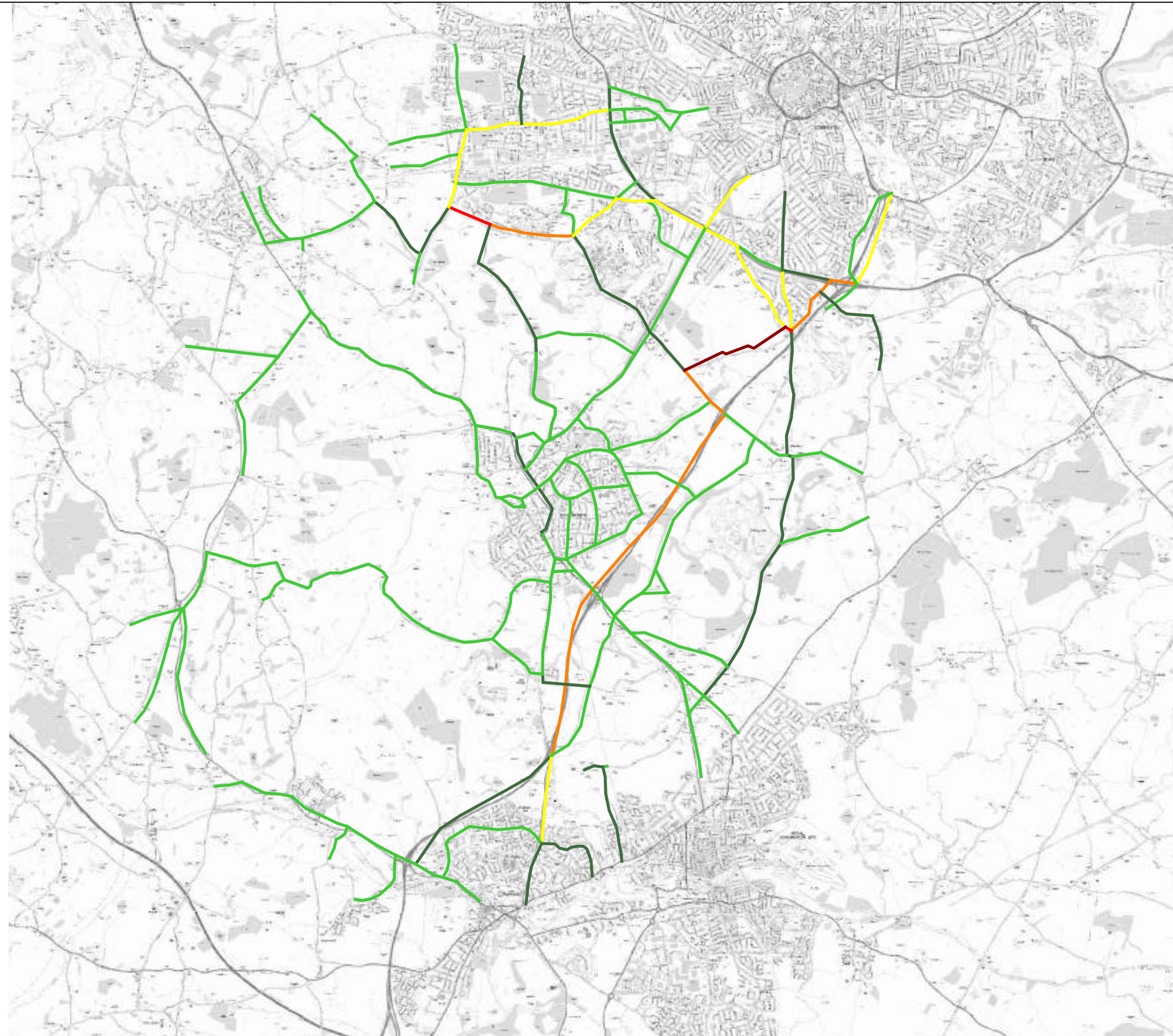
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DRAWING REFERENCE: WH + KH 3 AM



Legend

- 0 - 50
- 50 - 150
- 150 - 300
- 300 - 600
- 600 - 1000
- 1000 +

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PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

Westwood Heath and Kings Hill
developments Option Three Total
trips PM

SCALE:

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DRAWN:

DL

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DATE:

09/12/2015

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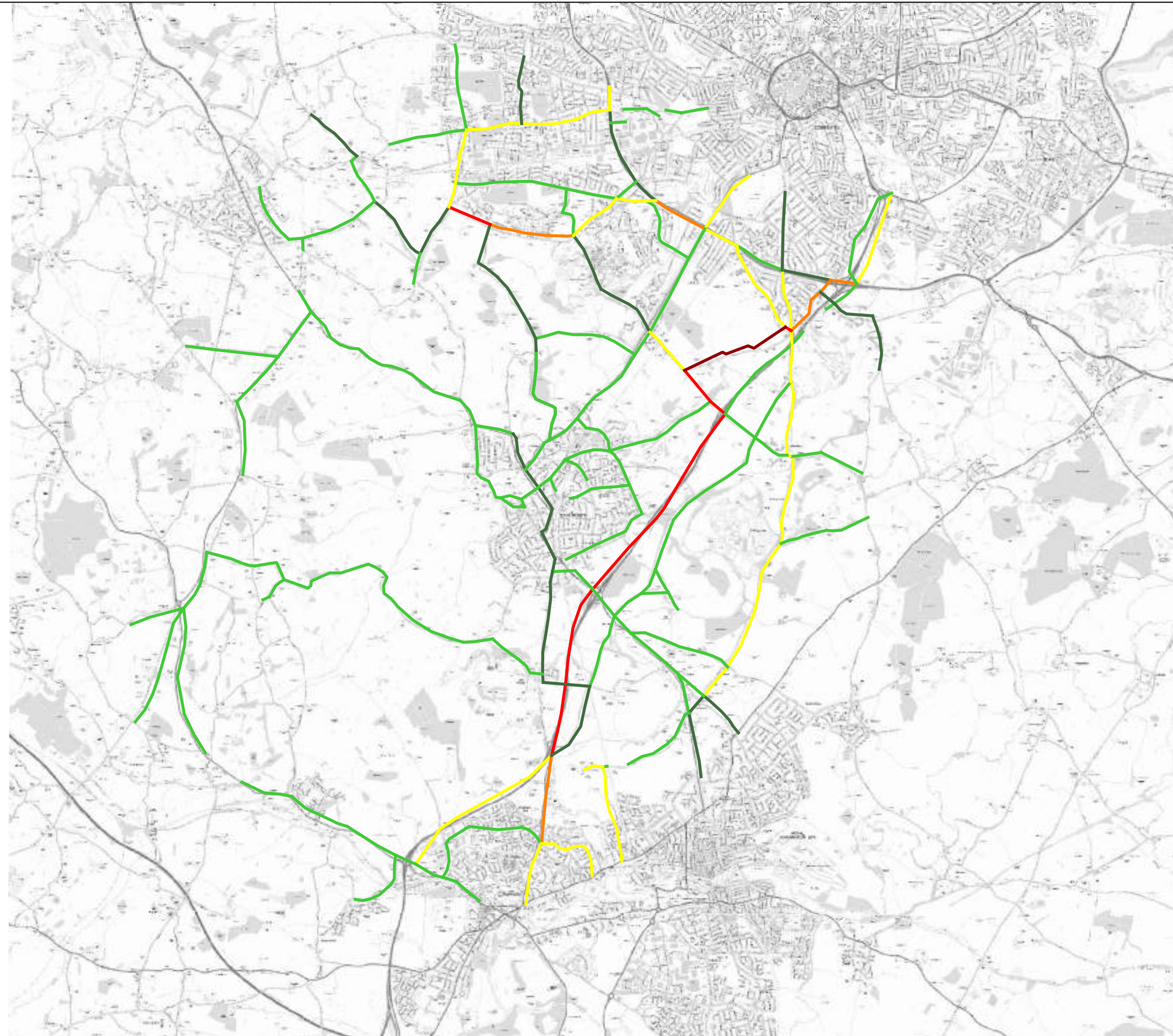
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WH + KH 3 PM



Legend

- 0 - 50
- 50 - 150
- 150 - 300
- 300 - 600
- 600 - 1000
- 1000 +

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PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

Westwood Heath and Kings Hill
developments Option Four Total
trips AM

SCALE:

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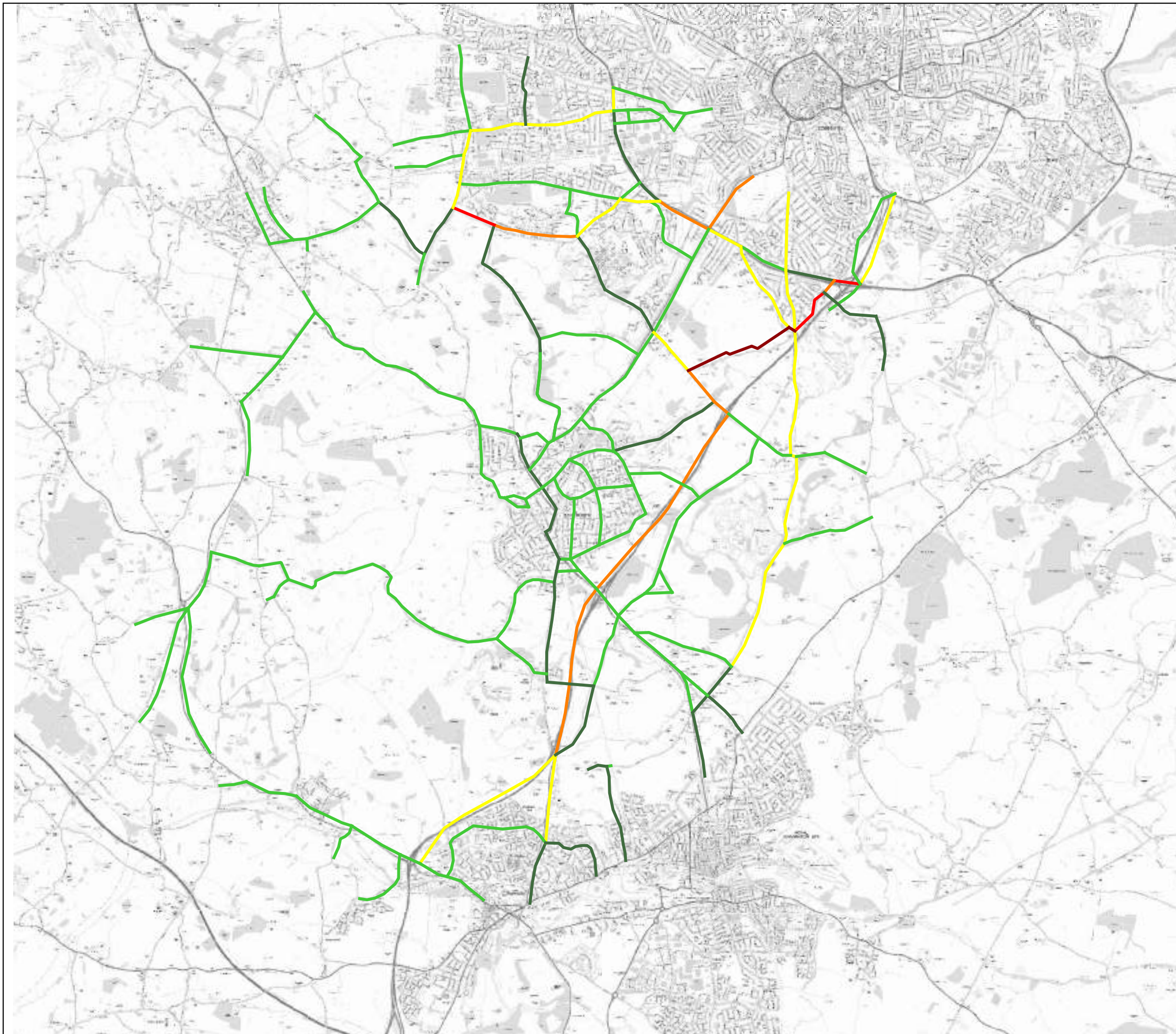
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WH + KH 4 AM



Legend

- 0 - 50
- 50 - 150
- 150 - 300
- 300 - 600
- 600 - 1000
- 1000 +

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PROJECT:

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TITLE:

Westwood Heath and Kings Hill
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trips PM

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WH + KH 4PM

APPENDIX B

GEH Significance



Legend

- 0 - 3
- 3 - 5
- 5 - 7.5
- 7.5 - 10
- 10 +

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CLIENT:



PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

GEH Significance for twelve sites in
the SW Coventry and NW
Kenilworth region Option One

SCALE:

NTS

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26/02/2016

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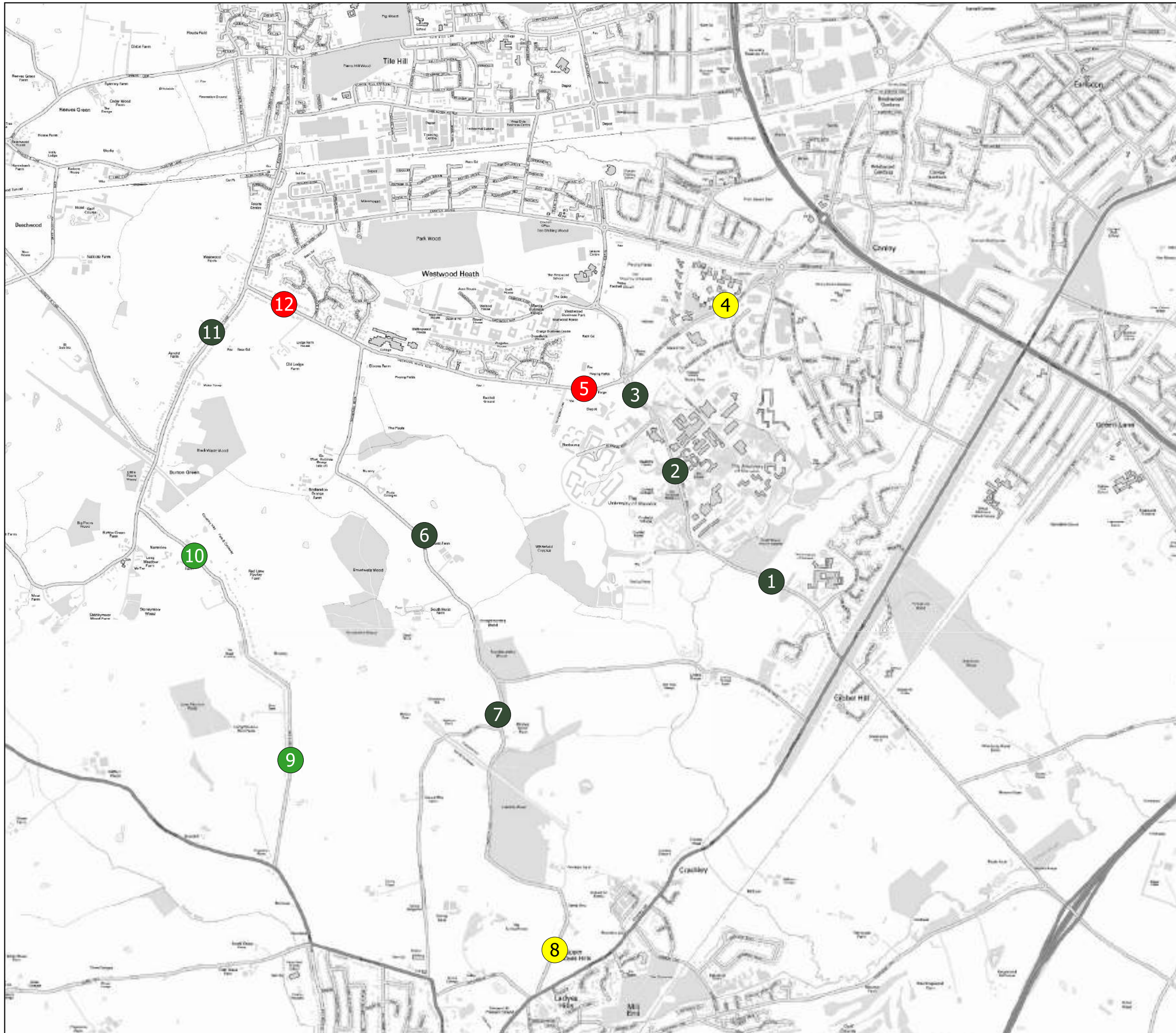
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DRAWING REFERENCE:

GEH Option One



Legend

- 0 - 3
- 3 - 5
- 5 - 7.5
- 7.5 - 10
- 10 +

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CLIENT:



PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

GEH Significance for twelve sites in
the SW Coventry and NW
Kenilworth region Option Two

SCALE:

NTS

DRAWN:

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DATE:

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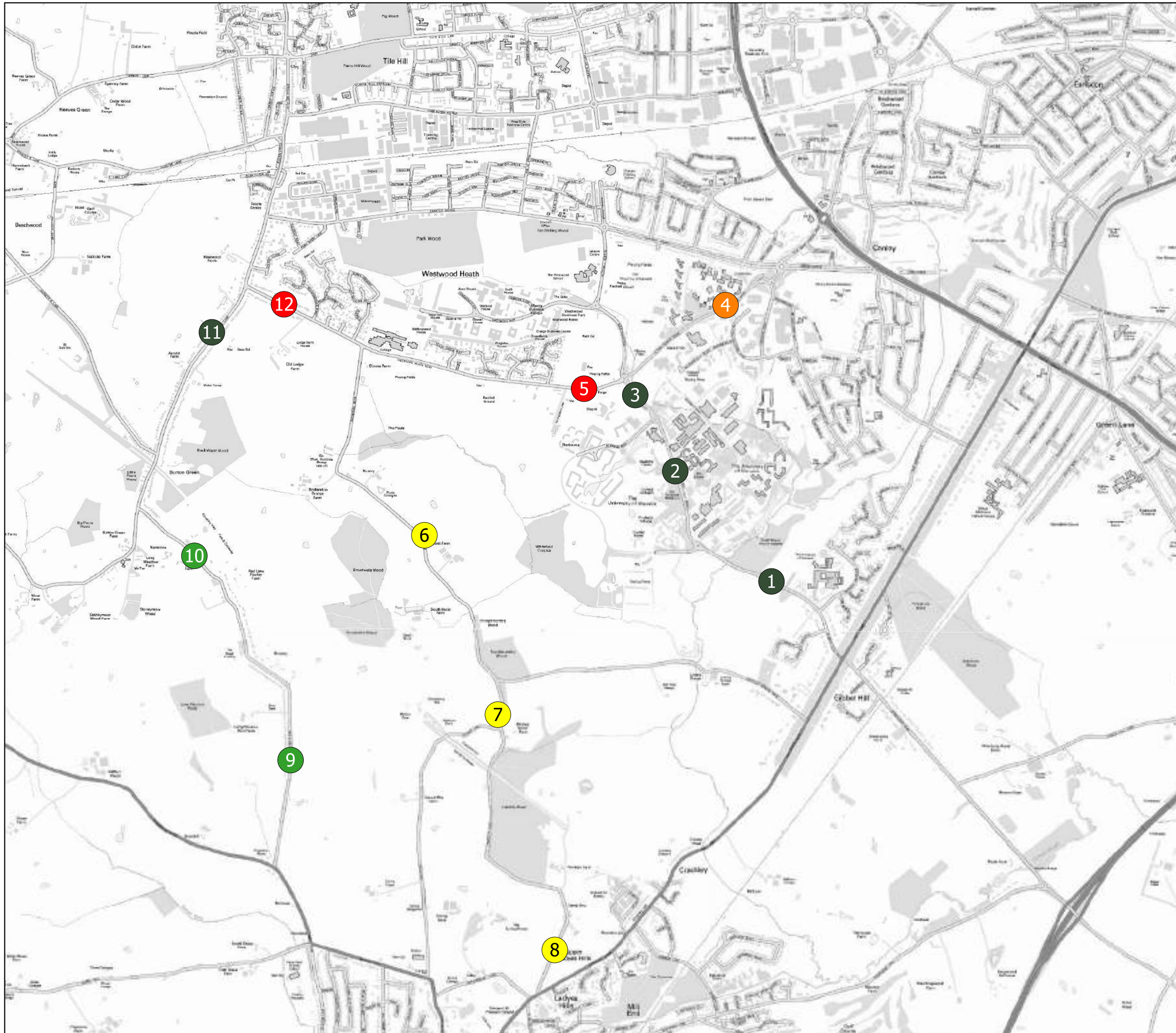
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GEH Option Two



Legend

- 0 - 3
- 3 - 5
- 5 - 7.5
- 7.5 - 10
- 10 +

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PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

GEH Significance for twelve sites in
the SW Coventry and NW
Kenilworth region Option Three

SCALE:

NTS

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DATE:

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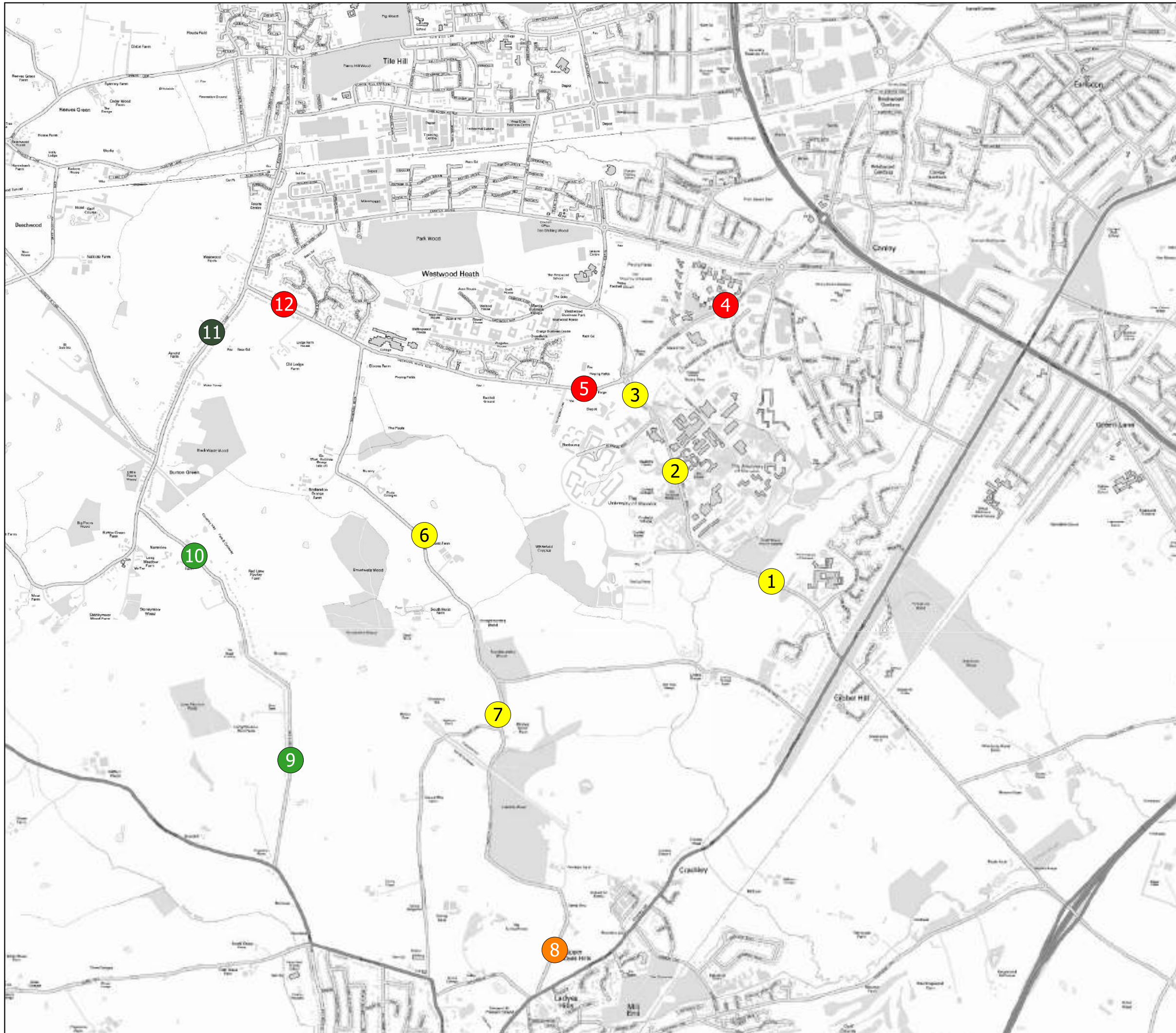
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GEH Option Three



Legend

- 0 - 3
- 3 - 5
- 5 - 7.5
- 7.5 - 10
- 10 +

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PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

GEH Significance for twelve sites in
the SW Coventry and NW
Kenilworth region Option Four

SCALE:

NTS

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DRAWING REFERENCE:

GEH Option Four

APPENDIX C

Percentage Link Capacity



Legend

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 +

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CLIENT:



PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

Percentage Link Capacity for Option
1 AM

SCALE:

NTS

DRAWN:

DL

CHECKED:

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DATE:

26/02/2016

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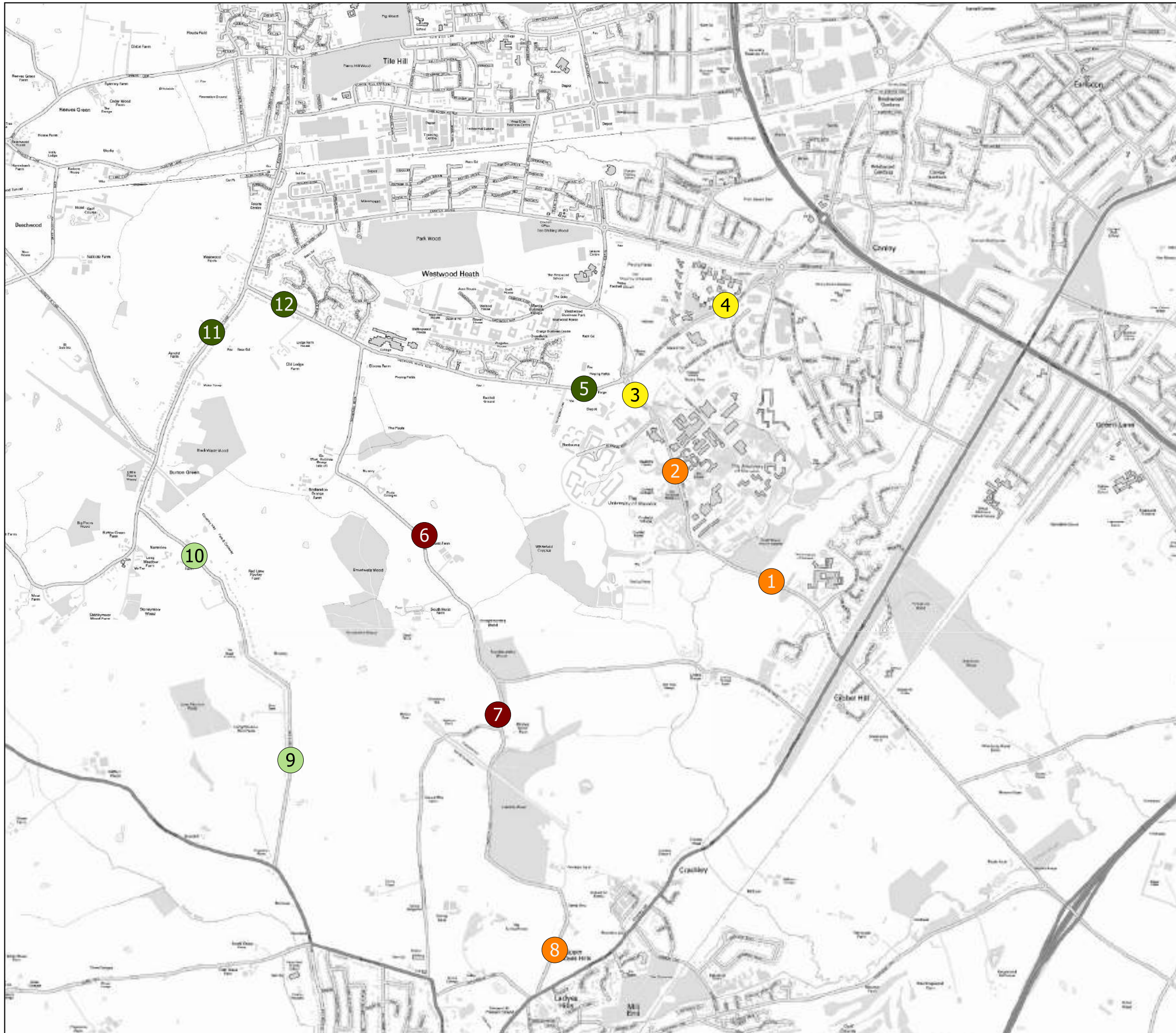
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DRAWING REFERENCE:

LC 001 - AM



Legend

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 +

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PROJECT:
**VM155037 WDC
 Strategic Transport Assessment**

TITLE:
**Percentage Link Capacity for Option
 1 PM**

SCALE:
NTS

DRAWN:	CHECKED:	DATE:	REVISION:
DL	JE	26/02/2016	1



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DRAWING REFERENCE:
LC 001 - PM



Legend

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 +

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CLIENT:



PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

Percentage Link Capacity for Option
2 AM

SCALE:

NTS

DRAWN:

DL

CHECKED:

JE

DATE:

26/02/2016

REVISION:

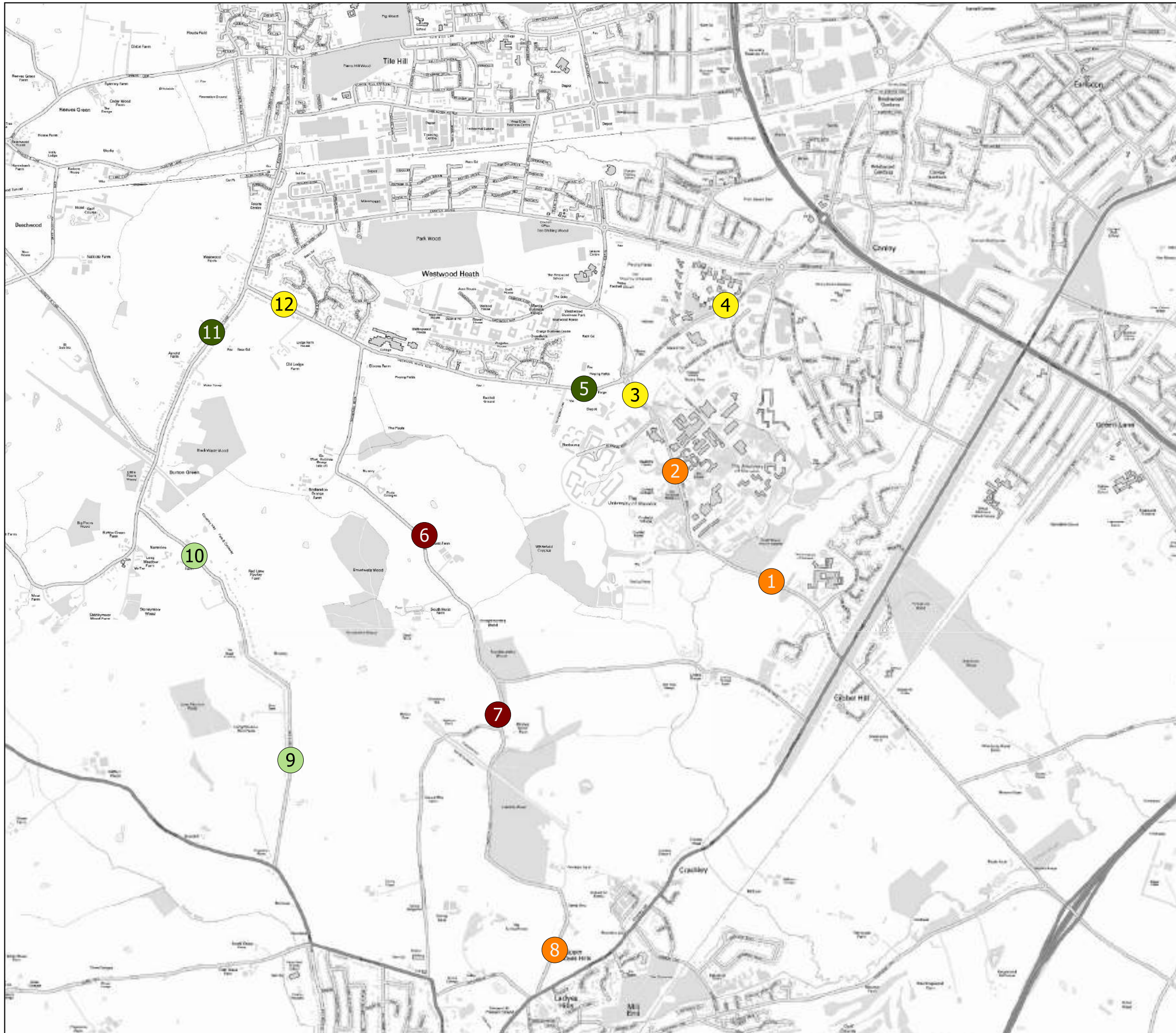
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Tel: 0121 213 6376 Email: microsim@vectos.co.uk www.vectos.co.uk

DRAWING REFERENCE:

LC 002 - AM



Legend

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 +

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CLIENT:



PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

Percentage Link Capacity for Option
2 PM

SCALE:

NTS

DRAWN:

DL

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REVISION:

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DRAWING REFERENCE:

LC 002 - PM



Legend

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 +

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PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

Percentage Link Capacity for Option
3 AM

SCALE:

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Legend

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 +

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PROJECT:

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TITLE:

Percentage Link Capacity for Option
3 PM

SCALE:

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Legend

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 +

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PROJECT:
**VM155037 WDC
 Strategic Transport Assessment**

TITLE:
**Percentage Link Capacity for Option
 4 AM**

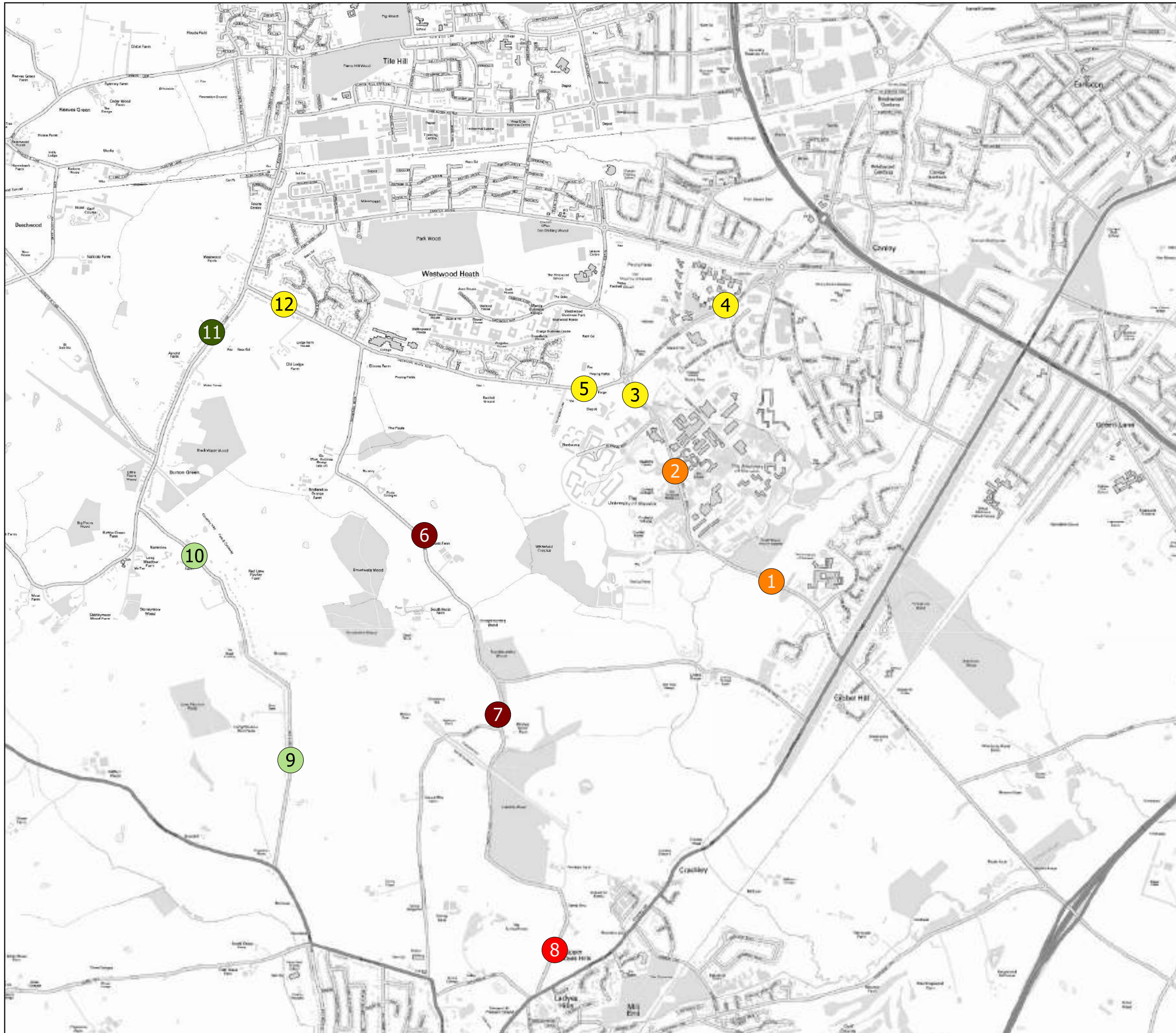
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DRAWING REFERENCE:
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Legend

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 +

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PROJECT:

VM155037 WDC
Strategic Transport Assessment

TITLE:

Percentage Link Capacity for Option
4 PM

SCALE:

NTS

DRAWN:

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DATE:

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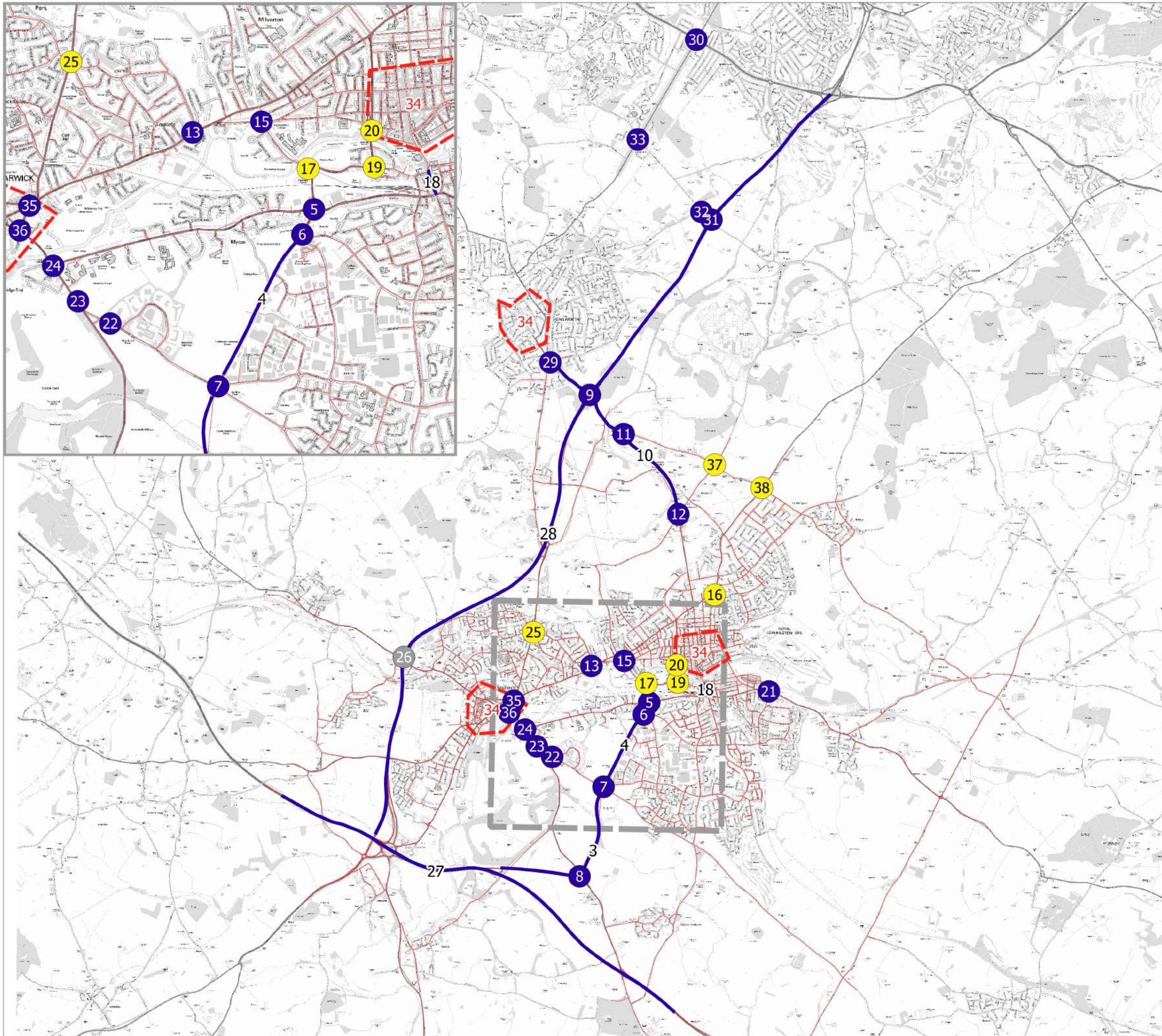
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LC 004 - PM

APPENDIX B

Updated Infrastructure Table

Corridor Strategy	Scheme	Grade (STA4)	Updated Status	Original STA Comments	Final Phase Comments	Physical Works	Signals	Stage of delivery	Funding/Finance	Existing business Case/Other?	Further scheme design	Status (1= Original Proposal, 2= amended in recent study, 3 = new scheme)
Sustainable Other	Sustainable Travel Infrastructure	Grade 1	Grade 1	Extensive sustainable travel infrastructure should be constructed to encourage modal shift and thus alleviate pressure on the road network. It is likely that this contribution would be best spent on provision of K2L cycle route between Kenilworth and Leamington, completion of the existing cycle networks - this has been termed "Missing Links" and provision of new cycle infrastructure linking proposed developments to the existing cycle network. Provision of "Missing Links" may involve working closely with WDC in order to provide the shortest routes to key destinations (e.g. Use of Victoria Park to link the town centre with the proposed cycle infrastructure for Ford Foundry, linking Connect2 to Kenilworth town centre and linking Warwick town centre to the rail station). Provision should include toucan/pedestrian crossings to avoid severance. Provision of minor schemes has not been included in these costs but provision of bus shelters should also be included. Included in terms of modal shift assumption (15%)	More detail provided within draft infrastructure delivery plan and the draft corridor strategy (appendix A)	Minor	No	Early & throughout the plan period.	Developer funding only at this stage, opportunities to secure funding through other sources (such as LSTF) will be investigated	In areas	Some early design work, in key areas will be desirable, in other areas design work envisaged to commence closer to delivery time.	1
	Virtual P&Rs	Grade 1	Grade 1	Virtual Park and Rides accrue the benefits of standard park and ride facilities without incurring the costs of providing expensive infrastructure. Developers would be encouraged to provide additional parking at edge of town sites which could then be utilised for P&R facilities. Instead of providing a bespoke bus services to the P&R facilities, a two stage bus journey would be made where the first stage would provide a direct service to the town centres or employment sites with perhaps one or two stop on route thus avoiding. The second stage would distribute local trips around housing areas or employment areas. This would maximise potential of new bus routes provided by developers which are necessary ensure sustainable access to their developments and to meet model share targets. Such facilities would be easier to deliver where there is a critical mass of development proposed in one area. Suitable sites may include developments along the A452 corridor to the south of Leamington or close to the sites next to the A46 proposed at Kenilworth. Included in terms of modal shift assumption (15%)	More detail provided within draft infrastructure delivery plan and the draft corridor strategy (appendix A)	Minor	No	Early & throughout the plan period.	Developer funding only at this stage, opportunities to secure funding through other sources (such as LSTF) will be investigated	None	Some early design work, in key areas will be desirable, in other areas design work envisaged to commence closer to delivery time.	1
A452 Europa Way - Sustainable Spine	Europa Way Corridor - Part 1	Grade 1	Grade 1	Delivery of Dualled sections are likely to be essential to compliment ATM works and reduce propensity for queues to propagate back, from Warwick, onto the M40 Mainline.	Schemes in the Europa Way area are considered to be of greatest strategic importance and should be delivered as soon as possible in the plan period. The scheme proposals within the modelling in some areas are considered to still be at concept stage and further work is recommended to determine the optimum preferred	Major	No	Early	Developer funded (significant contributions already secured) - additional funding contributions should be sought from SEP/Growth Deal	Europa Way Business Case (in part)	Some design work has commenced, significant further design work desirable to ensure opportunities to secure funding are not missed.	1
	Europa Way Corridor - Part 2	Grade 1	Grade 1			Major	No					1
	Europa Way/Myton Road Roundabout	Grade 1	Grade 1	Delivery of schemes in unison will enhance benefits, Shires Retail can be further enhanced to priorities public transport movements	Schemes along Europa Way considered critical and also intrinsically linked to works between Emscote Road and Park Drive identified previously. Significant design work still required in order that optimum scheme proposals can be identified.	Major	Yes	Early	Developer funded (significant contributions already secured) - additional funding contributions should be sought from SEP/Growth Deal	Europa Way Business Case	Some design work has commenced, significant further design work desirable to ensure opportunities to secure funding are not missed.	1
	Shires Retail Park Roundabout	Grade 1	Grade 1	MOVA or similar should be considered to optimise the scheme performance		Major	Yes					1
	Europa Way Roundabout	Grade 1	Grade 1	Further investigation should be undertaken inclusive of downstream affects of M40 J12 works which may minimise the need and extent of the scheme that is delivered here		Major	Yes					2
A452 Corridor (Leamington to Kenilworth)	Thickthorn Roundabout	Grade 1	Grade 1	Schemes are intrinsically linked to the delivery of local placed allocations	No major changes - gyratory is now considered to be a more significant scheme given increased focus of	Major	Yes	Medium	Developer funded - Some contribution possible from SEP/Growth Deal	A452 Business Case	Design work progressing to assist funding bids	2
	A452 Dualling	New	Grade 1	New scheme not originally identified	Delivery of scheme as a viable alternative to Northern Relief Road, Extensive works identified free up additional link capacity and also aid in delivery of sustainable transport (in particular cycling) provision along the corridor.	Major	No	Medium	Developer funded - some contribution possible via other funding sources but none secured as of yet	A452 Business Case		3
	A452/Bericote Roundabout	Grade 2	Grade 1	Growth in the North is more likely to trigger the need for early delivery	These schemes are now linked to the dualling of the A452 and are therefore considered to be of increased importance than previously identified	Major	Yes	Medium	Developer funded - Some contribution possible from SEP/Growth Deal		Design work progressing to assist funding bids	2
	A452/Blackdown Roundabout	Grade 1	Grade 1			Major	Yes					2
Warwick - Leamington - Lillington (via Emscote Road)	Emscote Road/Greville Road	Grade 1	Grade 1		No change to existing scheme proposals. Initial analysis reveals that there would be an additional benefit associated with revisiting the Princes Drive/Park Drive area at the same time. As yet no additional scheme has been identified for Princes Drive Park Drive but the benefits of further investigation in this area should be acknowledged.	Minor	Yes	Early to Medium	Developer funded - Some contribution possible from SEP/Growth Deal	None	Some design work has commenced, significant further design work desirable to ensure opportunities to secure funding are not missed.	1
	Emscote Road Bridge	Grade 3A	Not Required			Major	No				n/a	
	Princes Drive/Warwick New Road	Grade 1	Grade 1			Medium	Yes					1
	A445/Lillington Avenue/Lillington Road	New	Grade 2	New scheme not originally identified	Introduction of segregated left turn from A445WB approach to the roundabout and general widening where po	Medium	No	Medium	Developer funding only at this stage	None	Closer to delivery time	3
Leamington South (Including Techbrook)	Princes Drive/Park Road	New	Grade 2			TBC	Yes	Medium	Developer funded - Some contribution possible from SEP/Growth Deal	None	Some design work has commenced, significant further design work desirable to ensure opportunities to secure funding are not missed.	2
	Bath Street/High Street	Grade 1	Grade 1	Provides potential opportunity for public transport interchange facilities near Leamington Station	No change, scheme still considered desirable. Primary value of scheme is likely to be attributable to public transport interchange opportunities	Medium	Yes	Early	Developer funded - Some contribution possible from SEP/Growth Deal	Baths Street Business Case	Design work progressing to assist funding bids	1
	Adelaide Road/Avenue Road	Grade 2	Grade 2			Minor	Yes	Late	Developer funding only at this stage	None	Closer to delivery time	1
	Dorner Place/Adelaide Road	Grade 2	Grade 2	Delivery of schemes in unison will enhance benefits	No change, scheme still considered desirable	Minor	Yes		Developer funding only at this stage	None	Closer to delivery time	1
	Sydenham Drive/Radford Road	Grade 1	Grade 1	New scheme not originally identified	Widening, where possible of Radford Road to East of junction enabling two lane WB exit	Minor	Yes	Medium	Developer funding only at this stage	None	Closer to delivery time	3
Warwick TC to Heathcote via Gallows Hill	Gallows Hill - 2 Lanes	Grade 1	Grade 1	Scheme should be considered alongside development access strategies to ensure that new junctions tie in with proposals	Linked to Europa Way works & deliver of sites in land south of Gallows Hill	Major	No	Medium	Developer funding only at this stage	None	Closer to delivery time	1
	Banbury Road - 2 Lanes	Grade 2	Grade 1	Scheme reduced to two lane sections north of Gallows Hill and South of Myton but not entire length		Medium	No		Developer funding only at this stage	None	Closer to delivery time	1
Warwick TC to Leamington via Myton Road	Myton Road Roundabout	Grade 1	Grade 1	Potential for synchronisation of these signal schemes with between each scheme as well as with existing Coventry Road/Coton End signalised junction increases overall potential benefit of implementation substantially.	No change, schemes still considered desirable, it is recommended that further analysis of the schemes in this area is undertaken to identify an optimum solution. At that time, opportunities to enhance the public transport, cycling and walking provision should also be investigated.	Major	Yes	Early	Developer funded - Some contribution possible from SEP/Growth Deal	Europa Way Business Case	Earlier Design works could assist in securing additional funding	1
A429 Coventry Road, Warwick	Coventry Road/Spinney Hill Roundabout	Grade 2	Grade 2	Improvement of the routes into Warwick from the South & West may reduce the need for delivery	No change, scheme still considered desirable	Medium	No	Medium	Developer funded - Some contribution possible from SEP/Growth Deal	None	Earlier Design works could assist in securing additional funding	1
A425 Birmingham Road (Stanks)	A46/Birmingham Road 'Stanks Island'	Grade 1	n/a	Smaller version of original scheme implemented, MOVA to be considered for additional benefits	Scheme is now committed	Medium	Yes	imminent	SEP funding & growth deal funding secured	Successful	Scheme design has been completed	1
SRN improvements	M40 Capacity Enhancements	Grade 1	Grade 1	Additional Consideration Required	No change, scheme still considered essential	Major	Yes	Late	Can only be funded in part by developments, additional funding will be essential for delivery	None	Responsibility for further scheme design lies with Highways England.	1
	A46 Expressway upgrade	New	Grade 1	Additional Consideration Required	Upgrade of A46 spine through Warwickshire both on and off-line. Initially being brought forward via junction improvements. Eventually carriageway improvements to deliver expressway standard road connecting M5 and M6.	Major	Yes	Late	Can only be funded in part by developments, additional funding will be essential for delivery	None	Responsibility for further scheme design lies with Highways England.	3
Kenilworth improvements	Kenilworth Gyratory	Grade 3	Grade 1	Schemes are intrinsically linked to the delivery of local placed allocations	No major changes - gyratory is now considered to be a more significant scheme given increased focus of growth in Kenilworth, also further widening in this area is also considered desirable.	Minor	Yes	Medium	Developer funded - Some contribution possible from SEP/Growth Deal	A452 Business Case	Design work progressing to assist funding bids	2
	A45/Kenilworth Road	New	Grade 1	New scheme not originally identified	Widening and signal enhancements proposed. Area is currently heavily constrained, most likely a more significant scheme will be required in this area through natural traffic growth in any case	Minor	Yes	Medium	Developer funding only at this stage, need for scheme likely to be triggered outside of local plan due to existing pressures	None	Wider benefits if a more significant scheme can be identified/delivered	3
	Stoneleigh Road/A46 Junction	New	Grade 1	New scheme not originally identified								3
	Dalehouse Lane/Stoneleigh Road Junction	New	Grade 1	New scheme not originally identified	Introduction of new, grade separate, junction with the provision of a second bridge and, potentially, further enhancements to the Dalehouse Lane junction, to better accommodate the flow of traffic across the junction.	Major	No	Early	Developer funding only at this stage, need for scheme likely to be triggered outside of local plan due to existing pressures but delivery of the scheme opens up potential for development in the areas to the North of Kenilworth.	TBC	Wider benefits if a more significant scheme can be identified/delivered	3
	A429/Stoneleigh Road/Gibbet Hill Road	New	Grade 1	New scheme not originally identified	Widening and reconfiguration where possible, potential requirement for signals.	medium	TBC	Medium	Developer funding only at this stage	None	Closer to delivery time	3
Town Centre Strategies	Town Centre Strategies	New	Grade 1	New schemes, identified in part previously	Alternative strategies for the management of trips to/from the town centres, promotion of sustainable transport alternatives and, where possible, consideration towards the reallocation of road space from vehicular to pedestrian and cyclist use	TBC	No	Early to Medium	Developer funded - Some contribution possible from SEP/Growth Deal	None	Earlier Design works could assist in securing additional funding	3
	Priory Road/Smith Street/St Nicholas	Grade 1	Grade 1	Potential for synchronisation of these signal schemes with between each scheme as well as with existing Coventry Road/Coton End signalised junction increases overall potential benefit of implementation substantially.	No change, schemes still considered desirable, it is recommended that further analysis of the schemes in this area is undertaken to identify an optimum solution. At that time, opportunities to enhance the public transport, cycling and walking provision should also be investigated.	Medium	Yes		Developer funded - Some contribution possible from SEP/Growth Deal	Europa Way Business Case	Earlier Design works could assist in securing additional funding	1
	Castle Hill Gyratory Signals	Grade 1	Grade 1			Medium	Yes					1
A46 to Cubbington	Bericote Road/Stoneleigh Road	Grade 3	Grade 2	Delivery of schemes in unison will enhance benefits	Schemes upgraded as part of latest round of testing, indicative of increased significance associated with scheme delivery.	Minor	No	Medium	Developer funding only at this stage	None	Closer to delivery time	2
	Kenilworth Road/Westhill Road	Grade 3	Grade 2			Minor	No					2
	A445/Sandy Lane	New	Grade 3	New scheme not originally identified	Minor widening of approaches where possible	Minor	No	Late	Developer funding only at this stage	None	Closer to delivery time	3



Legend

- Grade 1
- Grade 2
- Grade 3
- Scheduled
- Town Centre Mitigation Locations
- Inset
- 1 Junction Scheme
- Corridor Scheme

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PROJECT:
VM165046 WDC Strategic Transport Assessment Final Phase

TITLE:
Warwick District Scheme Details - Grade

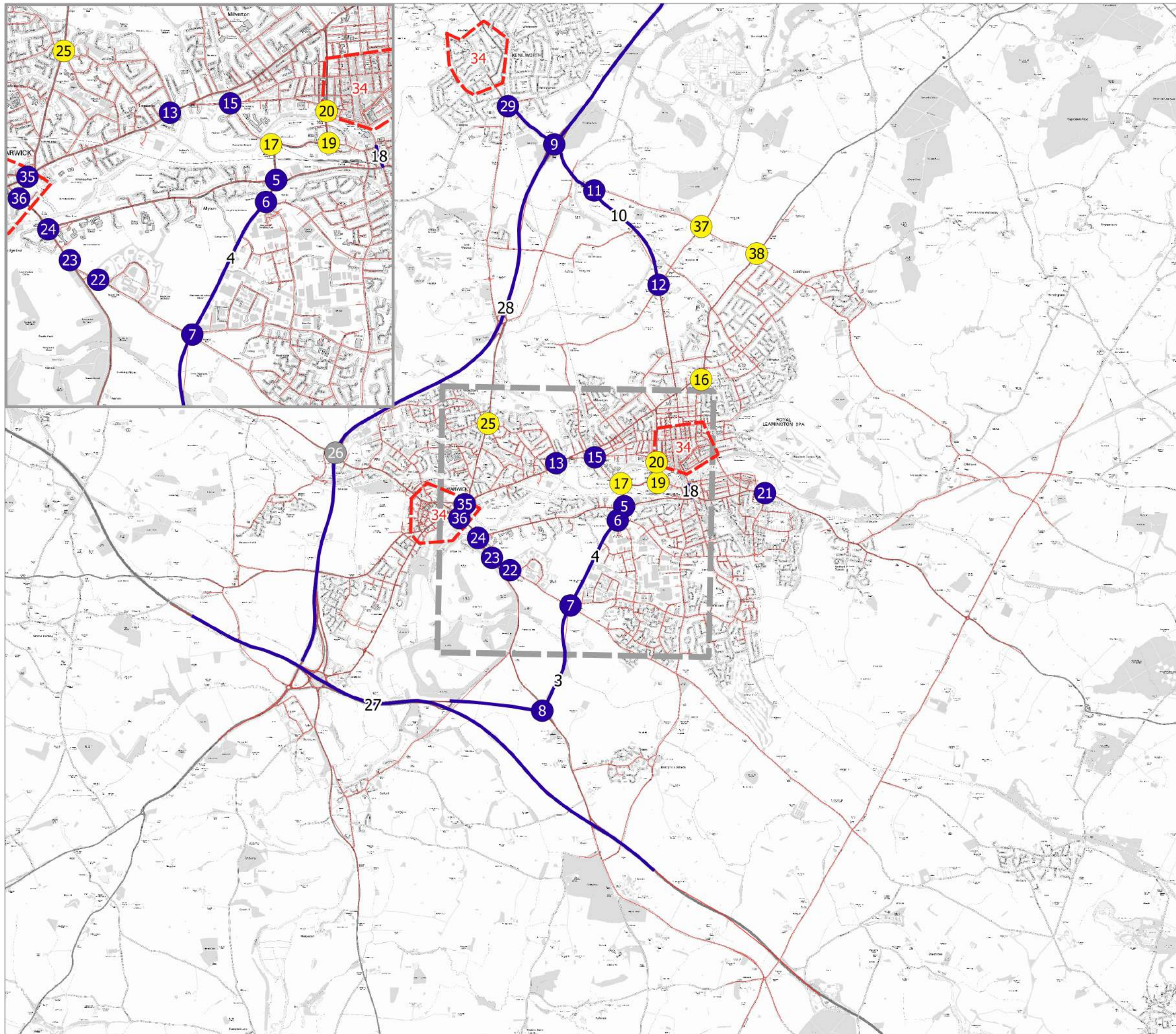
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DL	JE	26/02/2016	1



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DRAWING REFERENCE:
SD 001



Legend

- Grade 1
- Grade 2
- Grade 3
- Scheduled
- Town Centre Mitigation Locations
- Inset
- 1 Junction Scheme
- Corridor Scheme
- WLWA Network Extent

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CLIENT:



PROJECT:

VM165046 WDC Strategic Transport Assessment Final Phase

TITLE:

Scheme Details for Warwick and Leamington Model Extent

SCALE:

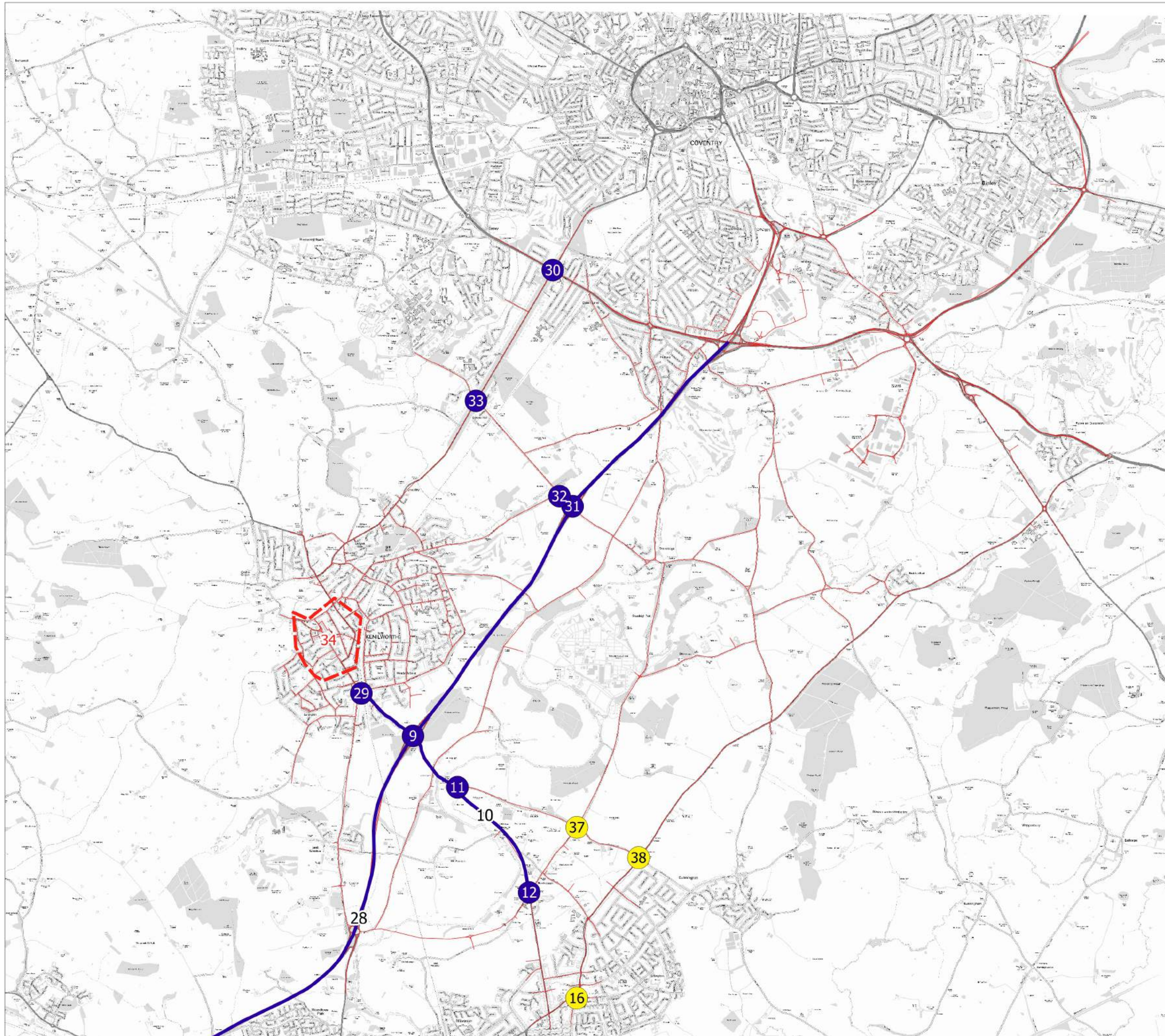
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DRAWING REFERENCE:

WLWA Scheme Dev 001



Legend

- Grade 1
- Grade 2
- Grade 3
- Scheduled
- Town Centre Mitigation Locations
- 1 Junction Scheme
- Corridor Scheme
- KSWA Network Extent

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CLIENT:



PROJECT:

VM165046 WDC Strategic Transport Assessment Final Phase

TITLE:

Scheme details for Kenilworth and Stoneleigh Model Extent

SCALE:

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DATE:

26/02/2016

REVISION:

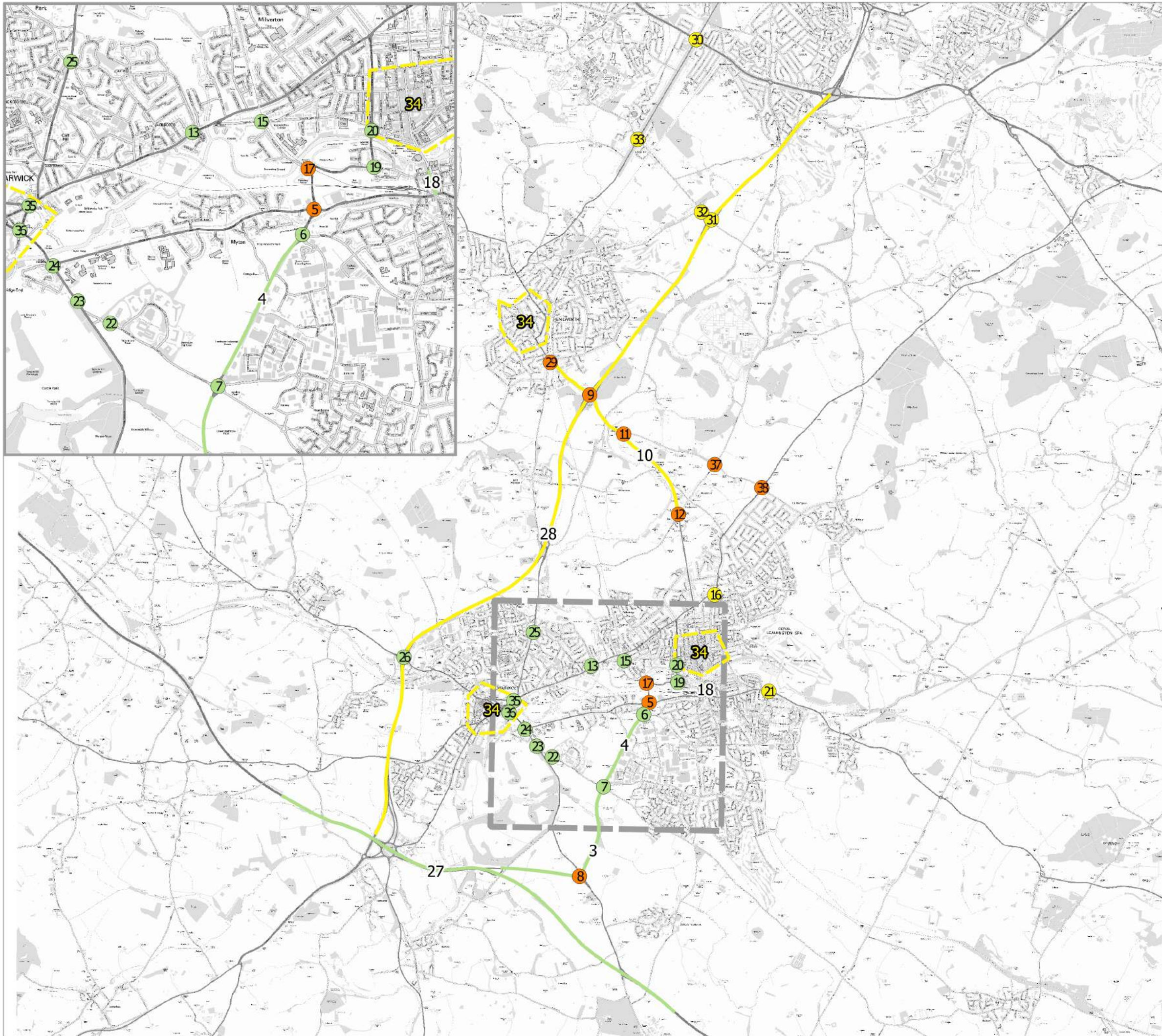
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DRAWING REFERENCE:

KSWA Scheme Dev 001



Legend

- Original Proposal
- Amended in Recent Study
- New Scheme

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PROJECT:

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TITLE:

Warwick District Scheme Details - Scheme Status

SCALE:

NTS

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SS 001



Legend

- Early
- Medium
- Late

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PROJECT:

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TITLE:

Warwick District Scheme Details - Time Frame

SCALE:

NTS

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DRAWING REFERENCE:

TF 001

APPENDIX C

Queue Impact Analysis Plots

- **MQ001** – WLWA Ref Case versus WLWA RDA + NS AM (07:00 to 10:00)
- **MQ002** – WLWA Ref Case versus WLWA RDA + NS PM (16:00 to 19:00)
- **MQ003** – WLWA Ref Case versus WLWA RDA AM (07:00 to 10:00)
- **MQ004** – WLWA Ref Case versus WLWA RDA PM (16:00 to 19:00)
- **MQ005** – KSWA Ref Case versus WLWA RDA + NS AM (07:00 to 10:00)
- **MQ006** – KSWA Ref Case versus WLWA RDA + NS PM (16:00 to 19:00)
- **MQ007** – KSWA Ref Case versus WLWA RDA AM (07:00 to 10:00)
- **MQ008** – KSWA Ref Case versus WLWA RDA PM (16:00 to 19:00)



Legend

- Less than 5 Vehicles
- Between 10 and 25 Vehicles
- Between 25 and 50 Vehicles
- Greater than 50 Vehicles

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CLIENT:



PROJECT:

**VM165046 WDC
Strategic Transport Assessment Final Phase**

TITLE:

**WLWA Reference vs WLWA RDA +
NS
AM 07:00 - 10:00
Average Maximum Queue (Average)**

SCALE:

NTS

DRAWN:

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DATE:

17/02/2016

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DRAWING REFERENCE:

MQ 001 AVE



Legend

- Less than 5 Vehicles
- Between 10 and 25 Vehicles
- Between 25 and 50 Vehicles
- Greater than 50 Vehicles

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PROJECT:

VM165046 WDC
Strategic Transport Assessment Final Phase

TITLE:

WLWA Reference vs WLWA RDA +
NS
PM 16:00 - 19:00
Average Maximum Queue (Average)

SCALE:

NTS

DRAWN:

DL

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DATE:

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DRAWING REFERENCE:

MQ 002 AVE



Legend

- Less than 5 Vehicles
- Between 10 and 25 Vehicles
- Between 25 and 50 Vehicles
- Greater than 50 Vehicles

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PROJECT:

**VM165046 WDC
Strategic Transport Assessment Final Phase**

TITLE:

**WLWA Reference vs WLWA RDA
AM 07:00 - 10:00
Average Maximum Queue (Average)**

SCALE:

NTS

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DRAWING REFERENCE:

MQ 003 AVE



Legend

- Less than 5 Vehicles
- Between 10 and 25 Vehicles
- Between 25 and 50 Vehicles
- Greater than 50 Vehicles

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PROJECT:

**VM165046 WDC
Strategic Transport Assessment Final Phase**

TITLE:

**WLWA Reference vs WLWA RDA
PM 16:00 - 19:00
Average Maximum Queue (Average)**

SCALE:

NTS

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DRAWING REFERENCE:

MQ 004 AVE



Legend

- Less than 5 Vehicles
- Between 10 and 25 Vehicles
- Between 25 and 50 Vehicles
- Greater than 50 Vehicles

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PROJECT:

VM165046 WDC
Strategic Transport Assessment Final Phase

TITLE:

KSWA Reference vs KSWA RDA +
NS
AM 07:00 - 10:00
Average Maximum Queue (Average)

SCALE:

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MQ 005 AVE



Legend

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- Between 10 and 25 Vehicles
- Between 25 and 50 Vehicles
- Greater than 50 Vehicles

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PROJECT:

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Strategic Transport Assessment Final Phase

TITLE:

KSWA Reference vs KSWA RDA +
NS
PM 16:00 - 19:00
Average Maximum Queue (Average)

SCALE:

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DRAWING REFERENCE:

MQ 006 AVE



Legend

- Less than 5 Vehicles
- Between 10 and 25 Vehicles
- Between 25 and 50 Vehicles
- Greater than 50 Vehicles

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PROJECT:

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Strategic Transport Assessment Final Phase

TITLE:

KSWA Reference vs KSWA RDA
AM 07:00 - 10:00
Average Maximum Queue (Average)

SCALE:

NTS

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DRAWING REFERENCE:

MQ 007 AVE



Legend

- Less than 5 Vehicles
- Between 10 and 25 Vehicles
- Between 25 and 50 Vehicles
- Greater than 50 Vehicles

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PROJECT:

VM165046 WDC
Strategic Transport Assessment Final Phase

TITLE:

KSWA Reference vs KSWA RDA
PM 16:00 - 19:00
Average Maximum Queue (Average)

SCALE:

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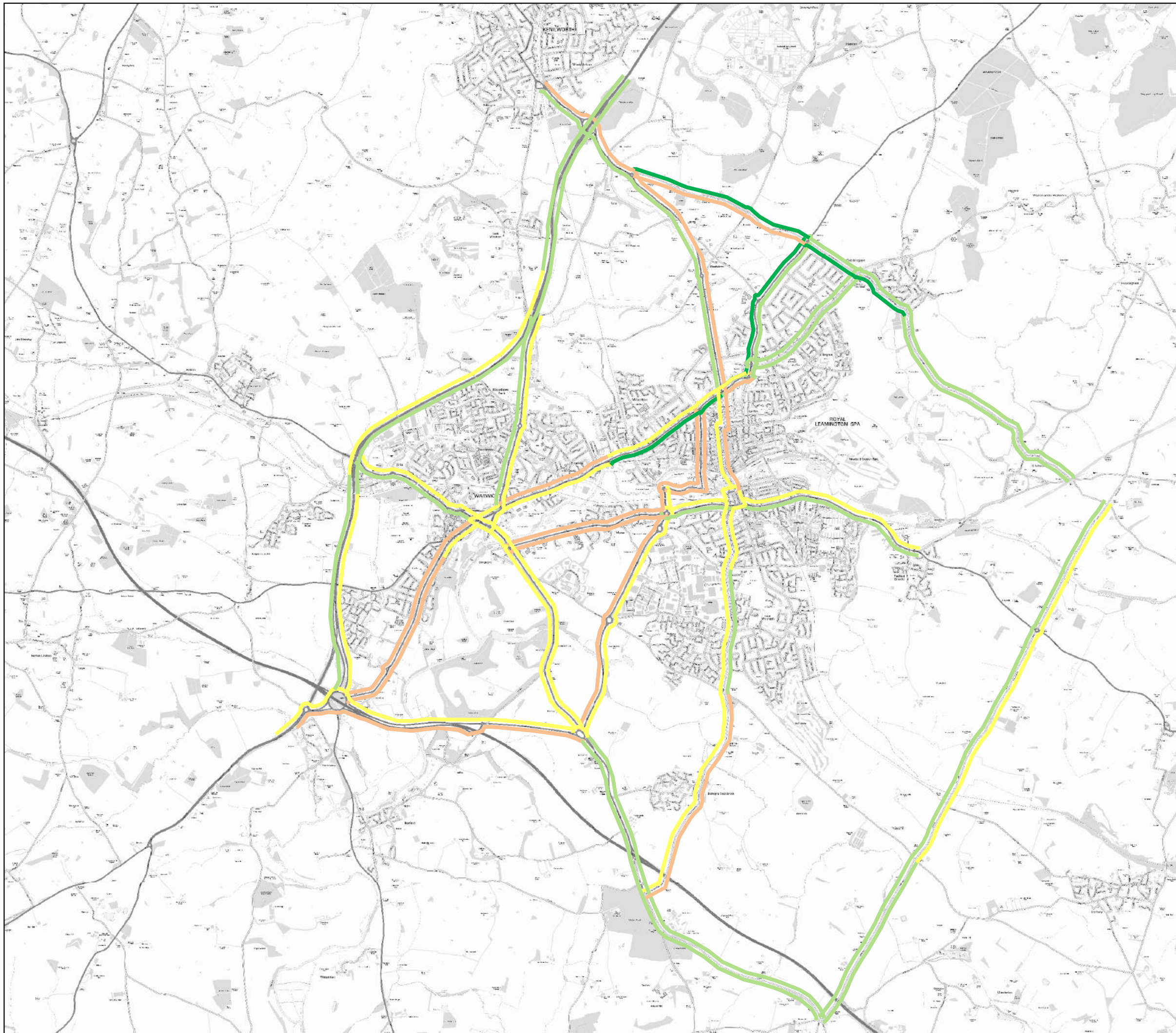
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MQ 008 AVE

APPENDIX D

Journey Time Impact Analysis Plots

- **MD001** – WLWA Ref Case versus WLWA RDA + NS AM (07:00 to 10:00)
- **MD002** – WLWA Ref Case versus WLWA RDA + NS PM (16:00 to 19:00)
- **MD003** – WLWA Ref Case versus WLWA RDA AM (07:00 to 10:00)
- **MD004** – WLWA Ref Case versus WLWA RDA PM (16:00 to 19:00)
- **MD005** – KSWA Ref Case versus WLWA RDA + NS AM (07:00 to 10:00)
- **MD006** – KSWA Ref Case versus WLWA RDA + NS PM (16:00 to 19:00)
- **MD007** – KSWA Ref Case versus WLWA RDA AM (07:00 to 10:00)
- **MD008** – KSWA Ref Case versus WLWA RDA PM (16:00 to 19:00)



Legend

- █ Greater than a 15% Reduction
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- █ Between 25% and 50% Increase
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PROJECT:

**VM165046 WDC
Strategic Transport Assessment Final Phase**

TITLE:

**WLWA Reference vs WLWA RDA +
NS
AM 08:00 - 09:00
Percentage Difference Mean Delay**

SCALE:

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DATE:

16/02/2016

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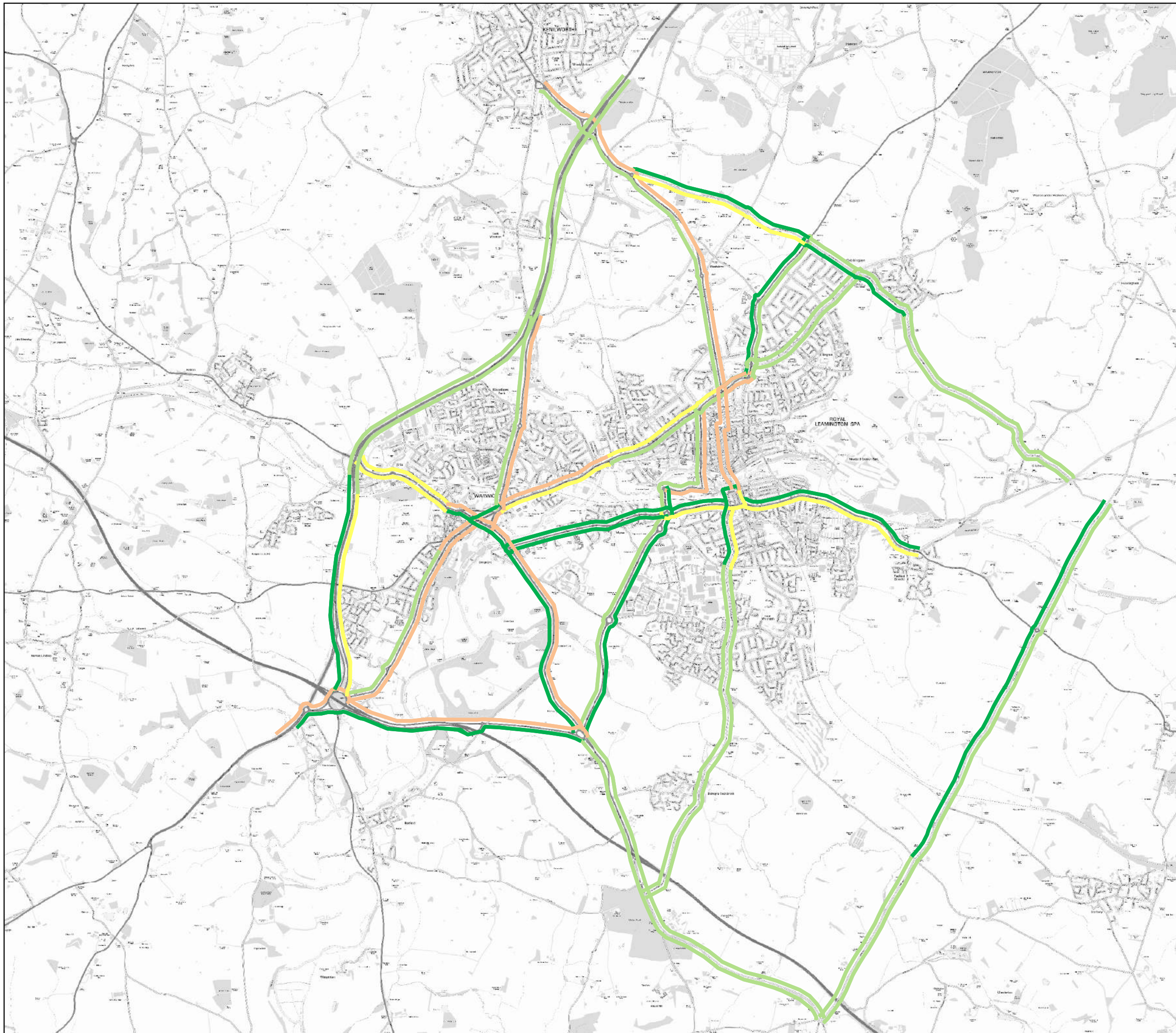
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MD 001



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Percentage Difference Mean Delay**

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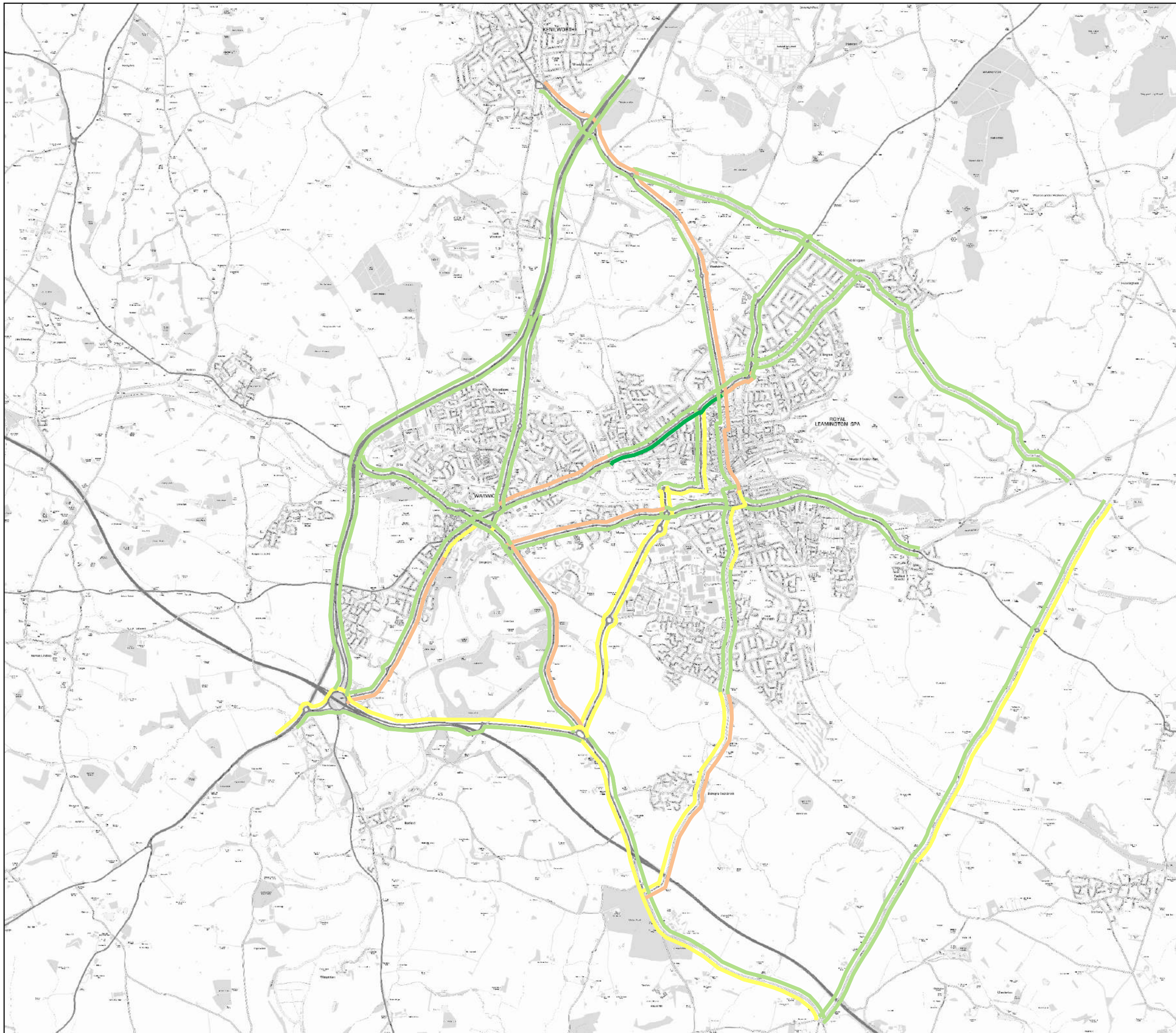
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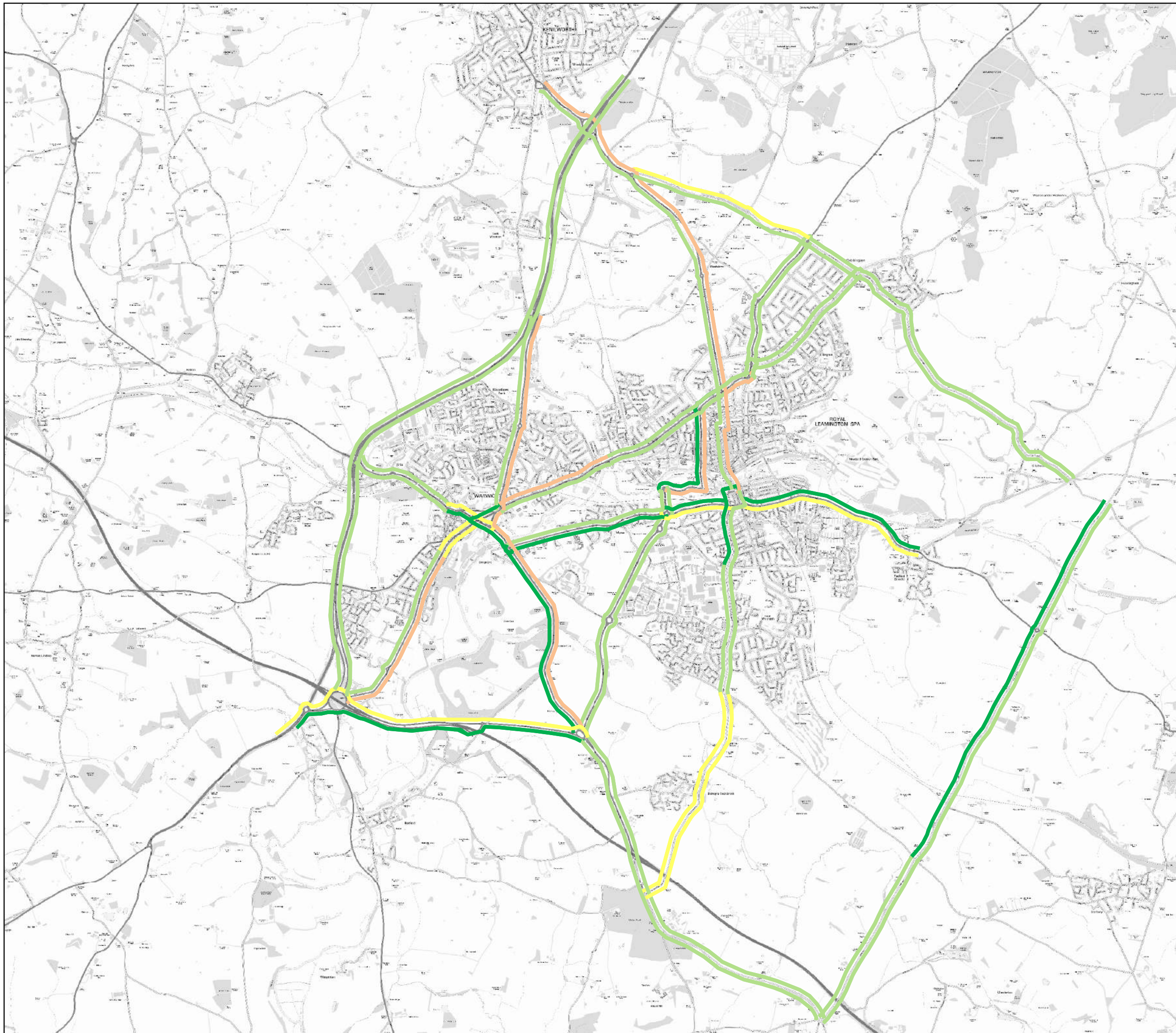
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TITLE:

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TITLE:

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VM165046 WDC
Strategic Transport Assessment Final Phase

TITLE:

KSWA Reference vs KSWA RDA
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MD 008

APPENDIX E

Sustainable Transport Strategy Overview

Project title WDC Strategic Transport Assessment Final Phase

Prepared by WCC Transport Planning

Date 03/03/16

Subject WDC Core Strategy – Sustainable Transport Overview

Introduction

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

- Contribute towards the delivery of sustainable development across 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; and
- Contribute towards the aims and objectives of the District Council's Garden Towns, Villages and Suburbs Prospectus.

Sustainable transport is an umbrella term which includes provision of bus services, bus infrastructure, park and ride, access to rail services, walking, cycling and behavioural measures (Smarter Choices). This note sets out what sustainable transport improvements will be sought through the planning process to support development generally within the District. Specific measures to mitigate the proposed major development to the south of Warwick and Leamington Spa and at Kenilworth/Kings Hill/Westwood Heath are also described in more detail.

Public Transport

Introduction

Public transport has an important role to play in supporting new development by providing genuine travel choice to residents and employees. This in turn can help mitigate the overall impact of development on the highway network by reducing the number of car trips generated as a result of growth.

Improvements to public transport can include service enhancements and investment in infrastructure. Further details of these are set out below.

Improvements to Bus Services – General

The County Council will require the Developer to secure the local bus services in accordance with a predetermined specification put forward by County Council officers. This will generally take the form of either enhancement to existing local bus services which fall within 400m walking distance of the site, or for larger sites the provision of new standalone bus services which deliver direct access to the development in question.

The Developers should contract new or enhanced bus services directly with a bus operator. Such requirements will be agreed as part of the planning process and conditioned accordingly.

Improvements to Bus Services – South Warwick/Leamington Spa

As has been raised in previous submissions by the County Council, the concentration of large scale development to the south of Warwick and Leamington Spa area should facilitate the conditions required to support the introduction of a network of new and/or enhanced services that stand a reasonable chance of becoming commercially viable over time.

As such, the County Council has developed an outline specification for enhancing the existing bus service in the area linking both Warwick and Leamington, and providing a new 15 minute frequency bus service serving the proposed major development in this area. These will deliver improved links between the new development and Warwick/Leamington Spa town centres, as well as other key trip attractors such as nearby employment areas and Leamington Spa rail station. Fig 1 (Fig 27 extracted from STA Phase 3 Report) provides a plan showing the potential routes of these bus services.

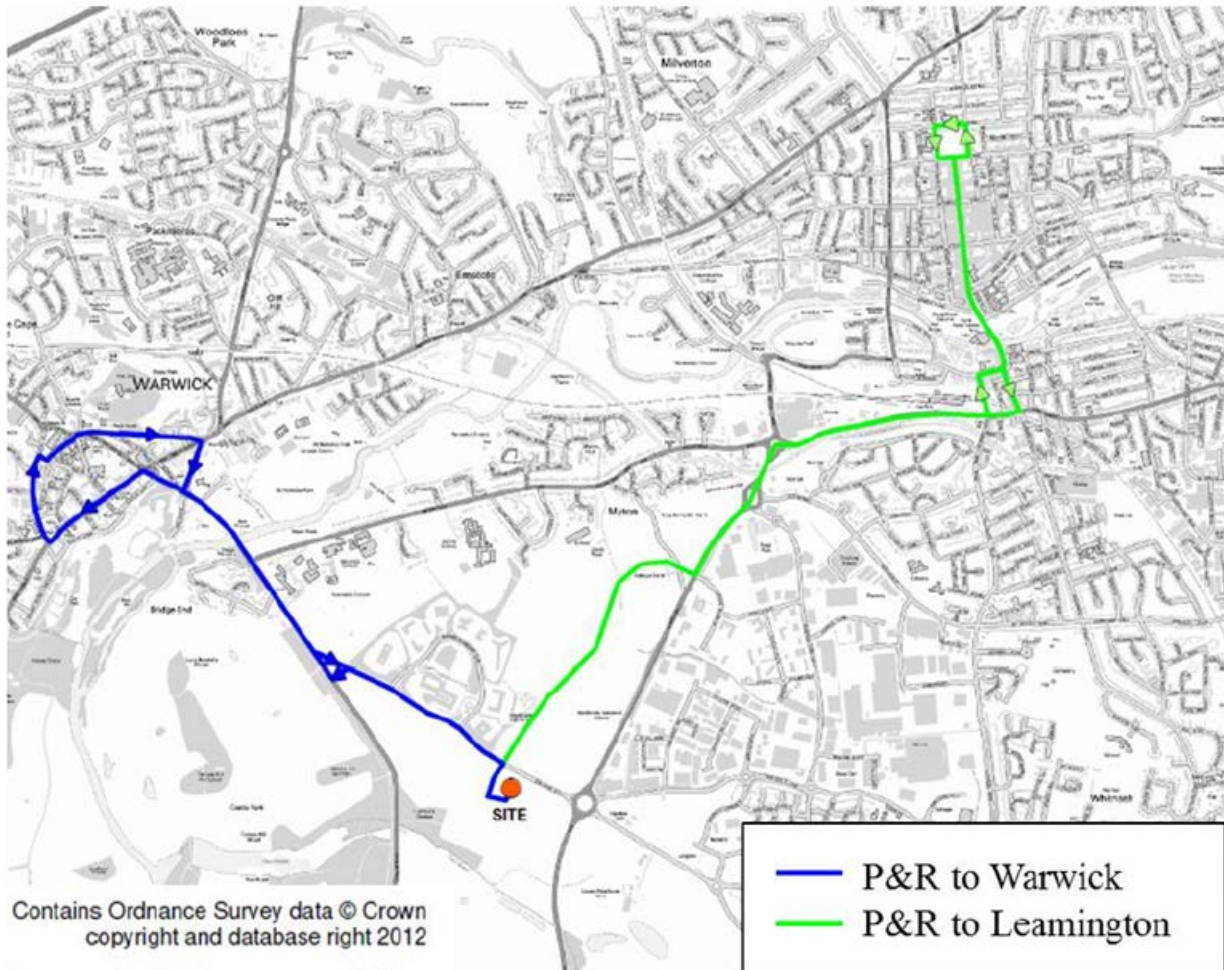


Fig 1 P&R Routing Assumptions (Fig 27 extracted from STA Phase 3 Report)

NB. P&R assumptions relating to the location of the southern P&R site have changed as a result of the Asps development site planning appeal decision. The P&R site is now intended to be located within the Asps site (see P&R section)

Bus Infrastructure

The principal infrastructure associated with bus service improvements are bus stops, shelters, laybys, information and priority measures.

In relation to bus stops, we would expect these to be well located in relation to the surrounding development (for example in terms of local service centres and schools), with a maximum walk distance of no more than 400m from any point within the development. In most cases bus stop poles with flags and timetable cases should be sufficient. At key stops, consideration should be given to providing a bus shelter. A commuted sum will be required for a period of five years to cover the maintenance costs of each shelter provided. Bus stop laybys are generally not required unless it is necessary for a vehicle to wait for some time at a particular point in its journey due to an operational issue (for example at the beginning or end of a route).

The County Council does not generally require Real Time Information (RTI) to be provided at bus stops and within bus shelters. However, liaison with site promoters will be undertaken to discuss the possible provision of supporting underground infrastructure, should RTI be pursued at some point in the future.

A considerable amount of work has been undertaken by the County Council to identify and test a number of potential bus priority measures to assist the operational reliability and attractiveness of bus services to/from the proposed major development area to the South of Warwick and Leamington Spa.

From the proposed southern Park and Ride facility (see below for further details) towards Leamington Spa rail station and town centre, the following bus priority measures have been identified and tested within the traffic modelling assessment:

- Bus loop detectors at the exit of the Park and Ride site and at the junction onto the Heathcote Farm development site distributor road;
- Bus lane northbound along the Heathcote Farm development site distributor road as far as the junction of Gallows Hill/Heathcote Lane;
- Bus gate at the junction of the Heathcote Farm development site distributor road with Gallows Hill/Heathcote Lane (to facilitate left and straight on bus movements);
- Bus lane on the exit from the Land west of Europa Way development site northbound, with a bus gate to provide access onto the A452 Europa Way. Bus loop detectors for the reciprocal movement from the A452 Europa Way south into the Land west of Europa Way development;
- Bus lane northbound around the western edge of the Shires Retail Park roundabout, with corresponding southbound bus lane provided as part of the hamburger design through the centre of the roundabout;
- Bus detector loops on each approach to the main access to the Ford Foundry development (Morrisons);
- Queue detector loops on all approaches to the proposed Old Warwick Road/ Lower Avenue/Spencer Street/Bath Street gyratory system; and
- Bus detector loops on the approaches to all three main junctions on the Parade (Regent Street, Warwick Street and Clarendon Avenue).

From the proposed southern Park and Ride facility towards Warwick town centre, the following bus priority measures have been identified and tested within the traffic modelling work:

- Bus loop detector on the approach to Banbury Road from Gallows Hill/Heathcote Lane with associated bus lane;
- Bus loop detectors on all approaches to the Banbury Road/Myton Road junction; and
- Bus loop detectors at the junction of St Nicholas Church Street/Castle Hill.

The above assumptions alter slightly as a result of the P&R site now being located within the Asps development site, however the routing and potential bus priority infrastructure would remain broadly similar and show similar benefits. There are limited further opportunities for bus priority in Warwick due to the constrained nature of the other principal junctions within the town centre.

Fig 2 (Fig 28 extracted from STA Phase 3 Report) provides further details regarding the location of the bus priority measures set out above. An initial assessment has been carried out regarding the impact of the bus priority measures on vehicle journey times and network performance. The findings of this work are detailed in the main report.

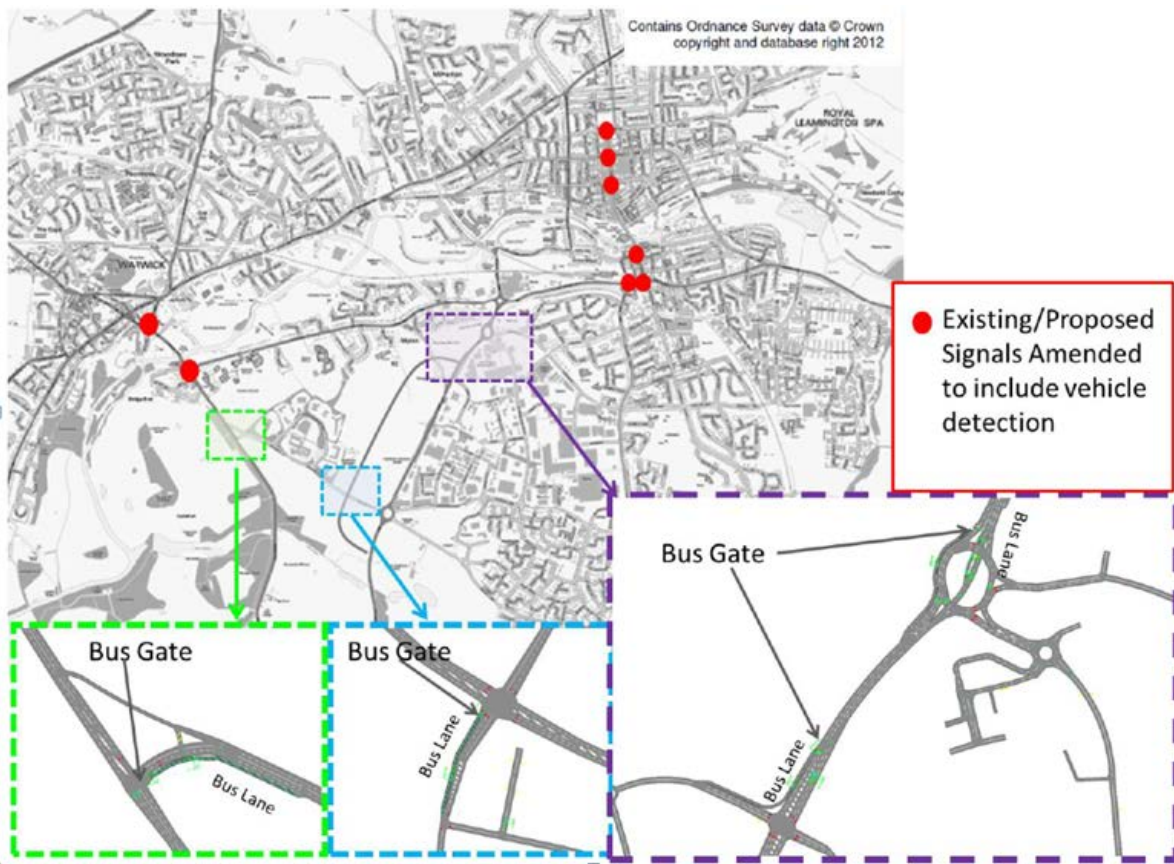


Fig 2 Bus Priority Assumptions (Fig 28 extracted from STA Phase 3 Report)

Further opportunities for bus priority provision elsewhere within the District will be sought as a result of new development.

Park and Ride

The County Council has previously highlighted the opportunity for some form of Park and Ride on the Europa Way corridor to be delivered as a result of development to the south of Warwick and Leamington Spa. This would be served by the enhanced existing and potentially new bus services to/from Leamington town centre described above. The Asps development situated west of Europa Way (as shown in Fig.3) will provide a Park and Ride facility within the development site as a contribution towards development's mitigation strategy.

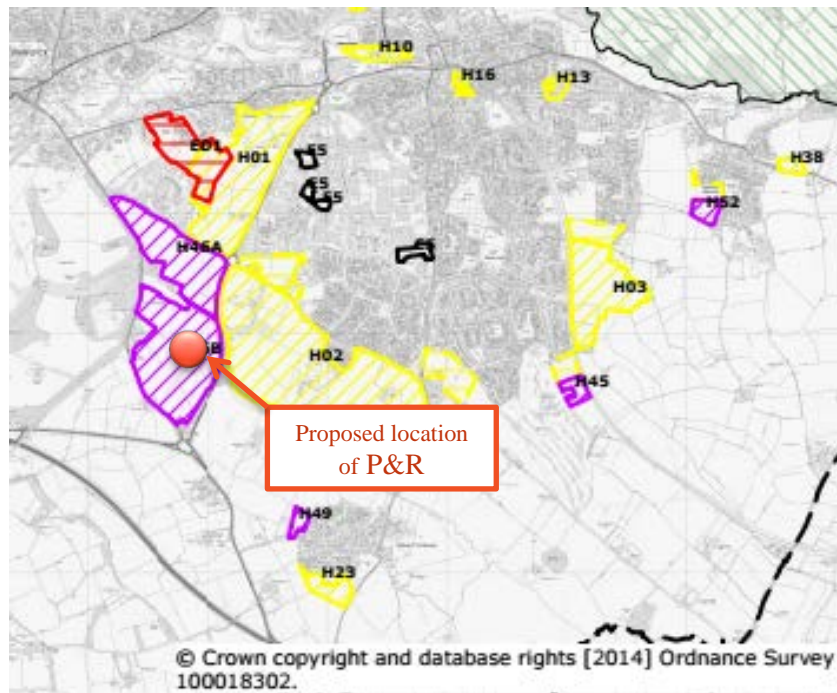


Fig 3 Proposed Location of P&R within Asps development site

An opportunity exists for a complimentary northern Park and Ride facility to be provided to further mitigate the impact of development planned within the District. Even with growth focussed to the south of Warwick/Leamington Spa, the modelling work undertaken by the County Council indicates that the A452 corridor (which already carries significant volumes of traffic throughout the day and particularly at peak times) will come under further pressure as a result of growth. Work undertaken previously by the County Council as part of the SPARK Major Public Transport scheme suggested that an optimum location for a northern Park and Ride site would be between the A46/A452 Thickthorn roundabout and the A452/B4113 Blackdown roundabout. It is anticipated that the facility would be served by some or all of the existing bus services which currently use this corridor, thus delivering a highly attractive frequency of service for users. This would ideally be accompanied by bus priority measures along the route, particularly at key pinch points.

It is anticipated that any Park and Ride facility provided within the District would be constructed, owned and operated in perpetuity by the District Council as an off-street car park, given that as an Authority it controls a significant proportion of the off-street car parks in both Warwick and Leamington Spa town centres and sets the parking charges therein. Any costs associated with the subsidy and operation above and beyond the funding provided by developers towards the bus services associated with the Park and Ride facility would also fall on the District Council.

The County Council recently commissioned a piece of work which reviewed the case for Park and Ride provision as part of an overall package of measures to deliver growth and provide a wider contribution to the two town centres of Warwick and Leamington Spa.

The work demonstrated that there would be a considerable level of demand for both sites, whilst discussions with bus operators indicate that the sites could be served by a combination of existing bus services and developer funded bus services operating at a 10 minutes frequency during the peak periods. An option to extend services from Warwick Town centre to the north-west area of Warwick including the hospital could be considered over the medium term.

Access to Rail Services

The principal access points to the rail network for those living or working in the District are Warwick, Warwick Parkway, Leamington Spa and Coventry. The smaller station facilities at Hatton, Lapworth and Claverdon provide important secondary facilities for local residents and the surrounding rural areas. The County Council is currently in the process of delivering a new station at Kenilworth as part of the NUCKLE Phase 2 proposals. These will build on the Phase 1 improvements that have recently been delivered between Nuneaton and Coventry, which include new stations at Bermuda and Coventry Arena.

The principal rail head which will serve the majority of the development proposed in the Core Strategy will be Leamington Spa, which currently benefits from direct rail services to London Marylebone, Banbury, Oxford, the South Coast, Solihull, Birmingham New Street, the North West and the North East. High frequency, rapid access from the proposed growth sites in south Warwick and Leamington Spa to the rail station would be provided via the new bus services described earlier in this note, linking the proposed southern Park and Ride facility with the town centre.

With the recent additions of housing allocations at Kings Hill and Westwood Heath, potential further growth at Warwick University and Coventry Local Plan housing allocations, there will be an increasing rail demand in the south Coventry area. The Kings Hill development site presents an opportunity to consider benefits and viability of developing either a local or potentially more strategic parkway or public transport interchange facility south of Coventry

Walking and Cycling

General

It is essential that high quality pedestrian and cycle routes are provided to and within all new development sites that come forward in the District.

Internal provision for pedestrians and cyclists should deliver good access to local service centres, schools and open spaces/play areas. The County Council's preference is that pedestrians and cyclists should generally be accommodated on streets rather than routes segregated from traffic. Short pedestrian and cycle only links are acceptable if well-designed where they provide short cuts or opportunities for leisure cycling or walking. Routes should also be provided as part of new 'green' corridors, with suitable links to them from within the development. Good connections to the external pedestrian and cycle network should also be provided.

In terms of other pedestrian and cycle infrastructure, crossing facilities should be considered where flows justify such provision. Toucan crossings may be required on key cycle routes. New or enhanced pedestrian/cycle signage should also be considered, particularly in terms of links to the National Cycle Network and important local facilities such as rail stations. We would expect to see good quality cycle parking provided at local service centres, schools and open spaces/play areas within development sites.

The cycle network within the Warwick/Leamington Spa area is reasonably well developed, although there are a number of missing links which would help to reinforce the overall network. Completion of the cycle route between Warwick and Leamington Spa (which currently ends near Tesco on the A445 Emscote Road) is also a high priority. There is also a need to improve cycle access to Leamington Spa town centre, particularly from the south.

Whilst some progress has been made recently to expand the cycle network within Kenilworth (including the Connect2 scheme), further investment is required to deliver a number of important routes. The most important inter-urban cycle route which is currently missing within the District is a dedicated facility between Kenilworth and Leamington Spa (often referred to as K2L). The traffic modelling work which has

been undertaken has demonstrated that there will be further pressure on the A452 as a result of growth, which reinforces the need for investment in sustainable transport measures such as this within the corridor. There is also a need to complete cycle links between Kenilworth and Warwick, Coventry and Stoneleigh Park.

The County Council will seek contributions towards these cycle improvements through the proposed CIL Charging Schedule and from other sources such as the Single Local Growth Fund.

Improvements for Pedestrians and Cyclists – South Warwick/Leamington Spa

In a similar way to public transport provision, a critical mass of development in the south Warwick and Leamington Spa area should provide the circumstances whereby a meaningful internal and external network of pedestrian and cycle routes can be delivered as a result of growth.

In terms of external access, links to the following will be required:

- The schools on Myton Road;
- Warwick Town Centre;
- Warwick Technology Park;
- The employment areas to the east of Europa Way (Tachbrook Business Park, Queensway Trading Estate and Heathcote Industrial Estate);
- Shires Retail Park;
- Ford Foundry site (Morrisons);
- Leamington Spa Town Centre;
- Leamington Spa Rail Station; and
- Warwick Gates and Whitnash.

Where possible, these links should maximise use of the existing pedestrian/cycle network, in particular the facilities on Myton Road, Old Warwick Road, Queensway the Grand Union Canal towpath and the Banbury Road/Heathcote Lane/Gallows Hill route which serves Warwick Technology Park and Warwick Gates.

Improvements for Pedestrians and Cyclists - Kings Hill / Westwood Heath

The delivery of a comprehensive network of internal cycle routes will be sought at these sites, together with external connections to Coventry's cycle network and key destinations within the city to enable cycling to be a viable choice for everyday journeys. External cycle links to the following destinations will be required:

- Coventry City Centre
- University of Warwick
- Gateway site
- JLR Whitley
- Middlemarch Business Park
- Westwood Heath Business Park
- Coventry Business Park
- Canley Station / Tile Hill Rail Stations
- Stoneleigh Park
- NCN52 (Coventry – Kenilworth – Warwick)

Demand Management

The County Council commissioned consultants to consider a number of options regarding an 'Alternative Approach' to dealing with the forecast transport impacts within Warwick and Leamington Spa town centres.

The study focused on the potential of five package options to encourage sustainable travel behaviours and reduce the demand for car travel. The five packages are:

A: Sustainable Transport Package: infrastructure and behavioural change package

B: Introduction of Park and Ride North and South of Leamington Spa (southern site to serve Warwick and Leamington)

C: Increases to long stay parking charges

D: Workplace Parking Levy

E: Warwick Town Centre Transit Charge

The report identified that the Sustainable Transport Package (Option A) and Park and Ride (Option B) options provide the greatest benefits in terms of improved network performance due to modal shift and are deliverable in the short to medium term.

In the longer term, measures such as increased parking charges and a Workplace Parking Levy need to be explored to encourage further modal shift and provide a possible funding stream for additional sustainable transport measures.

The study highlighted that the highway mitigation measures identified through the STAs provide opportunities to deliver improvements to support sustainable transport measures, for example through providing crossing facilities for pedestrians and cyclists and bus priority measures. There is therefore a benefit in introducing the preferred package options (option A and B) in conjunction with the measures contained in STA4 as part of an integrated programme of transport improvements for the area.

Further details of the specific proposals that form part of the preferred package options are provided on a corridor by corridor basis in the Infrastructure Development Plan.

Smarter Choices

In order to reinforce the investment in public transport, walking and cycling described in this section of the report, the County Council would expect to see the parallel deployment of a range of behavioural measures (also known as Smarter Choices) as part of the growth proposals across the District.

Examples of such measures include:

- Workplace Travel Plans (in respect of sites generating in excess of 100 jobs);
- Sustainable Travel Packs for new residents;
- Personalised travel planning;
- Travel awareness campaigns;
- Public transport information and marketing;
- Car clubs;
- Car sharing schemes; and
- Teleworking, teleconferencing and home shopping.

WCC Transport Planning