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The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East of Magor) Connecting Road) Scheme 201-

The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East of Magor) Connecting Road) (Amendment) Scheme 201-

The London to Fishguard Trunk Road (East of Magor to Castleton) Order 201-

The M4 Motorway (West of Magor to East of Castleton) and the A48(M) Motorway (West of Castleton to St Mellons)(Variation of Various Schemes) Scheme 201-

The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and the M48 Motorway (Junction 23 (East of Magor) Connecting Road) and The London to Fishguard Trunk Road (east of Magor to Castleton) (Side Roads) Order 201-

The Welsh Ministers (The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and the M48 Motorway (Junction 23 (East of Magor) Connecting Road) and the London to Fishguard Trunk Road (East of Magor to Castleton)) Compulsory Purchase Order 201-

The M4 Motorway (Junction 23 (East Of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East Of Magor) Connecting Road) (Supplementary) Scheme 201-

The Welsh Ministers (The M4 Motorway (Junction 23 (East Of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East Of Magor) Connecting Road) and The London to Fishguard Trunk Road (East of Magor to Castleton)) Supplementary Compulsory Purchase Order 201-

Summary Proof of Evidence

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Welsh Government, Air Quality

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1. Introduction

1.1 Personal Details

1.1.1 My name is Michael Andrew Bull. I hold a BSc (Hons) degree in Chemical Engineering from Exeter University in 1979 and a PhD in Public Health Engineering from Imperial College London in 1983. I am a Chartered Engineer, a Chartered Environmentalist and a Chartered Scientist. I am a Fellow of the Institute of Air Quality Management, a Member of the Institute of Environmental Science and a Member of the Institution of Chemical Engineers.

1.1.2 Full details of my experience and qualifications are provided in my main Proof of Evidence.

1.1.3 For the current assessment I have been the air quality expert for the proposals leading the air quality team that has undertaken the assessment. I have therefore determined the methodology to be applied and reviewed and approved the assessment. I have been principally assisted in this task by Lesley-Anne Stone who is the deputy air quality witness for this proposal.

1.1.4 The Proof of Evidence which I have prepared and provide in my summary and main Proof of Evidence is true and has been prepared and is given in accordance with the Code of Conduct of the Institution of Air Quality Management (IAQM). I confirm that the opinions expressed are my true and professional opinions.

1.2 Scope and Structure of this Proof of Evidence

1.2.1 My Proof of Evidence provides a summary of the assessment of air quality impacts reported in the Environmental Statement [Document 2.3.2], the Environmental Statement Supplement [Document 2.4.4] and the Environmental Statement Supplement December 2016 [Document 2.4.14]. My main Proof of Evidence includes details of the relevant air quality standards applied for the assessment, the existing air quality in the area based on published information and from air quality monitoring undertaken for the purposes of the Scheme, details the methods used for assessment of impacts during construction and operation, reports on the

input data used for the assessment, the results of the air quality modelling carried out to determine the likely changes in air quality and the significance of these changes.

1.2.2 My main Proof of Evidence also provides responses to objections that have included reference to air quality. This has been undertaken by responding to the general themes raised in the objections and in some cases where necessary, a detailed response to a specific objection has been provided.

1.2.3 At the outset it is worth considering the overall air quality impacts of the Scheme. The Scheme will result in a reduction in traffic along the current alignment of the M4, which passes through densely populated areas, and therefore pollutant concentrations will decrease at properties close to the route reducing overall population exposure to poor air quality.

1.2.4 Concentrations of pollutants will inevitably increase near to the route of the proposed new section of motorway. The new route passes through an area that is lightly populated, but does include designated ecological sites. Consequently it can be expected that the overall population exposure to air pollutants will reduce. The Scheme will result in an increase in pollutants at designated sites, however this has been assessed to be not significant.

2. Assessment Methodology

2.1 Air Quality Standards

2.1.1 The main pollutants associated with road transport are nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀). Air quality limit values and objectives are set both at European and National level. The Air Quality Standards (Wales) Regulations 2010 [Document 8.1.4] transpose the European Directive 2008/50/EC [Document 8.1.1] into national regulation. The UK Air Quality Strategy for England, Scotland Wales and Northern Ireland [Document 8.2.1] was published in its latest form in July 2007 and details air quality objectives for the UK. These have already been introduced into national legislation through the Air Quality Regulations 2000 [Document 8.1.2] and 2002 [Document 8.1.3]. Table 1 details the relevant UK and EU Air Quality Objectives and Limit Values.

Table 1 Air Quality Standards

Pollutant	Averaging Period	Limit Value/Objective	Date for Compliance	Basis
Nitrogen dioxide (NO ₂)	1 hour mean	200 µg/m ³ , not to be exceeded more than 18 times a year (99.8 th percentile)	31 Dec 2005	UK
			1 Jan 2010	EU
	Annual mean	40 µg/m ³	31 Dec 2005	UK
			1 Jan 2010	EU
Nitrogen Oxides (NO _x)*	Annual mean	30 µg/m ³	31 December 2000	UK
			19 July 2001	EU
Fine particulates (PM ₁₀) Measurement technique: Gravimetric	Daily mean	50 µg/m ³ , not to be exceeded more than 35 times a year (90.4 th percentile)	31 Dec 2004	UK
			None specified	EU
	Annual mean	40 µg/m ³	31 Dec 2004	UK
			None specified	EU

* For the protection of vegetation only, not applicable to human health

2.1.2 Each local authority in the UK is required to assess air quality in their district against these air quality objectives. If this shows that the objective is unlikely to be met by its target year, then the local authority must declare an Air Quality Management Area (AQMA) and propose actions to reduce pollutant concentrations. Action is also being taken at a national level to reduce pollutant emissions, largely through the use of vehicle emission controls to reduce emissions from the motor vehicle fleet.

2.2 Vehicle Emissions

2.2.1 Pollutant emissions from vehicles are regulated as a result of European led controls. Since 1992, increasingly strict emission controls have been introduced for both cars and HGVs. These have been introduced in six stages to date and consequently are known as Euro 1-6 controls (for cars and LGVs) and Euro I-VI (for HDVs), Euro 6/VI are the most recent controls. Each new Euro stage requires reductions in emissions of NO_x and PM₁₀ and hence, as newer vehicles enter the fleet, the average emission rate of pollutants should reduce.

2.3 Relevant Guidance

2.3.1 The principal guidance documents used in this assessment have been:

- a) Design Manual for Roads and Bridges Volume 11 (the “DMRB” [Document 6.1.8])
- b) Interim Advice Notes IAN 174/13 [Document 8.2.5], IAN 170/12v3 – [Document 8.2.6] and IAN 185/15 [Document 8.2.8]
- c) Defra documents LAQM.TG(09) [Document 8.2.3] and LAQM.PG(09) [Document 8.2.2] respectively
- d) Construction dust assessment guidance produced by the Institute of Air Quality Management (IAQM) [Document 8.2.7]

2.4 Study Area

2.4.1 The study area (see Figure 7.1 of the Environmental Statement [Document 2.3.2]) has been determined by identification of those roads where either the road alignment or traffic flows or speeds change by more than a set threshold defined in the DMRB. Roads that meet these criteria are known as the Affected Road Network (ARN).

2.5 Assessment of Baseline Conditions

2.5.1 The existing air quality in the study area has been assessed in three ways. Firstly a desk based review of relevant reports and air quality monitoring data has been undertaken. This information was supplemented by a Scheme specific air quality monitoring survey carried out between September 2013 and September 2015. Finally, detailed air quality modelling of the base year (2014) was carried out both to provide further information on air quality over the study area and to allow the performance of the model to be assessed by the process of model verification.

2.6 Construction Impact Assessment

2.6.1 Construction dust impacts have been assessed using the methodology outlined in the IAQM document “Guidance on the assessment of dust from demolition and construction” [Document 8.2.7]. The assessment of impacts from the exhaust emissions from construction traffic has been undertaken using a dispersion model known as ADMS-Roads. This is a commonly applied model widely used in the UK and internationally and is well established as a robust tool for this type of assessment.

2.7 Operational Impact Assessment

2.7.1 The air quality impacts during operation have been assessed using the ADMS-Roads air dispersion model for the opening and future years of Scheme, 2022 and 2037 respectively. The model takes as input information regarding the location of the road links and receptors to be included in the model, traffic and associated pollutant emission data for each road link, meteorological data and terrain height information.

2.7.2 Since submission of the Environmental Statement [Document 2.3.2], new traffic forecasts have been released for the opening (2022) and future (2037) year of the Scheme. These have been assessed to understand the implications of the new traffic forecasts on the conclusions of the air quality assessment presented in the Environmental Statement [Document 2.3.2]. The outcome of this assessment is presented in Appendix A of my main Proof of Evidence.

3. Results of Assessment

3.1 Existing Air Quality

3.1.1 The ARN extends into six local planning authority areas – Newport City Council, Monmouthshire County Council, Cardiff Council, Torfaen County Borough Council, South Gloucestershire Council and Forest of Dean District Council. Of the six authorities, only Newport City Council has designated AQMAs as a result of the existing M4 corridor. Newport City Council has also designated AQMAs within the city centre which have the potential to be affected by the Scheme. All the AQMAs designated by Newport City Council have been declared on the basis of an exceedance of the annual mean NO₂ objective. The locations of these AQMAs are shown in Figure 7.7 of the Environmental Statement [Document 2.3.2]. No other AQMAs designated by the other councils have the potential to be significantly affected by the Scheme.

3.1.2 Air quality monitoring in the study area shows that, as would be expected, pollutant concentrations are elevated near to busy roads. Monitoring within the AQMAs shows that NO₂ concentrations were very close to the objective levels in most cases (i.e. within 5% of the objective level). The highest concentrations measured within any AQMA potentially affected by the Scheme in 2014 was 46µg/m³.

3.1.3 Measured NO₂ and PM₁₀ concentrations away from busy roads were well below the relevant objective levels.

3.2 Assessment of Construction Impacts

3.2.1 The assessment of air quality impacts reported in the Environmental Statement [Document 2.3.2] and Environmental Statement Supplement [Document 2.4.4] included a comprehensive assessment of impacts during construction. This assessment concludes that, with the application of suitable mitigation measures, the air quality impacts during construction would not be significant. These mitigation measures are detailed in the Pre-Construction Environmental Management Plan.

3.2.2 The air quality impact of construction traffic was also considered by modelling the predicted changes in NO₂ and PM₁₀ concentrations at

selected human health receptors representative of locations likely to be most affected. The results are reported in detail in Appendix 7.3 of Volume 3 of the Environmental Statement [Document 2.3.2] and Appendix R7.3 of the Environmental Statement Supplement [Document 2.4.4]. No significant air quality impacts associated with construction traffic are predicted.

3.2.3 The impact on ecological receptors has also been considered. The predicted impacts on ecological receptors are negligible or minor adverse with the exception of one receptor in the Severn Estuary SPA/SAC/Ramsar which is predicted to have a moderate impact. However, this assessment is based on worst case assumptions and this SPA/SAC is not considered sensitive to changes in NO_x concentrations.

3.2.4 I therefore do not consider the air quality impacts during construction to be significant.

3.3 Assessment of Operational Impact – Human Receptors

3.3.1 As I described earlier, the assessment of operational impacts has been carried out for the opening and future years of the Scheme. Because of the expected continuing reduction in pollutant emissions from vehicles the highest predicted concentrations would be expected for the opening year case. For the future year predicted pollutant concentrations are lower as the reduction in emissions compensates for the increase in traffic volumes.

3.3.2 An overview of the results for the opening year (2022) is provided in Figure 7.11 of the Environmental Statement [Document 2.3.2]. As would be expected, pollutant concentrations reduce along the existing M4 corridor around Newport and increase at receptors near to the proposed new section of motorway. However, the assessment has also included receptors located away from the M4 in the centre of Newport and all of these are predicted to experience an improvement. It should also be noted that the assessment shows that predicted concentrations of NO₂ at receptors are lower in the opening year than the current year at all receptors, even those located next to the new section of the M4. This is

due to the expected reductions in pollutant emissions as a result of emission controls discussed in Section 2.2 of my main Proof of Evidence.

3.3.3 The Scheme results in significant reductions in pollutant concentrations at receptors near to the existing section of the M4 in Newport. Decreases in annual mean NO₂ concentrations of up to 6.9µg/m³ in 2022 are predicted. This level of improvement is considered to be a major beneficial change.

3.3.4 At properties near to the new section of the motorway pollutant concentrations will inevitably increase. The highest increase in annual mean NO₂ concentrations within 200m of the motorway is predicted to be 1.5µg/m³ at Fair Orchard Farm off Lighthouse Road. This is considered to be a minor adverse impact using the impact descriptors in IAN 174/13 [Document 8.2.5] as described in Para 7.3.89 of the Environmental Statement [Document 2.3.2].

3.3.5 The changes in predicted PM₁₀ concentrations follow a similar trend as NO₂ across the study area. There are no predicted exceedances of the annual mean or daily mean PM₁₀ objective in either the opening or future year.

3.3.6 Generally the Scheme results in an improvement in air quality in the more populated areas and a deterioration in the less populated areas near to the proposed new section of motorway. To assess the changes in exposure I have examined the predicted NO₂ concentration at all houses within 200m of the ARN for the opening year do-minimum (without the Scheme) and do-something (with completed Scheme) scenarios. Using this information I have determined the number of properties experiencing an improvement or deterioration in concentrations as 29,266 and 1,598 respectively demonstrating the large reduction in population exposure to air pollutants.

3.3.7 Air quality in the AQMAs is predicted to improve; a minor to major beneficial impact is predicted at AQMAs adjacent to the M4 and a minor beneficial impact is predicted at AQMAs within Newport city centre. No new AQMAs would need to be declared as a result of the Scheme.

3.4 Assessment of Operational Impacts – Designated Sites

3.4.1 The modelling has examined the predicted NO_x concentrations and nitrogen deposition rates at designated sites in the study area

3.4.2 Chapter 7 of the Environmental Statement [Document 2.3.2], the Environmental Statement Supplement December 2016 [Document 2.4.14] and my main Proof of Evidence outlines the predicted impacts at designated ecological receptors and determines that these are not significant following discussion with the Scheme ecologists. Further information regarding the significance of effects in relation to air quality impacts on designated sites and habitats are discussed in Proof of Evidence presented by Dr. Keith Jones [WG 1.18.1].

3.5 Regional Air Quality Assessment

3.5.1 I have also examined the regional impacts of the Scheme in relation to the total changes of local pollutant emissions. The Scheme will result in a decrease in emissions of NO_x and PM₁₀ emissions, as the scheme is 2.8km shorter than the existing route.

3.6 Outcome of Environmental Statement Supplement December 2016

3.6.1 The air quality modelling undertaken using new traffic forecasts, as presented in the Environmental Statement Supplement December 2016 [Document 2.4.14], has shown that there are no material changes to the air quality conclusions set out in the Environmental Statement [Document 2.3.3]. Detailed results including predicted pollutant concentrations at each assessed receptor are presented in Appendix A of my main Proof of Evidence.

3.7 Evaluation of Overall Significance

3.7.1 To evaluate the overall significance of the air quality changes I have followed the advice in IAN 174/13, this considers five different issues:

- a) Is there a risk that environmental standards will be breached?
- b) Will there be a large change in environmental conditions?
- c) Will the effect continue for a long time and will many people be affected?
- d) Will it be difficult to avoid, reduce or repair or compensate for the effect?

- e) Is there a risk that designated sites, areas or features will be affected?

3.7.2 Having considered each of the criteria I have concluded that the Scheme would not have a significant impact on air quality.

4. Response to Objections

- 4.1.1 There were several objections received that refer to air quality and my main Proof of Evidence provides a detailed response to each of these. Having reviewed the objections, none of the issues raised have changed the conclusions of my assessment.
- 4.1.2 In addition to objections, comments and questions of clarification were received from Natural Resources Wales regarding the air quality assessment presented in the Environmental Statement [Document 2.3.2]. The response to these and subsequent agreement of the air quality modelling and assessment are provided in Appendix B of my main Proof of Evidence.

5. Conclusions

- 5.1.1 I have examined and addressed the objections which relate to air quality. No issues have been raised that affect the conclusions of the assessment in the Environmental Statement [Document 2.3.2]. Air quality would generally improve in the more populated areas reducing overall exposure to air pollutants but inevitably reduce in areas alongside the proposed new section of motorway. However, no exceedance of air quality standards would be expected and air quality would particularly improve in the areas that are currently the most polluted including the Air Quality Management Areas.
- 5.1.2 My main Proof of Evidence includes all facts which I regard as being relevant to the opinions which I have expressed and the Public Local Inquiry's attention has been drawn to any matter which would affect the validity of that opinion.
- 5.1.3 I believe the facts which I have stated in this summary Proof of Evidence are true and that the opinions expressed are correct.
- 5.1.4 I understand my duty to the Public Local Inquiry to assist it with matters within my expertise and I believe that I have complied with that duty.