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Examination Principle Issues	• **Climate Change** • **Scope of Development and Environmental Impact Assessment** • **Others as indicated in text**

DEADLINE D1 SUBMISSION
(including WRITTEN REPRESENTATION, Part 1)

I am an independent scientist and environmental consultant, working at the intersection of science, policy, and law, particularly relating to ecology and climate change. I work as a consultancy called Climate Emergency Policy and Planning (CEPP).

In so far as the facts in this statement are within my knowledge, they are true. In so far as the facts in this statement are not within my direct knowledge, they are true to the best of my knowledge and belief.

Contents

RESUME : DR ANDREW BOSWELL

I am an independent scientist and environmental consultant, working at the intersection of science, policy, and law, particularly relating to ecology and climate change. I work at a consultancy called Climate Emergency Policy and Planning (CEPP).

I realised recently that my life-scientific goes back over 50 years to when aged 14 I became passionate by the mystery of quantum mechanics. As an undergraduate, I studied for BSc 1977, 1st class honours in Chemistry at Imperial College London. My doctoral work[1], at Oxford University was supervised by Professor R J P Williams, FRS, and was in structural biology, protein binding sites and dynamics (DPhil[2], 1981). I later did an MSc in the then emerging area of "Parallel Computing Systems" at the University of the West of England (1994).

Most of my career has been in scientific computation and modelling. Between 1985 and 1993, I engaged in the software engineering, and testing, of modelling and simulation systems for the high-level design and logic synthesis of Very Large Scale Integrated (VLSI) circuits. These simulation systems were state of the art UK software[3], and in the 1980s and 1990s were at the forefront of formal, mathematical based, methods in the verification of computer systems, both hardware and software, used in applications such as fly-by-wire commercial aircraft. Commercial customers of our products were running software models of microprocessors and Application Specific Integrated Circuits (ASICs), at that time[4], of up to one million transistors.

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[1] My doctoral supervisor was the prolific, much loved and highly missed, British chemist, Napier Royal Society Research Professor R J P Williams, FRS, MBE, see ███
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[2] DPhil title: "Nuclear Magnetic Resonance Studies of Modified Eukaryotic Cytochrome c"

[3] See references to Electronic Logic Language (ELLA), one of the systems on which I worked, in "The development and deployment of formal methods in the UK", (2020)

████████████████, Cliff Jones and Martyn Thomas, Professor at Gresham College. Professor Thomas was one of my mentors in computing and a superior colleague of mine from 1985-1992 when we both worked at Praxis Systems plc where he was a founding Director.

[4] One million was cutting edge at the time! Transistor counts now exceed two trillion on a single chip
███████████████████████████

Between 1995 and 2006, I ran the high-performance computer service at the University of East Anglia (UEA), and I supported the university's scientific research community in running models, across a range of sciences, on a small supercomputer which I developed and manged. I have a wide understanding of the principles and practice of modelling complex systems which I bring to my current work.

I provided consultancy across the science faculties at UEA on computer modelling. This ranged from advising several generations of PhD and post-doctoral research students on modelling issues including detailed program coding issues; advising professors and research leaders on system and architectural issues of modelling, and in many cases programming solutions for them; testing and debugging extremely complex modelling systems for scientists who did not have the relevant IT skills in forensic fault finding; systems administration of servers and several iterations of high-performance computers; and running training courses of parallel computing and scientific computing languages across the campus. Supporting scientists running climate models in UEA's esteemed Environmental Science department was a significant part of my work too.

Due to the climate crisis, from 2005 I have been involved in campaigning and politics, and have also been a Green Party Councillor on Norfolk County Council for 12 years. The severity of the climate emergency is clear through science and has been for several decades, and my work through CEPP now is to promote the necessary rapid response to the Climate Emergency in mainstream institutions, such as local authorities and government, through the lenses of science, policy, and law. I am an Expert contributor to the proposed UK Climate and Ecological Emergency Bill[5], drafted by scientists, legal experts, ecological economists, and environmentalists, and designed specifically to reverse the climate and ecological breakdown that we are facing. The Bill recently had a second reading in the House of Commons.

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[5] ▬▬▬▬▬▬▬▬▬

SUMMARY

This submission addresses the "carbon quantification" part of "carbon quantification and assessment" and the question how the Scheme's emissions should be calculated for EIA Regulation compliant assessment. To do this, I analyse the configuration of the core scenarios in the traffic models in the Transport Report from which the quantification of carbon is derived. I find, it is **without doubt** that the traffic model configuration leads to carbon quantities, which when processed by the differential DS-DM method, leads to a carbon assessment which is a solus <u>only</u> assessment, and <u>not</u> a cumulative assessment. **Since an assessment of the cumulative GHG emission impacts of the Scheme is legally required under the EIA Regs, and is not provided anywhere else in the Environmental Statement, this failing alone renders the Environmental Statement unlawful.**

I analyse the traffic model configurations and show that this situation arises out of the Applicant's very narrow range of traffic modelling, which is based, historically, on analysing and solving operational and performance issues. As well as these performance-oriented traffic models, a set of EIA Regs compliance-oriented traffic models are required to perform cumulative assessment. I define the traffic model configurations required so that cumulative assessment of the carbon impacts of the scheme is possible. Although, the issue in my representation is that cumulative carbon assessment has not been done, the issue that the traffic model configuration precludes cumulative assessment may extend to other environmental factors like noise too. **The performance-oriented traffic models also produce an underestimate for the carbon emissions associated with the scheme** in the Applicant's solus assessment, because journeys which should be attributable to scheme (in isolation) are included in the Do Minimum scenario. Further underestimates are reported in land-use emissions associated with the scheme, resulting in the assessment of carbon impacts being underestimated too.

I request that the ExA request the following additional information from the Applicant:

- Traffic modelling, carbon quantification and assessment based on the three EIA Regs compliance-oriented traffic models which I define at Table 2.

- Traffic modelling, carbon quantification and assessment based on the two further sensitivity test traffic models which I define at Table 2, and which assess the impacts of 11 Local transport developments and 85 land-use developments.

- Information of freight and airport traffic growth as applied in the Traffic modelling.

- An analysis of which other environmental factors (eg: noise) have no cumulative assessment due to the error (as explained in detail) of using performance-oriented traffic models as a basis for environmental impact assessment.

- For algorithmic transparency, a fuller explanation of how the traffic models used by the Applicant for the Environmental Assessment function and link together.

Following the demonstration <u>without doubt</u> that no cumulative carbon assessment has been made in the Environmental Statement, I now respectfully ask that the ExA determines that the EIA Reg 20 process to suspend the examination is now followed in relation to this matter, so that the Environmental Statement can be reworked, as necessary.

1   INTRODUCTION

1.1   *Deadline 1 (D1)*

1   This is my submission for Deadline D1. It comprises Part 1 of my written representation (WR). As this Part 1 already finds that the Environmental Statement is unlawful, I await the response from the ExA and the Applicant before considering the required content of any Part 2 WR.

2   I will also comment on:

   A.   PD-008, Examining Authority's Written Questions (ExQ1), question 1.2.15 which was directed to me, and relates to EIA Reg 20. This response is embedded in the main narrative at the appropriate place.

3   I explain later that there are two keys parts required for carbon appraisal of the scheme (1) carbon quantification, and (2) carbon assessment. The evidence in this Written Representation, Part 1, demonstrates <u>**without doubt**</u> that carbon quantification does not meet the requirements of the EIA Regulations, and therefore the Environmental Statement in unlawful.

4   I will submit further evidence on the carbon assessment stage in a Written Representation, Part 2, as and when necessary. The issue now is that carbon quantification has not been lawfully carried out, and representation of the carbon assessment stage, at this point, is therefore academic.

1.2   *Recent changes to relevant policy*

5   Since the application was published in June 2021, there have been a significant number of changes to national policy and guidance.

   (a)   The Government's Transport Decarbonisation Plan[6] (TDP) which requires ambitious quantifiable carbon reductions in transport at the local level was published on the 14th July 2021.

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[6] ▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆

    (b) The Government's Net Zero Strategy[7] (NZS) backing the urgent need for ambitious quantifiable carbon reductions in transport, at the local level was published on 19th October 2021.

    (c) HM Treasury Green Book supplement providing specific guidance on how analysts should quantity and value emissions of GHGs[8] was published in October 2021.

    (d) Government policy paper[9] setting out a revised approach to valuing GHG emissions, and revised carbon prices, in policy appraisal was published on 2nd September 2021

    (e) An updated version of the DfT's WebTAG guidance[10] and TAG data book, including changes to emissions factors, was published on 29th November 2021

    (f) Highways England Carbon Reporting Tool[11] was used to assess the GHG emissions for scheme construction and maintenance was withdrawn on 21 September 2021. It was replaced with the National Highways Carbon emissions calculation tool[12].

6   I note the ExA's ExQ1, Q1.1.14 on the recent United Nations COP25 conference on Climate Change.

7   I raise the above as further issues which the Applicant needs to make clear the implications for, or any amendments needed to, the application or Environmental Statement.

1.3   *Relevant documents from other DCO schemes beyond Norfolk*

8   I draw the ExA attention to these recent submissions on the A38 Derby Junctions scheme [TR010030] which also relate to carbon quantification and assessment, and cumulative carbon assessment:

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[7] ████████████████████████████████████

[8] "Valuation of energy use and greenhouse gas: Supplementary guidance to the HM Treasury Green Book on Appraisal and Evaluation in Central Government"
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1024054/1.Valuation_of_energy_use_and_greenhouse_gas_emissions_for_appraisal_CLEAN.pdf

[9] "Valuation of greenhouse gas emissions: for policy appraisal and evaluation", ████████████████████████████
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- Derby Climate Coalition, "Response to the Secretary of State's Consultation of 23 September 2021", 27th, October 2021, legal letter[13]

- Derby Climate Coalition, "Response to the Secretary of State's Consultation of 23 September 2021", 27th, October 2021, Expert Report of Dr Boswell[14]

1.4   Definitions

9   The word "cumulative" is used in different senses by the Applicant in different places. This is central to the Applicant's legal error, which I will explain later. Suffice to say here that definitions, usage and application of the word "cumulative" are a very important issue.

10   For scientific precision, I use the following additional definitions. My definitions are:

- **Absolute emissions** – *carbon emissions which are expressed in terms of **an absolute quantity** of emissions. The value of the absolute emissions, as released into the atmosphere, quantifies the real measure of the impact of greenhouse gases as an environmental factor (or receptor).*

- **Differential emissions** – *carbon emissions, with an associated value which has been **derived by differentiation of absolute emissions**. The differentiation is usually performed by the difference between two traffic scenarios, one with a transport intervention and one without. Differential values derived this way do not quantify the real impact of atmospheric greenhouse gases by the transport intervention within its transport system, and therefore do not represent the real global heating impact.*

1.5   Absolute and differential emissions

11   With respect to differential emissions, the applicant sometimes refers to these as "net" emissions. For example, Chapter 14, Table 14-18 [APP-045] labels a column *"Net (cumulative) GHG emissions over carbon budgets (tCO2e) ('Do-Something'-'Do-Minimum')"*. (In this header, the word "cumulative" is also used misleadingly[15]).

12   "Net" is usually used to mean the quantitative change of some physical parameter because of some process. The EIA Regulations refer to environmental factors at EIA Reg 5 (2), and the Design Manual for Roads and Bridges refers to receptors at "LA 103[16] [Page 6,

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[15] I suspect it is used to mean the sum of construction and operation emissions. This is not the meaning under the EIA Regulation which relates to the impacts of the A417 Missing Link scheme in cumulation with other schemes and developments, as I will discuss at length later on

[16] ██

PDF 7] with respect to cumulative impacts. "Net-ness" depends upon the factor/receptor being assessed for environmental impact. For road-use emissions in a transport system, changes in carbon dioxide in the global atmosphere is the relevant factor/receptor. The net change to the atmosphere, and consequential global heating, is given by the absolute emissions emitted from the transport system. So net change to the atmosphere, and the environmental impact, arises from the total absolute emissions, given in this case by the Do Something (DS) traffic modelling output (and not from the "net" DS - DM quantity).

13 The usage of "net" by the Applicant in Chapter 14, Table 14-18 and other places is misleading as it used to suggest that a quantum of differential emissions is all that is of concern for assessment of the environmental factor. Differential is clearer word to use (than "net") as it indicates that each figure being used in the Environmental Assessment is derived by a differentiation of two large absolute carbon emissions figures in the traffic model. The underlying **absolute** carbon emissions figures are actually the real measure of impact on the environmental factor/receptor (ie the global atmosphere and global heating), and therefore the metrics of primary concern.

14 **This is important** – is the purpose of assessment to quantify the impact on the environmental factor, or to quantify changes to the measuring system (in this case, the transport model)? It must be to quantify the impact on the environmental factor, in this case GHGs in the global atmosphere, and therefore absolute emissions are the preferrable quantification.

15 Differential emissions data, being a small number derived from two large numbers, is also very sensitive to changes in one of the large numbers used to calculate it. For example, if assumptions in how the baseline is modelled for the DM figure increases that figure, then the DS-DM will be consequential smaller.

2   CARBON QUANTIFICATION AND ASSESSMENT

16 There are two key questions (KQ-1 and KQ-2) that the ExA, and SoS, need to consider on carbon assessment:

(KQ-1) How will the Scheme's emissions be quantified?

(KQ-2) Against which "target(s)" or "budget(s)" should the Scheme's emissions be contextualised for assessment?

17 Key parameters on carbon quantification (KQ-1) are:

- **Carbon emission types** (eg: construction and operations, the PAS2080 types, and my simplified seven-type typography given in Appendix D)

- **Baseline, solus[17] and cumulative emissions** - this will be explained in more detail later in this document

- **Spatial scales of quantification** (local, regional and national)

- **Short-term, medium-term and long-term periods** of quantification, for example, carbon budgets like the 5th caron budget or long-term periods like the period 2050-2085 (the post net-zero "2050" year part of the 60 year appraisal).

18   The key parameters on targets and budgets (KQ-2) include:

- **Absolute v differential (delta) emissions** [see definitions above]

- **Local, regional and national** carbon budgets and targets

- **Other targets and budgets** from national, and international, policy and law

19   From these questions and parameters, important questions arise within the legal framework which includes the EIA Regulations, eg:

- "Should both the Scheme's construction and operational emissions be considered?"

- "Should the Scheme be considered in isolation, or in the context of other cumulative developments, or both?" etc

20   This submission will concentrate on KQ-1 – carbon quantification and cumulative carbon quantification. Further submissions will be submitted which will cover KQ-2, carbon assessment, for future deadlines, as and when needed.

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[17] Solus means, here, "alone; separate" as in the first definition in the Collins on-line dictionary

3 CARBON QUANTIFICATION AND THE TRANSPORT ASSESSMENT

21 I return to the first fundamental question (KQ-1) which the ExA and SoS need to consider of how the scheme's emissions should be quantified and prior to the assessment stage. A pre-requisite of the EIA regulations is that carbon is quantified in the correct way, so that both solus and cumulative assessment can be later carried out, and the NPS NN also requires this through its invocation of the EIA Regs, see next section. **The question as to how carbon is quantified depends upon the configurations of the traffic modelling.**

Before examining the traffic model, I give the background to the overall requirements of the NPS NN and the EIA regulations.

3.1 *Overall requirements of the NPS NN and the EIA regulations*

22 The NPS NN section 4.15 (Appendix B) invokes the EIA Regs and states that the Directive as transposed into UK law *"specifically requires an environmental impact assessment to identify, describe and assess effects on … climate …"*. The EIA Regs Schedule 4 is invoked which requires "*the likely significant effects of the proposed project on the environment, covering the **direct effects** and any indirect, secondary, <u>cumulative</u>, **short, medium and long-term**, permanent and temporary, positive and negative effects of the project*" to be described in the EIA.

The second highlighted section from NPS NN 4.15 above is directly "cut and paste" from the wording in the EIA Regs themselves, indicating it was the DfT's intention in the NPS NN that significant effects, impacts or benefits as described are included in the Environmental Statement.

23 Again the EIA Regs are invoked for the assessment of carbon emissions at NPS NN 5.17 which states "*any Environmental Statement will need to describe an assessment of any likely significant climate factors in accordance with the requirements in the EIA Directive.*"

24 The Applicant's assessment in Chapter 14 of the Environmental Statement has not met these requirements of the NPS NN. It has not assessed **cumulative impacts.** APP-045, section 14.4 addresses assessment methodology, and acknowledges the requirement to "*align with the requirements of the NPSNN and the EIA Regulations*". However, for GHG emissions assessment it loosely says, "Impact of the scheme on climate". This does not acknowledge that both solus and cumulative (quantification and) assessment are required**. I will show that the wrong "solus" quantification has been made, and no cumulative quantification has been made at all.**

3.2   Core scenarios in the Traffic models (Transport Case)

25 The Applicant has laid out how it how it has configured DM and DS core scenarios (ie **two** traffic model configurations) in the "**Transport Case** for the Scheme" [APP-426, Chapter 7.10 "Transport Report], and [APP-422 "Combined Modelling and Appraisal Report"]. The Applicant says that it has followed the Transport Appraisal Guidance (TAG). It is more accurate to say that the Applicant has followed its own particular interpretation of TAG, which is appropriate for operational/performance evaluation of the network, but which is not fit for purpose for cumulative carbon assessment, as I will discuss further below.

26 I now give a high-level description of how the traffic models are configured, and the elements of interest to us here.

27 A Transport Supply Uncertainty Log [APP-426, 5.2.19] has been compiled that contains the RIS2 schemes as well as relevant local schemes identified by the local highway's authority (Gloucestershire County Council). The Transport Supply Uncertainty Log is given at Appendix F of APP-422.

28 Local developments are captured [APP-426, 5.2.2] in a Development Uncertainty Log given at Appendix F of APP-422.

29 85 land-use developments [APP-426, 5.2.6] and 11 local[18] and 33[19] wider-area transport developments which at least 'near certain' or 'more than likely', are included in both the DM and DS traffic model configurations [APP-426, 5.2.22 and refs to APP-422].

30 APP-426, 5.1.2 gives a further overview of these elements, which it refers to "*a set of transport network changes*" and "*a specific set of development assumption*s". It also refers to "*application of growth of freight traffic from DfT Road Traffic Forecasts 2018 (RTF18)*" and "*application of forecast traffic growth at the primary airports and seaports within the south-west region*". I have not found further expansion of these latter elements. **The Applicant should be required to provide further information on this data and its effect in the traffic modelling.**

31 The Applicant clearly states at APP-422, 10.3.3 "*The inclusion of the scheme is the only difference between the DM and DS networks.*"

32 I now summarise this in Table 1 below where ✓ means that a feature (eg: a road, or set of roads) is included in the traffic model configuration whilst a ✘ means it is not included.

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[18] IDs 1 - 11 at APP-422, Table 10-2 "Do-Minimum schemes included in forecast models"

[19] IDs 12 – 54 at APP-422, Table 10-2 "Do-Minimum schemes included in forecast models"

Model configuration name	Performance-oriented (ie as in APP-426 and APP-422)	
	DM (Perf, baseline)	*DS (Perf, all)*
2015 Baseline Highway network	✓	✓
A417 Missing Link scheme	✗	✓
11 Local transport developments	✓	✓
39 Wider-area transport developments	✓	✓
85 land-use developments	✓	✓
Freight growth	✓	✓
Airport traffic growth	✓	✓
Forecast changes in trip demand (VDM)	✓	✓

Table 1

33 The red ellipse indicates the only change in the configuration between the DM and DS scenarios is the presence, or not, of the A417 Missing Link scheme in the modelling, as stated at APP-422, 10.3.3.

34 I refer to this set of traffic model configurations as "Performance-oriented", for reasons which will become clearer later. I also give each configuration a further unique name to distinguish it from other configurations which I will introduce later eg: *DM (Perf, baseline)* is the Applicant's DM model as described in APP-426.

35 The "<u>all</u>" in *DS (Perf, all)* [the Applicant's DS model in APP-426] indicates that all the possible elements are included in the traffic model configuration. The Applicant may introduce the notion of "inherently cumulative" to describe this situation which as I will explain later is confusing, and leads to a misunderstanding about what is "cumulative", and leads to the Applicant's legal error. I have used the term "all" to minimise possible confusion as explained in more detail later.

36 The operational performance, and design implications of the DM and DS configurations, above, are described in APP-426.

37 I now describe how the outputs of DM and DS are translated into the carbon quantifications in APP-045, Chapter 14, Climate.

3.3 Carbon quantification from the core scenarios

38 It is clear from Table 1 that the only difference in configuration between the DM core scenario and the DS core scenario is the A417 Missing Link scheme. Therefore differentials generated from between the outputs of these two model configurations (ie: DS – DM) are attributable only the A417 Missing Link scheme itself in isolation. Any environmental assessment based on such a differential quantity **can only be a <u>solus</u>**

assessment. This applies to carbon emissions and all other environmental factors too (eg: noise).

39 This is what happens in the Environmental Statement when the carbon assessment is performed based on the *DM (Perf, baseline)* and *DS (Perf, all)* traffic model configurations in Chapter 14. The outputs of the traffic modelling are taken forwarded and the corresponding **absolute quantities of carbon emissions** are calculated for different carbon budget periods. For example, for the 60-year appraisal period 2026-2085, the *DM (Perf, baseline)* traffic model output corresponds to the Applicant's absolute DM value of 11,675,627 tCO2e as in APP-045, Table 14-17, whilst *DS (Perf, all)* corresponds to the Applicant's absolute DS value of 12,578,522 tCO2e in APP-045, Table 14-17. (Note that as these quantities also include maintenance and land use emissions, the precise figures will be slightly smaller, vehicle emissions being the predominant quantity).

40 Also at APP-045, Table 14-17, the differential eg: *DS (Perf, all) - DM (Perf, baseline)*[20] quantity is calculated for the 60-year appraisal period 2026-2085 as 902,895 tCO2e. This is **a differential value of carbon emissions** for the vehicle emissions over the 60-year period.

41 Further derivatives of these figures are taken forward to the APP-045, Table 14-18, for example, 2,373,212 tCO2e as the 2026 – 2037 part of the absolute 12,578,522 tCO2e figure above [an absolute quantity], and 152,565 tCO2e as the 2026 – 2037 part of the differential 902,895 tCO2e figure above [a differential quantity]. The differential quantities of 96,302 tCO2e, 61,196 tCO2e, and 69,211 tCO2e for the 4th Carbon budget (4CB), 5th carbon budget (5CB) and 6th carbon budget (6CB) respectively are then fed into the carbon assessment.

Notes:

(1) the 4th carbon budget figure also includes the construction emissions.

(2) "Cumulative" in the headers of APP-045, Table 14-18 is a further misnomer and misleading usage of the word. It is just used to mean the sum or total of each years quantum over the 12 years 2026 – 2037, and is also redundant as the word "total" which conveys the same meaning is already used. It is **not** used here in the EIA Regulations' meaning of cumulative impacts of the project with other developments.

(3) The applicant fails to mention at section 14.10.13 that based on these differential values that scheme is estimated to contribute approximately 0.0072% of the 6th carbon budget: a higher value than the figures quoted.

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[20] Referred to a DS – DM in Chapter 14, Table 14-18

42 The key point here is that the Applicant has **only** taken forward the differential carbon quantifications into the assessment stage. I show later that it is an underestimate of the solus effects of the scheme (ie the **wrong** solus differential value has been taken forward).

43 **Without doubt**, from the explanation above, the quantity of 69,211 tCO2e, for example for the 6CB, results from the differential outputs of two traffic model configurations in which the only difference is the existence or not of the A417 Missing Link scheme (the same applies across the other carbon budgets in Table 14-18).

The key point at this stage is that the DM scenario includes 11 local transport developments, 39 wider-area transport developments, 85 land-use developments, freight growth and airport traffic growth as explained above. The differential carbon quantification is therefore an expression of the scheme in solus. **Therefore any carbon assessment based on it is also a solus only assessment, and not a cumulative assessment.**

44 **Since an assessment of the cumulative GHG emission impacts of the Scheme is legally required under the EIA Regs and is not provided anywhere else in the Environmental Statement,** *this failing alone renders the Environmental Statement unlawful.*

3.4 The EIA Regulations

45 In considering compliance with the EIA Regulations, the Applicant's standard response at other recent DCO applications and examinations is to pitch the NPS NN as somehow legally eclipsing the EIA Regulations, and ignore the very clear requirement **in the EIA Regulations** for cumulative assessment which the NPS NN cannot remove.

46 The matter here is not about **either** the EIA Regulations "winning over" the NPS NN, **or** the reverse of the NPS NN winning over the EIA Regulations. The ExA and SoS are required to take account of, and apply, both pieces of legislation (ie it is an **and-and** situation).

47 The NPS NN **directly invokes** the EIA Regulations at NPS NN 4.15 and 4.16 (see Appendix A). The NPSNN, therefore, fully accepts that the EIA process must be followed in full. The NPSNN cannot, as a matter of law[21], in any way limit or constrain what is required by the EIA process; a full assessment of a proposed DCO's environmental effects and their significance must be undertaken through the EIA process. This point is, in fact, recognised in the NPSNN at para 4.15 et seq. That section of the NPSNN even states, in relation to cumulative assessments that (at 4.17):

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[21] I am grateful to the recent legal submission to A38 Derby Junctions scheme [TR010022], of 27th October 2021, here,

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> *"The Examining Authority should consider how significant cumulative effects and the interrelationship between effects might as a whole affect the environment, even though they may be acceptable when considered on an individual basis with mitigation measures in place."*

48   Moreover, irrespective of what NPSNN policy might say as to how certain environmental effects should be considered, or weighed, in the decision-making process, the independent application of the EIA regime to the DCO process is designed to ensure that all significant environmental effects are both identified and assessed. Following this process, it is entirely permissible for the SoS to weigh a project's significant environmental effects (as part of the adverse impact of the project) into his assessment of the balancing exercise required under section 104(7) of the Planning Act 2008 (see **R (oao ClientEarth) v SSBEIS [2021] EWCA Civ 43** at [95]).

49   Further, for the EIA Regulations, it is necessary to clearly distinguish solus and cumulative assessment. Solus[22] being the impacts of the scheme in isolation. Solus and cumulative impacts in the context of EIA assessment are clarified in *Pearce v BEIS [2021] EWHC 326 (Admin)*.

50   We have already described the two fundamental questions (KQ-1 and KQ-2) which the ExA and SoS need to consider, **through the lenses of both** the EIA Regulations and the NPS NN:

   (KQ-1) How will the Scheme's emissions be quantified?

   (KQ-2) Against which "target(s)" or "budget(s)" should the Scheme's emissions be contextualised for assessment?

The EIA Regulations are clear that two types of assessments (KQ-2), are required: solus and cumulative. A pre-requisite of this is that two types of quantifications (KQ-1), solus and cumulative, are also required. As above, analysis of the Applicant's traffic model configurations (DM and DS) has demonstrated **without doubt** that **only a solus quantification and, therefore, only a solus assessment has been made by the applicant**.

3.5   *The overall picture – solus and cumulative assessment*

51   From the above, it is clear that the restricted configurations of the traffic model in the Transport Case in APP-426 only allows a solus carbon assessment to be made. I now show how the cumulative assessment may be performed.

52   First, it is necessary to understand that the TAG approach, and the knowledge and skills developed by traffic modellers, pre-date the current time when assessment of carbon emissions has become an important factor in planning policy and law. The **two** traffic

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[22] Solus means, here, "alone; separate" as in the first definition in the Collins on-line dictionary

model configurations (ie: DS and DM) which are deployed are geared to assessing operational performance. I accept that performance is an important design issue, and is necessary to test aspects of the transport network of interest to highways engineering, and therefore that these configurations have a value for that purpose. My submission does not seek to address the success, or not, of this aspect of the transport case. The performance issues that this approach to the modelling is designed to answer are described in APP-426.

53 However, the concern for cumulative carbon assessment is that this performance-oriented transport modelling configuration, derived from the historical context explained above, does not even allow the assessment of cumulative impacts of GHGs of the Scheme (when differential emissions (ie: DS - DM) are extracted). **Put simply, and as explained below, an additional complementary approach to the modelling is needed to properly assess carbon impacts, both solus and cumulative, when differential emissions are being used.**

54 Although, it is not the direct concern of this submission, this failure of the performance-oriented transport modelling to assess cumulative carbon impacts, may well extend to other environmental factors, such as noise, especially where a differential quantification of environmental factors based on DS - DM assessment is fed into assessment process. **I request that the ExA seeks to determine whether there are other situations, with different environmental factors, where only a solus assessment has been made, and the wrong solus assessment, and which are therefore are also in breach of the EIA Regulations. The Applicant should be required to provide evidence that it has carried out both solus and cumulative assessment on all environmental factors scoped-in in the EIA scoping report.**

55 Table 2 builds on Table 1 above, and shows the different complementary approaches which are needed to derive both differential solus and cumulative carbon quantities which may then be fed forward into the carbon (GHG) impact assessment.

Model configuration name	Performance-oriented (ie as in APP-426 and APP-422)		EIA Regs compliance-oriented (eg: for impact assessment of GHGs)			Example sensitivity tests	
	DM (Perf, baseline)	*DS (Perf, all)*	*DM (GHG, baseline)*	*DS (GHG, scheme)*	*DS (GHG, all)*	*DS (ST1)*	*DS (ST2)*
2015 Baseline Highway network	✓	✓	✓	✓	✓	✓	✓
A417 Missing Link scheme	✗	✓	✗	✓	✓	✓	✓
11 Local transport developments	✓	✓	✗	✗	✓	✗	✓
39 Wider-area transport developments	✓	✓	✗	✗	✓	✗	✗
85 land-use developments	✓	✓	✗	✗	✓	✓	✗
Freight growth	✓	✓	✓	✓	✓	✓	✓
Airport traffic growth	✓	✓	✓	✓	✓	✓	✓
Forecast changes in trip demand (VDM)	✓	✓	✓	✓	✓	✓	✓

ΔSolus (Perf)   *ΔSolus (GHG)*

ΔCumulative (GHG)

Table 2

56 In Table 2, I identify **seven** *Traffic Model configurations* and give each a unique name eg: *DM (Perf, baseline)*.   *DM (Perf, baseline)* and *DS (Perf, all)* are the two presented by the Applicant as DM and DS in APP-426 and APP-422, and as discussed above.

57 I have introduced **three** EIA Regs compliance-oriented configurations. There are many other potential configurations; however, these three are the fundamental ones required for EIA compliant solus and cumulative carbon quantification and assessment. For simple clarity, I have bundled the 11 Local transport developments and 39 Wider-area transport developments [blue highlight] and the 85 land-use developments [brown highlight]. The solus quantification of carbon emissions is carried out from the baseline *DM (GHG, baseline)*, representing the current environmental situation in which these developments have not been implemented, and by introducing the A417 Missing Link *DS (GHG, scheme)*. The cumulative quantification of carbon emissions is carried out from the

baseline[23] *DM (GHG, baseline)* and by introducing the A417 Missing Link and all the developments *DS (GHG, all)*.

58 Sensitivity tests could be done with any combinations of these included (and of course combinations based on breaking down the bundled development, say to assess the impact of particular local road scheme), and as an example I give configurations *DS (ST1)* and *DS (ST2)* which would test the existing road network and the A417 Missing Link scheme *DS (GHG, scheme)*, against adding the 11 local transport developments, and adding the 85 land-use developments respectively.

59 The crucial point here is that for EIA Regs compliance-oriented assessment, the bundling of road and land-use developments as shown in Table 2 would be the logical configuration to generate the correct carbon quantification for solus and cumulative assessment. Each of the models would be run at 2026 Opening Year, and 2041 Design Year, and the two additional forecast years, consisting of an intermediate year of 2031 and a final forecast year of 2051 as in the Applicant's Traffic modelling [APP-426, 5.1.1].

60 Each of the **seven** models in Table 2 will produce a carbon quantification output for the different carbon budget periods which is expressed as **an absolute value of carbon emissions**, as I have described above. I emphasise again that differences such as *DS (Perf, all) - DM (Perf, baseline)*, and its associated Chapter 14, Table 14-18 6CB value of 69,211[24] tCO2e, are a further derivation of the data, and are expressions of **differential quantities of carbon emissions** for the vehicle emissions.

3.6 *Differential emissions and the semantics of increments*

61 The arrows underneath the Table 2 show the different differential carbon emissions which can be derived. It is clear straightaway that two different solus values can be calculated. *ΔSolus (Perf)* corresponds to the Applicant's which takes all the possible developments for the DS and removes the A417 Missing Link for the DM. By contrast, *ΔSolus (GHG)* introduces the A417 Missing Link on top the baseline network (**ie the current environmental situation**), with the cumulative impacts of the other road schemes and land-use developments being calculated as a further step, indicated by *ΔCumulative (GHG)*.

62 *ΔSolus (GHG)* and *ΔSolus (Perf)* will calculate different quantities of carbon. *ΔSolus (GHG)* will be a larger value than *ΔSolus (Perf)* because there will be a significant number of journeys which will exist in *DM (Perf, baseline)* and attributed in that configuration to the road and land-use developments where these journeys would be assigned to the A417 Missing Link itself in *DM (GHG, scheme)*. **In other words, the *ΔSolus (Perf)* carbon quantification used by the Applicant for its solus carbon assessment is an underestimate of the real carbon impact of the scheme.**

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[23] More consideration needs to be given to Freight and Airport traffic growth, and I have left these in the baseline in this indicative scheme, although this is not necessarily correct

[24] Corrected for maintenance and land use emissions, as explained in main text

63 *ΔSolus (GHG)* and *ΔCumulative (GHG)* are the carbon quantifications, are more accurate, and are the quantities which should be carried forwarded into any EIA compliant assessment based on differential carbon quantities.

64 Therefore from the above, and Table 2, more than one possible quantity can be calculated as an "increment due to the scheme". *ΔSolus (GHG)* and *ΔSolus (Perf)* are each increments, where the only difference is the introduction of the A417 Missing Link scheme, but which will each have different carbon quantifications. Therefore I prefer the term differential emissions, as it is neutral in meaning, and defined purely by the difference of two quantities. It avoids risking the error that one quantity which is an increment being considered the only possible increment. **For it is the nature of the model configurations fed into the differentiation which gives the semantics of the differential quantity.**

65 In summary, **for carbon assessment**, the wrong solus differential quantity has been used by the Applicant [*ΔSolus (Perf)* instead of *ΔSolus (GHG)*], and the cumulative differential [*ΔCumulative (GHG)*], has not been calculated, or used, at all. **This error also requires that the transport models are run in the EIA Regs compliant configurations, and that the carbon assessment and Environmental Statement is reworked.**

66 It is, however, preferrable to compare carbon budgets, which express absolute values of carbon emissions, with absolute carbon emission quantifications of the scheme, as provided by *DS (GHG, scheme)* and *DS (GHG, all)* as I have described above. Absolute carbon emissions quantities are more directly comparable with the real geophysical impact on the global atmosphere (effectively, the receptor for carbon emissions in the EIA Regulations), and they also provide greater sensitivity in assessing solus and cumulative impacts.

3.7 *"Inherently cumulative" and the nub of the applicant's error*

67 I now introduce a subtle issue which gets to the nub of **the error** in the Applicant's oft stated notion at other DCO examinations that their **assessment** is "inherently cumulative". This error results from the fact that "solus" and "cumulative" are terms which the Applicant has applied to quantifications of both **absolute emissions** and **differential emissions**.

68 The issue is apparent from Table 2 above. The applicant's argument is that its DS model (ie *DS (Perf, all)* in Table 2) contains everything (ie: the A417 Missing Link itself, the land-use changes, and the local and wider-area road schemes, and therefore it is "cumulative". I accept this although I have referred to this as the "**all**" scenario, as above. In unravelling the Applicant's confusion, here, I developed a nomenclature for Table 2 in which **only** differential emissions quantities are referred to as either solus or cumulative. This is because it is by referring to both absolute emissions (and the traffic models from which they are derived) and differential emissions as being solus or cumulative that the

Applicant has confused the issue. DS is a carbon quantification expressed in **absolute emissions**, derived from a traffic model configuration contain **all** possible elements.

69   Similarly, the applicant's DM model (ie *DM (Perf, baseline)* in Table 2) contains everything except the A417 Missing Link, and the applicant refers to it as "cumulative". Again, output of *DM (Perf, baseline)* is a carbon quantification expressed in **absolute emissions,** derived from a traffic model configuration containing **all** possible elements except the A417 Missing Link.

70   However, it is the differential *ΔSolus (Perf)* quantity which the applicant takes forward into its carbon assessment. As we have shown above, **without doubt**, this differential carbon quantification [*ΔSolus (Perf)*] **results in a solus assessment** as it is derived from two absolute quantities [*DS (Perf, all) - DM (Perf, baseline)*] whose only difference is the existence or not of the A417 Missing Link.

71   The Applicant confuses the configurations of the traffic models which, when computed, express absolute vehicle kilometres, and absolute emissions, with the differential emissions which the Applicants feeds into its carbon assessment. In the case of the DS and DM traffic model configurations, they are both "all" (or "cumulative, or even "inherently cumulative") traffic model configurations, but the differential between them produces a solus carbon quantification, and therefore produces a solus carbon assessment.

72   This is the nub of the Applicant's error. They have taken traffic model configurations which may be reasonably to described as "inherently cumulative", but through a process of differentiation have produced from them a solus carbon quantification, and therefore a solus assessment of carbon emissions.

3.8   *Remedy for the Applicant's error*

73   First, for clarity, I should emphasise again that I am not saying that the performance-oriented models should not be run. I am aware of the importance of them for understanding the wider transport issues, and operational performance relating to the A417 Missing Link.

74   However, I am saying that, if differential emissions that are derived from different model runs, are to be used for carbon assessment, then the three additional models, which I identify in Table 2 as EIA Regs compliance oriented, need to be run to capture both the true solus impacts and the cumulative impacts of the scheme.

75   Overall as I stress elsewhere assessment of absolute carbon emissions is a far more reliable and sensitive approach.

76   The remedy for this is that the additional transport modelling (EIA Regs compliance-oriented), as specified in Table 2, namely configurations *DM (GHG, baseline), DS (GHG, scheme)* and *DS (GHG, all)* should be computed. **As only a solus assessment (and as we describe above the wrong solus assessment) has been attempted in the**

Environmental Statement, it is unlawful and does not comply with the requirements of the NPS NN and the EIA Regs.

77 I now come to EIA Reg 20 and can respond to the ExA question to me at ExQ1 question 1.2.15.

78 Reg 20 of the EIA Regs provides for a set procedure[25] to be followed in cases where an "*applicant has submitted a statement that the applicant refers to as an environmental statement*" (reg 20(2)(a)) and "*the Examining authority is of the view that it is necessary for the statement to contain further information*" (reg 20(2)(b)).

79 "Further information" is defined in reg 3 as meaning:

> "… *additional information which, in the view of the Examining authority, the Secretary of State or the relevant authority, is directly relevant to reaching a reasoned conclusion on the significant effects of the development on the environment and which it is necessary to include in an environmental statement or updated environmental statement in order for it to satisfy the requirements of regulation 14(2);*"

80 Reg 20(1) and (3) essentially require that – where further information is considered necessary (under Reg 20(2)) - the Applicant must provide that "further information".

81 It is clear that the Environmental Statement does not comply with the requirements of the NPS NN and the EIA Regs, and it therefore is unlawful.

82 In my Relevant Representation, I stated:

> "*The absence of <u>cumulative</u>, and short, medium and long-term, impact assessment of carbon emissions renders the Environmental Statement inadequate under the EIA Regs, and subject to EIA Reg 20.*"

83 I have demonstrated above the absence of cumulative impact assessment of carbon emissions. As well as being inadequate, the Environmental Statement is unlawful, as above. **This is why I said that EIA Reg 20 now engages. I hope this answers ExQ1 question 1.2.15 to the ExA's satisfaction.**

84 **Following the demonstration <u>without doubt</u> that no cumulative carbon assessment has been made in the Environmental Statement, as described above, I now ask that the ExA now determines that the Reg 20 process needs to be followed in relation to this matter.** I respectfully suggest that it would be preferrable, for all parties, to do this

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[25] I am grateful to the recent legal submission to A38 Derby Junctions scheme, here and in subsequent paragraphs

now rather than to delay until a later consultation process as in the case of A38 Derby Junctions application.

3.9   Transport Appraisal Guidance (TAG)

85   The Applicant refers (at other DCO examinations) to the requirement in TAG to generate "with scheme" and "without scheme" scheme scenarios. For example, TAG UNIT A3 on Environmental Impact Assessment, 4.2.14 states "*Having calculated the carbon dioxide equivalent (CO2e) emission levels for each year, the change between the 'with scheme' and 'without scheme' cases for each year can be calculated.*"

86   The EIA Regs compliance-oriented traffic models, which we have described, are entirely consistent with this. There are in fact two possible solus calculations of the change between "with scheme" and "without scheme" in Table 2 - *DS (Perf, <u>all</u>) - DM (Perf, <u>baseline</u>)* **AND** *DS (GHG, scheme) - DM (GHG, baseline)*. As we have said, the former performance-oriented differential underestimates the true carbon impact of the scheme, and the latter EIA Regs compliance-oriented differential should be used. Then there is the cumulative calculation *DS (GHG, all) - DM (GHG, baseline)* – in this case, one is "with scheme" and the other is "without scheme", with *DM (GHG, baseline)* also without other road scheme and land-use developments, enabling an EIA Regs compliant cumulative assessment of the "scheme with other developments" to be made.

87   Sensitivity testing is encouraged by TAG to test alternatives, and the EIA Regs compliance-oriented configurations, and the sensitive tests *DS (ST1)* and *DS (ST2)* introduced at Table 2 are just further variations. Apart from being unlawful as they do not provide for cumulative carbon assessment, the Applicant's performance-oriented model configurations are part of a paradigm which has evolved for historic reasons, as explained above. And it is entirely reasonable to continue to approach operational performance of a road scheme by this traffic model configuration, and paradigm. However, the range of traffic model configuration needs to be extended with the EIA Reg compliance-oriented configurations as described in Table 2, and narrative above, to meet the new paradigm of both solus and cumulative carbon assessment, and to comply with the EIA Regulations.

4   LAND USE EMISSIONS

88   I append at Appendix E, an EIR response from the Applicant to me on the scheme. This response makes it clear that in the calculation of Land Use emissions for the scheme that two quantities of carbon emissions have been "written off":

A.   At point C) in the EIR response at Appendix E, the Applicant acknowledges that their "habitats" gained calculation overestimate sequestration rates. This is because they assume that trees and vegetation absorb carbon as soon as they are planted.

New planting in mitigation for the loss of these woodlands will not be able to sequester carbon at the same rate until the woodlands have been established for

several decades. The Woodland Trust in a recent policy paper "Emergency Tree Plan for the UK (2020)" explains that "large, old trees fix significantly larger levels of carbon compared to smaller trees. A single big tree can add the same amount of carbon to the forest within a year as is contained in an entire mid-sized tree."[26] It is clear from this that the logic of cutting down old trees and woodlands, which have carbon stored in them for many years, and replacing with younger trees, even if in a greater quantity, is faulty. The key point is that the Applicant has failed to quantify the carbon correctly, and has written-off carbon emissions that it has not attempted to calculate.

    B.   At point E) in the EIR response at Appendix E, the Applicant acknowledges that they have excluded the carbon emissions linked to vegetation and soil loss.

89 Both of the above are yet further examples of **underestimates** being taken forward into the carbon assessment (the existing solus DS - DM calculation being an underestimate as above). I note that TAG UNIT A3 Environmental Impact Appraisal (July 2021), 4.1.6 states *"In principle, appraisal should consider all greenhouse gas emissions"*. The Applicant is neglecting to comply with TAG, with its systemic failures in underestimating carbon impacts, as well as failing to provide a legitimate EIA Regulations assessment.

5   INTERPRETATION OF THE NPS NN

90 I note that the term "*material impact*" is not defined in the NPS NN. It must, therefore, be a matter of (rational) judgment as to what having a "*material impact on the ability of Government to meet its carbon reduction targets*" means at NPS NN 5.18.

91 I submit[27] that "*material*" means anything that is non-negligible ie: if a project's carbon impacts will have a non-negligible impact on the ability of Government to meet its carbon reduction targets, then this can – according to the NPSNN – be a reason to refuse development consent.

92 There is a very wide spectrum of sensitivity of carbon assessment depending on the variables used – both (i) how carbon is quantified (KQ-1) and (ii) against what budget/target the emissions is compared to (KQ-2).

The Applicant has used the entire UK national carbon budget which **dilutes the effects** of the carbon emissions associated with the A417 Missing Link into the entire economy.

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[26] *Emergency Tree Plan for the UK: How to increase tree cover and address the nature and climate emergency*, January 2020, The Woodland Trust,

[27] I am grateful to the recent legal submission to A38 Derby Junctions scheme, here and in subsequent paragraphs

The single assessment that the Applicant has carried out is, anyway, **the wrong solus quantification** and overestimates the DM case, so that the DS – DM calculation underestimates the incremental effect of the A417 Missing Link

93 The resulting 0.0072%[28] of the 6th carbon budget **is wrong and an underestimate**. In any case, even if it were correct and it is not, the figure is at the most extreme (lowest) end of this spectrum. An assessment should be made using absolute carbon quantities to show the real impact of the road system including the A417 Missing Link against the relevant carbon budgets. The ExA and SoS should appreciate that a full range of assessment values is required to properly assess whether the Scheme will have a material impact on the Government's ability to meet its carbon reduction targets.

94 This is further supported by the EIA Regulation guidance to use more than one criterion in environmental assessment. **This is also wholly consistent with the usual approach of scientists is to find as wide a variety of criteria as possible to confirm an assessment.** The EIA Guidance[29] advocates using more than a singular criterion for significance determination:

> *"At the same time, significance determinations should not be the exclusive prerogative of 'experts' or 'specialists': significance should be defined in a way that reflects what is valued in the environment by regulators and by public and private stakeholders. A common approach used in EIA is the application of a multi-criteria analysis. Common criteria used to evaluate significance include the magnitude of the predicted effect and the sensitivity of the receiving environment:"*

95 The Applicant has not given regard to considering using multi-criteria appraisal which increases the sensitivity of assessment by, for example, making local, regional and national scale assessments, and absolute and differential quantities, for both solus and cumulative carbon emission.

96 Much more information is required to make a rational and science-based assessment (and why I defer discussing assessment in detail until a later submission). The traffic models need to be run in the additional configurations which I have laid out at Table 2, and absolute as well as differential carbon emission quantities need to be taken forward to the assessment. Assessment should also be done against local and regional carbon budgets.

97 **I request that ExA requires these calculations are made by the Applicant as part of making the Environmental Statement legal under an EIA Reg 20 process.**

98 The ExA and SoS need to consider all relevant carbon reduction targets that apply to the Scheme's operation. This will require a consideration of the Net Zero target and the impact that the Scheme's non-negligible emissions contribution will have on achieving

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[28] Not shown under Chapter 14, Table 14-18 but calculated by me

[29] Paragraph 1.4.2, page 49, Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report, 2017 – European Union

that target. The SoS can only sensibly conclude that a Scheme of this size and impact *will* have a material impact on the Government's ability to meet the Net Zero target (because it will make that target substantially harder to meet) even if the target can still technically be met (through compensatory action taken elsewhere).

99   The ExA and SoS must also consider any assessment of carbon impacts within the context of the parliamentary declared Climate Emergency, particularly in which a considerable amount of the Scheme's expected emissions (including all its construction emissions) will take place within the next 10 years – a period which the scientific community now accepts will be crucial in addressing climate change.

100 Notwithstanding the need to rework the Environmental Statement for the modelling configurations at Table 2 above so that EIA Regs compliance may be demonstrated, the ExA and SoS cannot rely on the limited information provided by the Applicant in its Environmental Statement to conclude that the Scheme will not materially impact on the Government's ability to achieve its carbon reduction targets.

101 In light of all of the above, and notwithstanding the need to rework the Environmental Statement by the Applicant, the Scheme clearly will have a material impact on the Government's ability to achieve its carbon reduction targets and **this impact represents a clear reason for refusal.**

6   TRANSPARENCY OF COMPUTER MODELLING

6.1   *The Algorithmic Transparency Standard*

102 The Government recently announced an "Algorithmic Transparency Standard" at ███ under the Central Digital and Data Office in the Cabinet Office. Under the new approach, government departments and public sector bodies will be required to explain where an algorithm was used, why it was used and whether it achieved its aim. There will also be an obligation to reveal the architecture behind the algorithm.

103 This follows from the debate on computing, AI and data in public bodies where decision may be made by computer or based on computer outputs. It also applies to decision making and one of the scopes is software that "has a potential legal, economic, or similar impact on individuals or populations" which includes transport models used for decision making of carbon in planning.

104 The need for such transparency was foreseen by Supreme Court judge Lord Sales in a 2019 speech[30] "Algorithms, Artificial Intelligence and the Law" which includes the key paragraph:

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[30] ██

"The question then arises, how should we provide for ex ante review of code in the public interest? If, say, a government department is going to deploy an algorithmic program, it should conduct an impact assessment, much as it does now in relation to the environmental impacts and equality impacts in relation to the introduction of policy. …

Therefore, there seems to be a strong argument that a new agency for scrutiny of programs in light of the public interest should be established, which would constitute a public resource for government, Parliament, the courts and the public generally. It would be an expert commission staffed by coding technicians, with lawyers and ethicists to assist them."

105 The Applicant is already in breach of the Aarhus Convention in providing very limited description of the traffic models and how they are configured, meaning that limited scrutiny of this aspect of the Environmental Statement is possible. Quite clearly, the lack of transparent information and data about the traffic models on which operational carbon emissions are based does not allow any independent review and scrutiny of the high-level figures published in the Environmental Statement. The UK is signatory to the Aarhus Convention[31] which at Article 4 grants the public rights regarding access to information, public participation and access to justice, in governmental decision-making processes on matters concerning the local, national and transboundary environment, and at Article 6 highlights the requirement for early public involvement. The applicant is clearly in contravention of the terms of the Aarhus Convention.

106 I have made best endeavours to disentangle the information in the Environmental Statement, working in good faith, and following my statement of truth on page 1 of this document "**In so far as the facts in this statement are within my knowledge, they are true.** ___**In so far as the facts in this statement are not within my direct knowledge, they are true to the best of my knowledge and belief**___". However, the current presentation of the material is largely opaque and hides much about the operation of the traffic models.

107 The issues raised here on compliance with the EIA Regulations could be understood and better presented to the ExA and SoS if further information on the traffic models were released.

108 The Algorithmic Transparency Standard is at a pilot stage and being tested by several government departments and public sector bodies in the coming months before being reviewed again and formally launched next year. Notwithstanding this, it is a standard that the Applicant as a public body, or publicly owned company, will be required to comply with in the future. It would be valuable to the examination if the Applicant were to provide more information of the architecture, and the configuration of, their traffic models**. For algorithmic transparency, I respectfully request that the ExA requires a fuller explanation of how the traffic models used by the Applicant for the Environmental Assessment function and link together.**

7   CONCLUSIONS

109The evidence is compelling that the Environmental Statement breaches the EIA Regulations in its assessment of carbon emissions. It is <u>**without doubt**</u> that only a solus carbon assessment has been made, and then on the wrong solus calculation which underestimates the carbon impacts of the schemes, and its impact of national and international climate change laws and targets.

I respectfully request that the ExA gives serious consideration to suspending the Examination under EIA Reg 20 so that the missing data and non-compliances may be resolved in the Environmental Statement.
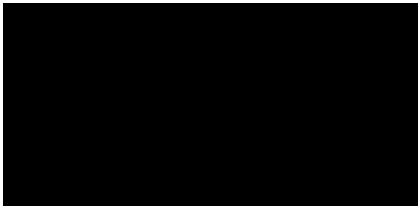
Dr Andrew Boswell,
Climate Emergency Policy and Planning, December 14th, 2021

8   APPENDIX A: NPS NN, Relevant sections on EIA Regs

110 The National Policy Statement for National Networks ("NPS NN") was promoted through the Planning Act 2008 ("PA2008"), approved by Parliament and published by the Secretary of State for Transport in December 2014.

111 Chapter 4 of the NPS NN (Department for Transport, 2014) sets out the principles for assessment of schemes such as the A417 Missing Link under the PA2008 DCO planning regime.

112 Section 4.3 lays out that the Examining Authority and the Secretary of State, for any proposed development, should take into account:

- *"its potential benefits, including the facilitation of economic development, including job creation, housing and environmental improvement, and any long-term or wider benefits;*

- *its potential adverse impacts, including **any longer-term and cumulative adverse impacts**, as well as any measures to avoid, reduce or compensate for any adverse impacts."   (my emphasis)*

113 The A417 Missing Link is an Environmental Impact Assessment (EIA) project

114 NPS NN Section 4.15 to 4.21 describes how environmental assessment should be done.

> *"The Directive specifically requires an environmental impact assessment to **identify, describe and assess effects on human beings, fauna and flora, soil, water, air, <u>climate</u>, the landscape, material assets and cultural heritage, and the interaction between them.** Schedule 4 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 sets out the information that should be included in the Environmental Statement including a description of the likely significant effects of the proposed project on the environment, **covering the direct effects and any indirect, secondary, <u>cumulative</u>, short, medium and long-term, permanent and temporary, positive and negative effects of the project, and also the measures envisaged for avoiding or mitigating significant adverse effects.**" (my emphasis)*

115 Section 4.16 states:

> "*When considering significant cumulative effects, any environmental statement should provide information on **how the effects of the applicant's proposal would combine and interact with the effects of other development** (including projects for which consent has been granted, as well as those already in existence)." (my emphasis)*

116 Specifically on assessment of carbon emissions in the Environmental Statement, Section 5.17 states:

> "Where the development is subject to EIA, any Environmental Statement will need to describe an assessment of any likely significant climate factors in accordance with the requirements in the EIA Directive."

9 APPENDIX B: EIA Regulations

117 The A417 Missing Link is an EIA development and the decision-making process, therefore, needed to comply with the EIA Regs.[32] As I note above in Appendix A, the NPS NN Section 4.15 to 4.21 also requires compliance with the EIA Regs.

118 Reg 4(2) prohibits the granting of development consent for EIA development "unless an EIA has been carried out in respect of that application". The EIA is defined in Reg 5 as:

> *(1) The environmental impact assessment ("the EIA") <u>is a process</u> consisting of—*
> *(a) the preparation of an Environmental Statement or updated Environmental Statement, as appropriate, by the applicant;*
> *(b) the carrying out of any consultation, publication and notification as required under these Regulations or, as necessary, any other enactment in respect of EIA development; and*
> *(c) the steps that are required to be undertaken by the Secretary of State under regulation 21 or by the relevant authority under regulation 25, as appropriate.*
> *(2) The EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors—*
> *(a) population and human health;*
> *(b) biodiversity, with particular attention to species and habitats protected under any law that implemented Directive 92/43/EEC[33] and Directive 2009/147/EC[34];*
> *(c) land, soil, water, air and __climate__;*
> *(d) material assets, cultural heritage and the landscape;*
> *(e) the interaction between the factors referred to in sub-paragraphs (a) to (d).*
> *(3) The effects referred to in paragraph (2) on the factors set out in that paragraph must include the operational effects of the proposed development, where the proposed development will have operational effects.*
> *(…)   (my emphasis)*

119 The Environmental Statement, is further defined in Reg 14:

> *(1) An application for an order granting development consent for EIA development must be accompanied by an Environmental Statement.*

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[32] Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

[33] Habitats Directive

[34] Wild Birds Directive

(2) An Environmental Statement is a statement which includes at least—

(a) a description of the proposed development comprising information on the site, design, size and other relevant features of the development;

(b) a description of the likely significant effects of the proposed development on the environment;

(c) a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;

(d) a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment;

(e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and

*(f) any additional information **specified in Schedule 4** relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected. (my emphasis)*

120 Schedule 4 of the EIA Regs then sets out in more detail the information to be included in Environmental Statements. This includes, *inter alia*:

*"**Para 1:***
A description of the development, including in particular—
*… (c) a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (**including water, land, soil and biodiversity**[35]) used;*

Para 4:
*A description of the factors specified in regulation 5(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, **climate (for example greenhouse gas emissions**, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.*

Para 5

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[35] This is relevant to land-use and land-clearance emissions from roads infrastructure construction as discussed in main text

A description of the likely significant effects of the development on the environment resulting from, inter alia—

*(a) **the construction and existence of the development, including, where relevant, demolition works;***

(b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;

*(c) the **emission of pollutants**, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;*

(d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);

*(e) **the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to** areas of particular environmental importance likely to be affected or the use of natural resources;*

*(f) the impact of the project on **climate (for example the nature and magnitude of greenhouse gas emissions)** and the vulnerability of the project to climate change;*

(g) the technologies and the substances used.

*The description of the likely significant effects on the factors specified in regulation 5(2) should cover the direct effects and any indirect, secondary, **cumulative**, transboundary, **short-term, medium-term and long-term**, permanent and temporary, positive and negative effects of the development.*

*This description **should take into account the environmental protection objectives established at Union level** (as they had effect immediately before exit day) or United Kingdom level which are relevant to the project, including in particular those established under [the law of any part of the United Kingdom that implemented Council Directive 92/43/EEC and Directive 2009/147/EC." (my emphasis)*

121 Paragraph 5 of Schedule 4 above shows that the Environmental Statement must cover "the direct effects and any indirect, secondary, **cumulative**, transboundary, **short-term, medium-term and long-term**, permanent and temporary, positive and negative effects of the development", taking into account the "**environmental protection objectives**" established both at EU or UK level. The "objectives" include relevant climate change targets set under UK law including:

- the UK's Nationally Determined Contribution (NDC) under the Paris agreement
- the legally binding target under the Climate Change Act 2008 to meet net-zero carbon emissions by 2050
- the UK Sixth Carbon Budget (6CB), and other carbon budgets and policy within that
- the Governments recent Transport Decarbonisation Plan (TDP)

- NPPF (July 2021) 152 planning requirement to have contributions to "radical reductions of greenhouse gas emissions",
- the statutory duty on National Highways under the Infrastructure Act 2015 section 5(2) to have regard for the environment

122 Finally, EIA Reg 20 allows for an Examining Authority to suspend consideration of an application if the Environmental Statement is found to be inadequate:

a. "Reg 20(2)
This paragraph applies if—
(a)the applicant has submitted a statement that the applicant refers to as an Environmental Statement; and
(b)the Examining authority is of the view that it is necessary for the statement to contain further information.

b. Reg 20(1)
Where an Examining authority is examining an application for an order granting development consent and paragraph (2) applies, the Examining authority must—
(a)issue a written statement giving clearly and precisely the reasons for its conclusion;
(b)send a copy of that written statement to the applicant; and
(c)suspend consideration of the application until the requirements of paragraph (3) and, where appropriate, paragraph (4) are satisfied." *(my emphasis)*

10   APPENDIX C: Highways England (National Highways) Licence

123 The National Highways licence requires at 5.23

> *"5.23 … the Licence holder should:*
>
> *…*
>
> *c.* **Consider the cumulative environmental impact of its activities across its network** *and identify holistic approaches to mitigate such impacts and improve environmental performance;"*

11   APPENDIX D: SUB-TYPES OF CARBON EMISSIONS

124 Emeritus Professor of Transport Policy, Phil Goodwin[36], has outlined 5 main ways in which increasing road capacity increases CO2 emissions[37], in summary:

- Construction, embodied carbon in concrete, tailpipe emissions for vehicles, and land clearance and preparation;

- Operation, maintenance, servicing, lighting;

- Vehicle emissions from use, including induced traffic and effects of changes of traffic speed;

- Wider impacts from induced development and car-dependent lifestyles and car ownership

- Synergetic effects

125 Whilst PAS 2080 defines these categories:

A.   Capital carbon, "GHG emissions associated with the creation, refurbishment and end of life treatment of an asset"

B.   Operational carbon "associated with the operation of infrastructure required to enable it to operate and deliver its service"

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[36] Emeritus Professor of Transport Policy at University College London and at the University of the West of England, also Senior Fellow (Transport and Climate Change) of the Foundation for Integrated Transport Policy

[37] Witness statement, Prof Phil Goodwin, for case CO/2003/2020, ████████████████ section 6

C. User carbon - "GHG emissions associated with Users' utilisation of infrastructure and the service it provides during operation"

126 In PAS 2080, these are coded into detailed "modules" which each have their own carbon emissions quantification. For example, module A-1 is embedded emissions from "raw material supply".

127 For this review, I introduce a simplified model for the carbon emissions that should be assessed, which is closer to the applicant's presentation, but also can be mapped to, **and is consistent** with the PAS-2080 modules. It uses seven carbon emission types for quantification, as follows:

	Accounting phase / <emission type>	**Description**	
Construction	*Construction <CONST>*	Material supply including primary extraction, manufacturing, transportation and construction process and site works associated with the scheme	Sub-modules within PAS-2080 module A
Land-use emissions from land-clearance	*Construction < CONST-LUC>*	Carbon released in land-clearance (eg: for carbon rich soils or woodland destroyed)	PAS-2080 module A-5
Loss of carbon sequestration	*Construction <CONST-SEQ>*	Future loss of ability to sequester carbon from habitats lost during construction	PAS-2080 module D
Operation (excluding road-user emissions)	*Operation <OP>*	Associated with the maintenance and refurbishment of the scheme, and lighting	PAS-2080 module B
Road user carbon emissions (operation)	*Operation <OP-USE>*	Vehicle emissions	PAS-2080 module B-9
Carbon sequestration gained	*Operation <OP-SEQ>*	Future ability to sequester carbon from habitats gained	PAS-2080 module D
End of life	*End of life <EOL>*		PAS-2080 module C

Table 3

128 Each of the seven types of carbon emissions identified is given a code for future reference. So far, this just identifies the type of emissions but not its temporal, or timeframe, characteristics with respect to carbon budgets which can be expanded later.

129 The land-use change emission types *< CONST-LUC>, <CONST-SEQ>,* and *<OP-SEQ>* are separated out as they operate in different ways and timescales. It is important to be clear on how these emissions are accounted to understand the assignment of PAS-2080 modules:

    i.   *< CONST-LUC>* are land-clearance emissions created at construction time, these are then accounted as construction emissions under PAS-2080 module

A-5. This interpretation is consistent with other National Highways schemes[38],[39].

    ii. **<CONST-SEQ>** are future carbon sequestration losses which would not occur if construction did not happen (ie "habitats lost"). These come under PAS-2080 Module D "Benefits and loads beyond the system boundary". However, these emissions are accounted for at construction time as they result from construction. This interpretation is consistent with other National Highways applications including the A417 Missing Link scheme [40].

    iii. **<OP-SEQ>** future carbon sequestration gains which occur if compensatory habitat is developed over the scheme lifetime (ie "habitats gained"). These come under PAS-2080 Module D "Benefits and loads beyond the system boundary". These are accounted over the 60-year appraisal period. This interpretation is consistent with other National Highways applications including the A417 Missing Link scheme [41].

130 The applicant has reported emissions under the **<CONST>, <CONST-SEQ>** , **<OP>, <OP-USE>** types, and has not reported **< CONST-LUC>**, **<OP-SEQ>** . I note that **<EOL>** emissions have been scoped out. To comply with the EIA Regs Schedule 4, Para 5, a full cumulative assessment over multiple, appropriate study areas (eg: local, regional and national) should include all sub-types (except **<EOL>)**. The penultimate paragraph states:

> *"The description of the likely significant effects on the factors specified in regulation 5(2) should cover **the direct effects and any indirect**, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development."*

131 The highlighted phrase indicate that all direct and indirect effects should be covered, and that suggests all sub-types should be assessed.

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[38] See Table 2-1 in "NORTH WEST RELIEF ROAD Carbon Management Report" where "*Land use change – removal of biomass*" emissions are listed as PAS-2080 Module A-5 emissions.

[39] See "Table 1.2 PAS 2080:2016 modules in the carbon model" in "Lower Thames Crossing

6.3/ Environmental Statement/ Appendices Appendix 15.1 Carbon and Energy Plan" [TR010032/APP/6.3],

[40] See Table 14-15 in "A417 Missing Link [TR010056] 6.2 Environmental Statement Chapter 14 Climate" where "*Land use change (D)*" emissions are accounted as Construction stage emissions.

[41] See Table 14-16 in "A417 Missing Link [TR010056] 6.2 Environmental Statement Chapter 14 Climate" where "*Land use and forestry (D)*" emissions are accounted for each year over the 60-year appraisal period.

12   APPENDIX E: EIR 102262: A417 MISSING LINK LAND-USE EMISSIONS

EIR 102262

Dear Mr Boswell

Thank you for your request for information about Land Use Change Carbon Emissions, dated 05/07/21, relating to the A417 Missing Link project Environmental Statement.

Your Request received 06/07/2021

I refer to document - A417 Missing Link, TR010056, 6.2 Environmental Statement, Chapter 14 Climate. Please provide all the detailed calculations and source information (where spreadsheet calculations are involved, please provide a SOURCE spreadsheet file EXCEL/XLS, not a PDF, derived from it)for:

A. *the 9,960tCO2e, at Table 14-15, of "Land use change (D); future loss of ability to sequester carbon from habitats lost during construction (over the 60 year assessment period)" emissions*

B. *the 10,793tCO2e, at Table 14-16, of "Land use and forestry (D): future ability to sequester carbon from habitats gained (over the 60 year assessment period)" emissions*

C. *any calculations, or further evidence, related to the statement at 14.5.9 "The calculation for 'habitats gained' is likely to moderately overestimate sequestration rates due to the time taken for the habitats to establish." ie: data quantifying the overestimation involved*

D. *the full data behind the statement at 14.6.9 "For the calculation of GHG emissions associated with ongoing land use change/sequestration (module D), the study area is defined by the total areas of loss and total areas of gain of habitats within the DCO Boundary. The estimated emissions were calculated based on UK Government data on emissions/sequestration by land type (per unit area) per local authority area. The scheme is located within Tewkesbury Borough and Cotswold District, and an average of these local authority figures was taken to calculate the total loss and total gain for each habitat type (per year and over the 60 year operational period)." This may be covered by A, B and C above.*

E. *The full data which supports the statement at 14.5.9 "Emissions from immediate loss/disturbance of habitats (e.g. those mobilised from vegetation or soil loss during construction) are excluded from the calculation due to their likely minor magnitude compared to sequestration, uncertainty and the limited information available on immediate losses." ie your data that provides a quantification of the "minor magnitude" of land use change emissions from land clearance.*

Our Response

A copy of this information is attached, in the form of a Microsoft Excel spreadsheet file as requested.

This spreadsheet contains the source data, calculation methods, assumptions and references for external data sets, that support Table 14-15 and Table 14-16 submitted in ES Chapter 14 Climate (Document reference 6.2).

A summary of how this information responds to your request is below.

You requested detailed calculations and source information for:

A) the 9,960tCO2e, at Table 14-15, of "Land use change (D); future loss of ability to sequester carbon from habitats lost during construction (over the 60-year assessment period)" emissions

This is presented in the attached spreadsheet, at cell K9, as the total loss of ability to sequester carbon, from all habitats removed during construction, in tCO2e over 60 years.

B) the 10,793tCO2e, at Table 14-16, of "Land use and forestry (D): future ability to sequester carbon from habitats gained (over the 60-year assessment period)" emissions

This is presented in the attached spreadsheet, at cell M9, as the total gain in ability to sequester carbon, from all habitats during operation, in tCO2e over 60 years.

C) any calculations, or further evidence, related to the statement at 14.5.9 "The calculation for 'habitats gained' is likely to moderately overestimate sequestration rates due to the time taken for the habitats to establish." i.e.: data quantifying the overestimation involved

The assessment moderately overestimates sequestration rates as habitats will naturally sequester carbon at different rates depending on their maturity. For the habitats gained calculation, we assume the planting is fully matured, whereas in reality this would be on a sliding scale, with newly planted habitat having a lower sequestration rate, which would increase as it established over time. The change in sequestration rates is not linear and the time to maturity varies by habitat type and with local variables. Rates of carbon sequestration even within the same species can vary greatly between sites, as a factor of local climatic conditions influencing habitat growth.

This is a common approach within the industry and is stated as an assumption made within the assessment. The effect of this assumption in the context of the overall scheme carbon calculation is considered to be negligible.

D) the full data behind the statement at 14.6.9 "For the calculation of GHG emissions associated with ongoing land use change/sequestration (module D), the study area is defined by the total areas of loss and total areas of gain of habitats within the DCO Boundary. The estimated emissions were calculated based on UK Government data on emissions/sequestration by land type (per unit area) per local authority area. The scheme is located within Tewkesbury Borough and Cotswold District, and an average of these local authority figures was taken to calculate the total loss and total gain for each habitat type (per year and over the 60-year operational period)." This may be covered by A, B and C above.

The calculations, methodology, source data and assumptions on which the emissions / sequestration losses and gains by land use type, are contained within the spreadsheet attached, as described above for points A, B and C.

E) The full data which supports the statement at 14.5.9 "Emissions from immediate loss/disturbance of habitats (e.g. those mobilised from vegetation or soil loss during construction) are excluded from the calculation due to their likely minor magnitude compared to sequestration, uncertainty and the

limited information available on immediate losses." i.e. your data that provides a quantification of the "minor magnitude" of land use change emissions from land clearance.

<mark>The exclusion of carbon emissions linked to vegetation and soil loss is stated as a limitation within the assessment.</mark> The minor magnitude attributed to emissions from vegetation or soil loss is based on the professional judgement of a competent expert, as detailed in Environmental Statement Appendix 1.2 Competent Expert Evidence (Document Reference 6.4), with consideration to the scale of these emissions compared to those from sequestration changes (which are included in the assessment) and the limited area and duration where this occurs.

This is a common approach within the industry and aligns with the approach taken on other similar schemes. The effect of this assumption in the context of the overall scheme carbon calculation is considered to be negligible.

If you are unhappy with the way we have handled your request you may ask for an internal review. Our internal review process is available at:

███

If you require a print copy, please phone the Information Line on 0300 123 5000; or e-mail ███████████████████████████████ You should contact me if you wish to complain.

If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision. The Information Commissioner can be contacted at:

> Information Commissioner's Office
> Wycliffe House
> Water Lane
> Wilmslow
> Cheshire
> SK9 5AF

If you have any queries about this letter, please contact me. Please remember to quote reference number **[EIR-102262]** in any future communications.

Yours sincerely,

Michael Goddard

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