Adran yr Economi a'r Seilwaith
Department for Economy and Infrastructure

Llywodraeth Cymru
Welsh Government

File Ref WG/OBJ0270.4 – GWT/Anderson

Objection Ref OBJ0270

Response to Objector's Evidence: Professor Kevin Anderson

(Gwent Wildlife Trust)

1. GROUNDS FOR OBJECTION

1.1. Details

1.1.1. Professor Kevin Anderson has submitted a Statement of Evidence, which is undated, in relation to the draft statutory Orders associated with the Welsh Government's proposals for the M4 Corridor around Newport, which has been received via the Programme Officer.

1.1.2. The Welsh Government understands the evidence submitted within Professor Kevin Anderson's Statement to be based on the following:

1. Considers that insufficiently rigorous analysis has been presented by the Welsh Government to appropriately address the implications of the M4 proposal for the total level of greenhouse gas emissions.
2. Considers that it is overall emissions that count.
3. Considers that a new road is very likely to lead to increased demand (induced demand), with yet further greenhouse gas emissions, which is not adequately considered in the plan.
4. State that Norwegian Public Roads Administration (Institute of Transport Economics, 2009, p.i). and William-Derry (2007) indicate road construction increases emissions.
5. States that the A46 Newark – Widmerpool scheme, which saw 17 miles of new dual carriageway constructed alongside the existing road, is estimated to have resulted in an addition of 28938 tonnes of CO2 emissions in the first year after opening. This equates to 425 tonnes per lane mile, and, if replicated for the M4 black route (14 miles, 3 lane carriageways), would see emissions of around 35700 tonnes.
6. Consider that there is no consideration in the draft Plan of the fact that all construction projects result in additional carbon emissions.
7. Considers that recent and rapid advances in automated vehicles are anticipated to deliver significant improvements in the efficient flow of vehicles on existing road infrastructure and this is not sufficiently assessed within the Carbon Report.

8. States that, if the Carbon report's traffic growth trend between 2022 and 2037 for both scenarios is projected forward, then 2038 is the first year where the carbon emissions from the "do-something" scenario exceed the "do minimum" scenario.

9. Considers that the impact that the proposed scheme would have on Carbon Emissions from Disturbed Soil is not clear at present, and further investigation is required.

2. REBUTTAL

2.1. Points Raised

2.1.1. The above points are dealt with by topic by the relevant witnesses Tim Chapman and Bryan Whittaker in the following sections. Readers should also make reference to the Proofs of Evidence in their entirety for a full understanding of the Welsh Government's case. For ease of reference the places where the above points are addressed in this Rebuttal are listed in the table below:

Objector's point reference	Rebuttal paragraph reference	Objector's point reference	Rebuttal paragraph reference
1	2.2.1	6	2.2.6
2	2.2.2	7	2.3.1
3	2.2.3	8	2.2.7
4	2.2.4	9	2.2.8
5	2.2.5		

2.2. Tim Chapman (Carbon)

2.2.1. Response to **Point 1** (Considers that insufficiently rigorous analysis has been presented by the Welsh Government to appropriately address the implications of the M4 proposal for the total level of greenhouse gas emissions):

1. I am not aware of any major new highway scheme that has analysed carbon emissions to the extent that it has been modelled for this project and presented in the Carbon Report (Appendix 2.4 of the March 2016 Environmental Statement (ES) Document 2.3.2) and in the Proof of Evidence of Tim Chapman WG1.13.1 (to be read alongside errata WG1.13.3 and WG1.13.4).

2.2.2. Response to **Point 2** (Considers that it is overall emissions that count):

1. As explained in the Carbon Report (Appendix 2.4 of the March 2016 Environmental Statement (ES) Document 2.3.2) and in the Proof of Evidence of Tim Chapman WG1.13.1 (to be read alongside errata WG1.13.3 and WG1.13.4), the carbon assessment focuses on total carbon emissions, using the new PAS 2080:2016 as a basis, demonstrating that the new scheme will be essentially 'carbon neutral'.

2.2.3. Response to **Point 3** (Considers that a new road is very likely to lead to increased demand (induced demand), with yet further greenhouse gas emissions, which is not adequately considered in the plan):

1. The traffic modelling undertaken, which fully models likely future demand under the Do Something and Do Minimum scenarios, shows a greater amount of traffic under Do Something. The traffic modelling therefore takes into account induced demand and as the carbon analysis is based on the traffic modelling, it too takes into account induced demand. Further information about induced demand and traffic is addressed by Bryan Whittaker's Proof of Evidence WG1.2.1.

2.2.4. Response to **Point 4** (State that Norwegian Public Roads Administration (Institute of Transport Economics, 2009, p.i). and William-Derry (2007) indicate road construction increases emissions):

1. Reference to the Norwegian (2009) and the William-Derry (2007) analyses are useful for context, but are based on generic assumptions and do not account for any of the particular conditions on the M4 or the extensive analysis and information available for the Scheme, presented in the Carbon Report (Appendix 2.4 of the March 2016 Environmental Statement (ES) Document 2.3.2) and in the Proof of Evidence of Tim Chapman WG1.13.1 (to be read alongside errata WG1.13.3 and WG1.13.4). Consequently, they do not provide any extra clarity to the M4 carbon analysis.
2. Interestingly, in both of the cases cited by Professor Anderson, the reports highlight that the carbon emissions observed in operation were significantly lower than the original predictions made during design - both schemes had been forecasting a greater increase in emissions than was observed in the opening years.

2.2.5. Response to **Point 5** (States that the A46 Newark – Widmerpool scheme, which saw 17 miles of new dual carriageway constructed alongside the existing road, is estimated to have resulted in an addition of 28938 tonnes of CO2 emissions in the first year after opening. This equates to 425 tonnes per lane mile, and, if replicated for the M4 black route (14 miles, 3 lane carriageways), would see emissions of around 35700 tonnes):

1. Professor Anderson's extrapolation of tailpipe emissions to calculate an increase in carbon emissions per new lane kilometre from the two case studies selected is interesting. The carbon emissions he quotes for the two highway projects, the A46 Newark - Widmerpool and the M25 widening from J16-23 are taken from the Post-Opening Project Evaluation (POPE) reports, where Highways England reviewed the operational performance of the new schemes one year after their opening.
2. These analyses may be useful for early-stage generic assessments where a rigorous analysis has not been completed, but they don't provide any lessons applicable to the M4, where a full and rigorous analysis of future carbon based on detailed and specific traffic modelling including assessment of congestion effects and allowance for traffic growth has been undertaken.

2.2.6. Response to **Point 6** (Consider that there is no consideration in the draft Plan of the fact that all construction projects result in additional carbon emissions):

1. Carbon embedded in construction and the disturbance of soil: please refer to Section 3.2 of the Carbon Report (Document 2.3.2, Appendix 2.4), where these have already been addressed.

2.2.7. Response to **Point 8** (States that, if the Carbon report's traffic growth trend between 2022 and 2037 for both scenarios is projected forward, then 2038 is the first year where the carbon emissions from the "do-something" scenario exceed the "do minimum" scenario):

1. The statement that "if the Carbon report's traffic growth trend between 2022 and 2037 for both scenarios is projected forward, then 2038 is the first year where the carbon emissions from the "do-something" scenario exceed the "do minimum" scenario" is valid for the results in that report, however they have been superseded by the more up-to-date Tempro 7.1 traffic model with updated VISSIM / PHEM analyses. These show now that the improvement diverges at an increasing rate with the calculations for 2037 showing that DS is some 3% better than DM for CO2e emissions. Furthermore, as outlined in Sections 2.3 and 2.4 of Tim Chapman's PIQ037 clarifications and errata WG1.13.4, there is also an overall carbon improvement on the wider network (excluding the core network) due to the Scheme, suggesting that the overall improvement is

even better than the models compute. For 2038 and beyond in my assessment of Carbon Neutrality I extrapolate the same rate of surplus rather than a diverging one – please refer to Table 3 of the PIQ037 clarifications and errata WG1.13.4.

2.2.8. Response to **Point 9** (Considers that the impact that the proposed scheme would have on Carbon Emissions from Disturbed Soil is not clear at present, and further investigation is required):

1. Further to the information included in the Carbon Report (Document 2.3.2, Appendix 2.4), I provide here a more detailed description of the carbon aspects associated with peat, as raised by Professor Anderson.
2. The term 'peat' has been used to describe not only the highly organic, water-logged soil material that comprises a wetland system (see definition in Lindsay, 2010) but also other organic soils, including topsoil and alluvial clays with organic content of 5% or less. It is only the former that has the ability, in the right conditions, to sequester carbon dioxide from the atmosphere or release methane to the atmosphere if dried out; the latter will only result in release of carbon dioxide if excavated, dried and oxidised over time.
3. The peat present at the ground surface to the north of Barecroft Common has been disturbed over the years by intensive farming and does not actively serve as a carbon sequestrator. I understand from Mr Sibert's evidence that its excavation will be limited and handled in such a way that it will not dry out and hence won't release methane or other greenhouse gases in any significant quantities during stockpiling.
4. In the case of this Scheme, the topsoil will be left in situ rather than being stripped prior to bulk earthworks as often happens so as to avoid damage to the desiccated crust. This organic layer is not expected to degrade in any different way to the way it would do naturally.
5. The weight of the embankment will cause the underlying soil to compress / consolidate, so the peaty layers will become somewhat denser, but will remain a soil of the same organic content.
6. The majority of the deeper peat layers should be largely unaffected as no significant change to water tables are planned, so the regime that causes

methanogenesis and other degradation processes that could release CO2e should be substantially the same as occurs now naturally.

7. Band drains are being installed to accelerate consolidation of the clayey soils but will not lower the water table, or allow air to come into contact with the soil. Deeper peat horizons will be minimally disturbed from the installation of these band drains, but they will not cause any drying out of the material and hence no release of methane. Therefore they should have no effect on the rate of degradation of any organic matter held in these deeper soil layers.
8. Similarly, installation of driven piles through organic soils will not involve excavation of the soils and hence should not release CO2e.
9. At some limited locations, mainly for bridges, bored piles will be installed. A typical pile will have arisings that may take soil from below the water table and put it above the water table, where it may be allowed to degrade. There are planned to be over 1,000 piles of this sort in places where the soil has a higher organic content – ranging in diameters from 0.9m to 2.1m.
10. My very conservative estimate of the total volume of organic material in the soil that piling will excavate from below the water table and hence has the potential to degrade is 571m3, of which 80% derives from alluvial clay with organic content of 5% or less and the rest to be more peaty, with higher organic content. Based on the ground investigation results where organic matter contents were measured, I allowed conservatively a 5% organic content for the alluvial clay and a 30% organic content for the more peaty horizons. In accordance with Broadmedow & Matthews (2003), I assumed that half of the organic matter by weight is carbon C, which can then be oxidised to form carbon dioxide CO2. I estimated the maximum total carbon dioxide to be 1,700 tCO2 if all were allowed to degrade, which would be very unlikely in practice as most is bound into a clayey soil, but if it did happen, it would amount to approximately 0.3% of the total capital carbon dioxide equivalent for the Scheme, i.e. negligible, as indicated in the Carbon Report.

2.2.9. I confirm that the statement of truth and professional obligations to the inquiry from my main proof still applies.

2.3. Bryan Whittaker (Traffic)

2.3.1. Response to **Point 7** (Considers that recent and rapid advances in automated vehicles are anticipated to deliver significant improvements in the efficient flow of vehicles on existing road infrastructure and this is not sufficiently assessed within the Carbon Report):

1. Car occupancy varies by journey purpose. The Department for Transport (DfT) WebTAG data book which provides all the parameter values to be used in scheme appraisal states that car occupancies that were observed in 2010 will be constant to 2036.
2. The DfT commissioned research into the impacts of connected and Autonomous Vehicles (AVs) on traffic flow which was published in May 2016. One of the key conclusions from that research was that there was great potential for substantial improvements in network performance, particularly in high speed, high flow situations. However, there was strong evidence that at low penetrations, any assertive AV's are limited by the behaviour of others, so that vehicles are not able to make use of their enhanced capability. This leads to suggestion of a tipping point – the proportion of enhanced vehicles required before benefits are seen. The research suggests that that this may be between 50% and 75% penetration of AV's. Results for the Strategic Road Network (SRN) (peak period) indicate improvements in delay of only 7% for a 50% penetration of AV's, increasing to as high as 40% for a fully automated vehicle fleet.
3. A paper was presented at the 2016 European Transport Conference which summarised the outcome of a 'Delphi' survey conducted amongst the leading professionals in the area of autonomous vehicles. The Delphi method is a structured communication technique developed as a systematic, interactive forecasting method which relies on a panel of experts. Delphi is based on the principles that forecasts from a structured group of individuals are more accurate than those from unstructured groups.

4. A total of 45 modelling experts took part. Ten of them were well known academics, 9 worked in Government Agencies and the rest worked in the private sector in different roles, mostly as consultants. They were grouped into 5 regions, the USA and Canada, Western Europe, Australasia, Latin America and the Rest of the World.
5. On when will AV's be available, the mean for all regions was 2023. In response to when would AV's be 10% of the fleet, the mean response was 2032 and 2040 when the percentage of AV's increase to 20%. The mean view arrived at in terms of improvement in capacity was that a 10% improvement in capacity could be achieved when AV's are 20% of the fleet..
6. The conclusion that I would draw from the above is that any effect on the M4 is so far in the future, it does not change the need for the scheme.

2.3.2. I confirm that the statement of truth and professional obligations to the inquiry from my main proof still applies.