

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 Air Quality

Date: Thursday 11 February 2015

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

Additional Traffic Forecasting Questions

Highways England's response

1. In response to the Examining Authority's question, Highways England confirmed that IAN 185/15 on speed banding was released at quite a late point in the air quality assessment period and was not utilised in the Environmental Statement. The Environmental Statement was prepared in line with the guidance available at the time of the environmental impact assessment, and so the air quality assessment considered speeds as provided by the traffic modelling across different periods of the day (morning, inter peak, evening peak and off peak).
2. However, although initially no adjustment was made to the model to adjust for speeds, Highways England undertook a later review to assess the Scheme against IAN 185/15. The review utilising the approach in the IAN provided results that were lower in terms of overall numbers of properties affected when included in an evaluation of significance. Highways England agreed to provide a note of the review at Deadline VII and to include the tables of results and a commentary on those results. That is provided at Appendix D to this Summary.
3. Highways England explained that, notwithstanding the fact that the IAN appears to say that the modelling method previously recommended did not adequately treat congestion effects, there were a number of reasons why the IAN review indicates less onerous impacts. The IAN was intended to address the variability in the way traffic models assess speed at the link level. It aims to allow traffic congestion to reflect journey times down to link level to support a more informed environmental assessment. The second part of the IAN reflects research on air quality. One area addressed in particular is the impact of congestion on emissions. It has been observed that during periods of congestion there were elevated emissions, so the IAN aims to reflect that in a pragmatic way in relation to assessment.
4. As the air quality assessment was based on the base year 2013 data, Trafficmaster journey time data covering the traffic model area was obtained from the Department for Transport ("DfT") to cover the 12 months from 01 September 2013 to 31 August 2014. This was to ensure consistency with the traffic model, which was itself developed from survey data collated from a similar time period in 2009-2010. The Trafficmaster data were then filtered to include only weekdays (i.e. excluding weekends and bank holidays). Then, aggregate journey time data was aggregated from the initial 15 minute intervals into the various weekday equivalent periods used in the assessments.

5. In relation to the accuracy of link speeds as detailed in the traffic model, Highways England explained that it had collected Trafficmaster data for one year across the strategic road network from 01 September 2013 to 31 August 2014 for consistency. 2013 was the revised basis for the ES air quality assessment. Highways England's model forecast 2013, so the validation was carried out against 2013 traffic data. This means that there would still be variability in the model speeds link by link. To account for this, Highways England compared the Trafficmaster data against the model on a link by link basis. This provided a suitable multiplier to ensure that speeds for further forecasting reflected the differential between observed speeds and the model.
6. Once these calculations were carried out, Highways England noted that the accuracy of model data becomes less relevant, as the factor is different for each link. The model is for the forecasting based on the outputs it had originally, so the adjustment factor has to be applied to 2022, which provides the amended air quality assessment figures.
7. In response to further questions from the Examining Authority relating to the reasons why emissions had reduced on some links, Highways England referred the Examining Authority to IAN 185/15, Annex 8, page 14, which is provided as at Appendix A to this Summary and which details speed band descriptors. There is a category within the descriptors which reflects occasions when slower speeds lead to higher emissions. In the fourth column of Annex 8 to IAN 185/15, speed is a feature but other features are also present, such as history of congestion on the local road network, volume over capacity ratios and so on. The assessment of all of the information available enables the provision of a reasonable measure of the traffic movement in order to undertake an air quality assessment.
8. Further, Highways England explained that although the results appeared to be slightly better, differing results were likely as both assessments utilised different methodologies. In IAN 185/15, approach speeds are treated as bands rather than as individual speeds. Therefore, Highways England had to change its verification approach to the baseline year for the IAN 185/15 air quality assessment. In doing so, Highways England found that the adjustment factors for oxides of nitrogen (both for approach in the ES and IAN 185/15) were very similar. On that basis, both air quality assessments were subject to similar adjustment factors to establish future concentrations of pollutants.
9. Another reason is that speeds on the motorway do not change so much that there is a great deal of band shifting. As a result, the number of residential receptors considered within the overall evaluation of significance (i.e. that would experience a change of $>0.4 \mu\text{g}/\text{m}^3$ with an

annual mean concentration of $>40 \mu\text{g}/\text{m}^3$) is very similar between the two methodologies. The environmental statement predicted 11 receptors with a small change in NO_2 over the objectives and 7 locations with a medium change over the objectives. Applying the IAN 185/15 approach, there were 15 receptors experiencing small changes and 1 receptor with a medium change. Taking account of this, it is plain that, in fact, the Environmental Statement air quality approach is actually the more precautionary approach. On that basis, the results of the Environmental Statement air quality assessment in this instance should be preferred.

10. Highways England stated that the objective of IAN 185/15 was to ensure that traffic models used were as reasonable and informed as possible to inform the Environmental Statement. IAN 185/15 recognises uncertainty but still aims to produce a pragmatic approach: in other words, an approach that was not necessarily better or worse than the previous approach, but one which is better informed.
11. Highways England addressed Annex C to the IAN 185/15 and the issue of the extent to which the emission levels are reflective of real life emissions levels, and noted that the emissions values provided by Highways England relate to 2011 to 2013 for light duty vehicles and heavy duty vehicles. Those figures are taken from the Defra Emissions Factor Toolkit ("EFT"). However, in addition, Highways England's assessment complies with IAN 170/12, which provides guidance as to the approach to uncertainty in Euro 6 emissions. The use of the Defra detail followed by the application of the IAN 170/12 advice produces a more robust assessment.
12. Highways England was unable to comment authoritatively as to how Defra's data on emissions compared to real life emissions, as only Defra is in a position to answer such a point. Highways England said that it understands that Defra are influenced by COPERT (Computer Programme to calculate Emissions from Road Transport, as co-ordinated by the European Environment Agency ("EEA")), which makes some allowance for variation in Euro 6 emissions. Highways England confirmed that it was not aware if Defra had carried out any comparison between the Defra EFT values and real life emissions.
13. Highways England confirmed that the starting point for assessment is individual traffic counts. When the model was built a number of counts were collated and then the relevant guidance from TAG Unit M1.2 Data Sources and Surveys was applied, The instructions in the guidance are to take counts over longer periods, such as a week or in neutral months (that is, those months with the lowest coefficient of variance). Following the advice in guidance minimises the risks of errors from taking individual single-day counts alone.

14. There is little guidance on potential errors contained in multiple counts. This is because by taking several counts, the guidance aims to minimise the extra variances introduced. At each step in the model build, Highways England eliminates as many errors as possible. The difference between Highways England's initial prior matrix and the end matrix is that 4% extra traffic is introduced. The matrix is only adjusted within certain limits to ensure that it meets the relevant criteria. Once this is complete, Highways England applies a validation process. Whilst there are statistical theories which consider the accuracy of traffic models, there is very little academic evidence on the overall accuracy of a traffic model. The Highway Assignment Modelling unit within TAG makes reference to "accurate" but that term is not defined. There are three main influences for subsequent assessments: vehicles, speed flow and lorries. On the basis that it is a requirement within TAG that modelled flows should be within $\pm 15\%$ of observed values and journey times should be accurate to within 15% in 85% of cases, if inaccuracies had been narrowed to acceptable levels, the probability would be that any speed or flows would be within $\pm 15\%$ for 85% of the time. That is the minimum guidance.
15. The assessment of motorway flows within the traffic model is even more accurate than that minimum requirement. It is in the region of 98-100%, and Highways England stated that it considers that this level of accuracy should enable the Examining Authority to have confidence in the data. Ultimately, the models prepared are determined in line with the validation criteria. The Highways England Traffic Appraisal, Modelling and Economics ("TAME") Appraisal Certifying Officer for the Scheme then assesses the models and identifies the risks arising from the model for the subsequent forecasts. This mechanism allows Highways England to have a second opinion on the risk identified in the model in relation to link speeds and impacts on air quality.
16. In response to further issues being raised proposing a re-run of the traffic flows using more conservative traffic flow figures, Highways England noted that it was not aware of any guidance on uncertainty which would provide a published mechanism for quantifying uncertainties in air quality modelling and assessment. Highways England made two further points:
 - a. In Defra's air quality guidance there is guidance on verification to bring the baseline towards the monitored data.

- b. In addition IAN 174/13, in Appendix A3, discusses the probability of an effect occurring and recognises that the assessment undertaken by Highways England is reasonable and robust:

“Is there a high probability of the effect occurring? (Checklist Question 11)

Whilst there is uncertainty in air quality monitoring and modelling (and the traffic data used in the assessment), the air quality assessment undertaken is based on the most reasonable, robust and representative methodologies. The context for this is that the assessment has been completed taking advice from published guidance and the results have been verified against monitoring data.

On this basis, whatever the outcomes of the air quality assessment, it can be considered to have a high probability that they will occur and the results and consequent evaluation of significance can be used to inform professional judgement accordingly.”

E.1 Re question 4.6.8 the applicant states at paragraph 14 that the 'scheme is assessed as not having a significant air quality impact it is, however, still likely to lead to some worsening at a small number of properties' REPS-004. At response to question 4.6.6 10 receptors are predicted to be above the annual average NO₂ objective (B867-B871, B877-B880 and X9). The applicant states that only two of the ten receptors would be considered as part of the overall evaluation of significance (X9 and B867) as they have changes greater than 0.4µg/m³.

- *Can the applicant confirm that these are the only receptors forecast to exceed the annual average NO₂ objective? Can the applicant also state what mitigation measures are proposed at these locations?*

Highways England's response

1. Highways England noted that the concentrations and changes in annual mean NO₂ referred to in the question, and in response to question 4.6.6 of the Examining Authority's second written questions, were those predicted as part of the sensitivity test carried out using the Hillingdon AURN monitoring station as a single verification point. This information was provided for the benefit of the London Borough of Hillingdon in response to their specific question. However, this information does not form part of the overall evaluation of significance for the Scheme, which remains as described in the Environmental Statement ("ES") (Application Document Reference 6-1, APP-146).
2. However, Highways England considered the question as related to the ES, and noted that the results presented in the ES show 189 receptors where annual mean concentrations of NO₂ are predicted to be above the objective value with the Scheme. These receptors are located at the following locations, adjacent to the M4:
 - a. Sindlesham, adjacent to B3030 (Drawing 6.15a);
 - b. Emmbrook, adjacent to A329 (Drawing 6.15b);
 - c. Dorney Reach, closest property to the M4 to the south (Drawing 6.10a);
 - d. Lake End, closest property to the M4 to the south (Drawing 6.10);
 - e. Slough, Chalvey, around junction 6 (Drawings 6.11b and 6.11c);
 - f. Slough, Winvale, adjacent to A332 (Drawing 6.11d); and
 - g. Hounslow, adjacent to M4 and A4 (Drawings 6.18a, 6.18b and 6.18c).

3. The vast majority (171) of these receptors are predicted to experience imperceptible (<0.4 µg/m³) increases in annual mean NO₂.
4. In relation to the sensitivity test based on the Hillingdon AURN monitoring station, receptors X9 and B867 are the only receptors which would exceed the annual average NO₂ air quality objective and where the Scheme's impact would be a change of more than 0.4 µg/m³. Highways England noted that, as identified in paragraph 8.3 of Highways England's response to question 4.6.6, there are ten receptors in the area affected by the sensitivity test predicted to exceed the annual mean objective for NO₂, including B867-B871, B877-B880 and X9, but these receptors show changes of less than 0.4 µg/m³. On that basis, the use of a single verification factor based on the Hillingdon AURN monitoring station does not change the conclusion reported in the ES that the Scheme will not have a significant air quality impact.
5. In response to further questions from the Examining Authority, Highways England noted that it had carried out two further iterations using the AURN data in the verification approach. One iteration took account of the AURN within Highways England's wider verification and the other iteration used an approach (which is not agreed or supported as valid by Highways England) of just using the AURN, as described in the above paragraph.
6. In response to further issues raised by the London Borough of Hillingdon suggesting that on the basis of IAQM guidance, mitigation was justified, Highways England explained that the danger of applying the verification approach of just using the AURN site is that it is contrary to the IAQM guidance itself, and is very reliant on a single location. The AURN-only approach is not one supported by any accepted methodology. On that basis, Highways England maintains that using a single location is not appropriate, particularly when there is other useful data available.
7. Highways England noted that in relation to IAQM guidance, the guidance itself states that it is not intended to replace existing highways guidance. In performing its assessment, Highways England confirmed that it used the accepted approach of using DMRB and associated IANs.
8. In relation to the Air Quality Directive and EU limits, Highways England explained that there were two elements within an air quality assessment which required judgement:
 - a. significant air quality effects and the relationship with air quality objectives; and

b. compliance with the Ambient Air Quality Directive.

9. These judgements are recognised in the NN NPS and developed guidance. IAN 174/13 provides guidance on "significance", and 175/13 provides guidance on "compliance". IAN 174/13 provides the framework within which professional judgements should be made in relation to significant air quality effects. Compliance with the Ambient Air Quality Directive is a different standard.
10. The IAQM guidance states explicitly that those undertaking highways schemes need to ensure that they undertake the correct assessment. It does not include guidance on compliance with EU Limit Values.
11. Addressing the choice of the baseline year, Highways England noted that DMRB indicates that it is the worst year within the first 15 years of opening which should be considered. The worst year in the first 15 years is generally assumed to be the first year. Whilst traffic may increase in later years, improvements in background air quality and vehicle emissions levels should offset this.
12. Highways England confirmed that 11 receptors in Slough were predicted to exceed the objective level by more than $0.4 \mu\text{g}/\text{m}^3$ as a result of the Scheme. In order to determine whether the provision of mitigation measures is necessary, IAN 174/13 directs that the number of properties in total should be taken as a whole and considered within the context of the IAN 174/13 evaluation of significance. Highways England noted that applying this methodology meant that the number of residential dwellings which would exceed the annual mean air quality objective for NO_2 with a change of more than $0.4 \mu\text{g}/\text{m}^3$ would be below the criteria needed for mitigation to be considered. Overall, the number of properties would be below the levels set out in IAN 174/13 at which Highways England is instructed to consider mitigation. Although Highways England accepted that there are certain locations where there are more properties that may be affected by concentrations of NO_2 predicted to be above the annual mean air quality objective, these properties are not predicted to have a change of more than $0.4 \mu\text{g}/\text{m}^3$. Highways England's studies confirm that the other contributions to the air quality environment appear to be mostly caused by motor traffic using the local road network and the mainline of the M4.
13. In response to issues raised by Slough Borough Council, Highways England noted that whilst it may be the case that some receptors met the IAQM criteria for significance, as had already been set out by Highways England, IAQM is not the appropriate methodology for assessment of a highways scheme. Highways England stated that picking and choosing different elements

from different standards, particularly those not applicable to highways schemes, would present an unrealistic and inappropriate burden for development of any highways scheme.

14. Highways England confirmed that it was not the body responsible for reporting compliance or otherwise to the European Union. Highways England's data shows that the Scheme will not affect compliance with European limit values, but, ultimately, Defra are the body responsible for reporting compliance and Defra would reach its own judgement. Defra was consulted by Highways England during the drafting of the IAN 175/13, and the approach set out in IAN 175/13 has been confirmed as an acceptable approach for Highways England to adopt by Defra.
15. Highways England explained the Defra approach as understood by Highways England, and noted that Defra have developed a network (Pollution Climate Mapping (PCM) model) to meet the requirements set out in Annex 3 of the Ambient Air Quality Directive. Defra submits annual reports and action plans to the European Commission. What is in the report is a matter for Defra, and Highways England stated that it is not aware of how the AQMA for Slough was considered in the reporting.
16. Highways England was unable to confirm whether Defra's Air Quality Plan of December 2015 had taken into account impacts from the Scheme, as that was a matter for Defra. Highways England noted that the locations at junction 6 (Slough) had been considered under the local assessment with detailed modelling, which was then considered against the air quality objective values. This is different to the consideration of EU limit values and compliance, which are part of Defra's responsibilities through their national model. Highways England stated that it is required to take the information from the air quality assessment, apply the IAN 175/13, and then inform Defra if the results of the analysis show that there is a risk that the Scheme might affect Defra's report to the EC: in other words, whether the Scheme causes a compliance risk. Highways England confirmed that it had made no such report to Defra in relation to the Scheme, as no EU compliance risk has been identified which would materially change the information which Defra would supply to the EC.
17. In response to a range of points raised in relation to air quality, the applicability of the NN NPS and the imposition of 50 mph speed limits on motorways, Highways England reiterated that the Scheme will not have a significant air quality impact nor will it affect EU compliance. Highways England stressed that the impacts of air quality are taken very seriously by it. By way of example, in relation to the A556 DCO, Highways England's assessment established that there was a potential significant air quality impact. Highways England brought this to the

attention of the Examining Authority and provided suggested mitigation to be included in the DCO - which included speed limits and on-going monitoring. Even with mitigation, there were some receptors which remained above 40 µg/m³, and this was found acceptable by the Secretary of State, who did not require that all receptors had to be mitigated to be below 40 µg/m³.

18. Highways England addressed a query as to whether highways schemes were required to be air quality neutral in accordance with Greater London Authority ("GLA") guidance. That guidance document indicates that it is not applicable to highways schemes. *Air Quality Neutral Planning Support Update: GLA 80371* published in April 2014 by Air Quality Consultants notes at paragraph 2.9 that *“Major transport infrastructure development, such as that proposed by TfL, is assessed using the Transport Advisory Guidance (TAG) methodology, which estimates changes to NO_x and PM emissions, and then applies an economic valuation. It is therefore suggested that it would be inappropriate to apply the air quality neutral policy to these types of development.”*

19. Mitigation measures are neither necessary nor proposed at these locations. This is because the outcome of the assessment indicates that the Scheme does not cause a significant air quality impact, nor does the Scheme affect the UK’s reported ability to comply with the Air Quality Directive. Highways England noted that this position is in compliance with the published guidance produced to address the requirements of the NN NPS, and is consistent with the approach taken by the Secretary of State on other national network schemes which have been the subject of applications for development consent under the Planning Act 2008.

E.2 In response to oral hearings issues from LBHill at para 1.33.2_{REP5-005} HE gives the range of concentration of the annual mean NO₂ measured as between 1.9 and 9.3µg/m³ with a standard deviation of between 0.9 and 3.5µg/m³.

- If the data used in the modelling has this level of standard deviation, can HE explain how these, and other, standard deviations of data are reflected in the output of the model?*

Highways England's response

1. Highways England noted that a standard deviation of modelled results is not an accepted way to consider uncertainty in air quality modelling assessments, and confirmed that the assessment for the Scheme was undertaken following appropriate guidance on methodologies.
2. The certainty of the modelled results in the base year, which informs future year model performance, is improved with the process of model verification. This involves comparing the modelled concentrations with monitored concentrations and where necessary adjusting the modelled results 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 or local road factor. The process of model verification follows Defra's published advice set out in their technical air quality guidance.
3. Highways England's response to the London Borough of Hillingdon at para 1.33.2 of_{REP5-005} was intended to provide information in relation to the variability of measured concentrations between different years and to show that the variability is generally higher than the change in concentrations as a result of the Scheme.
4. Highways England noted that there are other considerations applied to the data which are intended to reduce uncertainty, including:
 - a. The meteorological conditions and monitoring data for the base year are reviewed against meteorological data and monitoring data for a range of years to ensure it is not atypical i.e. the selected base year is broadly consistent with other years. For example 2010 was associated with elevated monitoring conditions across the UK and consequently a base year of 2010 is not used in Highways England's scheme assessments.
 - b. To help minimise the uncertainty in the vehicle emission factors and take account of recent measured traffic and air quality data, a base year is normally selected within 2

to 3 years of the assessment. From an air quality perspective, this helps to minimise any discrepancies between projections and observed monitoring, especially as Euro 6/VI vehicles start to enter the UK fleets.

- c. Additionally, Highways England published IAN 170/12 v3 to address uncertainty in the performance of Euro 6/VI vehicles and the influence those vehicles may have on future NO_x and NO₂ trends. The approach set out in IAN 170/12 v3 makes an allowance for all Euro 6/VI vehicles (cars, vans, HGVs and buses/coaches) not performing in line with their emission standards. This is a precautionary approach and ensures that the air quality assessment has addressed uncertainty in real world emission performance.
- d. The aim of the Design Manual for Roads and Bridges ("DMRB") is to establish the most likely air quality effects associated with a scheme. This ensures that the evaluation of the outcomes of the air quality assessment is consistent with the requirements of the NN NPS.

E.3 Within the response to oral hearings REP5-005 HE comments on LBHill's consultant's review of the methodology for calculating air quality impacts.

- • *Is LBHill content with the response from the applicant? If not, what are the outstanding concerns?*

Highways England's response

1. Highways England noted that it had engaged with local authorities throughout the lifetime of the Scheme to discuss the technical matters raised. The issues raised by Professor Laxen were only raised very recently, and Highways England was working to provide the requested information. Highways England met with the London Borough of Hillingdon on 9 February 2016 and discussed the understanding of NO₂ projections set out in IAN 170/12 and long term monitoring trends observed at the Hillingdon AURN site. Highways England understands that the London Borough of Hillingdon is content that the AURN does not demonstrate a significant upward or downward trend in measurements since 2009. A draft note has been provided to the London Borough of Hillingdon and following further discussions a note setting out the agreed position between Highways England and the London Borough of Hillingdon is provided at Appendix B to this summary.
2. In summary, whilst Highways England has provided previously a graph of the LTT_{E6} curve, it would not be correct to take one point in time and to say the value should be between one line and another. In developing LTT_{E6}, Highways England confirmed that it had made allowances for the introduction of Euro 6, but also applied a precautionary approach to accommodate the possibility that Euro 6 did not achieve anticipated performance in the real world. For that reason, it would be an over simplification to draw a line between two points, without addressing a range of factors.
3. Highways England has prepared a note providing more detail on the use of LTT_{E6}. This note is provided at Appendix C to this summary

E.4 Within the response to oral hearings REP5-005 HE comments on Slough BC's consultant's characterisation of Future NO₂ Concentrations in Slough, particularly concerning uncertainties in the modelling.

- Is Slough BC content with the response from the applicant? If not, what are the outstanding issues and areas of disagreement?*

Highways England's response

1. Slough Borough Council submitted a written report commenting on the effect of uncertainty in the modelling chain on future forecasts. Highways England agreed to discuss the written report with Slough Borough Council and to indicate agreement where possible. Highways England understands that Slough is submitting this report at Deadline VII, and therefore Highways England will be in a position to comment on it at Deadline VIII.
2. In further questions, the Examining Authority raised the issues of forecasting reliability and future responsibility for air quality levels. The Examining Authority asked what the position would be should the air quality levels not fall in line with the predictions. In response, Highways England noted that the responsibility for EU limit values lies with Defra, and if limit values were above 40 µg/m³ in, say 2020, Defra would need to update the National Action Plan and bring forward the measures for the UK government to undertake.
3. In relation to uncertainty in forecasting in general and the uncertainty in forecasting emissions in particular, Highways England referred to Figure A2, which is provided at the end of this Summary. Figure A2 shows opening year concentrations based on Defra's EFT tools as published. However, as Highways England appreciated the uncertainty in this data, Highways England made accommodation in its forecasting, and adopted a reasonable but precautionary approach. Further, Highways England confirmed that it keeps Defra advice under review on an on-going basis, so if a more pessimistic view is required (e.g. if it becomes apparent that most vehicles will fail Euro 6 tests), then Highways England can make any necessary changes. Highways England provided a note on how air quality is compliant with the NN NPS at Deadline VI, "*Note on Air Quality Requirements of the NPS*".
4. Highways England also made a wider point about Highways England's approach to air quality, noting that when Highways England was formed on 1 April 2015, it was provided with a £100m fund specifically to target air quality improvements. Highways England noted that it continues to seek solutions for air quality issues and has been commissioning research projects in that regard. For example, Highways England has constructed two air quality

barriers on the M62, which are being monitored at ground floor level and also at first floor level. Until now, barrier research has been focussed on the ground floor effects so this study is unique in looking at first floor effects as well. However, until fully evaluated, Highways England cannot comment on whether or not an air quality barrier would be effective. However, the study illustrates the approach Highways England takes. Other examples include a feasibility study with the haulage industry to see if Highways England can assist with the improvement of Euro 6 lorries. Highways England is also researching dynamic intervention; however, such an intervention on a motorway might lead to congestion on the local roads: the purpose of the research is to help Highways England understand the potential impacts and consequences not only the motorway but also on the local road network.

5. In response to the Examining Authority's comments concerning managing traffic in real time, Highways England reiterated that there is no mechanism to apply mitigation from time to time as opposed to consistently. Highways England confirmed that the mechanism to link speed changes to air quality monitoring data in real time is not yet available.
6. Highways England explained that the Scheme did not require monitoring, as monitoring was only required where a significant air quality impact was anticipated or possible. Whilst Highways England accepted that there was a need to address air quality in general, in Highways England's view, such general air quality was more effectively monitored at a national level, and Highways England was developing a national air quality monitoring network with the aim of putting out 40 air quality monitors. This would be a national, strategic plan, and not a Scheme-specific plan.
7. Highways England noted that the Examining Authority will have to come to a conclusion as to "significant" on the basis of the evidence presented. That evidence includes evidence that the uncertainties in the process have been taken account of, and no contrary evidence was submitted. The issue, in Highways England's view, was not "will the Scheme if delivered guarantee nil risk" or "can there be certainty": instead, the issue was whether the air quality effects were significant. .
8. In relation to air quality monitoring at the national level, Highways England noted that there were 40 air monitoring stations proposed, which would be situated around the country. In selecting the sites, Highways England was governed by issues such as health and safety, power, access and so on. A map with a suggested location is provided below. Highways England also noted that the intention is to have that monitoring point in place within approximately 12 months, subject to the tendering and commissioning process.

9. The table below describes the proposed location of an air quality monitoring station and this shown in the accompanying maps.

Site No	Name	X	Y	Map Finder
12	J11-12 M4 near Reading services (WB)	467970	169635	www.google.co.uk/maps/place/51.421661,-1.0238674



E.5 SBC requests that the assessment of Air Quality for Construction Compound 9 (CC9) should be in accord with Institute of Air Quality Management (IAQM) guidance. The ExA notes that the applicant uses the Design Manual for Roads and Bridges (DMRB) since the IAQM guidance is not intended for highway schemes promoted by HE. However, CC9 is within an air quality management area (AQMA), it is separate from the M4 in which highway works are be carried out, and is located within a residential area.

- In these circumstance would it not be appropriate to use the IAQM guidance?*

Highways England Response

1. Highways England stated that it does not believe the IAQM guidance is appropriate for use in this assessment. The correct guidance to utilise for a highways scheme, as noted by the IAQM guidance itself, is the guidance already available, which is the DMRB air quality guidance, set out at paragraph 3.45 of HA207/07.
2. It would be inappropriate and confusing to utilise two sets of guidance with inconsistent requirements for traffic screening and evaluation of significance within one Environmental Statement. Moreover, the use of construction compounds is an integral part of the Scheme. It is therefore correct to assess the construction compounds as part of highways schemes, and not separate development
3. Highways England also confirmed that it is assessment is that the number of HGV movements per day associated with Construction Compound 9 would be approximately 60 vehicle movements per day.
4. Highways England and Slough Borough Council confirmed that they were still discussing matters, and expected to provide a Statement of Common Ground to the Examining Authority at Deadline VIII.

E.6 The continuing uncertainty regarding real driving emissions was referenced in the Defra document 'Improving air quality in the UK – Tackling nitrogen dioxide in our towns and cities' REP5-004, Appendix E. Within that document a press release from the European Commission dated 28 October 2015 was referenced which said 'currently produced Euro 6 diesel cars exceed the NO_x limit 4-5 times (400%) in real driving conditions compared to laboratory testing'. A further document 'Real-world Exhaust Emissions from Modern Diesel Cars', Vincente Franco et al, October 2014 referenced by HE REP5-005 states that 'the average on road emission levels of NO_x were estimated at 7 times the certified emission limit for Euro 6 vehicles.' Within the paper the worst performing car was identified as having a conformity factor of 25.4, i.e. 25.4 times the certified emission limit.

- Can the applicant and the local planning authorities give their considered views on the possible impact of these figures on the modelling of the scheme currently and in the future?*

Highways England's response

1. Highways England confirmed that it has undertaken high level calculations to estimate the impact that different emission performance of Euro 6 cars could have on future NO₂ concentrations. This approach is set out in more detail in response to Question 7.
2. The conformity factor of 25.4 is a single reported maximum and is considered to be one of two outliers (the other recorded at 24.3), within the context of the reported values from a small sample. It is not reasonable or robust to consider the potential impact of uplifting Euro 6 cars by a factor of 7 based on 2 outliers in the Franco paper.
3. The air quality modelling undertaken for the Scheme is based on Defra vehicle emission rates (Emission Factor Toolkit v 6.0.1), which are derived from the COPERT 4 software tool. The Emission Factor Tool Kit makes allowance for Euro 6 diesel vehicles in real world driving conditions and assumes an uplift of approximately 2.5 of the Euro 6 emissions standard.

E.7 In response to question 4.6.3 at 3ii Table 2 the applicant gives NO_x emission rates for a single diesel car.

- Can HE confirm if these represent the levels adopted in the air quality assessment? If so, how do they compare to levels using 5xRDE and 7xRDE as indicated in the documents referred to in the preceding question? What difference would it make to the outcomes of the HE assessment if the levels were increased to those referred to in the Defra and the paper by Vincente Franco et al referenced in the preceding question?*

Highways England's response

1. Highways England confirmed that the numbers presented in response to question 4.6.3 are from Defra's Emissions Factor Toolkit, which was used in the air quality assessment presented in Chapter 6 of the Environmental Statement (Application Document Reference 6-1, APP-146).
2. The air quality assessment completed for the Scheme is based on LTTE6, which produces NO₂ concentrations consistent with both the 5x uplift on Euro 6 Diesel Cars and the 50% uplift to all Euro 6/VI emissions in EFT suggested by the Examining Authority previously.
3. Highways England has undertaken a series of high level calculations to review the potential impacts of changes in NO_x emissions for the following scenarios:
 - a. 5 x uplift in NO_x European Vehicle Emission Standard of 80mg/km for Euro 6 Diesel Cars;
 - b. 7 x uplift in NO_x European Vehicle Emission Standard of 80mg/km for Euro 6 Diesel Cars; and
 - c. 50% uplift compared to EFT in all Euro 6/VI NO_x emissions for all vehicle types.
4. Highways England noted that in order to provide further information on the relative impact of the different emission scenarios, a DMRB air quality spreadsheet model has been used to calculate a modelled NO₂ concentration at a receptor location 10m from the edge of the motorway. Traffic characteristics of 130,000 Annual Average Daily Traffic ("AADT"), 6% HDVs and average speed of 100kph were used to represent average traffic conditions on the M4 between junctions 3 and 12.

5. The purpose of this approach allows for a comparison of the relative changes in emissions and the impact on modelled NO₂ concentrations. Note that the modelled NO₂ concentrations have not been verified and are used only to illustrate the relative impact of the different emission scenarios on future levels of NO₂. A consideration of the relative changes between each emission scenario has been used to provide an indicative interpretation of the outcome of the presented air quality concentrations in the ES.
6. The relative contributions of the different vehicle types underpinning the emissions information are provided in Figure A1 at the end of this Summary. Figure A1 breaks down the relative contribution of each vehicle type (e.g. car, van, HGV, bus / coach) split by petrol and diesel usage for base year of 2013 based on unadjusted EFT and the various emission scenarios including the unadjusted EFT for 2022.
7. A summary of the key findings from Figure A1 is:
 - a. the highest NO_x emissions are in 2013 which are attributable to higher NO_x emissions with earlier Euro Standards (Euro 3/III to 5/V vehicles). There are no Euro 6/VI vehicles in UK vehicle fleet in 2013;
 - b. diesel cars, diesel vans and HGVs make up the majority of the NO_x emissions in 2013;
 - c. NO_x emissions are lower in 2022 for all emission scenarios and are attributed to lower Euro 6/VI emissions and their greater numbers in the vehicle fleet;
 - d. in 2022, diesel cars make the greatest proportion of the total NO_x emissions;
 - e. the contribution of HGV emissions is significantly reduced and attributable to far lower NO_x emissions per HGV as a result of a large proportion being Euro VI; and
 - f. The 7x Euro 6 diesel car emission scenario has the highest total NO_x emissions in 2022.
8. Highways England noted that Defra have also considered the impact of Euro 6/VI vehicles operating at 5x the emission standard as a sensitivity in their published National Air Quality Plan assessment of compliance with the EU Directive (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/492901/aq-plan-2015-technical-report.pdf), therefore the 5x test is consistent with Defra's reporting to the European Commission.

9. Figure A2 presents representative concentrations for the various emission scenarios for 2013 and 2022. A summary of the key findings from Figure A2 is:
 - a. 2013 has highest modelled NO₂ concentrations;
 - b. NO₂ concentrations in 2022 are lower than 2013 values for all emission scenarios;
 - c. EFT has the lowest modelled concentrations in 2022;
 - d. NO₂ concentrations based on LTT_{E6} comparable with the 50% and 5x emissions scenarios;
 - e. NO₂ concentrations based on 7x emissions scenario only slightly higher than LTT_{E6}.
10. Highways England confirmed that the 2013 data was not observed data, as it was from the EFT with the appropriate adjustment factors applied.
11. LTT_{E6}, was monitored from 2008. The underlying data was from Defra's emissions toolkit data. At the time of publishing IAN 170/12, it was clear that there would not be a rapid change in the level of concentration. Highways England confirmed that it was also aware of reports regarding the very early testing of Euro 6 lorries. From an air quality point of view, Highways England recognised that it needed to make allowance for Euro 6. However, Highways England went further, as it considered that 2008 was not necessarily precautionary enough, which is why Highways England added an additional uplift for LTT_{E6}.
12. In response to further questions from the Examining Authority, Highways England confirmed that the background NO₂ concentration used in the air quality modelling was obtained from Defra's background maps for the local area. The same background NO₂ concentration was used for all emission scenarios including LTT_{E6}. No adjustment was made to the background to make allowance for Euro 6/VI performance in the real world.
13. Highways England confirmed that LTT_{E6} was guidance not restricted to Highways England schemes, and it could be used by other air quality professionals to use. Highways England stated that LTT_{E6} was produced in 2012, with an update in 2013.
14. Highways England noted that other schemes that have used LTT_{E6} including A556 Knutsford to Bowdon Scheme and A160-A180 Port of Immingham Improvement Scheme:
 - a. The air quality assessment for the A556 used LLT_{E6}, and its application can be found in the Environmental Statement Update (January 2014) Section 6.1.12

(http://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/TR010002/2.%20Post-Submission/Representations/ExA%20Questions/29-11-2013%20%20Responses%20to%20ExA%20Questions%20Round%202/140121_TR010002_Highways%20Agency-Environmental%20statement%20addendum%20.pdf); and

- b. The A160 Immingham air quality assessment applied the original Long Term Trends (LTT) curve (see reference below)

[http://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/TR010007/2.%20Post-Submission/Application%20Documents/Environmental%20Statement/6.3.2%20ES%20-%20Volume%203%20Appendices%20Chapter%206.1%20to%206.7%20\(APP14a\).pdf](http://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/TR010007/2.%20Post-Submission/Application%20Documents/Environmental%20Statement/6.3.2%20ES%20-%20Volume%203%20Appendices%20Chapter%206.1%20to%206.7%20(APP14a).pdf)

15. At the time of the A160's air quality assessment, the LTT_{E6} factors had only just been released. Highways England confirmed that the results with the original LTT were not significant, and the difference between LTT and LTT_{E6} in the opening year (2016) was negligible, so Highways England elected to continue to rely on the LTT method rather than to update the assessment to LTT_{E6}.
16. In terms of other schemes using LTT methodology, Highways England confirmed that, for example, the previous LTT curve was used by the Broughton Bypass scheme, the assessments for which were undertaken prior to the issue of LTT_{E6}. Highways England also noted that the Congleton Bypass Options Appraisal Poynton Relief Road Options Appraisal used LTT_{E6}, but the full technical reports have not yet been published.

E.8 In the technical report issued with Defra's document 'Improving air quality in the UK Tackling nitrogen dioxide in our towns and cities' at section 6.1, the issue that vehicle performance and emissions in the real world have not corresponded with those measured in the European test cycles is considered. An alternative scenario was modelled based on the assumption that emissions would be higher than previously predicted and the comparative results are presented in Table 6.1. This shows that the number of zones not meeting the limit value in 2020 would increase from 8 to 30 if the Euro 6 emissions do not perform as modelled.

- *Can the applicant and the local planning authorities give their considered views on the effect on the relevant zones within the scheme if this scenario is realised and what measures should be taken to mitigate the effects? In addition, the views are sought on how this would affect compliance of the zones within the scheme with the National Policy Statement for National Networks (NPSNN) at paragraphs 5.10 – 5.13.*

Highways England's response

1. Defra's reported sensitivity test assumes that diesel car emissions were 5x their Euro 6 NOx European Vehicle Emission Standard of 80mg/km. Defra has advised Highways England that under this scenario, the South East, Reading and Wokingham and Greater London zones / agglomerations would not be compliant in 2020. However, even if this scenario were realised, Defra anticipates the South East, and Reading and Wokingham zones will still achieve compliance before 2025.
2. There are no changes to the road network assessed by Defra in their PCM model as part of their sensitivity test comparative to their reporting to the European Commission, therefore no additional roads would be brought into the Scheme compliance assessment. On this basis, based on the methodology described in IAN 175/13, Highways England maintained its conclusion that the Scheme is unlikely to affect the UK's ability to comply with the Air Quality Directive for this sensitivity test and is consistent with the policy tests in the NN NPS.

E.9 The applicant refers to the Emission Factor Toolkit in several of its responses to ExA second questions REP5-004, for example question 4.6.3. The ExA needs to understand the assumptions and options selected from this toolkit by the applicant in the modelling.

- The applicant should be prepared to give further explanation on the options selected, including advanced options, with a reasoned description and the effect these selections might have had on the output of the models.*

Highways England's response

1. Highways England explained that the Emission Factor Toolkit ("EFT") is based on national fleet data and fleet projections for a range roads e.g. Motorway, Urban and rural roads, derived by DfT and Defra. The EFT is used by Highways England for all its scheme assessments and is commonly used by local authorities and other developers to complete air quality assessments.
2. Whilst advanced options do exist to change the fleet mix in the modelling it would not be appropriate to use in a scheme assessment such as the M4 given that the traffic data that the assessment is based on does not contain detailed information of the fleet breakdown and the various Euro Standards of the fleet. It is worth noting that the scheme is not anticipated to change the fleet composition significantly therefore the assumptions regarding fleet compositions will be the same either with or without the scheme.
3. The following inputs were selected within the EFT for the air quality modelling, including:
 - a. Area: Either "England (London)" or "London" as appropriate for the location of the road.
 - b. Year: Either 2013 for the current baseline traffic dataset or 2022 for the future opening year datasets.
 - c. Traffic format: Basic Split – this allows inputs in the form of total number of vehicles, %HGV and speed as per the traffic data available for the relevant time period. The road type (e.g. "Urban (not London)", "London – Motorway" etc.) and number of hours the data is for is also entered here (e.g. AM peak = 3 hours).
 - d. Outputs: Air Quality Modelling (g/km/s) as this is the format input into the ADMS-Roads model which was used in the assessment.

- e. Pollutants: NO_x and PM_{10} as the two reported pollutants in the ES are NO_2 (converted from NO_x) and PM_{10} .
4. Further, Highways England explained that it used either the England or London sets depending on where the section was. Locations within the M25 were assessed using the London set, otherwise the England set was used.

E.10 In response to question 4.6.8 REP 5-004 at paragraph 9 the applicant states that it has not been able to consult with the eleven local authorities in time for the 8 January Deadline V and hence has provided an initial response.

- Have any discussions been held with the local authorities concerning future air quality issues? If so, which local authorities have been consulted, what has been discussed, and what are the outcomes?*

Highways England's response

1. Highways England confirmed that further meetings have been held with the London Borough of Hillingdon and Slough Borough Council with the Scheme's project team and Highways England's Lead Air Quality Adviser.
2. Highways England met with the London Borough of Hillingdon on 21 December to discuss sensitivity testing results and the Statement of Common Ground.
3. Further, on Tuesday 9 February, Andrew Bean of Highways England had a further meeting with the London Borough of Hillingdon and discussed the NO₂ projections set out in IAN 170/12 and the long term monitoring trends observed at the Hillingdon AURN site.
4. Additional discussions have been undertaken with the London Borough of Hillingdon and their consultant on the subjects including the AURN site, Long Term Trends and significance. A technical note has also been prepared by Highways England on the AURN measurement (Appendix A to this summary) data and the use of LTT_{E6} (Appendix C to this summary). Highways England understands that the London Borough of Hillingdon is content that the AURN does not demonstrate a significant upward or downward trend in measurements since 2008/2009.
5. Highways England met with Slough Borough Council on 5 February 2016 to discuss the Statement of Common Ground. There was a further meeting on 9 February 2016, when Andrew Bean of Highways England met with Slough Borough Council and discussed significance, the air quality barrier research, continuous monitoring specifications, a Low Emission Lane in Southampton and Highways England's mitigation research.
6. However, these discussions did not include the development of a monitoring strategy or mitigation options for the Scheme. This is because Highways England does not consider that either option is required for the Scheme. As addressed in Highways England's earlier responses from the Issue Specific Hearing, Highways England's position is explained in detail

in the comments on responses to the Examining Authority's second written questions, which were submitted by Highways England at Deadline VI. The position is essentially that, based on the NN NPS, there is no significant effect or a compliance risk.

E.11 At paragraphs 16 and 17 the applicant states that it does not agree that a requirement on future proofing is necessary proportionate or appropriate in respect of the scheme. It goes on to state that HE 'is looking to achieve improved air quality across the Strategic Road network.' In the HE Licence REP4-005 the aims and objectives are listed at Part 4 and states that 'the Licence holder must, in exercising its functions and complying with its legal duties and other obligations, act in a manner which it considers best calculated to:

Ensure the effective operation of the network;

Ensure the maintenance, resilience, renewal, and replacement of the network;

Ensure the improvement, enhancement and long-term development of the network;

Ensure efficiency and value for money;

Protect and improve the safety of the network;

Cooperate with other persons or organisations for the purposes of coordinating day-to-day operations and long term planning;

Minimise the environmental impacts of operating, maintaining and improving its network and seek to protect and enhance the quality of the surrounding environment;

Conform to the principles of sustainable development.'

4.2(c) is further defined in paragraph 5.6(c):

'Provide for sufficient flexibility and future-proofing in planning the long-term development and improvement of the network, taking account of long-term trends, uncertainties and risks - including new and emerging technologies and long-term trends in climate and weather conditions.'

- As the terms of HE's Licence specifically states that future proofing must be taken into account can the applicant clarify why it does not see the need to incorporate future proofing for elements such as air quality, climate change and other uncertainties and risks into this scheme such as by requirement in the dDCO?*

Highways England's Response

1. Highways England stated that it considered that the air quality assessment for the M4 Scheme is consistent with the requirements of the NN NPS and with Highways England's Licence.

2. The air quality assessment undertaken for the M4 Scheme does address the challenge of 'future proofing of air quality' through the use of the advice set out Interim Advice Note 170/12 (v3) which deals with future NO_x and NO₂ projections. The approach adopted in IAN 170/12 takes into account uncertainty in future NO₂ projections including uncertainty in Euro 6 / VI emission performance in the real world driving.
3. An assessment completed on this basis takes a precautionary approach to risk based on assessment solely reliant on the published vehicle emission factors. Against this more precautionary approach the outcomes and conclusions of the air quality assessment determine there to be no significant effects nor will it affect the UK's reported ability to comply with the Air Quality Directive.
4. In response to questions for the Examining Authority based on its empirical observations, Highways England noted that it operated under a licence with statutory duties to perform, and there should be a presumption that statutory bodies perform their statutory duties. Highways England confirmed again that the Scheme includes new and replacement barriers, and in respect of ponding, Highways England noted that further requirements were to be introduced into the draft DCO to provide further comfort, Addressing air quality, Highways England reiterated that, for the reasons explained, Highways England did not consider that there needed to be a requirement (with the idea of monitoring in mind, principally). Whereas, by contrast and for example, the approach to drainage is required to be under a requirement.
5. Highways England was asked how the Highways Monitor ensured the performance of Highways England. In response, Highways England stated that it was governed by a combination of the mandatory provisions of the licence, the supervision of the Office of Rail and Road ("ORR") and the requirements proposed as part of the Scheme. The law proceeds on the premise that bodies like Highways England comply with their statutory duties.
6. Further details on the operation of Highways England's Licence and its regulation by the ORR and the Highways Monitor are provided in the Summary of the representations made at the Issue Specific Hearing into Water.

E.12. IAN 175/13 para 2.4 discusses exceedance levels. Whilst exceedances of less than 0.4µg/m3 are considered to be imperceptible, any exceedance above that level would indicate a risk that a new exceedance in excess of the EU Limit Values would be created. There are a number of locations along the route of the scheme where the exceedance is forecast to be within an imperceptible range, but these results depend on the emissions limits adopted in the assessment being attained. The ExA considers that there is a high level of uncertainty in the future emission levels that will be achieved for Euro 6/V1 vehicles, which in addition to the usual uncertainties which must be inherent in any modelling exercise, give reasons for the dDCO to provide safeguards in the event that emissions levels are higher than the level adopted in the M4SM assessment.

Sections 4.2(c) and 4.2(g) of the HE Licence set out the duties and the obligations of the company regarding long term development and minimising environmental impacts of the network. However, the ExA is not satisfied that these duties and obligations are sufficiently targeted to ensure that measures would be taken to secure mitigation for the M4 scheme in the event that the levels forecast in the air quality assessment are not achieved.

- The applicant is requested to reconsider the potential for mitigation measures against breach of EU Limit Values as a result of the scheme which could be included within the dDCO, and which would be in accordance with the terms of the HE Licence.*

Highways England's response

1. Highways England noted that section 4.2 of Highways England's licence, sets out that "...the Licence holder must in exercising its functions and complying with its legal duties and other obligations...", and stated that the air quality assessment undertaken for the Scheme demonstrated that it is consistent with the air quality policy as set out in the NN NPS. The NN NPS sets out the obligations and legal responsibilities to be discharged by an infrastructure developer, including providing a judgement of the significance of the impacts, a judgement as to whether a scheme would affect the UK's reported ability to comply with the Air Quality Directive and, where necessary, to provide appropriate mitigation.
2. In respect of the NN NPS, Highways England confirmed that the assessments it has undertaken and reported in the ES provides evidence that the Scheme will not have a significant air quality impact, nor will it affect the UK's reported ability to comply with the Air Quality Directive, and therefore the assessment is consistent with the requirements of the NN NPS and mitigation for the Scheme is not required. In Highways England's view, this demonstrates that the Scheme has met the requirements of the NN NPS, and in doing so has met that aspect of its Licence requirements as set out in Section 4.2.

3. Highways England noted that its view was consistent with recommendations for other recent roads schemes including the A160, A30 Temple to Higher Carblake Improvements and Norwich Northern Distributor Road. These schemes can be distinguished from schemes where mitigation is applied by Highways England. This demonstrates that Highways England is properly applying reasonable judgement in determining the approach to mitigation on a case-by-case basis.
4. The A556 scheme is an example of Highways England discharging its responsibilities set out in its Licence (4.2(g)) to 'minimise the environmental impacts of its operations'. The conclusion reached in the assessment for the A556 scheme was that without mitigation, that scheme would result in a significant air quality impact, although, even then, not an air quality impact which would affect the UK's reported ability to comply with the Air Quality Directive. In light of the significant air quality impact, a 60mph speed limit along the route of the new bypass was put forward by Highways England as mitigation. This option resulted in a reduction in the total number of properties above the UK air quality objective for annual average NO₂ concentrations to a level which would not result in a significant air quality impact, in accordance with IAN 174/13. This was primarily due to an anticipated reduction in the number of vehicles travelling along the M56, because of the increased journey time. Air quality monitoring was included as a means to identify at what point mitigation was no longer required, and so to allow the subsequent removal of the 60mph speed limit in due course.
5. The mitigation approach put forward for the A556 scheme, which nevertheless is predicted to lead to the worsening of NO₂ concentrations at a number of properties, was accepted by the Examining Authority and the Secretary of State, and the DCO was granted on that basis. The Examining Authority for the A556 scheme accepted the air quality 'trigger', based on the initial significant air quality impact (without mitigation) and the consequent assessment showing that the scheme would no longer result in a significant air quality impact with mitigation.
6. In terms of addressing the concerns raised by Examining Authority in addressing uncertainty in future emission levels to be achieved by Euro 6/VI vehicles, Highways England confirmed that the air quality assessment undertaken for the Scheme addresses this uncertainty through the use of the advice set out Interim Advice Note 170/12 (v3) which sets out the approach for describing future NO_x and NO₂ projections. The approach adopted in IAN 170/12 takes into account uncertainty in future NO₂ projections, including uncertainty in Euro 6 / VI emission performance in the real world driving. Highways England noted that this has been demonstrated as being consistent with the model results for the 50% uplift and a 5x uplift of

Euro 6 diesel car emissions and supports the position that the approach adopted for the Scheme reasonably accounts for uncertainty in future Euro 6 emission factors.

7. The assessment completed on this basis takes a precautionary approach to risk, rather than using an assessment solely reliant on the published vehicle emission factors. Even using this more precautionary approach, the outcomes and conclusions of the air quality assessment still show that there will be no significant effects on air quality, nor will the Scheme affect the UK's reported ability to comply with the Air Quality Directive.
8. Highways England concluded that, consequently, the air quality assessment for the M4 Scheme is consistent with the requirements of the NN NPS and Highways England's Licence. On that basis, Highways England maintained its position that the imposition mitigation against a breach of EU limit values would not be reasonable or necessary in respect of the Scheme.
9. A note setting out the agreed position between Highways England and the London Borough of Hillingdon on the AURN measurement data is provided at Appendix A to this Summary.

E.13 In response to LBHill REP5-005 at 27 HE states that a monitoring scheme for the scheme would be challenging as total concentrations of pollutants will relate to elements out of HE's control. Elements such as realisation rates of new vehicle uptake into the national fleet, vehicle emission technology performance etc are listed.

- i. *Can the applicant clarify why these elements would be a challenge as it has previously stated that these elements have been taken into account in its modelling process?*

HE goes onto say that the background air quality includes contributions such as industrial and power emissions etc. However, the Defra air quality plans state that 80% of NO₂ emissions in the UK are from transport REP5-004, Appendix E.

- ii. *Can the applicant explain why then background air pollution from other sources cannot be estimated and factored into the monitoring results?*

Highways England's response

1. Highways England stated that it is important to distinguish between modelling and monitoring, and, by its very nature, monitoring is more accurate than modelling. However, it is not possible to disaggregate the relative contributions from the various sources to the monitored total. Highways England considered that it is reasonable, where monitoring is undertaken close to a major road for example, to attribute the majority of the contribution to that source but not the total contribution.
2. Highways England confirmed that, in order to develop an understanding the effects of a smart motorway, a number of the monitoring locations identified for Highways England's National Air Quality Monitoring Network will be targeted at areas where smart motorways have been, or are planned to be, introduced. Highways England noted that collecting data on the effect of smart motorway schemes at a national level, rather than at an individual location basis would result in a clearer understanding of actual monitored air quality effects, which could be separated from localised effects skewing the data.
3. In response to issues raised by Slough Borough Council with regard to third party developments influencing potential monitoring, Highways England suggested a further example: if there were numerous roads at a junction and an air quality monitor located close to that junction showed an increase in measured concentrations, it would not be possible, with any certainty, to accurately attribute any or all of the change in the measured concentration to

one of the many roads at the junction, nor even the fraction in the monitoring data associated with just one of the roads. In the same way, it is impossible to assess what the effects of concurrent third party development would be on a monitoring location, unless pre-development data is already available.

4. In response to questions from the Examining Authority on whether it was possible to put monitoring stations along the Scheme, Highways England repeated that the assessment was carried out in accordance with the relevant guidance and the conclusion based on that guidance and assessment was that monitoring was not required. The Examining Authority acknowledged that the assessment had followed the relevant best practice and guidance. However, on a practical level, Highways England accepted that it was possible to put monitoring stations on the M4, as Highways England is experienced in monitoring air quality concentrations. Highways England confirmed that it had around 1500 NO₂ diffusion tube monitoring stations next to various motorways around the network.
5. The Examining Authority noted that monitoring was being undertaken with local authorities in relation to the M25 scheme. The air quality monitoring undertaken for the M25, utilising diffusion tubes, was reported in *SM-ALR Monitoring, M25 J23-27 Twelve Month Evaluation Technical Report*. The conclusion of the air quality monitoring for the M25 is that it is not possible, at this stage, to directly attribute these improvements in air quality post-scheme opening to the M25 J 23-27 Scheme. The outcome of the M25 monitoring demonstrates the difficulty in determining the contribution of emissions from individual sources to total concentrations. In relation to monitoring along the Scheme route, and in particular in AQMA locations, significant air quality effects are not identified and therefore monitoring is not proposed. As identified previously, Highways England accepts that there is a need to address air quality in general, in Highways England's view, such general air quality is more effectively monitored at a national level, and Highways England is developing a national air quality monitoring network with the aim of putting out 40 air quality monitors, as part of its national, strategic air quality monitoring.
6. At the Hearing, the Examining Authority asked Highways England to consider Appendix E5 to the M25 report (page 93), where it says that 11 air quality monitoring points were higher and 2 were lower. However, reviewing the monitoring data provided in the M25 report (*SM-ALR Monitoring, M25 J23-27 Twelve Month Evaluation Technical Report*) and the associated appendices, it is not possible to derive any firm conclusions on the impacts of the scheme on the measured air quality data nor any differences in the monitoring data.

7. Highways England agreed with the London Borough of Hillingdon, which reiterated that the purpose of monitoring is to look for the change over time, not just the impact of the Scheme.
8. Highways England noted that even if it were possible in practical terms to put a monitoring station next to the M4, proper monitoring was likely to require a significant number of monitoring stations, each of which would require maintenance, analysis, the production of reports and consultation with local authorities. In circumstances where Highways England is responsible for public money, it would not be appropriate for Highways England to waste time, resources and money monitoring areas where the assessments indicate no significant effect, when such time, resources and money could be better spent monitoring schemes and roads such as the A556 where there is a clearly identified need. Moreover, if monitoring is provided on a scheme where the assessment has been that there will be no significant effect, it will be impossible for Highways England to distinguish schemes which require monitoring in the future. Highways England will be put into a position where it will be required to provide monitoring for every scheme it proposes, and the impact of this on the strategic road network would be considerable.

Examining Authority's Further Questions

In reference to Second Written Question E4.6.3. This gives emissions at different speeds. Looking at 80km/h, it is 192mg/kg. If you go to 110km/h, it is 295 mg/kg. If you reduce the speed to 50mph, it appears you get a 35% drop in NOx. Could we please get your comments on speed limits in this regard?

1. Highways England explained that whilst in general reducing speed limits on a motorway would reduce emissions, putting a speed limit on a motorway could have unintended consequences such as simply displacing traffic onto the local road which could lead to potentially greater air quality impacts (if, for example, there were more receptors on near the local roads).
2. Highways England illustrated its response by noting that if one were to assume that a car is travelling in a smooth state at 50mph, it would have the emissions stated. However, if that car travels in a smooth state at 70mph, it would have higher emissions. However, the caveat is that, on a motorway, at 50mph there are flow breakdowns with stop-start traffic which may lead to higher emissions due to acceleration and breaking, so the model cannot apply perfectly to real life.
3. Highways England noted the speed limits were not intended to make vehicles more efficient, but were used as a response to the traffic model. Traffic models are, to a large extent, built on costings of routes. For example on the A556, the speed limitation is intended to enact wider traffic management - to disincentivise drivers from using the route to produce less traffic.

On the same page, you have vehicle split for motorways (outside of London). Where does the hybrid number come from?

4. Highways England noted that the hybrid data provided in response to E4.6.3 of the Examining Authority's second written questions was taken from 'BasicFleetSplit' sheet of the Emission Factor Toolkit ("EFT") spreadsheet. The relevant extract for the base year (2013) and opening year (2022) is provided below. A screenshot of the relevant sheet from the EFT excel spreadsheet is also provided for reference.

Road Type	Vehicle Type	2013	2022
Motorway	1 Petrol car	34.2%	22.8%
	2 Diesel car	40.5%	48.3%
	3 Taxi (black cab)	0.0%	0.0%
	4 Petrol LGV	0.4%	0.2%
	5 Diesel LGV	12.4%	13.6%
	6 Rigid	4.2%	4.2%
	7 Artic	7.1%	6.2%
	8 Bus and coach	0.4%	0.4%
	9 Motorcycle	0.4%	0.3%
	10 HybridCarPetrol	0.3%	1.7%
	11 PlugInHybridCarPetrol	0.0%	0.5%
	12 HybridCarDiesel	0.0%	1.8%
	13 ElectricCar	0.0%	0.0%
	14 ElectricLGV	0.0%	0.0%

5. In Highways England's response to the written question, hybrid vehicles covered the following categories, and in 2022 the total equated to 4%:
- a. Hybrid Car Petrol;
 - b. Plug-In Hybrid Car Petrol;
 - c. Hybrid Car Diesel;
 - d. Electric Car; and

e. Electric LGV.

6. In response to further questions from the Examining Authority, Highways England agreed that IAN 170/12 v3, says in the amendments made in 2013 (page 2 of 12) that Highways England has developed a series of interim NOx projections, which are available on request until the IAN is updated. A copy is provided at Appendix E to this Summary.

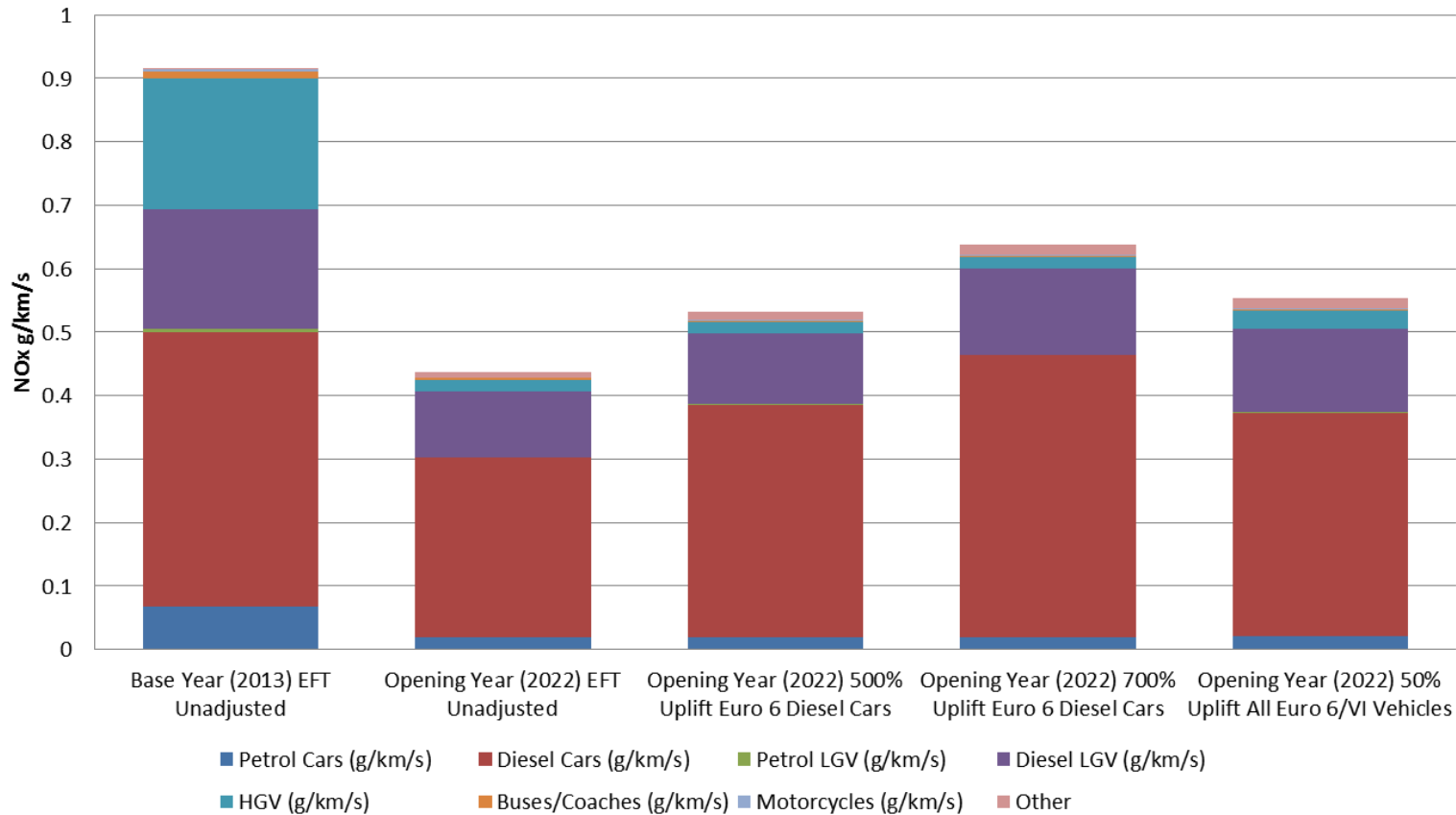
7. Screenshot of the 'BasicFleetSplit' sheet from EFT

The screenshot shows the 'BasicFleetSplit' worksheet in Microsoft Excel. The data is organized into columns representing years from 2008 to 2035 and rows representing different vehicle categories and regions. The regions are Urban, Rural, and Motorway. Each region has a list of vehicle types with their corresponding percentages for each year. The percentages generally show a trend of decreasing fossil fuel vehicle usage and increasing electric vehicle usage over the period.

Region	Vehicle Type	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
Urban	1Petrol car	56.1%	55.2%	53.6%	51.9%	49.7%	47.6%	45.5%	43.5%	41.7%	40.1%	38.9%	37.9%	37.2%	36.5%	36.0%	35.6%	35.3%	35.0%	34.7%	34.4%	34.1%	33.9%	33.5%	33.2%	32.8%	32.4%	32.0%	31.5%	
	2Diesel car	26.2%	26.8%	28.3%	29.9%	32.0%	33.9%	35.9%	37.7%	39.2%	40.4%	41.0%	41.2%	40.8%	40.4%	40.0%	39.4%	38.7%	37.9%	36.9%	36.0%	35.2%	34.4%	33.6%	32.9%	32.1%	31.5%	30.9%	30.3%	
	3Taxi (black cab)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	4Petrol LGV	0.8%	0.7%	0.7%	0.6%	0.4%	0.4%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	
	5Diesel LGV	11.5%	11.8%	12.1%	12.5%	12.7%	12.7%	12.7%	12.7%	12.9%	13.0%	13.1%	13.2%	13.3%	13.3%	13.3%	13.4%	13.4%	13.4%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.4%	13.4%	13.3%	13.3%	
	6Rigid	1.7%	1.7%	1.7%	1.5%	1.6%	1.6%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.6%	1.6%	1.6%	1.6%	1.6%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
	7Artic	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	
	8Bus and coach	1.6%	1.6%	1.6%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.3%	1.3%	1.3%	1.3%	1.2%	1.2%	1.2%	1.2%	1.2%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.0%	1.0%	1.0%	
	9Motorcycle	1.4%	1.5%	1.4%	1.4%	1.4%	1.4%	1.3%	1.3%	1.2%	1.2%	1.1%	1.1%	1.0%	1.0%	1.0%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	
	10HybridCarPetrol	0.1%	0.2%	0.3%	0.3%	0.4%	0.4%	0.5%	0.7%	0.8%	1.0%	1.3%	1.6%	1.9%	2.3%	2.7%	3.0%	3.3%	3.5%	3.9%	4.1%	4.2%	4.4%	4.5%	4.6%	4.7%	4.8%	4.8%	4.8%	
	11PlugInHybridCarPetrol	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.3%	0.5%	0.6%	0.9%	1.1%	1.5%	1.9%	2.4%	2.9%	3.5%	4.0%	4.7%	5.4%	6.1%	6.8%	7.6%	8.4%	
	12HybridCarDiesel	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.2%	0.4%	0.6%	1.0%	1.2%	1.5%	1.6%	1.8%	1.9%	2.1%	2.2%	2.4%	2.4%	2.5%	2.6%	2.6%	2.6%	2.7%	2.7%	
	13ElectricCar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.2%	0.3%	0.5%	0.6%	0.7%	0.9%	1.1%	1.3%	1.5%	1.7%	1.9%	2.0%	2.1%	2.3%	2.4%	2.5%	2.7%	2.9%	
	14ElectricLGV	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.2%	0.3%	0.4%	0.4%	0.5%	0.6%	0.7%	0.8%	0.9%	1.0%	1.2%	1.4%	1.6%	1.7%	1.9%	2.1%	2.2%	2.3%	
Rural	1Petrol car	51.7%	51.1%	49.8%	47.7%	45.5%	43.4%	41.3%	39.3%	37.4%	35.9%	34.7%	33.8%	33.2%	32.7%	32.3%	32.1%	31.9%	31.9%	31.6%	31.6%	31.4%	31.3%	31.1%	30.9%	30.6%	30.4%	30.0%	29.7%	
	2Diesel car	27.2%	27.6%	28.7%	30.6%	32.8%	34.8%	36.8%	38.6%	40.2%	41.4%	42.1%	42.3%	42.0%	41.7%	41.3%	40.8%	40.2%	39.5%	38.5%	37.7%	36.9%	36.1%	35.4%	34.6%	33.9%	33.3%	32.7%	32.1%	
	3Taxi (black cab)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	4Petrol LGV	1.0%	0.9%	0.8%	0.8%	0.7%	0.5%	0.4%	0.4%	0.4%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	
	5Diesel LGV	12.9%	13.2%	13.5%	13.9%	14.0%	14.2%	14.2%	14.3%	14.5%	14.7%	14.8%	15.0%	15.2%	15.3%	15.4%	15.5%	15.6%	15.7%	15.9%	16.0%	16.2%	16.4%	16.5%	16.6%	16.8%	16.9%	17.0%	17.2%	
	6Rigid	3.0%	3.0%	2.9%	2.7%	2.8%	3.0%	3.1%	3.2%	3.2%	3.1%	3.1%	3.1%	3.0%	3.0%	2.9%	2.9%	2.9%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.7%	2.7%	2.7%	2.6%	
	7Artic	2.4%	2.4%	2.4%	2.4%	2.2%	2.1%	2.0%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.9%	1.9%	1.9%		
	8Bus and coach	0.7%	0.7%	0.7%	0.6%	0.6%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%		
	9Motorcycle	1.0%	1.0%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.8%	0.8%	0.8%	0.7%	0.7%	0.7%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.5%	0.5%	0.5%	0.5%	0.5%		
	10HybridCarPetrol	0.1%	0.2%	0.2%	0.3%	0.3%	0.4%	0.5%	0.6%	0.8%	0.9%	1.1%	1.4%	1.7%	2.1%	2.4%	2.7%	3.0%	3.2%	3.5%	3.7%	3.9%	4.0%	4.2%	4.3%	4.4%	4.4%	4.5%	4.5%	
	11PlugInHybridCarPetrol	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.3%	0.4%	0.6%	0.8%	1.0%	1.4%	1.7%	2.2%	2.7%	3.2%	3.7%	4.3%	5.0%	5.7%	6.4%	7.1%	7.9%	
	12HybridCarDiesel	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.2%	0.4%	0.6%	1.0%	1.3%	1.5%	1.7%	1.9%	2.0%	2.2%	2.4%	2.5%	2.6%	2.6%	2.7%	2.8%	2.8%	2.8%		
	13ElectricCar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	14ElectricLGV	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Motorway	1Petrol car	42.6%	42.8%	41.8%	39.2%	36.6%	34.2%	31.8%	29.5%	27.4%	25.8%	24.6%	23.8%	23.3%	22.9%	22.8%	22.7%	22.8%	23.0%	23.1%	23.3%	23.5%	23.6%	23.7%	23.7%	23.7%	23.6%	23.5%	23.4%	
	2Diesel car	32.5%	32.1%	33.0%	35.7%	38.1%	40.5%	42.8%	44.9%	46.8%	48.2%	49.1%	49.3%	49.0%	48.7%	48.3%	47.7%	47.0%	46.2%	45.2%	44.2%	43.3%	42.4%	41.5%	40.7%	39.8%	39.1%	38.4%	37.7%	
	3Taxi (black cab)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	4Petrol LGV	0.8%	0.8%	0.7%	0.7%	0.6%	0.4%	0.4%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%		
	5Diesel LGV	11.1%	11.3%	11.5%	11.9%	12.1%	12.4%	12.5%	12.7%	12.8%	13.0%	13.1%	13.3%	13.4%	13.5%	13.6%	13.7%	13.8%	13.8%	13.8%	14.0%	14.1%	14.2%	14.4%	14.5%	14.6%	14.7%	14.8%	14.9%	
	6Rigid	4.2%	4.1%	4.1%	3.8%	4.0%	4.2%	4.4%	4.6%	4.6%	4.5%	4.4%	4.4%	4.4%	4.3%	4.2%	4.2%	4.1%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	3.9%	3.9%	3.8%		
	7Artic	7.9%	7.8%	7.8%	7.7%	7.4%	7.1%	6.8%	6.5%	6.5%	6.4%	6.4%	6.3%	6.3%	6.3%	6.2%	6.2%	6.1%	6.1%	6.1%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.1%	6.1%		
	8Bus and coach	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%			
	9Motorcycle	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%			
	10HybridCarPetrol	0.1%	0.1%	0.2%	0.2%	0.3%	0.3%	0.4%	0.5%	0.5%	0.7%	0.8%	1.0%	1.2%	1.4%	1.7%	1.9%	2.1%	2.3%	2.6%	2.8%	2.9%	3.1%	3.2%	3.3%	3.4%	3.5%			
	11PlugInHybridCarPetrol	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.3%	0.4%	0.5%	0.7%	1.0%	1.2%	1.6%	2.0%	2.4%	2.8%	3.3%	3.8%	4.4%	5.0%			
	12HybridCarDiesel	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.3%	0.4%	0.7%	1.2%	1.5%	1.8%	2.0%	2.2%	2.4%	2.6%	2.8%	2.9%	3.0%	3.1%	3.2%	3.3%				
	13ElectricCar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				
	14ElectricLGV	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				

Figure A1

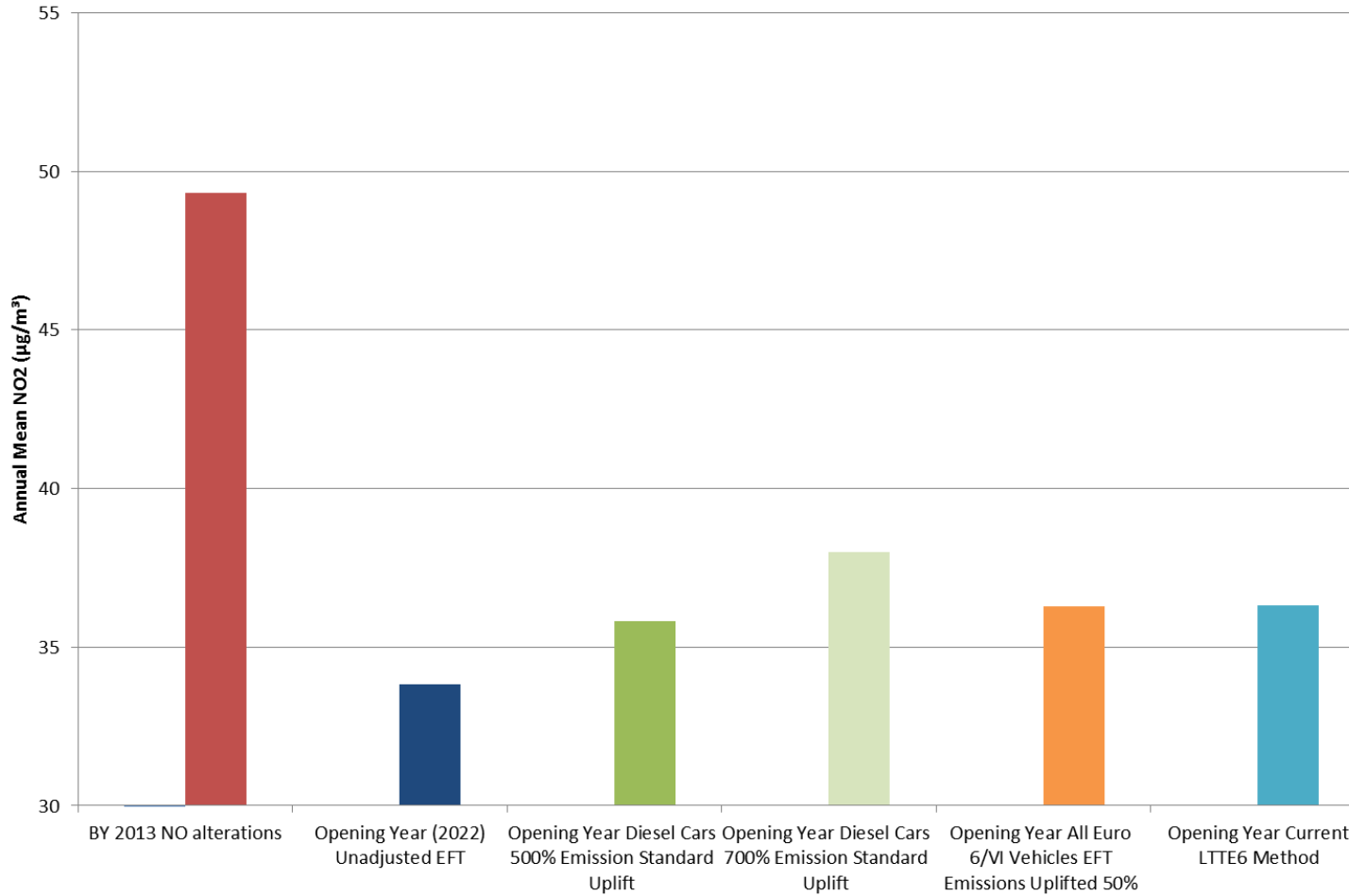
Proportion of NOx Emissions by Vehicle Type and Fuel Usage based on EFT and Euro 6/VI Uplifted Emission Scenarios for 2013 and 2022



¹ Available here: <http://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010019/Events/Deadline%20V%20-%202008-01-2016/Highways%20England%206.zip> and here <http://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010019/Events/Deadline%20V%20-%202008-01-2016/Highways%20England%209.zip> 41

Figure A2

Modelled NO₂ Concentrations for Base Year (2013) and Opening Year (2022), for EFT and Euro 6/VI Uplifted Emission Scenarios



¹ Available here: <http://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010019/Events/Deadline%20V%20-%202008-01-2016/Highways%20England%206.zip> and here <http://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010019/Events/Deadline%20V%20-%202008-01-2016/Highways%20England%209.zip> 42