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INTRODUCTION

My task

- 1 Norwich and Norfolk Transport Action Group (NNTAG) have asked me¹ to examine the documentation relating to the Norwich Northern Distributor Route (NNDR) to review the work that Norfolk County Council (NCC) has done in the context of the questions set out in the next paragraph and advise whether or not the work has been done using appropriate methods, to appropriate standards and has produced reasonably realistic results.
- 2 The questions for investigation were as follows.
 1. The extent to which a NNDR would reduce congestion and rat running in the Norwich northern suburbs and at the same time facilitate major development and economic growth (e.g. a new urban extension of 7,000 houses in north-east Norwich and expansion of Norwich Airport).
 2. The traffic impact of a three quarters NNDR on the north-west suburbs.
 3. The extent to which a NNDR would result in induced traffic on the network in the order of 1.5%.
 4. The extent to which non-road building alternatives have been fully considered in order to meet stated objectives, i.e. reduce congestion in northern suburbs and facilitate economic growth.
- 3 An additional question related to 1 was whether a location to the east of Norwich for a new urban extension is better related to the transport network than a north-east Norwich location and could avoid the need for a NNDR?
- 4 An additional question related to 4 was whether the scope of Norfolk County Council's TIF bid for funds to examine various charging options that involve the NNDR should be widened to include an option without the NNDR?

¹ My credentials are summarised on the final page of this document.

My clients

5 This work for NNTAG has been conducted with funding contributions from:

- Norfolk Wildlife Trust;
- Norfolk Campaign for the Protection of Rural England;
- Norwich Friends of the Earth; and
- Manuka Fund.

The documents I have reviewed

6 I have been provided with a large number of documents relating to the NNDR. In the short time available to me, I have not been able to review all these documents and I have focused my attentions on the following reports:

- Norwich Area Transport Strategy, 2002 Traffic Model, Local Model Validation Report, prepared for Norfolk County Council by Mott MacDonald and dated July 2004;
- Norwich Area Transportation Strategy, Options Assessment Report, prepared by Norfolk County Council and Mott MacDonald and dated November 2004;
- Norwich Northern Distributor Road, Traffic and Economic Assessment Report, prepared for Norfolk County Council by Mott MacDonald and dated February 2005;
- Norwich Northern Distributor Road, Report by the Director of Planning and Transportation to Cabinet on 19 September 2005.

The scope of my comments

7 I have concentrated on matters of methodology. Nothing in this report should be construed as indicating my views either for or against the NNDR. I reserve the right to modify my views in the light of any further reading or any further relevant information brought to my attention.

The structure of my report

8 Following this introduction, my report sets out:

- a **summary** of my main findings and conclusions;
- a **summary** of my answers to the questions posed;
- my understanding of the history of the NNDR;
- my more detailed reviews of each of the documents listed above; and, lastly,
- more detailed answers to the questions asked of me.

SUMMARY OF MY MAIN FINDINGS AND CONCLUSIONS

The history of the Norwich Northern Distributor Route or Road

9 The recent history of the NNDR is hard to follow from the documentation available to me. However, it does seem that, around 2001, the concept of the NNDR regained favour with NCC and work to develop the scheme was commissioned, in parallel with the

commissioning of a review of the Norwich Area Transportation Strategy (NATS), and therefore in advance of the outcome of that review. The resulting documentation gives the impression that the concept of the NNDR was based on the rationale for the scheme put forward in the work done on the original NATS by Halcrow Fox, perhaps coupled with the idea that an NNDR would be needed to cater for the new developments emerging around the north of Norwich. As I will explain in more detail later, the Norwich Area Transportation Strategy Options Assessment Report dated November 2004 does look to me like an exercise to justify a pre-conception in favour of an NNDR.

The 2002 Traffic Model

- 10 The technical case for the NNDR is dependent on the forecast changes in travel demands, traffic flows and travel times that would result without and with the NNDR and associated traffic calming measures. These changes are the inputs to the appraisals of traffic operations, economic benefits (and therefore the benefit/cost ratio), and traffic-related environmental impacts (both beneficial and adverse). They are derived from the traffic model and therefore the quality of the traffic model is important for the robustness of these appraisals and therefore the soundness of the decision build the NNDR.
- 11 The development and validation of the 2002 Traffic Model is described in the Local Model Validation Report (LMVR) dated July 2004. While the 2002 Traffic Model appears to have been updated in accordance with many aspects of the advice set out in Volume 12 of the Highways Agency's Design Manual for Roads and Bridges (DMRB), there are some aspects of the DMRB advice that have not been followed and, as a result, I have some concerns about the quality of the resulting model, as follows.
- I am unclear about the accuracy of the modelling of congestion outside the main area of the model. The proportion of benefits which comes from the area outside the main area of the model should be identified to ensure that the benefit/cost ratio is not unduly reliant on information from this area.
 - I am unclear whether all the roadside surveys have been conducted in a neutral month and, if not, whether adjustments have been made to correct for the biases that would occur as a result of using surveys conducted during holiday periods.
 - The model covers only the morning and evening peak periods. While this means that the economic benefits cannot be estimated for this period and therefore the benefit/cost ratio will be under-estimated in this respect, it also means that traffic growth forecasts and the traffic-related impacts of the NNDR outside the peak periods cannot be assessed.
 - The peak period models do not meet the validation criteria set out in the DMRB. In addition, there is no separate validation of flows of light and heavy vehicles, as recommended in the DMRB, or validation of turning movements at key junctions, again as recommended in the DMRB.
 - The trip matrices have been derived to a large extent directly from roadside interview surveys and no attempt has been made to address the errors in the matrices due to sampling. These errors will have been carried through into the forecasts, with the result that trip matrix cells with either too few or too many trips in the base year will also have too few or too many in the future years.
- 12 The DMRB sets out the standards that, if met, will generally yield an acceptable model. However, it is generally impossible to estimate the effects of any deficiency without correcting the fault and comparing the new results with the old.

13 The true test of whether or not the model is fit for purpose is to assess the robustness of any decisions made based on the model output by assessing the sensitivity of the model output to changes in elements of the model (and its inputs). In this case, no tests of the sensitivity of the model output to aspects of the model itself appear to have been done. That said, the benefit/cost ratio does appear to be quite high, although I have seen appraisals recently where the benefit/cost ratio has changed quite markedly as the work has been refined.

The Norwich Area Transportation Strategy Review

14 The Options Assessment Report (OAR) of November 2004 appears to be the main record of the technical work of the review of the Norwich Area Transportation Strategy. At first glance, the general approach adopted in this OAR follows the approach recommended in the Guidance on the Methodology for Multi-Modal Studies (GOMMMS), now the Department for Transport's Web-based Transport Analysis Guidance (WebTAG, www.webtag.org.uk). However, on closer inspection, there is much to criticise.

15 The general approach which has been adopted is as follows:

- problems and issues have been identified;
- aims and objectives have been set;
- interventions have been assessed on the basis of judgement and reasoned argument; and
- four alternative strategies have been subjected to more detailed assessment using the transport model.

16 Each one of these four stages can be criticised in some detail. However, at this stage, I have kept my comments at a fairly high level.

17 In my view, the OAR appears to have been written with the main aim of proving that the NNDR is required. This work seems to have been undertaken in parallel with work to develop options for the NNDR and after NCC's endorsement of the Shaping the Future Strategy which included an aspiration for the NNDR.

18 **Problems** have generally **not** been identified in an objective fashion in accordance with the advice in WebTAG. In particular, the **causes** of the problems have not been analysed.

19 While the NATS **objectives** are structured under the Government's objectives for transport, as advised by WebTAG, some of them include some solutions and preclude others, which is **at variance** with the above advice in WebTAG. In my opinion, the objectives should stop short of specifying any kind of solution because to do so may automatically preclude from consideration those solutions not specified.

20 In my opinion, the implications of Government policy for the development of solutions to road traffic problems are that potential solutions should be considered **in the following order**:

- first, measures to reduce the number of motorised journeys, especially by car;
- secondly, measures to increase use of alternatives to the car, including public transport improvements;

- thirdly, measures to make best use of the available road capacity; and, **as a last resort**,
 - infrastructure schemes to provide new road capacity.
- 21 It follows from this policy framework that starting the review of potential interventions with new road construction, and the NNDR in particular, as adopted in the OAR, is the wrong approach. Not only does it appear that the OAR is really a vehicle for promoting the NNDR rather than a dispassionate review of ways of solving Norwich's transport problems, but **the need for an NNDR in a scenario where traffic demand is much reduced is not considered**.
- 22 While the majority of the assessments provided in the OAR are uncontroversial, albeit somewhat brief, the assessment of road pricing is misleading. In my view, road pricing offers one of the most effective tools for addressing urban traffic congestion and the OAR shows unwarranted prejudice against the concept, especially bearing in mind Government's attempts through the Transport Innovation Fund to encourage local authorities to implement road pricing schemes.
- 23 The OAR sets out the following four alternative strategies:
- Northern Distributor Road and complementary transport measures;
 - Orbital bus route with associated management measures;
 - Light rapid transit scheme with associated traffic management measures; and
 - Measures to encourage modal shift to sustainable modes of transport.
- 24 Because the OAR does not include a comprehensive analysis of current and future problems and their causes, it is hard to see whether the four alternative strategies identified in the OAR all stand a reasonable chance of ameliorating the problems and achieving the objectives to a broadly similar degree. If the alternative strategies are not designed towards the same end, then some must appear to be less successful than others, especially bearing in mind that some of the objectives appear to favour some strategies and rule out others.
- 25 Given the nature of the four alternative strategies, and the way that the objectives are specified, it is not surprising that the conclusion is reached that the preferred strategy should include the NNDR. In my view, the case has not been proven in a satisfactorily objective manner.

Traffic and Economic Assessment

- 26 In my view, the assessment of the NNDR as described in the Traffic and Economic Assessment Report (TEAR) of February 2005 has some deficiencies.
- 27 Use of the Department of Transport's TEMPRO growth factors as controls on total growth at the study or modelled area level is recommended practice and, therefore, to this extent, the forecasting procedure adopted is compliant with guidance. However, it is good practice to identify the development sites and the scale and timing of the development for each site, and to use this information to disaggregate the study area TEMPRO forecasts in a manner which will reflect where the growth in traffic is likely to occur. This approach is likely to produce a geographically more specific forecast than the approach which seems to have been used. In addition, the date of the TEAR suggests that account has **not** been taken of any differences between the developments assumed or implicit in the TEMPRO forecasts used, on the one hand, and the latest development proposals, as set out in the Draft East of England Plan.

- 28 In my view, the method used to estimate **induced traffic** did **not** comply with the Department of Transport's Variable Demand Modelling Advice (VaDMA) which was current at the time that the work was done. However, even if my interpretation of the guidance is disputed, the method used is specifically **not** recommended in the latest guidance published in WebTAG. My judgement is that the method used is likely to have under-estimated induced traffic and therefore over-estimated the user benefits and therefore the benefit/cost ratio.
- 29 The proposals to introduce traffic calming on the minor and residential roads in northern Norwich accord with the Department for Transport's commitment to the policy of '**locking in**' the benefits of road schemes, as confirmed in 'The Future of Transport: a network for 2030'.
- 30 The approach adopted towards the **economic appraisal** seems generally to conform with WebTAG advice, except that benefits have been calculated for weekday peak periods only, that is, the benefit/cost ratios exclude the benefits which would accrue in the weekday inter-peak and off-peak periods and at weekends. In this respect, the benefit/cost ratios will be under-estimates. Also, the use of data for the average hours in the peak periods will tend to lead to under-estimates of congestion and therefore also under-estimates of benefits and the benefit/cost ratio.
- 31 From the information presented, I cannot tell what assumptions have been made to extrapolate the benefits from the last modelled year (2025) to cover the full appraisal period up to 2069 (assuming 2010 is year one). I also cannot tell what contribution the benefits from 2025 to 2069 make to the overall benefits and therefore how robust the benefit/cost ratio is to alternative assumptions for extrapolating the benefits over the full appraisal period.
- 32 In the light of the Government's general interest in developing a **national road pricing system**, it would be prudent, in my view, to consider the impacts of such a system on the case for the proposed NNDR, in order to consider whether the costs of providing infrastructure, which may, in the event of road pricing, prove to be unnecessary, could and should be avoided. This would be consistent with the undertaking given by the Government in relation to road schemes emerging from the Multi-Modal Studies.

SUMMARY OF MY ANSWERS TO THE QUESTIONS POSED

- 33 **Question 1.** The extent to which a NNDR would reduce congestion and rat running in the Norwich northern suburbs and at the same time facilitate major development and economic growth (e.g. a new urban extension of 7,000 houses in north-east Norwich and expansion of Norwich Airport).

An additional question related to 1 was whether a location to the east of Norwich for a new urban extension is better related to the transport network than a north-east Norwich location and could avoid the need for a NNDR?

My answer: According to the TEAR of February 2005, the **full** NNDR would reduce traffic on some of the roads in the northern suburbs of Norwich (mainly the orbital roads, both major and minor) and increase traffic on others (mainly the radials which would connect with the NNDR), with the scale of the reductions depending on the alignment option of the NNDR. With the better-performing options, flows on some roads could be below 2004 levels.

The forecasts of the use of the NNDR and the relief to the existing roads have been based on the assumption that traffic calming would be introduced on the minor roads in Norwich. This means that the traffic calming would need to be introduced to ensure that the forecast levels of relief did materialise.

I am currently unclear what assumptions have been made, in preparing the traffic forecasts, about the scale and locations of future development. My reading of the TEAR is that the TEMPRO growth forecasts have been applied as published by the Department for Transport and without necessarily specifically reflecting the growth at the particular locations noted in the question. NNTAG should seek clarification of the assumptions made about future developments in preparing the traffic forecasts.

The scale of the relief afforded on roads in the northern suburbs will depend on the scale of new developments that occur in the vicinity of the NNDR and the amount of traffic that is generated by such developments which would use the NNDR. The greater the use of the NNDR by traffic generated by new developments, the less will be the relief afforded to the northern suburbs.

In principle, further model runs are required to show the relationship between the scale of development adjacent to the NNDR and the relief afforded to the northern suburbs. Given that a three-quarters NNDR plus traffic management in Taverham and Costessey is now the preferred approach, the tests should obviously be conducted on this basis.

34 **Question 2.** The traffic impact of a three quarters NNDR on the north-west suburbs.

My answer: From the information available to me, it is hard to judge the impacts of the three-quarters NNDR on the minor and residential roads in the northern suburbs. No information appears to be available about the traffic management measures now proposed in Taverham and Costessey or the consequences for traffic flows in the area. In my view, NNTAG should request plots of the traffic flow changes that are forecast to arise with the three-quarters NNDR.

My understanding is that these forecasts have been made on the assumption that some traffic calming will be implemented on the minor and residential roads in northern Norwich (but not in Taverham and Costessey). NNTAG should request details of these assumptions, as they will influence the scale of the forecast traffic reductions on these roads.

35 **Question 3.** The extent to which a NNDR would result in induced traffic on the network in the order of 1.5%.

My answer: In my opinion, based on the TEAR of February 2005, induced traffic is likely to have been incorrectly estimated.

36 **Question 4.** The extent to which non-road building alternatives have been fully considered in order to meet stated objectives, i.e. reduce congestion in northern suburbs and facilitate economic growth.

An additional question related to 4 was whether the scope of Norfolk County Council's TIF bid for funds to examine various charging options that involve the NNDR should be widened to include an option without the NNDR?

My answer: In my opinion, the OAR of November 2004 appears to have been written with the main aim of proving that the NNDR is required and I am not therefore convinced by the OAR that a dispassionate and unbiased analysis has been carried out.

Of particular note in the OAR is that road pricing has been played down and its potential has not been fully and fairly considered. The impacts of a city-wide road pricing system ought to have been considered and modelled, and the need for the NNDR assessed in the light of the resulting traffic levels.

THE HISTORY OF THE NORWICH NORTHERN DISTRIBUTOR ROUTE OR ROAD

37 My understanding of the history of the scheme is as follows.

- 1992: The NNDR formed part of the Preferred Transport Strategy identified by Halcrow Fox and Associates.
- June 1992: The Halcrow Fox recommendations were adopted by Norfolk County Council (NCC) with the exception of the NNDR and associated environmental protection areas (in the northern suburbs).
- 1994: The public were consulted on the NNDR as part of a review of the Norfolk Structure Plan. While the majority of the respondents supported the NNDR, there were strong objections on environmental grounds to parts of the route.
- 1996: NCC abandoned the NNDR because the environmental impacts in the Wensum Valley were considered to be unacceptable, and because national policy had begun to change towards a presumption against providing additional highway capacity and less money was available for road schemes.
- 1999: Norfolk Structure Plan was adopted without the NNDR.
- 8 November 2000: NCC's Strategic Planning and Transport Review Panel received a report on the NNDR which noted in paragraph 1.1 that: "*Recent developments...have led to some requests that the possibility of a northern orbital route for Norwich be reviewed.*".
- 2001: Shaping the Future Strategy was published by the Shaping the Future Partnership². This report, signed by the Chief Executive of Norfolk County Council as Chair of the Management Board and by the Managing Director of Norwich International as Interim Chair of the Stakeholder Forum, included an aspiration for the NNDR (page 46).
- 19 September 2001: The Shaping the Future Strategy was endorsed by NCC, thereby apparently endorsing the concept of an NNDR, despite no change in the Government's policy of a presumption against providing additional highway capacity.

² I am told that this report was published in 2001; the report itself does not appear to be dated.

- 15 October 2001: A report by the Director of Planning and Transportation to NCC's Planning and Transportation Review Panel explained the need for a review of the NATS. This reported that Members had requested an assessment of the feasibility of constructing an NNDR. The Panel endorsed the review of NATS and the parallel work on the NNDR and commended the report's recommendations to Cabinet on 21 November 2001.
- December 2001: Work to assess possible NNDR options was commissioned by NCC. The Environmental Assessment Report for the NNDR published in 2003 explained that: "*The need for a road (the NNDR) will be considered as part of the review of the NATS strategy (sic) and can be examined in the issues consultation for the Structure Plan (review). However, Members have already agreed to reconsider a NNDR should this emerge as a chosen strategy from the NATS study.*".
- 18 August 2003: A report by the Director of Planning and Transportation to NCC's Cabinet explained that "*The original Norwich Area Transport Strategy in 1994, identified problems that could be overcome by providing more road capacity in the northern part of the city. This was identified as having the following environmental benefits:*
 - *relief of congestion on main roads;*
 - *reduce the use of residential estate roads by through traffic;*
 - *provision of schemes to improve people's environment and safety;*
 - *provision of more dedicated priorities for buses and cyclists.*
 - *significantly reduce accidents on the existing road network north of Norwich*

These problems still exist and a Northern Distributor Road is therefore an important element of the preferred strategy in the present review of NATS". This reads as though the NNDR was being taken as a given element of NATS prior to completion of the Options Assessment Report which was published in November 2004.

- 2003: The Environmental Statement for the NNDR was published and the public were consulted (October to December).
- 21 June 2004: A report by the Director of Planning and Transportation to NCC's Cabinet on the consultation results said that: "*It is recommended that an NDR be taken forward as a significant part of the revised strategy, with the route and standard to be determined following further consideration of alternative routes. The need for an NDR can be justified on a number of counts:*
 - *There was good support for it in the consultation*
 - *It has a positive economic rate of return*
 - *It makes other parts of the strategy easier to deliver, including improving public transport*
 - *It will improve strategic access from the north of Norfolk/Norwich, including Norwich international airport, to the main road network*
 - *With other measures, constrain traffic using unsuitable minor and residential roads around the north of Norwich*
 - *Helps cater for the growth that will happen within and around Norwich.*".
- November 2004: Norwich Area Transportation Strategy Options Assessment Report was produced. This purported to review transport problems in Norwich and consider options for ameliorating those problems and meeting the County Council's objectives for transport. The report identified four alternative strategies, one of which included the NNDR, with the other three not including this scheme. This report concluded that

the NNDR was the only option that “answers the majority of these concerns”, namely, “the problems and issues identified”.

- 19 September 2005: A three-quarter NNDR, from the A47 at Postwick to the A1067 Fakenham Road, was adopted by NCC.
- 8 May 2006: NCC’s Cabinet discussed proposals for traffic management measures in Taverham and Costessey. The Cabinet Report states, in paragraph 1.4: “In adopting the preferred route, Cabinet and local members raised some concerns over the residential impact in the Taverham/Costessey area and agree that officers should look at ways of relieving the pressure on existing roads across the Wensum through traffic management measures when the NDR is built.”. I am unclear whether these traffic management measures are intended to address the problems that would arise because of the three-quarters NDR or that would arise in any event.

38 The recent history of the NNDR is not easy to follow from the documentation available to me. I am unable to open any of NCC’s Cabinet papers on the County Council’s website with dates after June 2005 and so cannot check what was said in any papers since that date other than 8th of May report quoted above which was sent to me by NNTAG.

39 However, it does seem that, around 2001, the concept of the NNDR regained favour with NCC and work to develop the scheme was commissioned, in parallel with the commissioning of a review of the NATS, and therefore in advance of the outcome of that review. The resulting documentation gives the impression that the concept of the NNDR was based on the rationale for the scheme put forward in the work done on the original NATS by Halcrow Fox, perhaps coupled with the idea that an NNDR would be needed to cater for the new developments emerging around the north of Norwich. As I will explain in more detail later, the Norwich Area Transportation Strategy Options Assessment Report dated November 2004 does look to me like an exercise to justify a pre-conception in favour of an NNDR.

NORWICH AREA TRANSPORT STRATEGY, 2002 TRAFFIC MODEL, LOCAL MODEL VALIDATION REPORT, JULY 2004

40 The technical case for the NNDR is dependent on the forecast changes in travel demands, traffic flows and travel times that would result without and with the NNDR and associated traffic calming measures. These changes are the inputs to the appraisals of traffic operations, economic benefits (and therefore the benefit/cost ratio), and traffic-related environmental impacts (both beneficial and adverse). They are derived from the traffic model and therefore the quality of the traffic model is important for the robustness of these appraisals and therefore the soundness of the decision build the NNDR.

The nature of the local model

41 The Local Model Validation Report (LMVR) describes the development and validation of a road traffic **assignment** model **only**. It does **not** deal with procedures for forecasting either changes in demand over time or responses to interventions to the transport system, that is, it does not describe the ‘variable demand modelling’ procedures that are required to estimate induced traffic. Neither does the report describe a public transport model which would be required for the assessment of public transport options.

The degree of compliance with guidance

42 In my opinion, the 2002 Traffic Model appears to have been updated in accordance with many aspects of the advice set out in Volume 12 of the Highways Agency’s Design Manual for Roads and Bridges (DMRB). That said, there are some aspects of the DMRB

advice that have not been followed and, as a result, I have some concerns about the quality of the resulting model, as explained below. The various points are discussed in the order encountered in the LMVR and then summarised at the end of this section.

A query about the surveys

- 43 Figure 3.1 in the LMVR shows the locations at which roadside interview surveys were conducted for construction of the trip matrices. Unfortunately, the key does not explain the grey sites. If surveys were not conducted at these sites, then there would be some substantial deficiencies in the data collected. I presume that this is not the case as there is no mention in the text of such a problem.

A comment about the way in which congestion has been modelled outside the main area of the model

- 44 Chapter 4 of the LMVR deals with the coding of the highway network. Paragraph 4.1.1 says that: *“In the buffer area of the model, all roads have been assigned speed-flow curves based on the COBA10 default speed-flow curves for the appropriate class of road.”* As explained in the fifth paragraph in Section 3.1 of the LMVR, the model does not contain all the trips which would use the buffer network. Thus, the congestion levels on the buffer network will not be realistic, given that the speeds will have been determined using the speed/flow relationships and the **partial** trip data in the model. This means that the changes in congestion in the buffer network as a result of the schemes being tested will not be correct. To allay concerns that this issue could be affecting the economic benefit estimates to a material degree, it would be useful to assess the extent to which the economic benefits are due to modelled changes in congestion on the buffer network. One useful analysis would be to show the patterns of trips using the various sections of the NNDR so that the proportion of the total trips which would be attracted to the NNDR from outside Norwich, and which would use the buffer network in the absence of the NNDR, could be identified.

A query about the source of the modelled speeds in the main modelled area

- 45 Paragraph 4.1.1 goes on to say that: *“Within the simulation area, journey times are governed principally by delays at junctions. As such, simulation links have been assigned average journey speeds based on free-flow conditions...”*. This is in accordance with DMRB 12.2.1, paragraph 14. However, the source of the *“average journey speeds based on free-flow conditions”* is not stated and, while the advice in DMRB is not particularly clear on this point, one source of realistic traffic speeds between the queues at junctions that could have been used is the journey time surveys.

A query about the timing of the roadside interview surveys

- 46 Section 5.2 in the LMVR, fourth paragraph, says that: *“The origin and destination surveys were undertaken during the neutral survey days in October 2001 and Summer 2002.”*. DMRB advice (in Volume 12, Section 2, Part 1, paragraph 3.1.4) is that surveys should be conducted during neutral months, normally in the Spring and Autumn, and avoiding holiday periods and local school holidays. Surveys conducted during the “Summer” are likely to be atypical due to resident employees and schoolchildren being on holiday and the influx of visitors during the holiday season; traffic volumes, travel patterns and trip purpose splits could all be affected. I am unclear when the surveys were actually carried out; if it turns out that some surveys were conducted outside the usual neutral months, I would expect to find an explanation of how the possible biases have been corrected. According to page 14 of the LMVR, the Survey Report of May 2003 gives the dates of the surveys, so this point can be checked to an extent.

The absence of an inter-peak model

- 47 Chapter 11 of the LMVR presents the validation of the modelled traffic flows. However, no information is provided for the inter-peak period. The Executive Summary states that the “*report will be re-issued to include reporting on the interpeak once the modelling work is complete.*”. Clearly, until the inter-peak model is available, the appraisals will be incomplete, especially those, such as noise and air quality, which require traffic data for the full day.

The lack of evidence about the validation of the modelled half-hour periods

- 48 Section 6.5 explains that the model has been set up to represent four half-hour periods in the morning peak and five half-hour periods in the evening peak, with the queues remaining at the end of one half-hour being used as the starting point for the next half-hour. Thus, the whole peak periods have been modelled and the variations in traffic levels and congestion within those peak periods have also been modelled. This accords with DMRB advice (in 12.2.1, Appendix D). Section 11.1 of the LMVR makes it clear that the validation of the model has been undertaken at the period level rather than at the half-hour level and again this accords with DMRB advice. However, no evidence is provided in the LMVR that the model is correctly modelling traffic flows and congestion in each half-hour period; in my opinion, this is necessary for confidence to be gained that the model will behave appropriately in forecasting and that the complexity of the linked half-hour models (as opposed to the more usual peak hour approach) has been worthwhile.

A comment on the quality of the peak period flow validations

- 49 While the screenline validation does meet the DMRB criteria, the individual link flow validation fails by some margin: for all counts available, the model achieves a 69% pass rate in the morning peak period and a 67% pass rate in the evening peak period, compared with the DMRB acceptability guideline of 85%; for a sub-set of the available counts, these figures are marginally improved. These validations appear to apply to the whole of the peak periods – two hours in the morning and two and a half hours in the evening – and say nothing about the quality of the model in the half-hour periods actually being modelled.

A comment on the absence of validation information by vehicle type

- 50 Table 7-1 shows the generalised cost assignment parameters for light and heavy vehicles separately, and this table and the preceding text suggest that light and heavy goods vehicles were assigned separately. However, no comparisons between the modelled flows and counts by vehicle type appear to be provided. This is contrary to the advice given in DMRB, Volume 12.2.1, paragraph 4.4.38 which says: “*All of the above validation comparisons should be carried out separately for each time period being modelled...and with link flow comparisons being made for each vehicle type included in the model.*”. This is unfortunate because the nature of the assignment algorithm is such that, while an acceptable validation may result at the total flow level, it is quite possible for the underlying validation by vehicle type to be unacceptable.

A comment on the absence of validation information for turning movements at key junctions

- 51 The LMVR says, under Table 11-4: “*DMRB recognises that the accuracy of modelled turning flows is generally much less than that of modelled link flows. The turning counts and modelled flows have therefore been aggregated to link data...*”. However, DMRB, Volume 12.2.1, paragraph 4.4.36 says: “*In urban areas the performance of the model in reproducing the operating characteristics of road junctions is also very*

important...Comparisons should be made between modelled turning flows and observed turning counts at key junctions...". This level of validation is not reported in the LMVR; indeed, the turning movement counts have been aggregated to link counts and the validation undertaken at that much less demanding level.

A comment on the quality of the peak period journey time validations

- 52 Chapter 12 of the LMVR presents the journey time validation. At the high level presented there, the model appears to meet the DMRB criteria. However, inspection of the more detailed comparisons between the observed and modelled journey times in Appendix L shows that the model is not as good as might be thought from reading Chapter 12.

Some concerns about the quality of the trip matrices

- 53 One of the reasons for the less than adequate validation may well be the quality of the trip matrices. I have already noted one concern about the trip matrices, namely that some of the surveys may not have been conducted at a neutral time of year, with the result that some parts of the trip patterns may have been atypical. My second concern is the way in which data from the various survey sites have been combined, as explained in Section 6.4.5 in the LMVR. In essence, information for any one movement has been taken from one site only, even in cases where information about that movement is available from more than one site. The errors in the estimates of trip movements (trip matrix cell values) derived from any one site (due to sampling) will often be substantial and can be reduced by using information from more than one site, where available. Methods are available for taking account of the variations in accuracy of the surveys and, in my opinion, could have been used with benefit in this case.
- 54 My main concern, however, is that the majority of the trips in the final matrices have been taken directly from the survey data. While this is in accordance with DMRB advice (in 12.2.2, Section 4.3), it does mean that errors in the trip estimates due to sampling will remain and be carried through into the forecasts. Because trip estimates have been derived mainly from one site only, the resulting patterns are likely to be such that any trip matrix cells for which movements were made but not intercepted in the surveys would be recorded as zero and would remain as zero throughout the model building and forecasting process. Given that, typically, only around 20% or less of the trips will have been intercepted (the Survey Report should state the actual sample rates achieved), the resulting matrices could be quite distorted, even though the intercepted trips will have been expanded to the correct total traffic count. There is a growing acceptance among the profession that this particular aspect of DMRB advice ought to be reviewed.

In summary

- 55 While the 2002 Traffic Model appears to have been updated in accordance with many aspects of the advice set out in the DMRB, there are some aspects of the DMRB advice that have not been followed and, as a result, I have some concerns about the quality of the resulting model, as follows.
- I am unclear about the accuracy of the modelling of congestion outside the main area of the model. The proportion of benefits which comes from the area outside the main area of the model should be identified to ensure that the benefit/cost ratio is not unduly reliant on information from this area.
 - I am unclear whether all the roadside surveys have been conducted in a neutral month and, if not, whether adjustments have been made to correct for the biases that would occur as a result of using surveys conducted during holiday periods.

- The model covers only the morning and evening peak periods. While this means that the economic benefits cannot be estimated for this period and therefore the benefit/cost ratio will be under-estimated in this respect, it also means that traffic growth forecasts and the traffic-related impacts of the NNDR outside the peak periods cannot be assessed.
 - The peak period models do not meet the validation criteria set out in the DMRB. In addition, there is no separate validation of flows of light and heavy vehicles, as recommended in the DMRB, or validation of turning movements at key junctions, again as recommended in the DMRB.
 - The trip matrices have been derived to a large extent directly from roadside interview surveys and no attempt has been made to address the errors in the matrices due to sampling. These errors will have been carried through into the forecasts, with the result that trip matrix cells with either too few or too many trips in the base year will also have too few or too many in the future years.
- 56 The DMRB sets out the standards that, if met, will generally yield an acceptable model. However, it is generally impossible to estimate the effects of any deficiency without correcting the fault and comparing the new results with the old.
- 57 The true test of whether or not the model is fit for purpose is to assess the robustness of any decisions made based on the model output by assessing the sensitivity of the model output to changes in elements of the model (and its inputs). In this case, no tests of the sensitivity of the model output to aspects of the model itself appear to have been done. That said, the benefit/cost ratio does appear to be quite high, although I have seen appraisals recently where the benefit/cost ratio has changed quite markedly as the work has been refined.
- 58 I understand that the traffic model is currently being updated.

NORWICH AREA TRANSPORTATION STRATEGY, OPTIONS ASSESSMENT REPORT, NOVEMBER 2004

- 59 The Options Assessment Report (OAR) dated November 2004 appears to be the main record of the technical work of the review of the Norwich Area Transportation Strategy.
- 60 At first glance, the general approach adopted in this OAR follows the approach recommended in the Guidance on the Methodology for Multi-Modal Studies (GOMMMS), now the Department for Transport's Web-based Transport Analysis Guidance (WebTAG, www.webtag.org.uk). However, on closer inspection, there is much to criticise.

The general approach adopted

- 61 The general approach which has been adopted is as follows:
- problems and issues have been identified (in Chapter 2);
 - aims and objectives have been set (in Chapter 3);
 - interventions have been assessed on the basis of judgement and reasoned argument (in Chapter 4); and
 - four alternative strategies have been subjected to more detailed assessment using the transport model.

62 Each one of these four stages can be criticised in some detail. However, at this stage, I have kept my comments at a fairly high level.

Some criticisms of the ways in which problems have been identified and problem causes analysed

63 The problems are summarised in Section 12.2. In my opinion, this is a poorly structured and unconvincing list. The approach that should have been followed is set out in WebTAG Unit 2.2, Section 1.6 of which says that:

“Problems may be identified in a number of ways, including:

- *by **consulting** people about their perceptions of the problems, both those that they encounter when travelling and those which result from other people travelling;*
- *by **consulting** representatives of the regional and local authorities and the transport providers to gain an understanding of the transport and planning professional’s perceptions of problems with the transport system (...);*
- *by conducting **audits** of specific elements of the transport system in order to gain a deeper understanding of the roles performed and to analyse the extent to which the expected aims are not met; and*
- *by **objective analysis** of problems through analysis of outputs from the transport model in comparison with thresholds so as to enable the geographic display of the worst conditions on a consistent numerical basis across the study area.”*

*“The first two methods are essentially parts of the **consultation** step of the studies.... People will naturally have more reliable views about current problems than those predicted to occur at some future date. Problem identification through consultation is therefore of most use in the base or current year.”*

*“**Audits** can be useful ways of exploring in some depth particular aspects of the transport system. Again, however, their focus is on the current situation and past history so that trends can be identified, rather than on speculations about the future.”*

*“**Objective (or systematic) analysis** of problems lies at the heart of the problem-oriented approach to transport planning. A comprehensive list of types of problem can be achieved using the framework provided by the Government’s five criteria or objectives.”*

“Objective analysis of problems requires the adoption of thresholds. The idea is that when a condition is measured or predicted to differ from a threshold, then a problem is said to exist.”

“The strengths of the approach in which problems are identified using an objective or systematic analysis are that it enables:

- *problems to be identified across the study area on a consistent basis, on a geographical background for ease of appreciation;*
- *problems to be identified for the future years on the same basis as the base year (and these can be validated against local people’s opinions through consultation); and*

- *the effectiveness of the option being tested can be assessed by checking how well the problems at which the intervention was aimed would be ameliorated.*

“It is crucial to recognise that this approach may only show problems as symptoms. Some analysis of the underlying causes of the problems should always be considered. For example, it should not be assumed that a congestion problem can be solved by adding extra capacity at the location concerned. Other solutions, such as traffic reduction measures or road improvements elsewhere to take through traffic away from the problem area, may be more appropriate and may only be revealed by analysis of the causes of the problem.”

- 64 It does not appear that this approach has been adopted and no justification is given for the variant approach employed. Note that the approach adopted in the Norwich Area Transportation Strategy reported in June 1992 **did** adopt the approach since advised in WebTAG (although that is not to say that that analysis could not have been improved upon too).
- 65 Section 2.1 of the OAR says that: *“This summary is based on the report “Transport Related Problems and Issues in the Norwich Area” produced by Norfolk County Council. An outline of the population and growth pressures on the NATS area is followed by a review of problems and issues by transport mode.”* While it is possible that the report referred to here does present a compliant analysis, the text which follows in the OAR, which purports to summarise the report referenced, makes little or no mention of scale the problems that will be experienced in the future, under each of the Government’s criteria or objectives for transport, as would have been expected had the WebTAG advice been followed. In some of the few instances where problem scales have been quantified, reliance has been placed on the work reported in 1992 rather than up-to-date analysis using the new model.
- 66 Moreover, by considering the problems on a mode by mode basis, the focus is on the deficiencies of the modes, regardless of whether improvements to the individual modes would address the problems identified under each of the Government’s objectives for transport.
- 67 Furthermore, there is no analysis of the **causes** of the problems, as advised in paragraph 1.6.11 in WebTAG Unit 2.2.
- 68 In one instance (road safety in Section 2.3.2), the merits of the NNDR are quoted which seems highly out of place in a chapter on problems and issues and suggestive of a prejudice in favour of the NNDR being an appropriate solution.
- 69 In my opinion, the problems analysis, as presented, does not provide a convincing basis for the consideration of solutions.

Some criticisms of the NATS objectives

- 70 Turning now to the aims and objectives in Chapter 3, a set of NATS objectives is presented under the framework of the Government’s objectives for transport. Section 1.4 of WebTAG Unit 2.2 offers the following advice:

“The five criteria or objectives of Central Government ... are very broad and may not fully reflect the specific regional and subregional circumstances of individual studies. More specific objectives need to be set at the regional level through Regional Planning Guidance/Regional Transport Strategies.... Among other things, this sets priorities for transport investment across all modes, to support the objectives of the spatial strategy for the region. Outputs from the regional planning process should include integrated

planning and transport proposals and objectives for both the major transport corridors and major urban areas. Studies must reflect these strategic priorities and objectives for future land uses, and show how transport options can support them. Steering Groups are also free to set out other study-specific objectives as they see fit.”

“The sources for study objectives could include:

- *regional planning guidance;*
- *local transport plans;*
- *development plans;*
- *the plans of transport providers in the study area; and*
- *aspirations of local groups.”*

*“However, it is important that these **objectives** should be fully up to date; they must:*

- *all ‘nest’ within the Government’s five main objectives, with no local or regional objectives lying outside the framework provided by the Government’s objectives; and*
- *avoid at all costs indications of preferred solutions as these may then cause other better solutions to be overlooked in the process of establishing a strategy or plan.”.*

71 In Chapter 3 of the OAR, we find no reference to regional objectives and therefore to how the NATS objectives fit within the objectives proposed in the Draft East of England Plan.

72 While the NATS objectives are structured under the Government’s objectives for transport, as advised by WebTAG, some of them include some solutions and preclude others, which is at variance with the above advice quoted from WebTAG.

Environment

- *“Reduce CO₂ emissions from transport by encouraging sustainable modes of travel and vehicles using fuels derived from renewable sources or waste”:* This objective could be taken to preclude reducing CO₂ emissions by reducing travel and traffic using restraint mechanisms such as road pricing. It would be less controversial if the objective stopped at *“reduce CO₂ emissions from transport”* but then it would say no more than the Government’s corresponding objective.
- *“Promote the use of alternative modes of transport and less polluting fuels, particularly within Air Quality Management Areas”:* Presumably, this means alternative modes to the car and presumably the objective is aimed at local air quality. Again, though, it could be taken to preclude reducing CO₂ emissions by reducing travel and traffic by restraint mechanisms such as road pricing.

Economy

- *“Minimise congestion and delays for all modes of transport by improving the efficiency of the transport network”:* This objective again precludes minimising congestion and delays by reducing demand using restraint mechanisms such as road pricing.
- *“Cater for the travel consequences arising from growth aspirations. In particular accommodate transport needs arising from future growth of the airport and the cluster of the Norwich Research Park, university and hospitals at Colney.”.* This says nothing about the need to minimise the travel and traffic generated by developments, a requirement which lies at the heart of PPG13.

Integration

- “Promote sustainable means of travel, minimise the length of trips and encourage reduced car-use through land use policies, layout of development and promotion of travel plans”: Again, this precludes the promotion of sustainable means of travel, minimisation of the length of trips and encouragement of reduced car-use by means of other measures, such as road pricing.
- “Reduce the need to travel”: It is hard to see why this should appear under “integration”.

73 In my opinion, the objectives should stop short of specifying any kind of solution because to do so may automatically preclude from consideration those solutions not specified. The resulting objectives should then be reviewed to assess whether they add anything to the Government’s objectives for transport set out in paragraph 1.2.7 in WebTAG Unit 2.5 and, if they add nothing, they should be omitted from the set of NATS-specific objectives.

Some criticisms of the way in which the initial assessment of options has been presented

74 Chapter 4 provides an initial assessment of the available interventions, apparently based largely on judgement. In my view, this review is poorly presented and contains some errors of judgement.

75 In my opinion, the implications of Government policy for the development of solutions to road traffic problems are that potential solutions should be considered **in the following order**³:

- first, measures to reduce the number of motorised journeys, especially by car;
- secondly, measures to increase use of alternatives to the car, including public transport improvements;
- thirdly, measures to make best use of the available road capacity; and, **as a last resort**,
- infrastructure schemes to provide new road capacity.

76 Adoption of this policy framework provides a sound structure for the consideration of the interventions available and one which is in accord with Government policy. Thus, one would **first** review all possible means by which traffic could be reduced and draw a conclusion **before** considering alternatives to the use of cars. The reasons for considering travel and traffic reduction measures first are that the need for new road capacity may be reduced and the way in which new road and public transport capacity needs to be provided may be influenced by the nature and scale of the traffic reduction measures.

77 In building up a package of measures in this way, the need to control induced traffic should be recognised. Measures which reduce road demand will reduce congestion and travel times and, as a result, some new traffic will be induced. Similarly, measures which make best use of existing road capacity will tend to increase the available capacity and thereby reduce congestion and travel times, again with the result that some extra traffic will be induced. This point is recognised at various points in Chapter 4 of the OAR, and

³ My analysis of the Government documentation which supports this view is provided in Appendix A.

the four alternative strategies identified for further testing in Section 4.12 all include some complementary or associated traffic management measures, so this is not a criticism that can be levelled at the OAR.

- 78 It follows from this policy framework that starting the review of potential interventions with new road construction, and the NNDR in particular, as set out on page 4-1 in the OAR, is the wrong approach. Not only does it appear that the OAR is really a vehicle for promoting the NNDR rather than a dispassionate review of ways of solving Norwich's transport problems, but the need for an NNDR in a scenario where traffic demand is much reduced is not considered.
- 79 While the majority of the assessments provided in Chapter 4 are uncontroversial, albeit somewhat brief, the assessment of road pricing is misleading.

Some criticisms of the initial assessment of road pricing

- 80 The first paragraph in Section 4.5.5 says: "*Road pricing addresses similar problems to restricting traffic (problems for other modes including accidents, air quality and accessibility) but is likely to have a lesser impact.*". There are a number of things wrong with this statement. First, whether road pricing has a greater or lesser impact than restricting traffic by management measures will depend on the area charged and the level of the charges, on the one hand, and the area of the traffic management scheme and the nature of the restrictions, on the other. There are circumstances where either traffic management or road pricing could have the greater impacts. Secondly, road pricing is unlikely to cause, and could be designed to avoid, adverse impacts on accidents, air quality and accessibility; in fact, road pricing is likely to reduce accidents and improve air quality, among other beneficial impacts. Thirdly, unlike traffic management measures, road pricing will yield a net revenue stream which can be used to address any capacity deficiencies which might arise on the public transport system.
- 81 There is much more to say about road pricing than said either in the OAR or in the paragraph above. In my view, road pricing offers one of the most effective tools for addressing urban traffic congestion and the OAR shows unwarranted prejudice against the concept, especially bearing in mind Government's attempts through the TIF to encourage local authorities to implement road pricing schemes.

Some criticisms of the initial assessment in Section 4.9 of the Options Assessment Report

- 82 Section 4.9 in the OAR presents an assessment of the interventions considered earlier in the Chapter against "*the problems and issues and aims and objectives*". There are several criticisms to be made of this assessment, as follows:
- first, the problems and issues listed on pages 4-15 and 4-16 do not correspond with the problems summarised in Section 2.12;
 - secondly, there are 38 interventions discussed in Sections 4.2 to 4.8 but only 20 are included in the assessment Tables 4.1 to 4.6, so some appear to have been discarded before the assessment stage; and
 - thirdly, the scoring system which has been used is not recommended by WebTAG because it implies equivalences between impacts for which there is little or no justification.

Some criticisms of the alternative strategies identified for further appraisal

- 83 Section 4.12 of the OAR sets out the following four options for further appraisal:
- Option 1 – Northern Distributor Road and complementary transport measures;
 - Option 2 – Orbital bus route with associated management measures;
 - Option 3 – Light rapid transit scheme with associated traffic management measures; and
 - Option 4 – Measures to encourage modal shift to sustainable modes of transport.
- 84 As I explained earlier, my view is that the preferred transport strategy should be built up by considering groups of measures in the following order:
- **first**, measures to reduce the number of motorised journeys, especially by car;
 - **secondly**, measures to increase use of alternatives to the car, including public transport improvements;
 - **thirdly**, measures to make best use of the available road capacity; and, **as a last resort**,
 - infrastructure schemes to provide new road capacity.
- 85 The way in which the four options are presented appears to have come about from a different way of thinking. It looks as though one of the strategies was to include the NNDR and the other three were to be thought of as possible alternatives to the NNDR. Given the way in which the problems have been summarised in Section 2.12 and the objectives formulated in Chapter 3, the dice seem to me to be loaded in favour of the NNDR.
- 86 Because the report does not include a comprehensive analysis of current and future problems and their causes, it is hard to see whether these four alternative strategies all stand a reasonable chance of ameliorating the problems to a broadly similar degree. If the alternative strategies are not designed towards the same end, then some must appear to be less successful than others in both ameliorating problems and achieving objectives, especially bearing in mind that some of the objectives appear to favour some strategies and rule out others.
- 87 I have the following comments on the four options described in Section 6.1.
- **Option 1:** This NNDR-based option appears to be internally coherent, although the relationship between the problems and objectives and this solution is not wholly clear from the OAR.
 - **Option 2:** I would not expect this bus-based option to be an alternative to the NNDR-based option. Improvements to bus services on their own will attract very few people from cars. The evidence for this can be found by considering that:
 - the patterns of travel that can be conveniently accommodated by bus will generally be only a subset of the very dispersed pattern of travel made by car;

- the generalised costs of travel by bus (and LRT) (walk time, wait time, on-bus time, fare and interchange inconvenience) will be much higher than those of car (in-vehicle time, fuel cost and parking charge); and
- the sensitivity of a mode choice model, had one been used to assess this option (which is hasn't), to changes in generalised cost would be quite low (as explained in WebTAG Unit 3.10.3, Section 1.11).

The way to address the last two difficulties is to increase the cost of travel by car through some form of restraint, such as road pricing. A restraint mechanism based on charging would also provide a net revenue stream which could be used to support the provision of a wider set of bus service improvements than would otherwise be affordable. Promotion of this twin-track approach – restraint of car use by road pricing and enhanced bus services – lies at the heart of the Government's intentions with the Transport Innovation Fund.

- **Option 3:** This LRT-based option appears to recognise the need for some restraint of car use in association with enhanced public transport. Unfortunately, however, the restraint mechanism chosen is unlikely to produce sufficient transfer from car to public transport so that the need for the NNDR is avoided, that is, to act as an alternative to Option 1. The restraint mechanism included in this option is either road pricing or a workplace parking levy, **but only within the Inner Ring Road.**

In my judgement, neither road pricing nor a workplace parking levy applied solely within the Inner Ring Road would have a significant effect on the traffic that would use an NNDR. A workplace parking levy would, in my view, be particularly ineffective. This policy lever was not reviewed in Chapter 4, although reductions in long-stay car parking in the city centre were discussed and rejected. If a workplace parking levy did not result in either parking spaces being removed by employers or the charges being passed on to parkers, then no restraint would result. As there is very little evidence that employers in general are willing to charge their employees to park at work, the primary aim of a workplace parking levy must be to reduce spaces but, as I note, this was rejected in Chapter 4.

In addition to the ineffectiveness of the restraint mechanisms, an LRT line would be much less effective in catering for the dispersed pattern of car movements that could use an NNDR than would enhanced bus services (as included in Option 2). The capital costs of an LRT line would also be much higher than the costs required to provide additional buses.

- **Option 4:** This option is highly unlikely to solve Norwich's transport problems in general, and reduce the demand for an NNDR in particular, although many of the measures should, in my view, form part of the total strategy.

While planning new development so that homes, workplaces and services are closer together is obviously sensible, without measures to curb the use of the car, this will not necessarily result in less travel⁴.

The *Smarter Choices* report⁵ reviews the effectiveness of several of the other elements of this option. The Report postulates low and high intensity scenarios, as follows.

⁴ See the Report from the Town and Country Planning Association, *The People: Where Will They Work?* prepared for the Department of the Environment, Transport and the Regions in 1999.

⁵ *Smarter Choices – Changing the Way We Travel*, produced by Cairns et al for the Department for Transport in July 2004.

The impacts of the high intensity scenario are reported to be: a reduction in peak period urban traffic of about 21% (off-peak 13%); a reduction of peak period non-urban traffic of about 14% (off-peak 7%); and a nationwide reduction in all traffic of about 11%. The *Smarter Choices* report emphasises that the achievement of these levels of traffic reduction are dependent upon a range of supporting policies and measures to ensure that the capacity released is not taken up by increases in use by other car users. The report suggests that these policies include re-allocation of road capacity and other measures to improve public transport service levels, parking control, traffic calming, pedestrianisation, cycle networks, congestion charging or other traffic restraint, other use of transport prices and fares, speed regulation, or stronger legal enforcement levels.

The effects of the low intensity scenario are estimated to be considerably less than those of the high intensity scenario: peak period urban traffic would be reduced by about 5% and nationwide traffic by 2% to 3%. These smaller figures also assume that sufficient other supporting policies are used to prevent induced traffic from eroding the effects, notably at peak periods and in congested conditions. Without these supportive measures, the effects could be lower, temporary, and perhaps invisible.

As Option 4 does not include measures to lock in the benefits of the smarter choice measures, I conclude that the effects on traffic levels would be quite muted and insufficient to reduce traffic to the levels required to avoid the need for an NNDR.

- 88 It appears that only Option 1, the option based on the NNDR, has been assessed using a model of any kind. This is evident from the Appraisal Summary Tables in Appendix B, in which the only numbers recorded for Options 2, 3 and 4 relate to the option costs.

In summary

- 89 In my view, the OAR appears to have been written with the main aim of proving that the NNDR is required. As noted earlier, this work seems to have been undertaken in parallel with work to develop options for the NNDR and after NCC's endorsement of the Shaping the Future Strategy which included an aspiration for the NNDR.
- 90 **Problems** have not been identified objectively in accordance with the advice in the Department for Transport's Web-based Transport Analysis Guidance (WebTAG). In particular, the **causes** of the problems have not been analysed.
- 91 While the NATS **objectives** are structured under the Government's objectives for transport, as advised by WebTAG, some of them include some solutions and preclude others, which is at variance with the above advice quoted from WebTAG.
- 92 In my opinion, the implications of Government policy for the development of solutions to road traffic problems are that potential solutions should be considered **in the following order**:
- first, measures to reduce the number of motorised journeys, especially by car;
 - secondly, measures to increase use of alternatives to the car, including public transport improvements;
 - thirdly, measures to make best use of the available road capacity; and, **as a last resort**,

- infrastructure schemes to provide new road capacity.
- 93 It follows from this policy framework that starting the review of potential interventions with new road construction, and the NNDR in particular, as adopted in the OAR, is the wrong approach. Not only does it appear that the OAR is really a vehicle for promoting the NNDR rather than a dispassionate review of ways of solving Norwich's transport problems, but the need for an NNDR in a scenario where traffic demand is much reduced is not considered.
- 94 While the majority of the assessments provided in the OAR are uncontroversial, albeit somewhat brief, the assessment of road pricing is misleading. In my view, road pricing offers one of the most effective tools for addressing urban traffic congestion and the OAR shows unwarranted prejudice against the concept, especially bearing in mind Government's attempts through the Transport Innovation Fund to encourage local authorities to implement road pricing schemes.
- 95 The OAR sets out the following four alternative strategies:
- Northern Distributor Road and complementary transport measures;
 - Orbital bus route with associated management measures;
 - Light rapid transit scheme with associated traffic management measures; and
 - Measures to encourage modal shift to sustainable modes of transport.
- 96 Because the OAR does not include a comprehensive analysis of current and future problems and their causes, it is hard to see whether the four alternative strategies identified in the OAR all stand a reasonable chance of ameliorating the problems to a broadly similar degree. If the alternative strategies are not designed towards the same end, then some must appear to be less successful than others in both ameliorating problems and achieving objectives, especially bearing in mind that some of the objectives appear to favour some strategies and rule out others.
- 97 Given the nature of the four alternative strategies, and the way that the objectives are specified, it is not surprising that the conclusion is reached that the preferred strategy should include the NNDR. In my view, the case has not been proven in a satisfactorily objective manner.

NORWICH NORTHERN DISTRIBUTOR ROAD, TRAFFIC AND ECONOMIC ASSESSMENT REPORT, FEBRUARY 2005

- 98 The Traffic and Economic Assessment Report (TEAR) documents the assessment of the full NNDR. Although I realise that a three-quarters NNDR has now been adopted, my reading is that the methodology used for the appraisal of the full NNDR was also applied to the three-quarters scheme and I have therefore reviewed the contents of the TEAR (in the absence of a revised TEAR which covers the assessment of the three-quarters scheme).

The traffic model

- 99 Chapter 2 of the TEAR summarises the development of the 2002 Traffic Model set out in more detail in the Local Model Validation Report reviewed earlier in my report.
- 100 The one additional point to note is that, on page 3, the report says that: "*The traffic model assignments are average hour assignments for the peak periods.*" As discussed above, the model has been set up to cover four linked half-hour periods in the morning peak and five half-hour periods in the evening peak and I had understood from the LMVR that the

model had been validated for the whole of the morning and evening peak **periods** – the plots and tables in Appendices J and K are clearly labelled to this effect. However, it appears that the model has been used to forecast the **average** hourly traffic flows in the two peak periods, rather than to forecast the actual peak hour within the peak periods. This seems to defeat the purpose of modelling the peak periods in a series of half-hour periods and will lead to an understatement of congestion and an under-estimation of benefits.

The forecasting procedure

101 Chapter 3 of the TEAR explains two important points:

- that the growth in traffic over time has been forecast by applying the growth rates given in the Department for Transport's **TEMPRO** database; and
- variations in demand due to changes in congestion have been estimated using an **elastic** assignment model.

The use of the TEMPRO growth factors

102 Use of the TEMPRO growth factors to control total traffic growth at the study or modelled area level is recommended practice and, therefore, to this extent, the forecasting procedure adopted is compliant with guidance. This practice is intended to ensure that the growth forecast in each individual case, when summed across the country, will not exceed the total growth expected at the national level.

103 However, the Department for Transport normally advises that consideration be given to the disposition of the development sites within the modelled area. It is good practice to identify the development sites and the scale and timing of the development for each site, and to use this information to disaggregate the study area TEMPRO forecasts in a manner which will reflect where the growth in traffic is likely to occur. This approach is likely to produce a geographically more specific forecast than the application of the TEMPRO forecasts at the level of the rather large zones for which the data are published, which is the approach which seems to have been used.

104 In addition, the date of the TEAR suggests that account has not been taken of any differences between the developments assumed or implicit in the TEMPRO forecasts used, on the one hand, and the latest development proposals, as set out in the Draft East of England Plan. TEMPRO 5.2 was published in July 2006, since the NNDR appraisal being reviewed here was undertaken, and my understanding is that this update of TEMPRO includes the current position with regard to the draft and approved Regional Spatial Strategies. At some stage in the future, it will therefore be appropriate to revise the traffic forecasts using the latest version of the TEMPRO traffic growth data.

The use of elastic assignment

105 The TEAR explains, in Section 3.1, that elastic assignment has been used to estimate trip suppression in the without-NNDR case and trip induction in the case with the NNDR. This report is dated February 2005 and it seems likely that the modelling work described therein will have been undertaken after publication of VaDMA⁶ (Variable Demand Modelling Advice) in June 2003 and before WebTAG Units 2.9.1-2 and 3.10.1-4, dated

⁶ VaDMA was the initial version, published in draft for consultation, of what is now published as WebTAG Units 2.9.1-2 and 3.10.1-4. VaDMA was designed to replace Part 2 of Section 2 of Volume 12 of the Design Manual for Roads and Bridges on Induced Traffic Appraisal.

June 2005, were issued for consultation in October 2005. (As will be noted below, this June 2005 version has now been superseded.)

- 106 Section 13 of VaDMA explains how the choice should be made between the use of elastic assignment (sometimes referred to as an 'own-cost elasticity' model) and a model in which the individual responses of change of trip frequency, mode and destination are separately represented (sometimes referred to as the 'VDM' or 'variable demand model' responses).
- 107 Elastic assignment is an approximation of the VDM responses and was only considered appropriate in certain circumstances. In paragraph 13.3, VaDMA advised that an own-cost elasticity model should be considered where two or three of the following criteria apply:
- "a) *none of the VDM responses...individually is important but the aggregate effect is.*
 - b) *no public transport schemes are likely to be considered within the study (and thus the mode-choice responses do not need to be separately identified).*
 - c) *where the modelled area is a corridor rather than a relatively self-contained area such as a travel to work area (this is because corridor studies usually exclude most of the travel to non-corridor destinations so that redistribution can only be partial, and its omission in the common elasticity mechanism is therefore less important)."*
- 108 Given that the TEAR was produced **after** the OAR, it would have been evident that public transport schemes did need to be appraised – see Options 2 and 3 in Chapter 6 in the OAR. Also, it was clear that the modelled area was not a corridor but included the whole of Norwich and its hinterland, thereby allowing a full estimate of the redistribution response. Thus, my view is that **the adoption of an elastic assignment model to estimate trip suppression and induction did not comply with the guidance at the time that the work was done.**
- 109 However, even if my interpretation of the guidance is disputed, we need to recognise that the Department's advice on the appropriateness of elastic assignment has now changed. During 2005, in the preparation of the June 2005 WebTAG Units (published in October 2005), research revealed that elastic assignment methods could produce misleading results, with the consequence that the June 2005 Units advised **against** their general use for variable demand modelling.
- 110 The final version of the variable demand modelling advice has recently been posted on WebTAG, in the same Unit numbers as previously, but now dated June 2006. This confirms in paragraph 1.3.5 of Unit 3.10.1, that while an elasticity model may be used to assess the **need** for variable demand modelling, it also confirms in paragraph 1.2.3 of Unit 3.10.3 that "*pending further research, it is recommended that simple elasticity models are **not** used to model the full effects of variable demand*".
- 111 Elasticity models have long been recognised as an approximate way of modelling induced traffic⁷. More sophisticated models include separate sub-models or stages to estimate explicitly the changes in trip frequency (including not making a trip at all), mode (between car and public transport), time of travel (macro shifts between periods as opposed to micro shifts giving rise to peak contraction), destination (and origin), and route (including change of public transport sub-mode). Other recognised responses include change of car

⁷ See Chapter 14 in the 1994 Report of the Standing Advisory Committee on Trunk Road Assessment on Trunk Roads and the Generation of Traffic.

occupancy (or choosing to travel as a car passenger in the mode choice stage) and micro-time-shifting (leading to peak contraction), although the inclusion of these in operational models is much less common.

- 112 Elasticity models of road trips will approximate the changes in trip frequency, mode, and time period but will not realistically represent changes in destination or origin. (Route choice is represented by the assignment model.)
- 113 The importance of the deficiencies of elasticity models may be judged by considering what is currently known about the sensitivity of each of the components of induced traffic to changes in generalised cost. The currently available evidence is set out in WebTAG Unit 3.10.3, Section 1.11. This suggests that the order of increasing sensitivity is: change in trip frequency (least sensitive), main mode choice (between car and public transport), macro-time-period choice, destination choice, micro-time-shifting, and route choice (most sensitive). The significant point here is that people, when faced with a generalised cost change, are more likely to change their destination than their mode of travel, not only for discretionary trip purposes such as shopping but also for travel to and from work (people are more willing to change jobs nowadays than change their mode of travel)⁸.
- 114 One check which is not mentioned in the TEAR and which may not have been done (and which was not sufficiently emphasised in VaDMA (of June 2003)) is to assess whether or not the demand elasticity with respect to fuel cost which is output by the model accorded with established values. If the output elasticity lay outside the established range, the demand elasticity with respect to generalised cost should have been adjusted until the output elasticity fell within that range. If the output demand elasticity with respect to fuel cost is too low, the demand elasticity with respect to generalised cost will be too low and the forecasts of induced traffic, and the adverse impacts on the economic benefits, will also be too low. My judgement is that **the elasticity of -0.24 which has been used is likely to have under-estimated induced traffic and therefore over-estimated the user benefits and therefore the benefit/cost ratio.**

The need for measures to 'lock in' the benefits of the scheme

- 115 The Department for Transport's commitment to the policy of 'locking in' the benefits of road schemes is confirmed in The Future of Transport, in paragraph 3.10, which says: "*We do not want to lose the benefits of this extra capacity, so we have started to consider how best to implement demand management policies – see Managing Our Roads.*". While this statement applies specifically to the Highways Agency's roads programme, I would expect the Government to argue that the concept of locking in benefits should apply also to local authority major highway schemes, such as the NNDR. Indeed, the TEAR appears to recognise this point in Section 4.2, which explains that: "*The NNDR scheme will enable traffic calming to be introduced in some form on the residential streets of the northern suburbs and on the minor roads crossing the Wensum Valley. The provision of a high quality orbital route will provide an attractive alternative to the orbital residential and minor roads, relieving them of undesirable through-traffic, with traffic calming 'locking in' the benefits of the NNDR.*".

Some comments on the economic appraisal

- 116 The economic appraisal is described in Chapter 5 of the TEAR. The approach adopted seems generally to conform with WebTAG advice, except to note that benefits have been calculated for weekday peak periods only, that is, the benefit/cost ratios exclude the

⁸ Further evidence of these phenomena can be found in the Report from the Town and Country Planning Association, *The People: Where Will They Work?* prepared for the Department of the Environment, Transport and the Regions in 1999.

benefits which would accrue in the weekday inter-peak and off-peak periods and at weekends. In this respect, the benefit/cost ratios will be under-estimates.

- 117 I have noted earlier that the use of data for the average hours in the peak periods will tend to lead to under-estimates of congestion and therefore also under-estimates of benefits and benefit/cost ratio.
- 118 From the information presented, I cannot tell what assumptions have been made to extrapolate the benefits from the last modelled year (2025) to cover the full appraisal period up to 2069 (assuming 2010 is year one). I also cannot tell what contribution the benefits from 2025 to 2069 make to the overall benefits and therefore how robust the benefit/cost ratio is to alternative assumptions for extrapolating the benefits over the full appraisal period.

The need for an assessment of the robustness of the scheme appraisal in the context of a national road pricing scheme

- 119 In the light of the Government's general interest in developing a national road pricing system, it would be prudent, in my view, to consider the impacts of such a system on the case for the proposed NNDR, in order to consider whether the costs of providing infrastructure, which may, in the event of road pricing, prove to be unnecessary, could and should be avoided. This would be consistent with the undertaking given by the Government in relation to road schemes emerging from the Multi-Modal Studies⁹. Advice has recently been published on WebTAG about how to model road pricing¹⁰.

In summary

- 120 In my view, the assessment of the NNDR as described in the Traffic and Economic Assessment Report of February 2005 has some deficiencies.
- 121 Use of the Department of Transport's TEMPRO growth factors as controls on total growth at the study or modelled area level is recommended practice and, therefore, to this extent, the forecasting procedure adopted is compliant with guidance. However, the Department for Transport normally advises that consideration be given to the disposition of the development sites within the modelled area. It is good practice to identify the development sites and the scale and timing of the development for each site, and to use this information to disaggregate the study area TEMPRO forecasts in a manner which will reflect where the growth in traffic is likely to occur. This approach is likely to produce a geographically more specific forecast than the application of the TEMPRO forecasts at the level of the rather large zones for which the data are published, which is the approach which seems to have been used. In addition, the date of the TEAR suggests that account has **not** been taken of any differences between the developments assumed or implicit in the TEMPRO forecasts used, on the one hand, and the latest development proposals, as set out in the Draft East of England Plan.
- 122 In my view, the method used to estimate **induced traffic** did **not** comply with the Department of Transport's Variable Demand Modelling Advice (VaDMA) which was current at the time. However, even if my interpretation of the guidance is disputed, the method used is specifically **not** recommended in the latest guidance published in WebTAG. My judgement is that the method used is likely to have under-estimated induced traffic and therefore over-estimated the user benefits and therefore the benefit/cost ratio.

⁹ See page 7 of The Government's Response to the Transport Select Committee's Report Jam Tomorrow?: The Multi-Modal Study Investment Plans, June 2003.

¹⁰ See WebTAG Unit 3.12.2.

- 123 The proposals to introduce traffic calming on the orbital and residential roads in northern Norwich accord with the Department for Transport's commitment to the policy of '**locking in**' the benefits of road schemes, as confirmed in *The Future of Transport: a network for 2030*.
- 124 The approach adopted towards the **economic appraisal** seems generally to conform with WebTAG advice, except that benefits have been calculated for weekday peak periods only, that is, the benefit/cost ratios exclude the benefits which would accrue in the weekday inter-peak and off-peak periods and at weekends. In this respect, the benefit/cost ratios will be under-estimates. Also, the use of data for the average hours in the peak periods will tend to lead to under-estimates of congestion and therefore also under-estimates of benefits and benefit/cost ratio.
- 125 From the information presented, I cannot tell what assumptions have been made to extrapolate the benefits from the last modelled year (2025) to cover the full appraisal period up to 2069 (assuming 2010 is year one). I also cannot tell what contribution the benefits from 2025 to 2069 make to the overall benefits and therefore how robust the benefit/cost ratio is to alternative assumptions for extrapolating the benefits over the full appraisal period.
- 126 In the light of the Government's general interest in developing a **national road pricing system**, it would be prudent, in my view, to consider the impacts of such a system on the case for the proposed NNDR, in order to consider whether the costs of providing infrastructure, which may, in the event of road pricing, prove to be unnecessary, could and should be avoided. This would be consistent with the undertaking given by the Government in relation to road schemes emerging from the Multi-Modal Studies.

NORWICH NORTHERN DISTRIBUTOR ROAD, REPORT BY THE DIRECTOR OF PLANNING AND TRANSPORTATION TO CABINET, 19 SEPTEMBER 2005

- 127 The following further points are apparent from this Cabinet report.

Appraisal of public transport options

- 128 Paragraphs 2.4 and 3.3.1 state that a public transport model is being developed to assess the benefit/cost ratio of a public transport based transportation strategy without an NNDR (see paragraph 2.4). However, no mention is made of the need for a variable demand model, which is required for the appraisal of all the options, including the NNDR.

Appraisal of a partial NNDR

- 129 Paragraph 3.7.1 says that: "*Options for constructing a distributor road around only part of Norwich were examined during the initial assessment of options for NATS. This work which was covered in the NATS options assessment report produced ...in November 2004, found that partial options, although having significant benefits in themselves, did not provide the full range of benefits within the NATS area as well as a full NDR.*". The only references that I can find in the OAR to partial options are Sections 4.2.1, 4.2.2 and 4.2.3 in the OAR. These sections comprise a few brief qualitative judgements and cannot, in my view, be fairly described in the terms used in the Cabinet report.
- 130 Paragraph 3.7.2 goes on, however, to say: "*In view of the complexity of issues on the west, the effectiveness of a half option (A140 to A47 Postwick) and a three-quarter NDR option (A1067 to A47 Postwick) in delivering the objectives of NATS has been re-examined and a revised Options Assessment Report prepared.*". I have not yet seen this revised OAR. However, Appendix 5 of the 19 September 2005 report to NCC's Cabinet

provides a brief statement of the differences in the traffic impacts between the full and three-quarters NNDR.

- 131 Paragraph 7.6 goes further and says: "*Economic analysis shows that a three-quarter route will deliver most of the benefits of a Northern Distributor Road, but not all the strategic benefits.*". This suggests that some technical analysis of a partial NNDR has been undertaken. Indeed, the TUBA output has been sent to me by NCC and this shows a healthy benefit/cost ratio. My comments at various stages in my report about the robustness of the benefit/cost ratio apply equally to this assessment of the three-quarters NNDR, as far as I can tell from the information available to me.

Alternatives considered

- 132 Paragraph 8.1 says: "*Alternative strategies that would not include a Northern Distributor Road were considered before the County Council adopted its present Norwich Area Transportation Strategy.*". It may be that this statement is based on work that I have not seen but, if this refers to the OAR, then I would say that the consideration given to alternative strategies was flawed, as I have explained above.

MY ANSWERS TO NNTAG'S QUESTIONS

Question 1. The extent to which a NNDR would reduce congestion and rat running in the Norwich northern suburbs and at the same time facilitate major development and economic growth (e.g. a new urban extension of 7,000 houses in north-east Norwich and expansion of Norwich Airport).

A further possible additional question related to 1 was whether a location to the east of Norwich for a new urban extension is better related to the transport network than a north-east Norwich location and could avoid the need for a NNDR?

- 133 According to Figures A.1 and A.2 in the TEAR of February 2005, the **full** NNDR would reduce traffic on some of the roads in the northern suburbs of Norwich (mainly the orbital roads, both major and minor) and increase traffic on others (mainly the radials which would connect with the NNDR), with the scale of the reductions depending on the alignment option of the NNDR. With the better-performing options, flows on some roads could be below 2004 levels. These Figures do not, however, show flows for all roads, although it would be reasonable to assume that the significant and/or typical flow changes have been shown.
- 134 It should be noted that the forecasts of the use of the NNDR and the relief to the existing roads have been based on the assumption that traffic calming would be introduced on the minor roads in Norwich. This means that the reduced speeds which would arise with the traffic calming in place have been used to produce the forecasts. It also means that the traffic calming would need to be introduced to ensure that the forecast levels of relief did materialise.
- 135 I am currently unclear what assumptions have been made, in preparing the traffic forecasts, about the scale and locations of future development. The population and growth pressures are discussed in Section 2.2 of the OAR of November 2004. However, my reading of the TEAR is that the TEMPRO growth forecasts have been applied as published by the Department for Transport and without necessarily specifically reflecting the growth at the particular locations noted in the question. It would be necessary to seek further information from NCC about the proposed developments that have been assumed in preparing the traffic forecasts.

136 The scale of the relief afforded on roads in the northern suburbs will depend on the scale of new developments that occur in the vicinity of the NNDR and the amount of traffic that is generated by such developments which would use the NNDR. Some assessments of the potential impacts on the traffic flows on the NNDR arising from new developments adjacent to the road were carried out by Halcrow Fox in the early 1990s and are reported in the 1994 SACTRA Report¹¹. The significant point here is that the greater the use of the NNDR by traffic generated by new developments, the less will be the relief afforded to the northern suburbs.

137 In principle, further model runs would be the most reliable way of answering whether the NNDR would facilitate (cater for) major development and economic growth (e.g. a new urban extension of 7,000 houses in north-east Norwich and expansion of Norwich Airport) and whether a location to the east of Norwich for a new urban extension would be better related to the transport network than a north-east Norwich location. These model runs could also show the relationship between the scale of development adjacent to the NNDR and the relief afforded to the northern suburbs. Given that a three-quarters NNDR plus traffic management in Taverham and Costessey is now the preferred approach, the tests should obviously be conducted on this basis.

Question 2. The traffic impact of a three quarters NNDR on the north-west suburbs.

138 Some information about traffic flows with a **three-quarters** NNDR is given in Appendix 5 to the Report by the Director of Planning and Transportation to NCC's Cabinet on 19 September 2005. However, from this information, I find it hard to judge the impacts of the three-quarters NNDR on the minor and residential roads in the northern suburbs. No information appears to be available about the traffic management measures now proposed in Taverham and Costessey or the consequences for traffic flows in the area.

139 In my view, NNTAG should request plots of the traffic flow changes that are forecast to arise with the three-quarters NNDR. These plots could be along the lines of those shown in Figures A.1 and A.2 in the TEAR of February 2005, but with data provided for all significant minor and residential roads which would expect to see some effect from the scheme, both beneficial and adverse.

140 My understanding is that these forecasts have been made on the assumption that some traffic calming will be implemented on the minor and residential roads in northern Norwich (but not in Taverham and Costessey). NNTAG should request details of these assumptions, as they will influence the scale of the forecast traffic reductions on these roads.

Question 3. The extent to which a NNDR would result in induced traffic on the network in the order of 1.5%.

141 In my opinion, based on the Traffic and Economic Assessment Report (TEAR) of February 2005, induced traffic is likely to have been incorrectly estimated. The use of an elastic assignment procedure to estimate suppressed trips in the without-NDR case and induced trips in the with-NDR case was, arguably, not compliant with the guidance available at the time and is certainly not compliant with the guidance now published. Moreover, my judgement is that the elasticity used would yield a fuel cost elasticity which is too low and possibly outside the acceptable range, meaning that the estimates of both trip suppression and induction will be too low and the economic benefits over-estimated.

¹¹ Standing Advisory Committee on Trunk Road Assessment, Trunk Roads and the Generation of Traffic, 1994, paragraphs 10.53 to 10.56.

Question 4. The extent to which non-road building alternatives have been fully considered in order to meet stated objectives, i.e. reduce congestion in northern suburbs and facilitate economic growth.

A further possible additional question related to 4 was whether the scope of Norfolk County Council's TIF bid for funds to examine various charging options that involve the NNDR should be widened to include an option without the NNDR?

142 In my opinion, the OAR of November 2004 appears to have been written with the main aim of proving that the NNDR is required and I am not therefore convinced by the OAR that a dispassionate and unbiased analysis has been carried out.

143 Of particular note in the OAR is that road pricing has been played down and its potential has not been fully and fairly considered. The impacts of a city-wide road pricing system ought to have been considered and modelled, and the need for the NNDR assessed in the light of the resulting traffic levels.

144 In any case, in the light of the Government's general interest in developing a national road pricing system, it would be prudent, in my view, to consider the impacts of such a system on the case for the proposed NNDR, in order to consider whether the costs of providing infrastructure, which may, in the event of road pricing, prove to be unnecessary, could and should be avoided.

Summary of further information required from Norfolk County Council

145 In relation to **Question 1**:

- information about the scale and locations of proposed developments that have been assumed in preparing the traffic forecasts;
- the results of any model runs which have been undertaken to explore the traffic impacts on the use of the three-quarters NNDR and existing roads of alternative development scenarios.

146 In relation to **Question 2**:

- plots of traffic flow changes on existing roads that are forecast to arise with the three-quarters NNDR; and
- details of the traffic calming which has been assumed on the minor and residential roads in northern Norwich in preparing the three-quarters NNDR traffic forecasts.

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APPENDIX A: AN ANALYSIS OF THE IMPLICATIONS OF GOVERNMENT POLICY IN RELATION TO NEW ROAD INFRASTRUCTURE

147 The implications of Government policy for the development of solutions to road traffic problems are that potential solutions should be considered **in the following order**:

- measures to reduce the number of motorised journeys, especially by car;
- measures to increase use of alternatives to the car, including public transport improvements;
- measures to make best use of the available road capacity; and, **as a last resort**,
- infrastructure schemes to provide new road capacity.

The following Government documents may be cited in support of this approach.

148 **Planning Policy Statement No 1 (PPS1): Delivering Sustainable Development**, published by the Office of the Deputy Prime Minister in 2005 is a source of the idea of generally reducing the need to travel, as the following quotations show.

149 Paragraph 13 (ii) of PPS1 under “Key Principles” says:

“Regional planning bodies and local planning authorities should ensure that development plans contribute to global sustainability by addressing the causes and potential impacts of climate change⁴ – through policies which reduce energy use, reduce emissions (for example, by encouraging patterns of development which reduce the need to travel by private car, or reduce the impact of moving freight), promote the development of renewable energy resources, and take climate change impacts into account in the location and design of development.”.

150 Paragraph 23 (vii) of PPS1 under “Sustainable Economic Development” says:

“Ensure the provision of sufficient, good quality, new homes (including an appropriate mix of housing and adequate levels of affordable housing) in suitable locations, whether through new development or the conversion of existing buildings. The aim should be to ensure that everyone has the opportunity of a decent home, in locations that reduce the need to travel.”.

151 Paragraph 27 (v) and (vii) of PPS1 under “Delivering Sustainable Development” introduces the idea of promoting the use of alternatives to the car, as well as reinforcing the idea of reducing the need to travel. It says:

“(v) Provide improved access for all to jobs, health, education, shops, leisure and community facilities, open space, sport and recreation, by ensuring that new development is located where everyone can access services or facilities on foot, bicycle or public transport rather than having to rely on access by car, while recognising that this may be more difficult in rural areas.

(vii) Reduce the need to travel and encourage accessible public transport provision to secure more sustainable patterns of transport development. Planning should actively manage patterns of urban growth to make the fullest use of public transport and focus development in existing centres and near to major public transport interchanges.”.

152 **Planning Policy Guidance Note 13 (PPG13): Transport**, published in March 2001 also has advice about the need to reduce travel. Paragraphs 3 and 4 say:

“Land use planning has a key role in delivering the Governments integrated transport strategy. By shaping the pattern of development and influencing the location, scale, density, design and mix of land uses, planning can help to reduce the need to travel, reduce the length of journeys and make it safer and easier for people to access jobs, shopping, leisure facilities and services by public transport, walking, and cycling. Consistent application of these planning policies will help to reduce some of the need for car journeys (by reducing the physical separation of key land uses) and enable people to make sustainable transport choices. These policies are therefore part of the Governments overall approach to addressing the needs of motorists, other road and public transport users, and business by reducing congestion and pollution and achieving better access to development and facilities. They will also help to promote sustainable distribution. In this way, planning policies can increase the effectiveness of other transport policies and help maximise the contribution of transport to improving our quality of life.”

“The objectives of this guidance are to integrate planning and transport at the national, regional, strategic and local level to:

- 1. promote more sustainable transport choices for both people and for moving freight;*
- 2. promote accessibility to jobs, shopping, leisure facilities and services by public transport, walking and cycling; and*
- 3. reduce the need to travel, especially by car.”*

153 And paragraph 74 of PPG13 links the idea of providing better public transport with reducing the need to travel by car. It says:

“In preparing their development plans and determining planning applications, local authorities, in conjunction with work on the local transport plan, should:

- 1. identify the key routes for bus improvements and priority measures, and the measures that will be taken;*
- 2. ensure, so far as is practicable, that traffic management measures do not impede the effectiveness of public transport services;*
- 3. explore the potential, and identify any proposals, for improving rail travel, in liaison with the SRA, including the reopening of rail lines, or creation of new stations on existing rail lines, light rail or guided bus routes (giving due consideration to the funding and value for money of such proposals);*
- 4. identify the potential for improved interchange between different transport services and between public transport and walking and cycling;*
- 5. negotiate for improvements to public transport as part of development proposals, in order to reduce the need to travel by car and the level of parking at such sites, and*
- 6. work with transport operators and other organisations to improve personal security across the whole journey.”*

154 These quotations from current Government policy documents support the idea that reducing the need to travel by car and promoting the use of alternatives to the car should be considered **before** additional road capacity is considered. That traffic management should be considered before new infrastructure is supported by paragraph 3.123 in **A**

New Deal for Transport: Better for Everyone, published by the DETR in July 1998. This says:

“The days of ‘predict and provide’ are over – we will give top priority to improving the maintenance and management of existing roads before building new ones.”

- 155 The proposition that new road building should be a measure of last resort is supported by the **Guidance on the Methodology for Multi-Modal Studies (GOMMMS)** which was prepared by the DETR to guide the conduct of the programme of Multi-Modal and Roads-Based Studies initiated following the review of the trunk road and motorway programme in 1998 (A New Deal for Trunk Roads in England, DETR, July 1998). The relevant paragraph is 1.1.7 which says:

“In seeking solutions to the problems to be addressed in the study, the contributions of all modes should be considered, including walking, cycling, air transport, shipping and pipelines, as well as roads, railways, buses and other forms of public transport. Solutions may also relate to non-transport policies, for example land-use, health and education. Although the genesis of the initial programme of Studies lies with problems on the trunk road network, the focus of the Studies will not primarily be on ways of providing additional road capacity. However, proposals for road improvements, whether through better management, widening or new alignments, are not ruled out and could be an output if such a solution were shown to be the most appropriate in the circumstances. Indeed, some schemes put on hold by the Roads Review have specifically been remitted for the Studies to consider in more detail.”

- 156 The implications of this paragraph are that the provision of additional road capacity is, in principle, a legitimate outcome, **but only providing that** other non-road building options have been considered first.

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THE DENVIL COOMBE PRACTICE

157 The Denvil Coombe Practice Limited is the trading company for the services of Dr Denvil Coombe and offers the following services:

- working with clients to identify the scope of studies, to design initial study specifications, and to draft terms of reference;
- specification of technical work, especially transport planning processes, transport models, and appraisal procedures;
- documentation of all types, from consultation leaflets and non-technical summaries to complete reports of complex technical work;
- facilitation of discussions and workshops, especially in consulting with the public, and efficient chairing of meetings and conferences; and
- direction and management of transport studies, especially complex and large-scale studies undertaken by consortia covering a range of disciplines.

158 Denvil Coombe's qualifications are:

- University of Bradford, B Tech (First Class Honours) Civil Engineering, 1967
- University of Leeds, PhD, Centre for Transport Studies, 1971
- Chartered Engineer, 1973
- Fellow, Institution of Highways and Transportation, 1986
- Fellow, Institution of Civil Engineers, 1987

159 Denvil Coombe's experience of particular relevance to this commission includes:

- Member of the **Standing Advisory Committee on Trunk Road Assessment (SACTRA)** for the 1994 Report on **Trunk Roads and the Generation of Traffic** and the 1999 Report on **Transport and the Economy**;
- **Guidelines on Developing Urban Transport Strategies** – he designed the Guidelines, drafted some of the contents, and managed the creation of, and edited, the Guidelines on behalf of the Institution of Highways and Transportation;
- **Guidance on the Methodology for Multi-Modal Studies (GOMMMS)** – he designed the Guidance, drafted some of the contents, and directed the creation of the Guidance, for the Department of the Environment Transport and the Regions;
- **Web-Based Transport Analysis Guidance (WebTAG)** – he assisted with the migration of GOMMMS to the web and updated some parts of the guidance, for the Department for Transport;
- **Guidance on Modelling for Major Public Transport Schemes** – he scoped the guidance and prepared a draft for eventual inclusion in WebTAG, for the Department for Transport;
- **Variable Demand Modelling Advice** – he conducted extensive reviews of the June 2003 version of VaDMA, and commissioned and managed contributions from Rand Europe and MVA, for the Department for Transport; and
- **Guidance on Road Pricing Scheme Design, Modelling and Appraisal** – he reviewed draft guidance on road pricing and presented the resulting advice on modelling to the TIF-bidding local authorities, for the Department for Transport.

160 Denvil Coombe also directed the Norwich Area Transportation Strategy produced by Halcrow Fox and Associates for Norfolk County Council in 1992. This work included an assessment of the options for the Northern Distributor Route.