

Project:	Highways Agency Spatial Planning Framework	Job No:	60043053
Subject:	Daventry Public Inquiry – Assessment of Flore-Weedon Bypass: Minimum Impedance ‘Buffer’ Test”	Date:	31 March 2009
HA ref:		Workstage:	R086602

Introduction

This technical note has been prepared to address outstanding SRN impact issues following submission of Faber Maunsell’s Technical Note dated 29th January 2009. The methodology employed for the necessary technical work to inform this process was developed in consultation with NCC, WNDC and the transport consultants of the three appellants, being circulated in draft format for comment prior to amendment and issue of the final version.

The additional technical work seeks to assess the scale of mitigation that could be expected at the A5/FWUH Bypass and M1 J16 by considering a maximum scale of realistic mitigation at the two junctions. This analysis, for the purpose of providing evidence to the inquiry, could replace the need to fully update the Arup transport model to DMRB/WebTag requirements at the current time.

The traffic flows for analysis took account of the Faber Maunsell 2026 Base Case plus demand flows predicted from the Arup model for the 2026 FWUH Reference and Scenario 1 cases. An examination of flow changes associated with the inclusion of the bypass was undertaken to establish the scale of existing trips along the A45/A5 corridors released by the bypass and the scale of potential redistribution of trips attracted by the inclusion of the bypass.

The determination of the design traffic flows used in the assessment was described in the technical note entitled “Flore-Weedon Bypass: Minimum Impedance ‘Buffer’ Test” distributed on 12th March 2009. These design flows take no account of specific development in Northampton, background traffic growth being considered through the use of growth factors only.

It should be noted that the assessment undertaken was purely technical and was not limited by deliverability factors.

Analysis

A5/Bypass Junction

An at grade roundabout was initially tested, however the size of junction required to accommodate the traffic was out of scale with the bypass proposals and required significant land take. Traffic on the A45 bypass was shown to queue extensively, therefore further testing was carried out assuming a traffic signalled controlled junction.

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This junction was modelled in Linsig and then designed in accordance with TD 50/04 “The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts”.

The junction was also modelled with uncontrolled left-turn slip lanes on the A5 Northbound and A5 Southbound. The Right turn from the bypass eastbound and westbound runs in separate stages due to significant volumes of ahead traffic.

The A5 approach arms have three lanes, two for ahead traffic and one for the right turns. The Flore Weedon Bypass also has three lane approaches, one for ahead and left, ahead and right turn flare. The flare lengths have been designed to accommodate queues on the approaches.

The Signalised junction modelled in LINSIG operates within capacity at 0.84 RFC for the A5 approaches. For the bypass approaches the junction operates slightly above the capacity with a highest RFC value of 1. However the installation of MOVA controlled signals is likely to further improve the performance of the junction, thus improving the performance of the junction.

As the traffic signal junction is shown to operate at capacity in this test, consideration was also given to a grade separated junction. It is believed that grade separation of the junction is feasible, as the embankment required to cross the WCML and Grand Union Canal could be extended to bring the A45 over the A5. Grade separation could then occur with a dumbbell style arrangement on the A5, in accordance with Figure 5/2 in TD22/06. Initial testing in Arcady has concluded that this arrangement would satisfactorily accommodate the traffic on the A5.

M1 J16

The scheme for M1 J16 was developed using a VISSIM model which had been previously prepared for the HA. The tested scheme consisted of full signalisation with widening on entries and the circulatory carriageway. The circulatory carriageway was increased to three lanes, plus both A45 approaches and the southbound off slip. The northbound off slip remains at two lanes but a free flow left slip has been incorporated into the design. MOVA signal control was incorporated into the VISSIM model to optimise junction performance with hurry calls triggered by loop detectors on the off M1 off slips. The scheme is shown on drawing no. 60043053/6602/J6/SIG. The discussion of the results presented in the section below is based on observation of the performance of the VISSIM model.

Discussion

The additional work reported here, was based on two documents, the methodology note, issued by Ian Braddock in final form on 12th March 2009, and the technical note entitled “Flore Weedon Bypass: Minimum Impedance ‘Buffer’ Test” distributed on 12th March 2009.

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The objective of the exercise was to determine if a technically acceptable scheme could be identified for the junction of the proposed bypass with the A5 and for M1 J16. To do this, “do maximum” flows were determined from a modified version of Arups transport model which predicted the maximum likely traffic flows along a FWUH Dual carriageway bypass in the absence of a transport model fully validated in the A5 and M1 corridors.

It must be borne in mind that this exercise is theoretical in nature and that it in no way replaces the need to develop a fully validated wider network traffic model in the future to determine the nature, form and scale of the bypass, its junctions and any further mitigation requirement at M1 J16. The exercise does however present a “worst case” assessment and it is considered that future technical work would identify modified schemes which would be of a lesser rather than greater scale than those identified here.

A5/bypass Junction

With regard to the A5/bypass junction, two options have been identified which would satisfactorily accommodate predicted “do maximum” flows. The signalised cross roads scheme shown on drawing no. 60043053/6602/J5A/SIGNALS would provide an acceptable level of capacity to both the A5 and the bypass provided it was MOVA controlled.

The use of signal control may however present a number of issues which would require further consideration including the maintenance requirements and consistency of junction type with those up and downstream on both the local and strategic networks. The grade separated junction shown on drawing no. 60043053/6602/J5A/RBOUT would resolve both of these issues and would provide acceptable levels of capacity but may present additional cost. It must be borne in mind however, that the design of the bypass is not sufficiently progressed to enable preferred junction types to be identified and that design considerations may yet preclude one or other of these junction types. The work does however demonstrate that a technically feasible solution exists.

M1 J16

With regard to M1 J16 (referred to elsewhere as J6), the scheme shown on drawing no. 60043053/6602/J6/SIG would provide an acceptable level of capacity for the M1 off slips.

The main difficulty is presented by the increase in right turn manoeuvres from the A45 (W) to M1 (S). This traffic conflicts with East to West A45 traffic movements at the top of the Southbound on slip. Although the identified signals layout can accommodate predicted future year traffic flow conditions, it becomes necessary to consider the ability of the M1 mainline to accommodate the resulting additional traffic flows.

According to information from the HA TRADS2 database, the M1 is currently operating, on average, within 24% of its capacity in peak hours. It is apparent however that flow on the M1 reaches capacity at times. Published growth factors predict a 29% increase in traffic flow between 2007 and 2026. This means that the M1 will be operating on an average day at its

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current capacity before the development of Daventry Town is taken into account. Hard Shoulder Running (HSR) is however being considered by the HA to provide improved future year network performance.

At present, J16 operates in such a way that the volume of traffic leaving the M1 at the junction is approximately equal, on average, to the volume of traffic joining. Therefore, provided the merges and diverges work satisfactorily, mainline flow is not an issue; the southbound flow on the M1 north of the junction is the same as that to the south of the junction. The transport model, however, predicts a change due to the scenario 1 development, such that the volume of southbound traffic leaving the M1 at J16 reduces and the volume of traffic joining increases. The net result is that the southbound flow increases by 872 vehicles per hour through the junction. Mainline flow could therefore be an issue for development scenario 1 and it is possible that the FWUH bypass would trigger the need for hard shoulder running on the M1.

In terms of merge operation, the current southbound merge is a type B parallel merge as defined by TD22/06 figure 2/4.1. Using Figure 2/3 MW of TD22/06 with the predicted future year mainline flows, this type of merge would be satisfactory for merging flows of no more than 600 vehicles per hour. The modelling work however, predicts a merging flow of 1671 vehicles per hour. It is clear therefore, that the predicted merging traffic flow could only be accommodated with hard shoulder running on the M1 mainline as this would enable the construction of a merge type appropriate to the predicted traffic conditions; type F lane gain with ghost island merges as defined by TD22/06 figure 2/4.4.

In summary, provided that the HA's plans for HSR are realised, it is technically feasible to improve M1 J16 to accommodate the predicted "do maximum" traffic flows.

Conclusion

This note sets out the additional technical work necessary to determine if a technically acceptable scheme could be identified for the junction of the proposed bypass with the A5 and for M1 J16. The work has identified that an acceptable scheme can be identified for the A5/bypass junction. In respect of J16, predicted traffic flows can not be fully accommodated by the junction or the M1 mainline. However, should the HA's plans for HSR be realised, then a satisfactory solution is achievable.

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