

WDC STA Phase 5: Local Plan Development Impact Assessment

Project title	KSWA LP Sensitivity testing	Job number	VM165086
cc	Alan Law (WCC)	File reference	VM165086.TN002
Prepared by	Vectos Microsim	Date	2 December 2016

Introduction

1. Vectos Microsim (VM) have been working alongside Warwickshire County Council (WCC) to support Warwick District Council through the Local Plan examination process. During the Examination a question has been raised regarding the status of the cap on dwellings to be delivered within the Westwood Heath area and, specifically, whether this cap would be supported if the assessment was run in the recently extended Kenilworth and Stoneleigh Wide Area (KSWA) model.
2. This note supersedes previous analysis undertaken as part of Phase 5 of the WDC strategic Transport Assessment conducted in February 2016. Since the issue of that note, the Kenilworth and Stoneleigh Wide Area (KSWA) Paramics model has been updated to reflect 2016 traffic counts whilst also being extended to include Gibbet Hill Road, Westwood Heath Road and Charter Avenue. As a result, it was considered pertinent to retest the development assumptions within the updated KSWA model.
3. This Note therefore supersedes the evidence presented within Appendix A of the Warwick District Council Strategic Transport Assessment – Final Phase Assessment of Additional Housing Allocations (Feb 2016).

Purpose of this Note

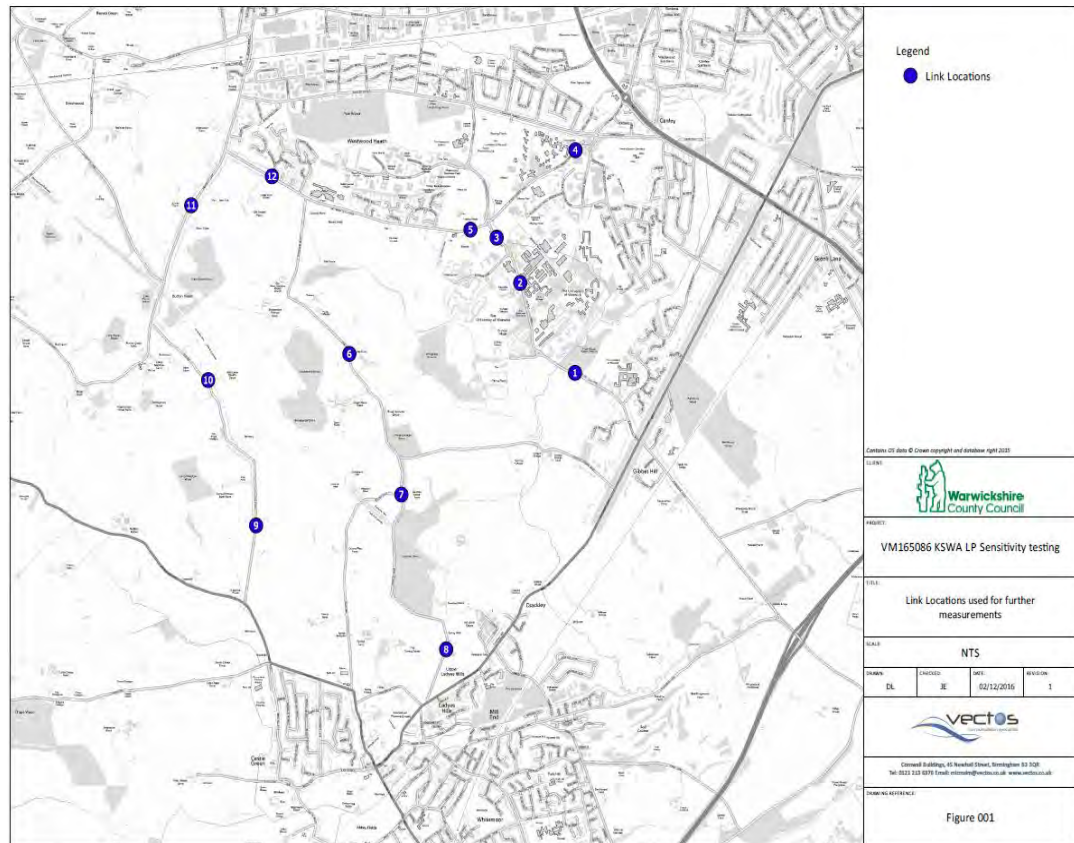
4. This note has been produced to summarise the findings of the revised analysis pertaining to the Westwood Heath area development cap and present any conclusions or recommendations therefrom.

Scope

5. In February 2016, VM conducted some initial analysis on the impact of the delivering the Local Plan allocated sites across the KSWA study area. However, a shortfall of the original assessment work was that some of the network likely to be affected by the allocations was not included within the microsimulation models and, as a result, it was therefore not possible to assess impacts of these sites within the physical model network.

6. The original analysis identified a number of link locations which were included within the manual assessment. In order that a synergy with the original modelling could be retained the same link locations were adopted in this updated assessment and are illustrated within **Figure 1**.

Figure 1 – Link Locations used for further analysis



Scenarios

7. As well as assessing the validity of the original conclusions WCC requested that VM define three scenarios for the assessment, each with varying development quantum within the Westwood Heath area (either at the allocated Crest site or in the Cromwell Lane area).
8. The scenarios tested are as follows:
 - *M004 - KSWA 2029 Local Plan Sensitivity* – This model includes all developments allocated in the WDC Local Plan as of October 2016. Inclusive of 1800 dwellings at Kings Hill and 425 dwellings in the Westwood Heath Area.
 - *M005 - KSWA 2029 Local Plan Sensitivity with 610 dwellings at Crest* - The previous scenario with an additional 185 dwellings in the Westwood Heath area (610 in total)
 - *M006 - KSWA 2029 Local Plan Sensitivity with Cromwell Lane and 425 dwellings at Westwood Heath* - This model includes all developments allocated in the WDC Local Plan as of October 2016 plus an additional 130 dwellings in the Cromwell Lane area.

Objectives

9. The primary objective of this work is to understand the traffic constraints that are likely to exist which will serve to restrict the amount of housing that can be delivered without additional, more significant infrastructure being required.
10. This analysis is to follow work undertaken in February 2016 within the updated Paramics model.

Methodology

11. The distribution of trips across the model network has been informed via an extraction of the likely routing, associated with both sites, using 2011 Journey to Work (JtW) Census Data.
12. A number of measures have been adopted to inform the assessment and these have been detailed within the following section of this note.

GEH

13. 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.
14. 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.
15. 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

16. 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

17. For the creation of percentage link capacity, knowledge of one way hourly flow capacity is required 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 (DRBM-UAP). Road width was estimated using Google Maps, 'Measure distance tool' as well as being cross referenced through GIS to

ensure maximum accuracy. Validation of the road classification was undertaken through Google Street view spot checks.

18. If links do not fully fulfil the criteria in the DMRB-UAP, further assessment using Sweet (2012) 'Capacity of single track Rural Lanes'² was used to get more representative capacity values.
19. 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 numbers, 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	2220
2	UAP 3	6.75	1110	2220
3	UAP 3	7.3	1620	3240
4	UAP 3	7.3	1620	3240
5	UAP 3	7.3	1620	3240
6	Two Lane Rural	5.2	200	400
7	Two Lane Rural	5.2	200	400
8	Two Lane Rural	5.2	200	400
9	UAP 2	6.75	1260	2520
10	UAP 2	6.75	1260	2520
11	UAP 3	7.3	1620	3240
12	UAP 3	7.3	1620	3240

20. 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.
21. Following examination comments in November 2016, it was suggested that VM should provide further evidence as to the classification of the 'Two Lane Rural' roads to ensure that the hourly road capacity is as accurate as possible. During the build of the 2016 KSWA Base model, VM undertook a videoed site visit, part of which included travelling along Crackley Lane. Consequently, **Appendix A** provides photographic evidence of the road network at the points along the network that are being tested. These reaffirm that the road classification were initially correct and therefore no further changes have been assumed within this note.
22. For the purpose of this study, Peak hour AM and PM traffic flows have been extracted to represent the busiest period and a robust assessment.

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

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

GEH Significance analysis

23. The GEH Plot has been produced to assess major flow changes that are predicted to occur across the Local Plan model compared to the updated 2016 Base Model across the combined AM and PM periods. This follows the previous methodology to provide synergy with the comparisons. The outputs can be found in **Appendix B**.
24. The plot shows that within this study, the GEH along Cromwell Lane pertains low values of 0-3 which indicates that the development traffic does not largely affect traffic flow along this link. Consequently, little further analysis is undertaken at this location.
25. Conversely, flows at sites 1 and 2 on Gibbet Hill Road and sites 6, 7 and 8 on Crackley Lane increase significantly by between 5 to 7.5 and 7.5 to 10 respectively. This indicates that the development traffic largely effects flow along these links. Further tests on Link capacity are undertaken along these sites to quantify the affects.

Link Capacity analysis

26. 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. Following comments at the November 2016 examination regarding link capacity, a review of this method was undertaken. This is summarised in paragraph 26 of this note.
27. Modelled flow was compared to the two way link capacity and a percentage was determined. Resultant plots and tables for each scenario (AM & PM) can be found in **Appendix C**.
28. For this analysis, three models outlined in paragraph 9 of this note have been produced for sensitivity tests to assess the carrying flows across the North Kenilworth area. This section aims to analyse each scenario and the effects on the local road capacity.

M004 - KSWA 2029 Local Plan Sensitivity

29. This model assumes 425 dwellings at the Crest Site whilst excluding the MEC site at Cromwell Lane. Therefore this scenario can be deemed as '*the best case scenario*' of the three tested as part of this study.
30. Within both the AM and PM periods, flows along site 6 are over capacity indicating severe issues are likely in this area whilst routes through the university vary from being at capacity South of the University to being at moderate capacity towards Kirby Corner Road.
31. During the AM, sites 7 and 1 are over and at capacity respectively whereas during the PM, percentage capacity decreases to at and reaching capacity which indicates lower traffic flows during the peak PM hour.
32. Location 2 at the university is expected to be at 75% capacity in both periods considering the pedestrian activity and shared space of this area, it is considered that this section of Gibbet Hill Road is very close to being at full capacity.

33. The analysis in both AM and PM periods suggests that the preferred route to Kenilworth and the A46 towards Warwick and Leamington is via Crackley Lane. This is a direct re-routing response to the congested network at Gibbet Hill Road

M005 - KSWA 2029 Local Plan Sensitivity with 610 Crest

34. With the addition of the largest development quantum at the Crest site of 610 dwellings, capacity increases the greatest along Crackley Lane. Two way flow at site 6 is expected to increase by 8% when compared to M002 which constitutes a total a flow of 132% link capacity.
35. Furthermore, in both periods site 7 returns values of being over capacity indicating additional traffic is causing issues south of Cryfield Grange Road.
36. It should be noted that location 8 is at 98% and 96% link capacity in the AM and PM respectively which denotes that this link is very close to being over capacity.

M006 - KSWA 2029 Local Plan Sensitivity with MEC and 425 Crest

37. With the inclusion of Land at Cromwell Lane, Westwood Heath Road at link location 12 increases to moderate capacity during the AM period. This is caused by the routing of vehicles to the A45.
38. The inclusion of Land at Cromwell Lane results in an average of a 1% increase of traffic flows along Crackley Lane throughout the AM whilst during the PM, this is less than a 1% increase indicating that this site results in very little change in overall flows.
39. When comparing to M004, flow increases by 9% at link location 10 on Cromwell lane during the AM. Nevertheless, overall link capacity still remains below 20% representing minimal impact.

Summary

40. VM have been working alongside WCC and WDC in assessing the impact of Local Plan site allocations on the future road network in the Kenilworth area specifically in the area around of Crackley Lane and Gibbett Hill. This note supersedes Appendix A of the Warwick District Council Strategic Transport Assessment – Final Phase Assessment of Additional Housing Allocations (Feb 2016).
41. Three scenarios were assessed based on 425 dwellings and 610 dwellings at the Crest site as well as including the Land at Cromwell Lane. This site was allocated in November 2016.
42. Two methods were used to analyse future traffic issues which included and assessment of; GEH significance and link capacity which was based upon road capacities calculated from standard values.
43. Following examination comments, further evidence was required as to the classification of the road type. This has been provided in **Appendix A**.
44. Low GEH occurs along Cromwell Lane which outlines that the additional development traffic does not route along this link. Subsequently, this area is not featured heavily in subsequent

analysis. Conversely, GEH along Gibbet Hill Road and Crackley Lane is greater than 5 which signifies that the additional traffic from the allocated sites cause significant increases in traffic flows and should be investigated further.

45. In terms of percentage link capacity, in all scenarios, Site 6 on Crackley Lane is over capacity indicating severe issues are set to occur. At this site, when development quantum increases to 610 dwellings at the Westwood Heath area, link capacity exceeds 130%.

Conclusions

46. It can be concluded that by the addition of approximately 425 dwellings, the Crackley Lane route is likely to be over capacity and therefore this can be representative of the development cap in Westwood Heath.
47. The addition of 610 dwellings at this site results in link capacity being at 132% along Crackley Lane in the AM period which would require extensive mitigation.
48. The addition of Land at Cromwell Lane results in minimal impacts on Crackley and Gibbet Hill Lane. The largest flow increases from this site occur at Cromwell Lane however following the analysis undertaken in this study, link capacity is still in the lower thresholds less than 40% and therefore constitutes little impact on the local road network.

DOCUMENT CHECKING

	Prepared by	Checked by	Approved by
Name	Darren Lashford	James Edwards	Alan Law
Date	01/12/2016	02/12/2016	02/12/2016

APPENDIX A

Link Classification Evidence



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CLIENT:



PROJECT:

VM165086 KSWA LP Sensitivity testing

TITLE:

Link Location 6 as per the Survey
Video

SCALE:

NTS

DRAWN:

MG

CHECKED:

SA

DATE:

02/12/2016

REVISION:

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Appendix A - Link Location 6



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CLIENT:



PROJECT:

VM165086 KSWA LP Sensitivity testing

TITLE:

Link Location 7 as per the Survey
Video

SCALE:

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Appendix A - Link Location 7



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PROJECT:

VM165086 KSWA LP Sensitivity testing

TITLE:

Link Location 8 as per the Survey
Video

SCALE:

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DRAWING REFERENCE:

Appendix A - Link Location 8

APPENDIX B

GEH Significance



Legend

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

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CLIENT:



PROJECT:

VM165086 KSWA LP Sensitivity testing

TITLE:

GEH Statistic comparing the Local
Plan Model to the updated 2016
Base

SCALE:

NTS

DRAWN:

DL

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DATE:

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REVISION:

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Appendix B

APPENDIX C

Percentage Link Capacity



- Legend
- 0 - 20%
 - 20 - 40%
 - 40 - 60%
 - 60 - 80%
 - 80 - 100%
 - Greater than 100%

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CLIENT:



PROJECT:

VM165086 KSWA LP Sensitivity testing

TITLE:

Percentage Link Capacity from the M004 - KSWA 2029 Local Plan Sensitivity Model. AM (0800 to 0900)

SCALE:

NTS

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Appendix C



- Legend
- 0 - 20%
 - 20 - 40%
 - 40 - 60%
 - 60 - 80%
 - 80 - 100%
 - Greater than 100%

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PROJECT:

VM165086 KSWA LP Sensitivity testing

TITLE:

Percentage Link Capacity from the M004 - KSWA 2029 Local Plan Sensitivity Model. PM (1700 to 1800)

SCALE:

NTS

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Appendix C



- Legend
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 - 20 - 40%
 - 40 - 60%
 - 60 - 80%
 - 80 - 100%
 - Greater than 100%

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CLIENT:



PROJECT:

VM165086 KSWA LP Sensitivity testing

TITLE: Percentage Link Capacity from the M005 - KSWA 2029 Local Plan Sensitivity with 610 dwellings at Crest Model. AM (0800 to 0900)

SCALE:

NTS

DRAWN:	CHECKED:	DATE:	REVISION:
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Appendix C



- Legend
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 - 80 - 100%
 - Greater than 100%

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CLIENT:



PROJECT:

VM165086 KSWA LP Sensitivity testing

TITLE: Percentage Link Capacity from the M005 - KSWA 2029 Local Plan Sensitivity with 610 dwellings at Crest Model. PM (1700 to 1800)

SCALE:

NTS

DRAWN:	CHECKED:	DATE:	REVISION:
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Appendix C



- Legend
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 - 40 - 60%
 - 60 - 80%
 - 80 - 100%
 - Greater than 100%

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CLIENT:



PROJECT:

VM165086 KSWA LP Sensitivity testing

TITLE: Percentage Link Capacity from the M006 - KSWA 2029 Local Plan Sensitivity with MEC and 425 dwellings at Crest . AM (0800 to 0900)

SCALE:

NTS

DRAWN:	CHECKED:	DATE:	REVISION:
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Appendix C



- Legend
- 0 - 20%
 - 20 - 40%
 - 40 - 60%
 - 60 - 80%
 - 80 - 100%
 - Greater than 100%

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PROJECT:

VM165086 KSWA LP Sensitivity testing

TITLE: Percentage Link Capacity from the M006 - KSWA 2029 Local Plan Sensitivity with MEC and 425 dwellings at Crest . PM (1700 to 1800)

SCALE:

NTS

DRAWN:	CHECKED:	DATE:	REVISION:
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Appendix C