

THE PLANNING ACT 2008

**M4 (JUNCTIONS 3 TO 12) (SMART MOTORWAY) DEVELOPMENT CONSENT ORDER
APPLICATION**

TR010019

**Written Summary of Issue Specific Hearing Dealing With Matters Relating to Traffic
Forecasting**

Date: Wednesday 10 February 2016

**Venue: Holiday Inn Maidenhead/Windsor, Manor Lane, Maidenhead, West Berkshire, SL6
2RA**

1. *Traffic forecasting scenarios*

Re question 4.9.3 of ExA's second round questions regarding traffic forecasting scenarios:

- *What are the applicant's quantified confidence levels, expressed as a standard deviation around a mean, for the traffic forecasting scenario that predicts the most onerous conditions for air quality – i.e. the worst anticipated case?*

Highways England's response

1. Highways England has based its assessments on the core scenario forecasts which, as stated in Transport Analysis Guidance ("TAG"), in the Department for Transport's ("DfT") view, represents the best basis for decision-making given current evidence. High and low growth scenarios have been derived following the TAG methodology to provide a range in relation to the core scenario to reasonably capture the likely variability in the key underlying national drivers. On this basis, a simple indicator for the level of confidence in the core forecast level of demand based on these calculations is that in 2022, the core demand could potentially vary by $\pm 4\%$, being the amount derived from the traffic model based in turn on the prescribed calculation in TAG to define the range between high and low growth curves for that year.
2. Following this methodology, the overall assessment of the core scenario is used as the basis for the high and low scenarios. This means that any change to the core scenario changes the high and low scenario figures. On this basis, confidence in the core scenario leads to confidence in the low and high scenario figures. Using this methodology takes account of uncertainty.
3. Highways England considers that whilst there is no significant difference between core and high scenarios, the initial figures for the higher scenario are likely to be higher than in the real world. This slight discrepancy is caused by congestion on the network, which means that the input figures will tend to be higher than output figures due to this constraint in the network. The $\pm 4\%$ is a weighted average across the length of the Scheme.
4. At the Hearing, the Examining Authority queried the effect on emissions of both vehicle numbers and the speed at which the vehicles are travelling. Vehicle speeds and volumes will both affect vehicle emissions and as these vary across the Scheme route this variation will be captured within the monitoring results at adjacent monitoring locations. The variation in emissions along sections of the Scheme can therefore be identified and corrected for within

the air quality modelling predictions. In this approach the modelled concentrations are compared with monitored concentrations and, where necessary, adjustments to the modelled results are made in line with the monitoring data. Where an adjustment is required this could take the form of either a single adjustment factor or alternatively several area specific adjustment factors to represent different conditions within the study area e.g. motorway factor, local road factor. The process of model verification follows Defra's published advice set out in its technical air quality guidance and has thereby reduced uncertainty as appropriate.

5. Following further consideration and in the context that the question was framed, i.e in respect of relative traffic conditions on the M4, the less congested / higher speed combination would have a lesser air quality impact than higher volume flows under congested conditions with associated low speeds. As the impact of speed on air quality is non-linear, very high speeds will lead to higher emissions from the lower flows, making the comparison more balanced.
6. In response to a representation from Ms Bates on behalf of Friends of the Earth regarding the use of averaging across the Scheme, Highways England explained that whilst the overall Scheme impact used average values to summarise effects, the impact on individual receptors was calculated by using the specific flow and speed data for the link closest to each individual receptor within the detailed air quality assessments.

Detailed response

7. It is not normal practice to seek to describe the robustness of a set of forecasts in terms of the suggested statistical metrics, although Highways England accepts that such range and confidence estimates could provide useful insight into the level of accuracy of the forecasts.
8. One of the metrics that is used is a statistic that describes the degree of 'convergence' achieved, which describes how well, after a series of iterations, a model has reached a stable situation. Paragraph 6.3.1 of TAG Unit M2 (Variable Demand Modelling) stresses its importance in the following terms:

"It is of crucial importance to demonstrate that the whole model system converges to a satisfactory degree, in order to have confidence that the model results are as free from error and 'noise' as possible."

9. The recommended criterion for measuring convergence between demand and supply models is the demand/supply gap. The DMRB target level of convergence is to achieve a %GAP

value of less than 0.1%. The results for the checks on model convergence are presented in Tables A-1, B-1 and C-1 of the appendices to the Traffic Forecasting Report (submitted as Appendix 1 to Document 3 of Highways England's response to relevant representations at Deadline 1). As can be seen from the tables, all models have achieved a demand/supply gap which meets or is significantly less in most cases than the required level and have therefore converged satisfactorily and are providing a high degree of confidence in the model.

10. In considering how best to assist the Examining Authority in terms of the level of confidence in the model and, in particular, with reference to the assessment of air quality, Highways England recognised that the difference between do-minimum and do-something outcomes is the key determinant of impact. Therefore, standard deviations for the total traffic flows on the 19,000 links comprising the model network were calculated for both the do-minimum and do-something situations for each of the core and high forecasts. In each case the difference between the do-minimum and do-something standard deviations was 1%: this demonstrates stability and consistency between model runs.
11. From another perspective, traffic forecasts are based on a number of variables, many of which are inter-dependent and each of which is subject to assumptions and uncertainty. The overall confidence level for any set of forecasts would therefore need to be derived from statistical assessments of the underlying variables.
12. DfT's TAG, and in turn Highways England, therefore takes an alternative approach to addressing the issue of uncertainty. Paragraph 3.1.1 of TAG Unit M4 states:

*"The **core scenario** will form the basis for the analysis reported in the Appraisal Summary Table (AST) and, as such, should represent the best basis for decision-making given current evidence."*
13. However, as stated in paragraph 4.1.1 of the TAG Unit, *"there is no guarantee the outturn will match the assumptions."* To address such uncertainty, TAG provides a rationale for handling uncertainty at the national level through the development of high and low growth scenarios directly from the core scenario by the application of a set formula: *"The high growth scenario should consist of forecasts that are based on a **proportion of base year demand** added to the demand from the **core scenario**."* Similarly, the low growth forecast is to be based on the same proportion of base year demand but subtracted from the core scenario.

14. In statistical terms, the core scenario is in effect the mean estimate and the differences between it and the high and low forecasts are the variances from the mean. On that basis, it is possible to calculate a form of standard deviation (being the square root of the average of the sum of the variances squared) to apply to the core scenario, but it is of little meaning as it is derived from variances directly input rather than derived from the more usual approach based on random sampling of a population of values within a normal distribution.

15. Highways England has based its assessments on the core scenario forecasts which, as stated in TAG, in the DfT's view, represent the best basis for decision-making given current evidence. High and low growth scenarios have been derived as per the TAG method to provide a range about the core scenario to reasonably capture the likely variability in the key underlying national drivers. In summary, a simple indicator for the level of confidence in the core forecast level of demand based on these calculations is that in 2022 the core demand could potentially vary by $\pm 4\%$, being the amount derived from the traffic model based in turn on the prescribed calculation in TAG to define the range between high and low growth curves for that year.

2. *Traffic modelling assessment reports*

Re question 4.9.4 of ExA's second round questions:

- *Would the applicant please state the position with regard to ExA's request for a copy of the traffic modelling assessment reports by the HE Traffic Appraisal, Modelling and Economics (TAME) Appraisal Certifying Officer and the Department for Transport (DfT) Transport and Strategic Modelling Team?*

Highways England's Response

1. A copy of the reports and an explanatory note will be submitted at Deadline VII.

3. Uncertainty in modelling

Re question 4.9.7 of ExA's second round questions regarding uncertainty in modelling:

- *Would the applicant, Buckinghamshire County Council, and LBHill please state the current position with regard to dialogue between the applicant and the two councils, highlighting areas now agreed, areas not yet agreed and proposals for action? Is the Construction Traffic Management Plan (CTMP) tabled at Deadline V now satisfactory from the Councils' points of view?*

Highways England's response

1. ***Buckinghamshire County Council***

- 1.1 Highways England submitted a response to Q4.9.7 at Deadline V.
- 1.2 Meetings were held between Highways England and Buckinghamshire County Council ("BCC") on 25 November 2015 and 21 December 2015. Prior to the 25 November meeting, Highways England prepared a schedule of the forecast traffic flow changes on the local roads for which BCC had requested junction modelling, for each of the requested time periods. On the basis of the limited changes in 2018 and 2022, BCC agreed that any junction assessments would only be required for the year 2020.
- 1.3 The 25 November meeting also concluded that due to the lack of existing traffic flow data for the routes which BCC had expressed concern about, any modelling completed prior to the close of the Examination would be un-calibrated and un-validated. On that basis, any modelling would only provide indicative partial results and would not be fit for BCC's purposes.
- 1.4 It has been agreed that surveys of existing traffic flow are to be undertaken as a sensitivity test on the assessments undertaken to date to identify the need for any modelling on junctions on the A4, A412 and A4007 and the scope and timing for all the assessments will depend on the collation of existing traffic flow data, for which the first available neutral month for surveys is March 2016. It is expected that the surveys will demonstrate that there is no requirement for further appraisal. However, should that prove not to be the case and the surveys reveal the need for further modelling, a verification appraisal will be undertaken.
- 1.5 Highways England and BCC are still to review how the ongoing communication and agreement of any necessary traffic assessments could be incorporated into the DCO.

- 1.6 No traffic impact issues were raised at the 21 December meeting. The above position was reviewed in conversation with BCC on 8 February 2016 during which Highways England confirmed the above position.
- 1.7 In relation to the impact of construction traffic, Highways England noted that at the time when Highways England and BCC had their initial discussions, a contractor had only just been appointed. Highways England confirmed that the contractor has been analysing the construction data, and Highways England would be able to provide clarity on the position by the close of the Examination. In any event, Highways England confirmed that the CTMP was a live document, which would be updated throughout the construction process.
- 1.8 BCC expressed the view that, as drafted, the CTMP apparently attempts to offer to monitor the traffic flows and, in the event that this does occur, an assessment will then take place. BCC questioned the appropriateness for a detailed assessment to take place after the detrimental effects have come to pass.
- 1.9 Accordingly, BCC asked if Highways England would agree to do surveys and undertake modelling for junctions in the base year and to undertake modelling for 2020 with and without traffic management. Highways England agrees that the proposed surveys which are secured by 7.1.3 of the CTMP will establish a baseline situation as of 2016. In response to BCC's request, Highways England further agrees that on completion of the surveys it would be appropriate to undertake verification modelling for 2020 with and without traffic management in place on the M4 to identify the possible need for any mitigation. This will be secured in an addendum to the SoCG with BCC that will be agreed between the parties and provided to the Examining Authority prior to the close of the Examination.
- 1.10 In summary, it is agreed that surveys of existing traffic flow are to be undertaken as a sensitivity test on the assessments undertaken to date to identify the need for any modelling on junctions on the A4, A412 and A4007. Pending these surveys and subsequent verification, based on the assessments undertaken on the basis of the traffic forecasts, it is not agreed that mitigation of the effects of traffic during construction of the Scheme is required.

2. *London Borough of Hillingdon*

- 2.1 Highways England submitted a response to Q4.9.7 at Deadline V.
- 2.2 A further submission was made by London Borough of Hillingdon ("LBH") on 7 December 2015. It includes clarification requests for traffic growth and development assumptions within the M4 J3-12 traffic forecasts. Highways England submitted its response at Deadline V.

- 2.3 A meeting was convened with LBH on 21 December 2015 to review matters within the draft Statement of Common Ground. At the meeting LBH were briefed on the outcome of a review of each of the development sites raised by LBH in their submission of 7 December, together with the 25 sites included as Appendix 2 to LBH's comments on the Examining Authority's First Written Questions.
- 2.4 At the meeting on the 21 December 2016, Highways England demonstrated an interactive map of the traffic flow plots which Highways England has prepared to enable London Borough of Hillingdon to interrogate and view the changes in forecast flows for Scheme opening and design years for every link in the traffic model network within the borough.
- 2.5 The electronic copy of this interactive map was provided to London Borough of Hillingdon and it supplements the detailed traffic information previously issued to London Borough of Hillingdon. The electronic copy was supplied to London Borough of Hillingdon using a software package that London Borough of Hillingdon had advised was used by the Council. A further meeting between Highways England and London Borough of Hillingdon to discuss the model and the software has been offered to London Borough of Hillingdon.
- 2.6 Highways England repeated the offer for it to revisit LBH to assist them with accessing the information.
- 2.7 The Hakesleys raised a number of queries at the hearing in relation to the impacts of the Scheme A site meeting with the Hakesleys and their surveyor took place on 12 January 2016 to enable Highways England to better understand the likely impact of the Scheme on the caravan park and the Hakesleys and their agent have subsequently been provided with more detail of the works in their immediate vicinity, including likely construction vehicle movements in Amerden Lane.

4. *Effects on local road networks*

Re question 4.9.9 of ExA's second round questions regarding effects on local road networks:

- *Would the applicant and other interested parties please state the current position with regard to dialogue between them, highlighting areas now agreed, areas not yet agreed and proposals for action?*

Highways England's response

Reading Friends of the Earth

1. Highways England provided the following response at Deadline V:

“The SATURN modelling package used for the M4 smart motorway model contains many of the features of a congested assignment model (TAG Unit M3.1 Highway Assignment Modelling, paragraph 2.7.10 provides a useful summary). In particular, its approach to the modelling of junctions draws on the capacity relationships used in lower level individual junction capacity models. It also has the ability to distinguish between the traffic that would like to get through the network but is restrained by a lack of capacity – the demand flow – and the flow that passes through the junction during the modelled time period – the actual flow. SATURN is also able to model ‘blocking back’ which replicates queues associated with a junction blocking back to an upstream junction and incurring delays at that location. As such, Highways England considers that junction delays are modelled within the M4 smart motorway model to sufficient accuracy to properly assess the operation of the local highway network.”

2. Reading Friends of the Earth made enquiries regarding journey time calculations at the Hearing and requested clarification regarding the journey time calculations to inform their Deadline VII submission on 15 February 2016. Further calculations and explanatory text were provided to Reading Friends of the Earth by Highways England by email on 16 February 2016.

Mr Dave Green

3. Highways England provided the following response at Deadline V:

“An assessment of the effects on all travellers was undertaken in accordance with the Design Manual for Roads and Bridges as part of the Environmental assessment of the Scheme. This is reported in chapter 13 of the ES (Document Reference APP-153). One of the metrics used for the assessment was driver stress, which is based on flow per lane and speed. The changes across the local road network directly joining M4 (and it is confirmed this included the A404M and M25) in these terms were insufficient to move the assessed level of stress from one category to another and hence the overall net effect was assessed as “neutral”.

It is acknowledged that for traffic flows to increase on the M4 as a result of the Scheme, it follows that there will be increases on some of the roads that provide access to the M4. It is, however, to be noted that some of that increase joins the M4 west of junction 12, being re-assigned from other long-distance routes.”

4. A response to the information provided by Highways England has been provided by Mr Green and it is clear he does not agree with Highways England. A full response by Highways England will be provided at Deadline VII.

Mr Mike Knowles

5. Highways England provided the following response at Deadline V:

A request for additional information from Highways England was received from Mr Knowles on the 24th November 2015. A copy of the request is provided below, together with Highways England’s responses to the various points raised. In his Written Representation – Additional Comments from the University of Reading, Mr Knowles acknowledges (para 1.2) that : “Following the Hearing further information has been requested and now received from Highways England on 25 November 2015. The additional information is being considered and it is likely that further clarification on a number of points will be needed.” No further clarification was sought.

6. In an email received from Mr Knowles on 29 December 2015, he states:

“Further to the Deadline 4 submission made on behalf of the University of Reading further consideration has been given to the additional information (for which the University is grateful) which has been made available by Highways England, both in

its Deadline 3 response to the Deadline 2 submission of the University of Reading and in its response dated 25 November 2015 to the email from RPS to Highways England dated 24 November 2015. (A copy of the Highways England response of 25 November 2015 is attached with the RPS email of 24 November 2015 being included in the response).

*The University continues to support the M4 Junctions 3 to 12 Smart Motorway Scheme and **agrees** with the strategic aims of the Scheme which are set out in paragraph 2.1.3 of Volume 4.1 of the Statement of Reasons. The Deadline 3 response of Highways England has demonstrated how the aims will be met. (Paragraphs 9.1 and 9.2 of the Deadline 3 response).*

The University notes that Highways England has also confirmed in its Deadline 3 response that consideration has been given to the impacts of the Scheme on the wider road network, including the A327 route. In particular the driver stress analyses have been referred to in paragraphs 10.1 to 10.6 of the response. Highways England is satisfied that the Scheme will have no impact on the assessed level of driver stress on the A327. Driver stress is seen as a measure of traffic conditions on the route. Highways England has also confirmed that the analyses undertaken have taken account of general traffic growth and also developments in the area which were considered to be “reasonably foreseeable”.

Highways England has also confirmed that the Scheme will not result in any material change in the performance of Junction 11 of the M4 Motorway and therefore no additional junction assessments were undertaken. (Paragraphs 11.1 and 11.2 of the Deadline 3 response).”

7. There are no further matters to be agreed with Mr Knowles.

Buckinghamshire County Council

8. As stated in response to Question 3 above, the position with regard to BCC is:

Agreed - Surveys of existing traffic flow are to be undertaken as a sensitivity test on the assessments undertaken to date to identify the need for any modelling on junctions on the A4, A412 and A4007 and the scope and timing for all the assessments will

depend on the collation of existing traffic flow data, for which the first available neutral month for surveys is March 2016.

To be agreed - Highways England and BCC are to review how the ongoing communication and agreement of any necessary traffic assessments could be incorporated into the DCO.

9. The following additional text at section 13.5.5 within the CTMP has been put forward by Highways England at Deadline V:

“The main contractor will prepare a traffic management plan which will describe the traffic management, safety and control measures proposed during construction of the Scheme. The traffic management plan will include details of the following, as appropriate:

- *measures to provide for the safety of traffic, the public and construction staff during traffic management works and temporary traffic control measures;*
- *procedures to be followed for the temporary or permanent closure or diversion of roads or accesses;*
- *procedures to be followed to obtain consent to work on or over railways;*
- *existing pedestrian, equestrian and cyclist routes, including whether the routes are used by one or more of these groups of road users;*
- *measures to be implemented to reduce construction traffic impacts or impacts associated with over-parking on residential streets;*
- *temporary and permanent access to the works;*
- *permitted access routes for construction traffic;*
- *monitoring requirements in relation to the plan;*
- *a programme of traffic management measures to be implemented and details of traffic management proposals for the works on or adjacent to public roads;*
- *details of phasing of works;*
- *drawings showing traffic management layouts, signing and apparatus to be implemented, including proposed routes for pedestrians, equestrians and cyclists;*

- *timing of operations;*
- *a list of roads which may be used by construction traffic in the vicinity of the site including any restrictions to construction traffic on these routes;*
- *the name and contact details of the contractor's traffic safety and control officer and information and advice for the public regarding ways to raise complaints or request information; and*
- *a register of applications for consents associated with temporary traffic management measures."*

10. A response from Buckinghamshire County Council is awaited.