

Alwyn Road/Main Street Junction, Rugby Scheme Option Appraisal

VM225389.TN001

Introduction

1. Warwickshire County Council (WCC) has requested that Vectos Microsim (VM) review the operation of the Alwyn Road/Main Street/Lawford Lane junction, located within Rugby, following recent analysis of the junction which identified potential queuing issues not flagged within the original Local Plan Strategic Transport Assessment (STA) work.
2. The Alwyn Road / Main Street junction lies within the Rugby Wide Area (RWA) Base model network (see **Figure 1**) and was calibrated against an observed survey collected in 2016. The nature of the junction is such that it was not considered a 'critical' junction and therefore was not assessed in detail at the time of the original Local Plan STA. As a result, the effect that the Local Plan (or committed developments) had on the operation of this junction has not previously been reported on in detail, by VM, prior to this study.

Figure 1 Alwyn Road Junction Location



Background

3. As part of the planning application work in support of the Miller Homes 'Poets Meadow' residential site, located off the B4642 Coventry Road to the south of the Alwyn Road/Main Street junction, isolated junction traffic modelling was undertaken. This isolated junction modelling flagged the Alwyn Road/Main Street junction as problematic, with significant queueing predicted within the future year scenarios.
4. A review of the isolated junction model outputs revealed that the modelling was undertaken using a traffic survey for this junction, to which a TEMPro and then NTM adjustment factor had been applied to create forecast future year flows.
5. This forecasting process resulted in the prediction of very high future year traffic flows at the junction which would be considered a very robust level of traffic increase, simply due to the methodology applied. The RWA forecast models contain a similar level of traffic growth, however, this is spread across the entire Rugby study area, meaning that traffic growth does not manifest at the same rate at this location. Both approaches are in line with guidance as TAG stipulates the NTM adjustments are required for isolated junction modelling to reflect the greater level of uncertainty therein.
6. Subsequently, a revised set of traffic flows were extracted directly from the RWA traffic models for assessment within the isolated junction models. Analysis of these flows indicated that the junction would likely operate within capacity within the future year scenarios inclusive of consented development traffic only (Reference Case) however, in the scenario containing all SW Rugby allocation demands, queues again begin to manifest at this location.
7. This has led to the Poets Meadow Transport Assessment concluding that the issues at the junction are not a direct result of delivering this development itself, rather a cumulative impact of delivering all allocated sites within the SW Rugby area, and as a result, it is understood that the transport consultant working on behalf of the Poets Meadow site are now seeking to vary the planning condition, which currently requires this development to deliver additional capacity at the junction by widening Alwyn Road. However, it is also evident that there is a cumulative impact at the junction arising from the SW Allocations which the Poets Meadow site contributes to.
8. VM have undertaken testing on behalf of WCC within the RWA 2031 Local Plan model (the scenario in which impacts at the junction are predicted to occur) to understand what options may exist to mitigate the cumulative effects which predict that the junction will be significantly over capacity in the 2031 Local Plan, during the AM peak hour.
9. This note documents in detail the impacts modelled at the junction, and presents a high level review of potential options for mitigating any impacts as well as how a level of impact could be attributed to each of the SW Rugby sites if necessary based on traffic flows.

Objectives

10. The study documented within this note aims to address the following objectives:

- **Stage 1** - To complete a detailed review of the junction operation and traffic flows based on the the RWA Paramics model outputs.
- **Stage 2** - To consider solutions for improving the operation of the junction prior to any schemes being taken forward for further consideration.
- **Stage 3** - To identify the magnitude of attributable to the SW Rugby allocated sites still to come forward, such that a contribution strategy can be identified.

11. Each of these stages and the associated outcomes is discussed within the remainder of this note.

Stage 1 – Junction Operation Review

12. The first stage of the study presents the analysis undertaken within the RWA models, with regards the Alwyn Road/Main Street junction operation. The existing Baseline junction performance and how the RWA model predicts this will change because of the delivery of consented developments (Reference Case) and allocated sites (Local Plan) has been reviewed.
13. Accordingly, modelled traffic flows and queues lengths for the junction have been reported from the following RWA model scenarios:
- Base
 - 2031 Reference Case
 - 2031 Local Plan

Table 1 0800 to 0900 AM Peak Total Vehicle Throughput

	Main Street WB	Alwyn Road NB	Main Street EB	Total Throughput
Base Model	633	139	486	1258
2031 Reference Model	568	118	646	1332
2031 Local Plan Model	614	236	845	1695

Table 2 1700 to 1800 PM Peak Total Vehicle Throughput

	Main Street WB	Alwyn Road NB	Main Street EB	Total Throughput
Base Model	647	116	412	1175
2031 Reference Model	779	109	380	1268
2031 Local Plan Model	963	197	464	1624

14. **Table 1** and **Table 2** outline the total vehicle throughput at the junction across the three model scenarios assessed. The analysis presented indicates that flows through the junction are highest in the AM peak hour. It is notable that the total throughput increases by less than 100 vehicles across the AM and PM peak in the Reference Case, compared with the Baseline.
15. The Local Plan scenario shows more significant increases in flows, with total throughput increasing by around 450 vehicles in both peak hours. This increase in flows is mainly attributable to flows on the Main Street EB approach in the AM peak hour, and Main Street WB approach in the PM peak hour, and is a result of the additional traffic on the network in this scenario generated by the allocated sites in the SW Rugby area.

Table 3 0800 to 0900 AM Peak Average Maximum Queue Lengths

	Main Street WB	Alwyn Road NB	Main Street EB
Base Model	12	5	6
2031 Reference Model	13	5	7
2031 Local Plan Model	28	29	10

Table 4 1700 to 1800 PM Peak Average Maximum Queue Lengths

	Main Street WB	Alwyn Road NB	Main Street EB
Base Model	13	4	3
2031 Reference Model	15	5	4
2031 Local Plan Model	14	6	6

16. **Table 3** and **Table 4** present the average maximum queue lengths recorded from the various RWA model scenarios at the junction across the AM and PM peak hours. This analysis indicates that there is not predicted to be any significant worsening of queueing at the junction within the 2031 Reference Case relative to the Baseline.
17. Once the Local Plan traffic is accounted for, queues increases occur. This increase in queueing is most notable in the AM peak hour, with a 16 vehicle queue increase predicted on the Main Street WB approach, and 24 vehicle queue increase on the Alwyn Road NB approach to the junction. Both of which would be considered significant impacts.
18. The queue increase on Main Street WB is attributable to the increase in flow on Main Street EB from the allocated sites. The increase in flows results in traffic waiting to turn right into Lawford Lane blocking the Main Street WB movement whilst vehicles wait for gaps in the oncoming traffic flow before making the manoeuvre. Increased queues form on Alwyn Road in the Local Plan scenario because of increased traffic flows on Alwyn Road (circa 50%) alongside Main Street EB increases which results in fewer gaps in the traffic for vehicles to exit Alwyn Road compounding issues associated with the flow increases.

Summary

19. The traffic flow and queue results presented earlier demonstrate significant impacts at the junction are likely to occur in the Local Plan scenario only. The analysis has indicated that impacts will occur most notably in the AM peak hour, on the Main Street WB and Alwyn Road NB approaches to the junction. This is attributable to the significant increases in flows through the junction in the Local Plan scenario because of the allocated sites, particularly those within the SW Rugby area. The analysis of the predicted flow increases, and subsequent queue impacts indicates that a mitigation scheme is required to support the delivery of the SW Rugby Local Plan sites (inclusive of the Poets Meadows site).
20. As detailed previously, this was not flagged within the original STA work, however, at that time this junction was not considered a ‘critical’ junction and as such detailed modelling at this location was not carried out. Since the time of the STA the trip generation and trip distribution assumptions applied to the sites in the SW area have been refined, and more detail around each site comes forward. These changes have further increased the

impacts at this location. The STA concluded that sites would be required to consider their localised impacts as they come forward, and the resultant impacts being flagged at this junction through this detailed modelling demonstrates why this subsequent analysis is necessary.

Stage 2 – Scheme Assessment

21. Following the identification of the requirement for a scheme within in the Local Plan scenario, this stage of the assessment considers the options for mitigation at the junction. Each option considered has been run and assessed within the existing 2031 RWA Local Plan model and the relative performance benchmarked against the “Local Plan Do Nothing” (i.e. Local Plan model inclusive of the junction as the existing layout on-street) as well as the 2031 Reference Case (which provides the benchmark for ‘impacts’ concerning the remaining Local Plan allocations.
22. As part of this testing, the following mitigation options have been tested:
 - Option 1 – Mini Roundabout
 - Option 2 – Traffic Signals
 - Option 3 – Pedestrian Crossings
 - Option 4a – Right Turn Bay (Main Street EB)
 - Option 4b – Right Turn Bay (Main Street WB)
 - Option 5 – Alwyn Road Widening (splitting left, right and ahead movements)
 - Option 6 – Roundabout
23. It is important to note that at this stage each option is a ‘concept’ scheme, it is anticipated that any option identified for delivery would require further feasibility work to confirm deliverability prior to adoption.

Modelled Queue Results

24. Each of the options have been included within the 2031 Local Plan model, and the resultant queues at the Alwyn Road/Main Street junction across the AM and PM peak hours assessed. These queue impacts are presented within **Figure 2** and **Figure 3** for the AM and PM peak hours respectively.

Figure 2 AM Peak Hour (0800 to 0900) Average Maximum Queue Lengths

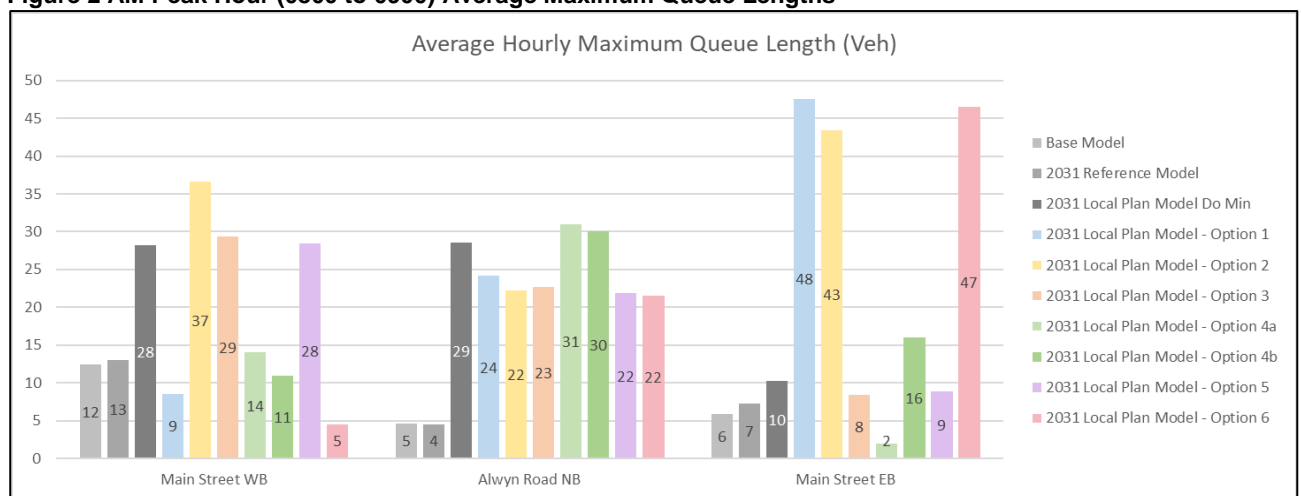
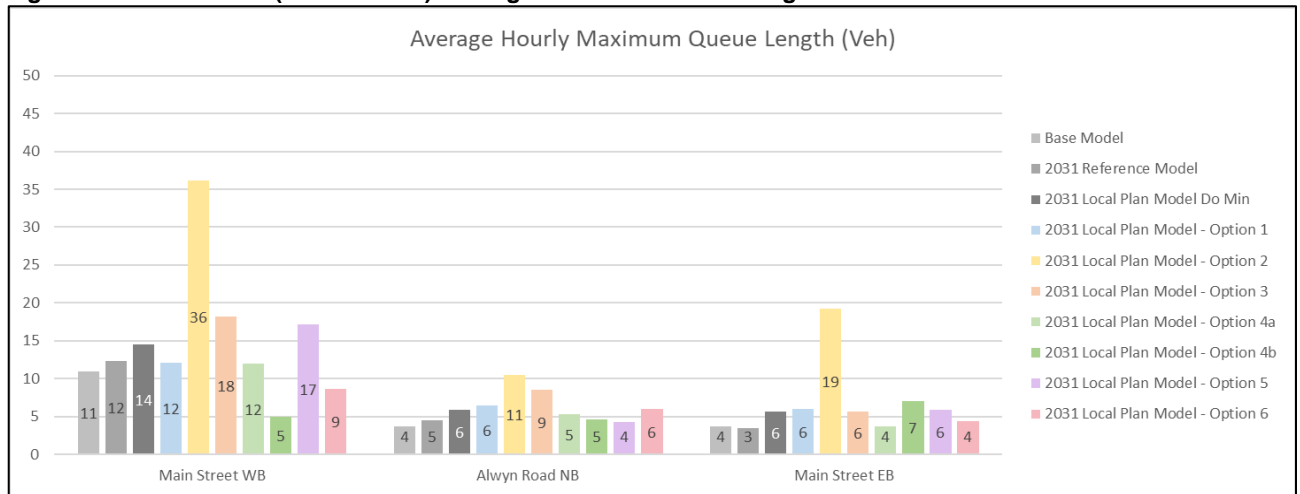


Figure 3 PM Peak Hour (1700 to 1800) Average Maximum Queue Lengths



- 25. The results presented within **Figure 2** and **Figure 3** illustrate the queue impacts at the Alwyn Road/Main Street junction in each of the options alongside the Baseline, Reference Case and 2031 Local Plan Do Nothing conditions.
- 26. Further analysis of each option is presented within the following section. As the impacts at the junction are predominantly focused within the AM peak hour the benefits of each option has been assessed on the basis of the effects observed within the AM peak hour.

Model Results Analysis

- 27. A high level review of the operation of each scheme considered has been presented for each junction as follows:

Option 1 – Mini Roundabout

- 28. This option comprised reconfiguration to a mini roundabout. The results indicate that this option improves queues on Main Street WB, however there are predicted to be significant queue increases on the Main Street EB approach as a result. The scheme delivers little change in queues reported on Alwyn Road.
- 29. On the basis of the impacts predicted on the Main Street EB approach, this option has been discounted.

Option 2 – Traffic Signals

- 30. This option comprises the introducing traffic signal control on each junction approach. The results have indicated a slight worsening of the queueing levels reported on Main Street WB, whilst also increasing on the Main Street EB approach. The scheme delivers little change in queues reported on Alwyn Road.
- 31. On the basis of the impacts predicted to occur on both Main Street approaches, this option has been discounted. However, this option could potentially be re-visited should there be sufficient space to accommodate segregated turning lanes for the Main Street EB and Main Street WB approaches.

Option 3 – Pedestrian Crossings

32. This option comprises delivery of a staggered pedestrian crossing on Main Street, to the west of the junction. The intention of this scheme is to establish whether this would create sufficient gaps to allow traffic to more easily turn right from Main Street WB into Lawford Lane and also exit Alwyn Road in the same gaps.
33. The results indicated little benefit occurs via this option. There are no notable changes in the level of queueing reported across the junction. On this basis this option has been discounted at this stage.

Option 4a – Right Turn Bay (Main Street EB)

34. This option comprises delivery of a segregated right turn bay on the Main Street EB to provide stacking space for traffic waiting to turn right from Main Street into Alwyn Road to reduce blocking the straight ahead movement on Main Street EB
35. The results indicate that this option delivers a significant improvement in queueing on Main Street WB. The modelling also demonstrates an improvement in the queue lengths on the Main Street EB. It is notable that this option does not induce any change in the Alwyn Road queueing.
36. The results indicate that delivering the right turn bay on Main Street EB results in more free flowing traffic on this approach, which in turn results in less WB blocking. This, in turn, enables the right turn from Main Street WB into Lawford Lane to be more easily made due to the reduced friction.
37. On the basis of the analysis summarised above, this option is considered to deliver the greatest benefits of each option tested.

Option 4b – Right Turn Bay (Main Street WB)

38. This option comprises delivery of a segregated right turn bay on the Main Street WB approach to provide stacking space for traffic waiting to turn right from Main Street WB into Lawford Lane to reduce the blocking of the straight ahead movement on Main Street.
39. The modelling results indicate that this option, like Option 4a, delivers a significant improvement, with queues on Main Street WB reduced below the levels reported in the Base model. The modelling however, indicates a worsening of queues reported on the Main Street EB approach (compared with the Local Plan Do Minimum). As per Option 4a, this option also does not deliver any notable changes in queues reported on Alwyn Road.
40. A review of the model operation has indicated that delivering the right turn bay on Main Street WB significantly improves the queues reported on this approach, however, as it does not deliver any improvement for queues on the Main Street EB approach, Option 4a is considered preferable to this option.

Option 5 – Alwyn Road Widening

41. This option comprises widening the mouth of the Alwyn Road approach, splitting out the left, right and ahead movements into two lanes (left turn lane one, ahead and right lane two). The modelling indicates that this option does not significantly change the level of queues reported on the Alwyn Road approach, only a minor reduction

in queues is apparent and, furthermore, this option does not reduce any of the queues reported on the Main Street approach arms.

42. On this basis the option has been discounted.

Option 6 - Roundabout

43. This option comprises reconfiguration to a compact roundabout. Similar to the mini roundabout testing (Option 1), this option results in an improvement in queues on the Main Street WB approach but has a knock on effect of increasing queues on the Main Street EB approach. This option also does not have deliver any improvement in queueing on the Alwyn Road approach.
44. As this option worsens queue conditions on the Main Street EB approach it has been discounted at this stage.

Option Review Summary

45. Based on the results set out within this section, it has been determined that the delivery of a right turn bay on the Main Street EB approach to the junction (Option 4) delivers the most notable improvement in the level of queueing reported at the junction. As such it is recommended that this scheme is subject to further detailed design and feasibility review to confirm its deliverability.

Stage 3 - Detailed Traffic Flow Review

46. The final stage of this study is a review of the composition of future year traffic demand at the junction within the RWA 2031 Local Plan model.
47. This is intended to provide an indication of the relative impact that each of the allocated sites (alongside the Poets Meadow site) has on the junction. If the scheme is to be delivered on the basis of the cumulative impact then it may be necessary to collect contributions for the scheme delivery then the relative impact of each additional site provides a justifiable means for identifying an appropriate level of contribution.
48. The magnitude of trip generation derived from the SW Rugby Local Plan development sites, including the Poets Meadow site, has been identified and disaggregated to establish the volume of traffic demand at the junction associated with each specific development.
49. The sites considered for this stage of the assessment are highlighted within **Figure 4**. The resultant breakdown of modelled traffic flows through the junction generated by each site is then presented within **Table 5** for the AM and PM peak hour.

Figure 4 2031 Local Plan sites

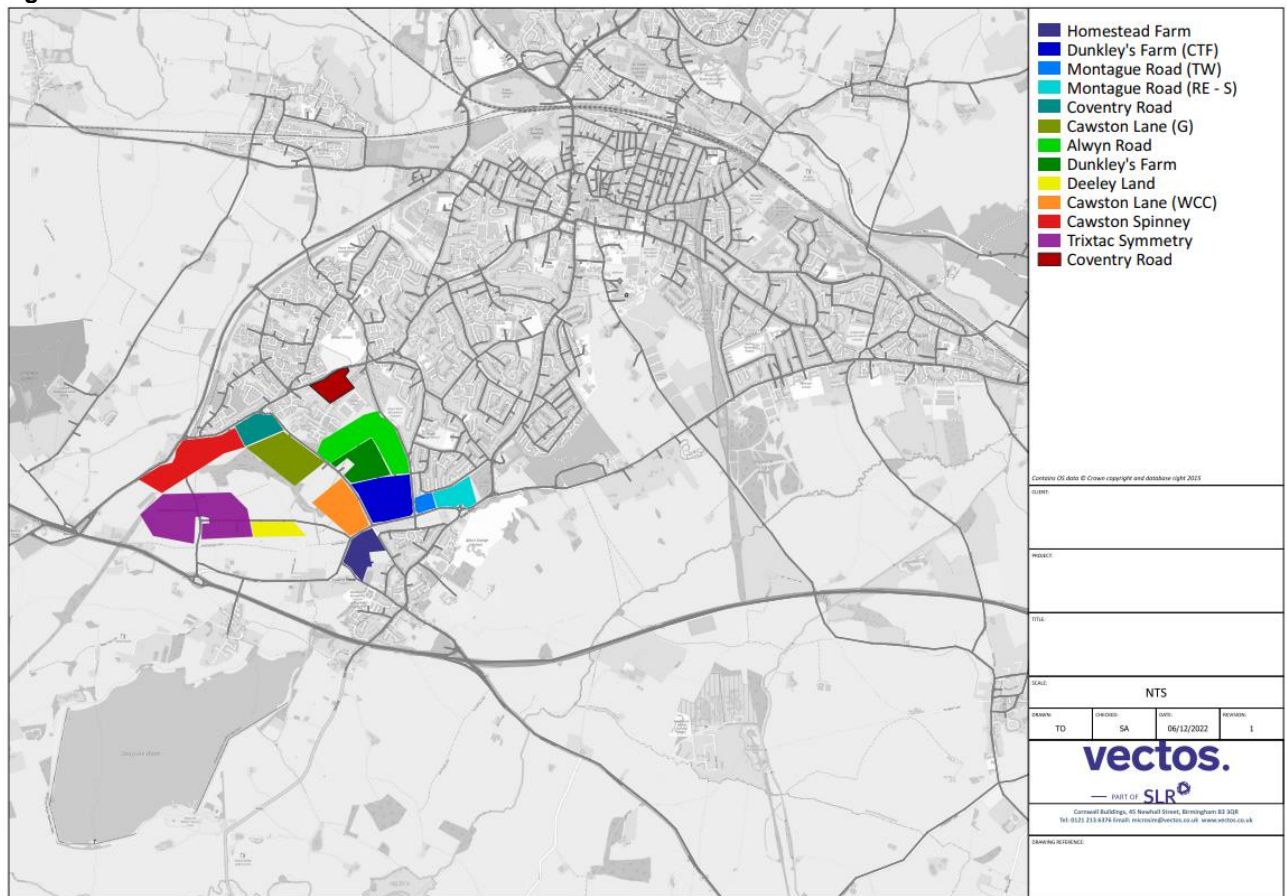


Table 5 2031 Local Plan Peak Hour Flows

	All Traffic (vehicles)	Local Plan Traffic (vehicles)	Local Plan Traffic (% of total traffic)
08:00 - 09:00	1702	525	30.84%
17:00 - 18:00	1610	392	24.37%

Traffic Flows (% of Local Plan Trip Totals)	Homestead Farm	Dunkley's Farm (CTF)	Montague Road (TW)	Montague Road (RE - S)	Coventry Road	Cawston Lane (G)	Alwyn Road	Dunkley's Farm	Deeley Land	Cawston Lane (WCC)	Cawston Spinney	Tritax Symmetry - Permitted	Tritax Symmetry - Allocated	Poets Meadow
08:00 - 09:00	1.5%	3.2%	0.3%	0.6%	20.8%	11.0%	23.4%	4.5%	1.6%	3.0%	7.8%	4.2%	3.6%	13.5%
17:00 - 18:00	1.3%	2.0%	0.1%	0.3%	11.2%	13.9%	26.8%	4.0%	1.4%	0.8%	12.4%	4.3%	3.7%	16.8%

50. **Table 5** provides a breakdown of traffic flows through the junction, extracted for the AM and PM peak hours from the 2031 RWA Local Plan model. The analysis has indicated that in the AM peak hour the Local Plan sites (inclusive of the Poets Meadow site) generate around 30% of all vehicular trips through the Alwyn Road junction, whilst in the PM this drops to approximately 25%. This equates to around 500 trips in the AM and 400 in the PM.
51. In terms of a breakdown of the Local Plan trips through the junction as a whole, the modelling indicates that the Poets Meadow site contributes 13.5% of these flows in the AM, and 16.8% of traffic in the PM.

52. This analysis indicates that the Poets Meadow site contributes the third highest proportion of Local Plan traffic through the junction, with only the Land off Coventry Road and the TW Alwyn Road sites contributing more trips.
53. On this basis it is clear that any impacts identified within the Local Plan scenario at this junction, although considered cumulative, can clearly be identified as being contributed to by the Poets Meadow site.

Summary & Conclusions

54. The analysis presented in this note considers the operation of the Alwyn Road/Main Street junction and specifically the impacts predicted to occur at the junction as a result of delivering consented and allocated development sites in the area.
55. The need for this analysis has also been driven by the recent transport work undertaken on behalf of the Poets Meadow residential site which identified queuing issues at the junction as a result of an isolated junction modelling approach.
56. This analysis completed via this study demonstrates that the operation of the junction remains consistent until demands associated with the allocated development sites are included. At this stage, the cumulative impact of delivering these sites clearly triggers the need for mitigation to alleviate the impacts at the junction.
57. This note has documented the testing of a number of concept schemes for the junction which has demonstrated that the preferred scheme comprises a right turning bay on the Main Street EB approach to the junction (Option 4a). This delivers a reduction in queuing on the Main Street EB approach, whereby right turning vehicles on this approach now can wait to make the turning movement without blocking the straight ahead movement. This scheme also benefits the Main Street WB approach, with less blocking back for the right turn movement into Lawford Lane now also occurring as a result of delivering the right turn bay on the opposite carriageway. It is important to note that this scheme does not necessarily remove all queueing impacts reported on the Alwyn Road approach to the junction but does still deliver an overall improvement at the junction.
58. It is recommended that this proposed scheme is now subject to more a feasibility review to ensure that it is deliverable within the confines of the highway boundary.
59. A final stage of analysis has been undertaken which provides a breakdown of traffic flows through the junction to provides an indication of the relative impact that each of the allocated sites (alongside the Poets Meadow site) has on the junction. If necessary this information can be used as a mechanism to determine prospective funding contributions to the scheme from each development identified within the Local Plan which contributes to the impacts at the junction.