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EXPERT WITNESS STATEMENT : CLIMATE CHANGE

Contents

1 INTRODUCTION

1 I, Dr Andrew Boswell, have been asked by Mair Bain and Derby Climate Coalition to provide an expert report on the technical issues relating to climate change.

2 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).

3 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 was involved 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 1 million transistors.

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. I have a wide understanding of the principles and practice of modelling complex systems which I bring to this submission.

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;

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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 https://www.wadham.ox.ac.uk/news/2015/march/in-memoriam-rjp-bob-williams and https://link.springer.com/article/10.1007/s00775-015-1328-5

[2] DPhil title: "Nuclear Magnetic Resonance Studies of Modified Eukaryotic Cyctochrome 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) https://www.researchgate.net/publication/342120805_The_development_and_deployment_of_formal_methods_in_the_UK/link/5ef76e3b458515505075a29e/download, 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] 1 million was cutting edge at the time! Transistor counts now exceed 2 trillion on a single chip https://en.wikipedia.org/wiki/Transistor_count,

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 Norfolk County Councillor 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 is due to have its second reading in the House of Commons on 29th October 2021.

4 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.

1.1 Scope

5 I refer to these documents from the PINS website for the A38 Derby Junction scheme, and relevant guidance

Reference in document	
APP-042	Environmental Statement (ES), Chapter 4 – EIA Methodology
APP-052	ES, Chapter 14, Climate
APP-053	ES, Chapter 15, Assessment of Cumulative Effects
APP-166	ES, Scoping opinion
APP-167	Scoping Option Response Tables
APP-254	Application, Volume 7.3, Transport Assessment Report
REP3-026	Actions Arising from ISH2
RR	ExA's Recommendation Report
SoM	Statement Of Matters
RESP-8.121	Applicant's Response
DMRB	Design Manual for Roads and Bridges[6], selected parts reproduced in text LA 103 "Scoping projects for environmental assessment"

[5] https://www.ceebill.uk/bill

[6] https://www.standardsforhighways.co.uk/dmrb/

	LA 104 "Environmental assessment and monitoring"
EIA Regs	Infrastructure Planning (Environmental Impact Assessment) Regulations 2017-SI 2017 No 572[7], selected parts reproduced at Appendix B and in text

1.2 Acronyms

AST	Appraisal Summary Table
NDC	Nationally Determined Contribution
NZS	Net Zero Strategy

1.3 Overview of Statement

6 This statement covers these areas of the Secretary of State's request for further representations in the SoM:

- Changes in local and national policy (point 2, 4th bullet) at section 2.
- The Carbon Impact of the Development (point 2, 1st bullet) at section 9.
- Direct, indirect and cumulative likely significant effects of the development on climate (point 2, 2nd bullet) at section 10.

1.4 Definitions

7 I note the applicant's definitions at RESP-8.121, 3.2.1 for "cumulative" in the context of climate change:

> *"Cumulative effects of the Scheme - The consideration of the GHG emissions impact of the Scheme with other relevant committed developments included within the traffic model for the Scheme."*

8 I have not been able to find the above definition in the ES itself, so it appears to have been added later. The word "cumulative" does not appear in the ES Chapter on Climate [APP-052]. Further, in Chapter 15 [APP-053] on cumulative assessment in general does not consider the greenhouse gas (i.e. the climate mitigation aspect of climate), indicating that no genuine attempt to assess cumulative impacts of the scheme on GHGs, or define how to do it, was undertaken through the ES. Clarity on the meaning of "cumulative" is critical to the issues before the SoS on Climate Change, and cumulative carbon assessment, as I lay out in sections 4 and 5.

[7] https://www.legislation.gov.uk/uksi/2017/572/made

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

- **Absolute emissions** – *carbon emissions which are expressed in terms of **an absolute value** of emissions. The quantum of absolute emissions, as released into the atmosphere, and representing a real measure of 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

10 With respect to differential emissions, the applicant sometimes refers to these as "net" emissions. For example, RESP-8.121, Table 2-2 labels a column "*Net project GHG emissions (tCO2e) over relevant carbon budgets*". "Net" is usually used to mean the quantitative change of some physical parameter as a result 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[8] [Page 6, 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 arises for the total absolute emissions, given in this case by the Do Something traffic modelling output.

This is important – is the purpose of assessment to quantify the impact of the environmental factor, or to quantify changes to the measuring system (in this case, the transport model)?

The usage of "net" by the Applicant in Table 2-2 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 the figures 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.

[8] https://www.standardsforhighways.co.uk/prod/attachments/fb43a062-65ad-48d3-8c06-374cfd3b8c23

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. I discuss this further in section 5.

1.6 Overview of expert report

11 I first respond to the SoM point 2, 4th bullet which requests an update of changes in local and national policy, considered relevant. Given the recent publication of the Net Zero Strategy, and its relevance to transport decarbonisation, I provide this at section 2, before the rest of my statement.

12 Then, I first appraise both the original Environmental Statement [APP-052] and the Applicant's response [RESP-8.121], setting out fundamental errors and inconsistencies between them. It is necessary to unravel these first, before proceeding to other sections: this is done in Section 3 below.

13 Then further background sections 4 to 8 cover:

- Cumulative assessment in the Environmental Statement and at the Planning Examination
- Solus and cumulative assessment of GHG emissions
- Sub-types of carbon emissions
- What study area? Local and regional spatial scale
- Assessing impacts: the difference between absolute emissions and differential emissions

14 Sections 9 – 10 cover:

- The carbon impact of the development (SoM, point 2, 1st bullet)
- Direct, indirect and cumulative likely significant effects of the development on climate (SoM, point 2, 2nd bullet)

15 Then follow Appendices A - J

2 CHANGES IN LOCAL AND NATIONAL POLICY (POINT 2, 4TH BULLET)

16 The Secretary of State requests further representations on:

> *"Any change in whether the Development would be consistent with the requirements and provisions of relevant local or national policies, given the length of time since the examination closed. This will include those policies included in the Applicant's Planning Statement and National Policy Statement Accordance table and any updated versions thereof (including the updated Derwent Valley Mills World Heritage Site Management Plan 2020-25), as well as any wholly new policy that may be applicable"*

17 The section provides update which I consider relevant.

2.1 Transport Decarbonisation Plan

18 On the 14th July 2021, the Government released its Transport decarbonisation plan[9] (TDP).

19 The Rt Hon Grant Shapps MP, Secretary of State for Transport states in the foreword:

> "*But **we cannot, of course, simply rely on the electrification of road transport**, or believe that zero emission cars and lorries will solve all our problems, particularly for meeting our medium-term carbon reduction targets to 2035. Road traffic, even on pre-pandemic trends, was predicted to grow by 22 percent from 2015 to 2035 much of it in cities, where new roadbuilding is physically difficult and disadvantages communities. We cannot pile ever more cars, delivery vans and taxis on to the same congested urban roads. That would be difficult for the roads, let alone the planet, to tolerate. **As we build back better from the pandemic, it will be essential to avoid a car-led recovery.***"
>
> (my emphasis)

20 On local transport challenges, the TDP states:

> *"We will drive decarbonisation and transport improvements at a local level by making quantifiable carbon reductions a fundamental part of local transport planning and funding. Local Transport Plans (LTPs) are existing statutory requirements that set out holistic place-based strategies for improving transport networks, proposed projects for investment and, ultimately, lay out how key objectives will be achieved. **Going forward, LTPs will also need to set out how local areas will deliver ambitious quantifiable carbon reductions in transport, taking into account the differing transport requirements of different areas**. This will need to be in line with carbon budgets and net zero."*

[9] https://www.gov.uk/government/speeches/transport-decarbonisation-plan

21 This indicates that the Government consider it essential to avoid car-led delivery, and are aware that electrification of road transport is not sufficient to tackle road-use emissions.

2.2 Net Zero Strategy

22 Published last week, the Government's Net Zero Strategy (NZS) backs the urgent need for ambitious quantifiable carbon reductions in transport, at the local level, with this statement:

> *"We are driving decarbonisation and transport improvements at a local level by making quantifiable carbon reductions a fundamental part of local transport planning and funding. Local Transport Plans (LTPs) – statutory requirements that set out holistic place-based strategies for improving transport networks and proposed projects for investment – will need to set out how local areas will deliver ambitious carbon reductions in line with carbon budgets and net zero."*

23 Critically, the NZS also sets out delivery pathways which link to existing carbon budgets and targets, and define indicative targets based on the pathways for each sector. For example, as far as the Paris Agreement and International Emissions Targets, the NZS Technical Annex states at page 307:

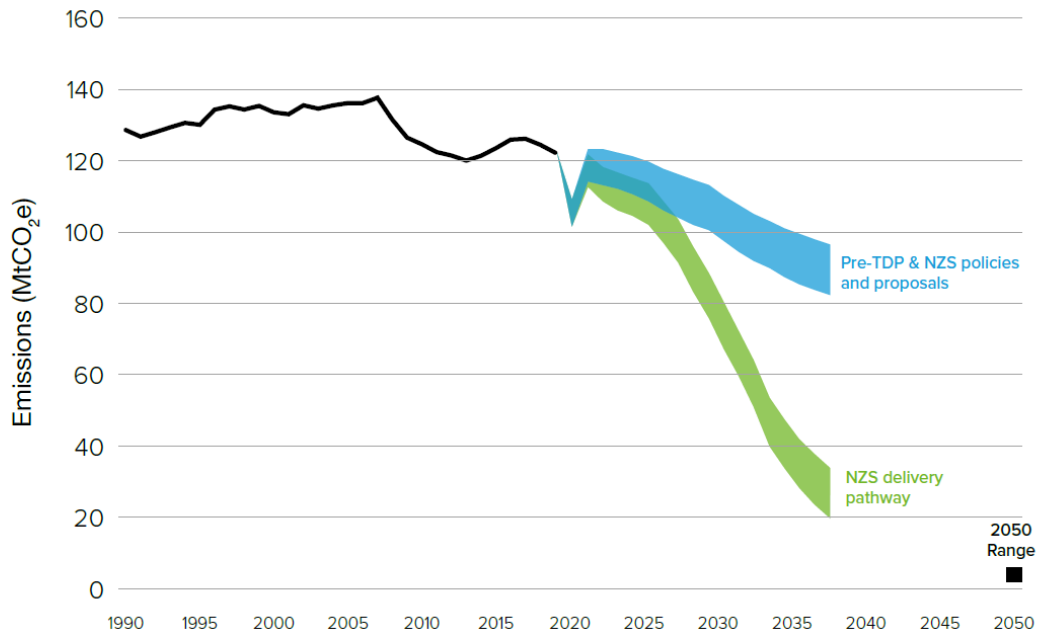
> ***"International emissions targets***
>
> *7. The 2015 Paris Agreement under the UN established the goal of keeping the global mean temperature rise to well below 2°C, whilst pursuing efforts to limit the rise to under 1.5°C. Under the Kigali amendment to the Montreal Protocol, the UK has also committed to reducing F-gas emissions by 85% on 2011-2013 levels by 2036.*
>
> *8. Under the Paris Agreement, the UK announced its Nationally Determined Contribution (NDC) in December 2020, which commits the UK to reduce net greenhouse gas (GHG) emissions by at least 68% by 2030 compared to 1990 reference year levels. This represents an increase of ambition on the fifth carbon budget, which covers the years 2028-2032.*
>
> *9.* ***The UK will therefore need to overachieve on the fifth carbon budget to meet its international climate targets and stay on track for the sixth carbon budget. Accordingly, the policies and proposals, delivery pathway, deployment assumptions and any other analysis presented in the Net Zero Strategy for the fifth carbon budget period are consistent with the action required to meet the UK's 2030 NDC.****"*
>
> (my emphasis)

24 And for UK carbon budgets:

> ***"Climate Change Act***
>
> *… In 2019, on advice of the CCC, the UK committed to reaching net zero emissions by 2050 and consequently the target reduction in the Act was increased to at least 100%.*
>
> *3. To keep the UK on a pathway to achieving the 2050 target, the Government is obliged to set legally binding, five-year caps on emissions – carbon budgets – twelve years in advance and then to publish a report setting out policies and proposals for meeting that budget and those budgets previously set.*
>
> *4.* ***The Net Zero Strategy is the means by which we satisfy the requirements of the Act in relation to policies and proposals for meeting the current carbon budgets****.*
>
> *…*
>
> ***6. To show how we will meet our climate targets, including legislated carbon budgets up to and including the sixth carbon budget, the Net Zero Strategy contains both an indicative delivery pathway and illustrative 2050 net zero scenarios. The pathway, which stretches to the end of the Sixth Carbon Budget period in 2037, provides an indicative trajectory of emissions reductions which we aim to achieve through the Strategy and through delivery of the policies and proposals outlined. <u>It therefore indicates the timescales over which we expect those policies and proposals to take effect to deliver our targets.</u>*** *The pathway is designed to be broadly consistent with all three of the illustrative 2050 scenarios set out in the Journey to Net Zero chapter of the Net Zero Strategy. There is uncertainty associated with our decarbonisation pathway through to 2037 and the 2050 scenarios – the exact path we take to meet our climate targets is likely to differ and must respond flexibly to changes that arise over time."*
>
> (my emphasis)

25 The NZS delivery pathway, related to road transport, in the Figure below corresponds to a fall in residual emissions from domestic transport emissions (excluding aviation and shipping) by around 34-45% by 2030 and 65-76% by 2035, **relative to 2019 levels** (see Figure 21 from the NZS reproduced below).

Figure 21: Indicative domestic transport emissions pathway to 2037



Source: BEIS analysis

26 In section 9, I will make an assessment of the absolute carbon emissions associated with the study area for the scheme against the delivery pathway, lower and upper bounds, for both 2030, indicative of meeting the UK NDC under the Paris agreement, and 2035, indicative of meeting the 6th carbon budget, and therefore net zero by 2050.

27 I have also shown that construction emissions dominate over differentially derived operational emissions in the period to 2035 for the A38 Derby Junctions scheme in isolation at 72% of total scheme emissions to 2037, as reported by the Applicant in RESP-8.121, Table 2-2. The policy interventions on the NZS and TDP, such as electric vehicles and modal shift, only effect operational road-user emissions, and do not address construction emissions which is the largest impact during the period. Construction emissions are absolute emissions generated on top of the usual road-user emissions, and therefore add emissions to the transport sector whilst it already has the extremely challenging targets as above for 2030 and 2035.

2.3 Chatham House Report

28 In September, Chatham House, The Royal Institute of International Affairs, [10] published its "Climate change risk assessment 2021" with the strapline "the risks are compounding, and without immediate action the impacts will be devastating. The summary report is attached at Appendix I, and the lead's author biography is in footnote[11]. The summary report intended for heads of government is based on research from Professor Nigel Arnell and team at the University of Reading.

29 Some of the headline points of carbon emissions, carbon budgets and emissions reductions are reproduced below:

> ***"Current emissions and temperature pathways***
>
> ***Central estimate 2.7ºC, plausibly higher***
>
> *Global efforts to reduce CO2 emissions are dangerously off track. Current nationally determined contributions (NDCs) indicate a 1 per cent reduction in emissions by 2030, compared with 2010. If policy ambition, low-carbon technology deployment and investment follow current trends, 2.7°C of warming by the end of the century is the central estimate, relative to preindustrial levels, but there is a 10 per cent chance of warming of 3.5°C. These projections assume that countries will meet their NDCs; if they fail to do so, the probability of extreme temperature increases is non-negligible. A global temperature increase greater than 5°C should not be ruled out.*
>
> ***Net zero pledges***
>
> *Many countries are currently focusing on net zero pledges, with an implicit assumption that these targets will avert climate change. However, net zero pledges lack policy detail and delivery mechanisms, and the gap between targets and the global carbon budget is widening every year. Unless NDCs are dramatically increased, and policy and delivery mechanisms are commensurately revised, many of the impacts described in this summary report will be locked in by 2040, and become so severe they go beyond the limits of what nations can adapt to.*
>
> ***Consequences for reaching the Paris Agreement goals***

[10] Chatham House is a world-leading policy institute with a mission to help governments and societies build a sustainably secure, prosperous and just world.

[11] Dr Daniel Quiggin is a senior research fellow with the Environment and Society Programme at Chatham House. He has expertise in the modelling, analysis and forecasting of national and global energy systems, having modelled various UK and global energy scenarios. As a senior policy adviser at the UK Department for Business, Energy & Industrial Strategy in 2018–20, Daniel led work on the post-Brexit policy implications for the energy sector's trade of goods and services, and helped shape effective strategies for the energy and climate package of the UK–EU FTA negotiations. He also previously worked as an analyst at Investec Asset Management within a commodities and resources investment team. Daniel holds master's degrees in particle physics and climate science, and a PhD in energy system modelling.

If emissions follow the trajectory set by current NDCs, there ***is a less than 5 per cent chance of keeping temperatures well below 2°C****, relative to preindustrial levels, and* ***a less than 1 per cent chance of reaching the 1.5°C Paris Agreement target.****"*
(my emphasis)

30 The report covers much more on heat, productivity and health; food security; water security; flooding; and tipping points and cascading risks. Whilst all of these are of extreme important to the future of sustaining wellbeing of this planet, I do not reproduce further clips on these topics, given the concerns here are about carbon emissions.

31 This report highlights that there is a huge gulf between extremely credible scientific assessments, such as the one providing the foundation of the Chatham House report, and the Applicant's ES and response. Transition to net-zero requires a heavy investment, and no credible pathway to mobilising that level of investment has been demonstrated. The NZS sets out target-compliant "indicative delivery pathways" for each sector until 2037, such as the Figure 5.2 reproduced above, but Carbon Brief have pointed out that the NZS[12] fails to quantify the impact of the new plans and policies it contains, meaning it is not possible to say if the government is now doing – or spending – enough to meet its legally binding goals.

32 Whilst the Chatham House report is not policy, it is important research that should underwrite policy and should be at the forefront of the minds of policy makers and decision makers. I include it here as relevant as it shows that the TDP and NZS are totally inadequate to the scale of the problem that is faced in the Climate Emergency. My assessment of the carbon impacts of the scheme in section 9 of this statement shows that meeting the TDP and NZS targets will be severely impacted if the Scheme goes ahead.

33 In this context, the Chatham House report, provides an alarming risk assessment on how these targets in the more global context of net-zero targets around the globe and the chances of staying below 1.5°C and 2°C is already extremely unlikely. Therefore, the Precautionary Principle must be considered. Any scheme which increases emissions, then impacts the TDP and NZS targets, and when these policies are unlikely to deliver anyway, must be tested against the precaution of not creating additional harm to the existing catastrophic situation.

34 The history of climate change in the last 30 years is littered with promises which have been broken, or not delivered. The Chatham House report puts this into fine focus. In making planning decisions on carbon-intensive infrastructure, like the A38 Derby Junctions, no reliance should be placed on unactioned paper plans, such as the NZS

[12] https://www.carbonbrief.org/in-depth-qa-the-uks-net-zero-strategy, 21st October 2021

35 The findings within Chatham House report and other reports such as the IPCC 6th Assessment report[13] (Code Red), provide a clear context for decision making. And the TDP and NZS, by requiring local transport carbon budgets and targets, insist that regard must be given of the full extent of the carbon impacts on any transport project. That can only be fulfilled, by a detailed, and scientifically congruent, consideration of the carbon impacts involved. I will make the case, on the basis of the NPS NN, the EIA Regs and guidance, and the DMRB, that this requires both a solus and cumulative assessment across all sub-types of carbon emissions and against local, regional and national carbon budgets.

3 INCONSISTENCIES AND ERRORS BETWEEN APPLICANT'S ENVIRONMENTAL STATEMENT AND RESPONSE TO THE SoM

36 I have found substantive inconsistencies and errors between the ES, Chapter 14, APP-052 and the Applicant's response to the SoS, RESP-8.121, which I now present.

3.1 Differential operational emissions data is inconsistent

37 APP-052 (i.e. Chapter 14 of the ES) gives two "snap shots" of emissions at Table 14.15 for the years 2024 and 2039, with the differential road-user emissions being given by the row labelled "Variation".

38 RESP-8.121 (i.e. the Applicant's more recent Response document) Table 2-2 gives 5-year differential "operation" emissions against the 4th carbon budget (4CB), 5th carbon budget (5CB) and 6th carbon budget (6CB) periods.

39 APP-052 also gives 4CB and 5CB "operation" differential emissions at Table 14.16.

40 These three sets of data are not reconcilable, nor internally consistent, as shown in Table 1.

[13] Summary for Policymakers (SPM), AR6 Climate Change 2021:The Physical Science Basis, https://www.ipcc.ch/report/ar6/wg1/#SPM

		A	B	C	D	E	F
	Differential emissions data tCO2e	**Opening year 2024**	**4CB (2023-2027)**	**5CB (2028-2032)**	**6CB (2033-2037)**	**7CB (2038-2042)**	**Design Year 2039**
1	RESP-8.121, Table 2-2 ***"Operation"***		9,887	19,085	22,343		
2	APP-052, Table 14.15 (1 year) ***"DS-DM"***	856	*3,424* [A2*4] *			*13,615* [F2*5]	2,723
3	APP-052, Table 14.16 "***Operation***"		12,342	20,569			

* Derived calculations are given in square brackets, for example this indicates the calculation (ie A2*4 = 856*4 = 3,424) for four-fifths of the 4CB period

Table 1

41 Here, I am largely looking at the order of magnitude, in a general, ballpark sense rather than the precise figure to make these comparisons. To do so, I have had to derive the data which is in italics. I assume the 4CB in RESP-8.121, Table 2-2 is modelled from the beginning of the opening year of 2024 ie 4 full years 2024-2027, or four fifths of the 4CB period.

42 I note that the RESP-8.121 data is labelled "operation", and the meaning of "operation" here is defined by the Applicant at RESP-8.121, 2.2.4 as "*including road user, operational energy use and maintenance emissions*". APP-052, Table 14.15 is only road-user emissions. Lighting and maintenance emissions are usually no more than 100 tCO2e/year on similar schemes, and so the addition of these emissions do not fully explain the scale of the differences in Table 1.

43 As an example, the equivalent of the 4CB operation emissions in RESP-8.121 of 9,887 tCO2e is 3,424 tCO2e in the ES when using the APP-052 Table 14.15 data. If the APP-052, Table 14.16 data is used it is 12,342 tCO2e.

44 The key inconsistencies are:

- The 1-year differential data in the Environmental Statement, APP-052, Table 14.15 is much lower in comparison with the other data. When the 2024 opening year data is scaled up to four fifths of the 4CB carbon budget (assuming the data represents 2024-2027 inclusive), then at 3,424 tCO2e, it does not fit the comparative data of 9,887 tCO2e (RESP-8.121, Table 2-2) and 12,342 tCO2e (APP-052, Table 14.16).

- The carbon budget figures in the response [RESP-8.121, Table 2-2] don't agree with those in the Environmental Statement at Table 14.16. Whilst the 4CB figures may have been adjusted for a delay in the opening year[14], the 5CB figures would be

[14] This could suggest that the modelling has been updated with the road opening in mid-2025, not January 2024, or some other change to the modelling.

expected to only be different in the quantum of lighting and maintenance emissions. The difference appears to be too great for this to be the only explanation.

45 This implies differences in the road-user operational emissions between documents, and that the Applicant may have made modifications to the traffic modelling between APP-052 and RESP-8.121, but has not notified, nor explained this to the Secretary of State (SoS). If further modelling or assessments have been made, then they need to be made available to both the SoS and interested parties, so that they can be properly scrutinised.

46 **Remedial action.** With respect to the SoS's point 2, 5th bullet in the SoM "adequacy and need for further environmental information", a further consultation round is therefore required so the Applicant can update the Environmental Statement (ES) to:

i. clearly identify the two types of operational emissions: road-user and non road-user emissions

ii. clearly calculate and present the figures for the two types of operational emissions **for each year**[15] (ie: 2023, 2024 … 2037) of the relevant carbon budgets: 4CB, 5CB and 6CB

iii. clearly calculate traded and non-traded operational (road-user) emissions **for each year** (ie: 2023, 2024 … 2037) for 4CB, 5CB and 6CB

iv. provide the 60-year appraisal and the TAG GHG workbook, and add it to the ES

v. fully explain any changes to the traffic modelling which has resulted in the inconsistencies above

vi. fully explain any further reasons which may have caused the inconsistencies above

3.2 Erroneous table header in RESP-8.121, Table 2-2

47 The second column header is RESP-8.121, Table 2-2 is labelled "Estimated total GHG emissions over relevant carbon budgets (tCO2e) (DS - DM Scenario)*" (i.e. "Do Something" – "Do Minimum" Scenario).

48 This is erroneous because the 101,240,659 tCO2e figure given for "operation" is for absolute operation carbon emissions. It is, as it states, "*Estimated **total** GHG emissions over relevant carbon budgets (tCO2e)*". Contrary to the column headers, it is not DS – DM, or differential, data. An example of a table from another National Highways schemes with a similar header (ie stating it is DS-DM data) and genuinely showing the DS-DM data is given in Appendix E for comparison.

[15] It would be helpful to all parties to have the data for each individual year given that the opening year being pushed back between the Environmental Statement and the response to the SoS may contribute to some of the inconsistencies found.

3.3 Inconsistent values between the AST table and the Environment Statement

49 The Appraisal Summary Table[16] (AST) states:

> *"Predictions indicate that there would be an increase in greenhouse gas emissions over 60 years due to an increase in vehicle-kilometres travelled with the Scheme. In the Scheme's opening year (2024) the increase would be 856 tonnes. The increase in the 4th carbon budget period would be 4,172 tCO2e."*

50 ES, Chapter 14, Table 14.16 gives the operational emissions in the 4th carbon budget as 12,342 tCO2e, not 4,172 tCO2e. The scale of the difference cannot be explained by lighting and maintenance operation emissions which will be in the former figure but not the second.

4 CUMULATIVE ASSESSMENT IN THE ENVIRONMENTAL STATEMENT AND AT THE PLANNING EXAMINATION

51 I now lay out the references to cumulative assessment of carbon emissions prior to the SoS' decision.

4.1 The Applicant's position at the Examination

52 The Applicant responded at the A38 Derby Junctions ISH2 on cumulative emissions. In REP3-026, PDF page 67, asked by the ExA:

> *"Does the Applicant's assessment of this consider cumulative increases in carbon emissions of the proposed development with that of other highways developments and with other changes to carbon emissions in the UK?"*

The Applicant responded

> *"**It is not considered practical or possible to calculate these cumulative impacts in any meaningful way due to constraints on data availability and scale of emissions that would need to be calculated.** With specific regard to the Scheme, the assessment included in the Environmental Statement [APP-052] would not be significant.*
>
> *The Applicant considers the issue of cumulative emissions from this Scheme combined with other road schemes and proposed developments is a national policy issue, rather than a Scheme-specific issue."*
>
> (my emphasis)

[16] Obtained under a Freedom of Information request, https://www.gov.uk/government/publications/appraisal-summary-table-for-a38-derby-junctions

53 This is recorded in the A38 Derby Junctions ExA's Recommendation Report at 4.15.64.

54 This clearly indicates that the Applicant did not consider that they had done cumulative assessment at the Examination, nor that they considered it necessary to update the Transport Assessment and Environmental Statement to include it, during the Examination period.

55 In RESP-8.121, the Applicant has not revisited these statements to clarify or correct, them, nor has the Applicant provided any new information on cumulative impacts in relation to greenhouse gas emissions, but instead has implied that cumulative assessment was done all along as it "*is inherent within the methodology followed in the Environmental Statement*" [RESP-8.121, 3.2.5]. **The only logical conclusion is that the statement at REP3-026 is not consistent with that in RESP-8.121, and that the Applicant has changed their story and is now attempting to retrofit the situation.**

56 I address RESP-8.121, 3.2.5 further in section 5.

57 Where the Applicant stated above "*The Applicant considers the issue of cumulative emissions from this Scheme combined with other road schemes and proposed developments is a national policy issue",* they appear to be at odds with the recent R (on the application of Transport Action Network) v The Secretary of State for Transport et anr [2012] EWHC 2095 (Admin) case where the Court was clear that the EIA Regs applies at the DCO stage, in saying at paragraph 123:

> *"Where environmental impact assessment is required for an individual project, the environmental statement may be required to address the impact upon the climate including GHG emissions (see e.g. regulation 14 and schedule 4 to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017-SI 2017 No 572)."*

58 The EIA Regs require cumulative assessment at Schedule 4, Para 5(e), see Appendix B.

4.2 The Applicant's Environmental Statement

59 Two other pieces of information are relevant at this point:

- No cumulative assessment of climate, either for "greenhouse gas emissions" or "impacts relevant to adaptation" is given in Chapter 14, Climate [APP-052]. The word "cumulative" is not even used in the chapter.

- ES, Chapter 15 [APP-053] on cumulative assessment does not consider the greenhouse gas, climate mitigation, aspect of climate.

60 Both of these confirm that no genuine attempt to assess cumulative impacts of the scheme on GHG emissions was undertaken, which was in fact the Applicant's previous position at the Examination, as above.

4.3 The Examining Authority's position in the Recommendations Report

61 In the Recommendations Report (RR), 4.15.116, the ExA say:

> *"We agree with Derby Climate Coalition, FoED and others that the emissions from the Proposed Development should not be seen in isolation.* ***The Applicant was not able to provide an assessment of cumulative impacts of the Proposed Development with other highways developments****, particularly given its approach of assessing the proposal against UK carbon budgets."*
>
> (my emphasis)

62 **This is a clear statement from the ExA that they considered the Applicant had not made an assessment of the cumulative impacts of carbon emissions.** I can find no evidence that the Applicant has disputed this, until the response at RESP-8.121, which as above appears to be an attempt to retrofit this situation, by saying that the methodology is "inherently cumulative".

63 This led to the recommendations at RR, 4.15.12 stating that the ExA had not been provided with enough information to determine (with two other sub-clauses):

> *"consideration of the cumulative effects of carbon emissions from the Proposed Development with those from other developments on a consistent geographical scale, for example by assessing the cumulative RIS1 or RIS2 programmes (of which the Proposed Development is part) against the relevant UK carbon budget;"*

64 It is of concern that cumulative assessment of the RIS1 and RIS2 programmes are still not publicly available.

65 I discuss later that the "*consistent geographical scale*" should be at each of the local, regional and national levels as in the EIA guidance.

66 Now that I have laid out the position up the SoS's decision letter, I next examine solus and cumulative assessment of carbon emissions in more detail.

5 SOLUS AND CUMULATIVE ASSESSMENT OF GHG EMISSIONS

67 SoM, point 2, 2nd bullet requests representations on:

> *"The direct, indirect and cumulative likely significant effects of the development on climate, including greenhouse gas emissions and climate change adaptation, in light of the requirements set out in the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations') and in light of paragraphs 5.17 and 5.18 of the National Policy Statement for National Networks (NPSNN');"*

68 For the EIA Regulations, it is necessary to clearly distinguish solus and cumulative assessment. Solus[17] 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).

To assist the SoS, I set out the multiple (different) definitions of "cumulative" that have been used by the Applicant, which are relevant to whether the Applicant has assessed cumulative carbon emission impacts, and whether it has complied with relevant legislation and guidance, and its own definitions.

Before going further, it is important to point out that the Applicant does not demonstrate "cumulative" assessment of carbon emissions in either the ES, Chapter 14 on climate, or ES, Chapter 15 (on 'Assessment of Cumulative Effects').

5.1 The Applicant does not refer to "cumulative" in critical ES chapters

69 ES, Chapter 15 (on 'Assessment of Cumulative Effects') does not consider the cumulative effects of greenhouse gas emissions (i.e. the climate mitigation aspect of considering 'climate' effects) indicating that no genuine attempt to assess cumulative impacts of the scheme on GHGs was undertaken.

70 Nor, is any cumulative assessment of climate, either for "greenhouse gas emissions" or "impacts relevant to adaptation", given in the ES Chapter 14 itself. I note that an in-combination climate change impact (ICCI) assessment is presented for (climate adaptation only (as appendix 14.2 of the ES)).

71 As Chapter 14 does not consider cumulative impacts, no genuine attempt to assess cumulative impacts of the scheme on GHGs was undertaken.

72 To understand what cumulative assessment would be expected, I next review the DMRB requirements and then definitions for cumulative assessment used by the Applicant themselves, and demonstrate that it has not be done.

[17] Solus means, here, "alone; separate" as in the first definition in the Collins on-line dictionary https://www.collinsdictionary.com/dictionary/english/solus.

5.2 DMRB LA 103 definitions of cumulative effects

73 In this section, I give each definition, or relevant clause, a code for easy reference in the sections below (eg: LA_103_1).

74 The DMRB "LA 103[18] Scoping projects for environmental assessment" defines "cumulative effects" [Page 6, PDF 7] as follows:

> "*Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project.*
>
> *NOTE: For the purposes of this document, a cumulative impact may arise as the result of:*
>
> *1) the combined impact of a number of different environmental factors (**LA_103_1**);*
>
> *2) specific impacts from a single project on a single receptor/resource (**LA_103_2**); and/or*
>
> *3) the combined impact of a number of different projects (in combination with the environmental impact assessment project) on a single receptor/resource. (**LA_103_3**)"*
>
> (my emphasis, and definition/reference codes added)

5.3 DMRB LA 104 requirements for "cumulative effects"

75 DMRB "LA 104[19] Environmental assessment and monitoring", section 3.19 requires that EIAs (ie the ES) effects "*must include cumulative effects in accordance with the requirements of the EIA Directive 2014/52/EU*" which now means the UK transposition of the EU Directive as the EIA Regs.

76 Section 3.21 states:

> "*Environmental assessments **shall** assess cumulative effects which include those from:*
>
> *1) a single project (e.g. numerous different effects impacting a single receptor) (**LA_104_1**); and*
>
> *2) different projects (together with the project being assessed) (**LA_104_2**).*"
>
> (my emphasis, and definition/reference codes added)

77 Section 3.21.2 states:

[18] https://www.standardsforhighways.co.uk/prod/attachments/fb43a062-65ad-48d3-8c06-374cfd3b8c23

[19] https://www.standardsforhighways.co.uk/prod/attachments/0f6e0b6a-d08e-4673-8691-cab564d4a60a

"*The assessment of cumulative effects should report on:*

*1) roads projects which have been confirmed for delivery over a similar timeframe (**LA_104_3**);*

*2) other development projects with valid planning permissions or consent orders, and for which EIA is a requirement (**LA_104_4**); and*

*3) proposals in adopted development plans with a clear identified programme for delivery (**LA_104_5**)".*

(my emphasis, and definition/reference codes added)

78 Statement 3.22 states:

"*The assessment of cumulative effects shall:*

*1) establish the zone of influence of the project together with other projects (**LA_104_6**);*

*2) establish a list of projects which have the potential to result in cumulative impacts (**LA_104_7**); and*

*3) obtain further information and detail on the list of identified projects to support further assessment (**LA_104_8**).*

***NOTE 1** The assessment of cumulative impacts can be established through a desk study and mapping exercise, together with a review of planning/development applications and development plans.*

***NOTE 2** There are no defined limits or criteria for selecting the list of projects for cumulative assessment. Professional judgement using Annex III of the EIA Directive 2014/52/EU [Ref 1.N] can be applied and justification provided for developments selected (and excluded).*

***NOTE 3** The temporal and spatial scope, together with characteristics of the identified projects, are key considerations in identifying projects that require further assessment (**LA_104_9**).*

***NOTE 4** The Overseeing Organisation and/or authorities likely to be concerned by a project can provide relevant advice on the scope of the assessment of cumulative effects.*"

(my emphasis, and definition/reference codes added)

79 These DMRB definitions are generic, in that they apply to the entire range of environmental factors as defined by the EIA Regs (and not just GHG emissions).

5.4 DMRB LA 104 requirements for "study areas"

80 DMRB LA 104, states at 3.13:

> *"The study area for an assessment shall be clearly defined for each environmental factor at the earliest opportunity. (**LA_104_10**)"*
>
> (my emphasis, and definition/reference codes added)

and at 3.13.1:

> *"The study area for an assessment should reflect the project and the surrounding environment over which effects are reasonably be thought to occur, taking into account cumulative effects. (**LA_104_11**)"*
>
> (my emphasis, and definition/reference codes added)

81 The clear requirement of the DMRB is, therefore, that **intentional and specific regard** must be given to each environmental factor, and that it must take into account potential cumulative effects (as relevant to the specific environmental factor at issue). As both the DMRB and the EIA Regs require **project-based spatial scoping** (LA_103_3, LA_104_2, LA_104_3, LA_104_4, LA_104_5, LA_104_9 above and EIA Regs, Schedule 4, Para 5 (e)), this means regard must be given to a project-based spatial scoping of cumulative effects for a given environmental factor.

82 To help with interpretation later, it is quite reasonable, and rational, for the environmental factor in the EIA Regs "climate" to be broken down into sub-types, each with their different study area, as long as this is clearly defined. For example, the EIA Regs themselves break "climate" down into (i) adaptation issues and (ii) "greenhouse gases".

83 Whilst greenhouse gases may be further broken to their own sub-types eg: construction emissions and operational emissions, it is reasonable and rational to assess **all** greenhouse gas sub-types against the same study area. Not least because the final assessment of impact, across all GHG sub-types needs to be performed against the same accounting baseline (eg local transport carbon targets, or a national carbon budget).

84 The key problem for the Applicant with the Environmental Statement is that they have not given intentional and specific regard to defining the study area for carbon emissions, and moreover the sub-types of carbon emissions have different study area definitions.

85 I now examine the definitions introduced by the Applicant with respect to "cumulative" and the environmental factor of "greenhouse gas emissions" (a sub-factor of "climate" in the EIA Regs).

5.5 Applicant's definition of "cumulative" in Applicant's EIA Methodology

86 APP-042 (i.e. the ES Chapter 4), 4.3.26 defines cumulative effects as follows:

> "*Cumulative effects are the result of multiple impacts on environmental receptors or resources. There are principally two types of cumulative impact:*
>
> - ***The combined action of** a number of different projects, cumulatively with the Scheme, on a single resource or receptor (cumulative effects).*
> - *The combined action of a number of different environmental topic specific impacts as associated with the Scheme upon a single resource or receptor (in combination effects)."*
>
> (my emphasis)

87 The first bullet refers to project-based cumulation. For carbon emissions, the receptor is the global atmosphere, and this definition is clear that it is the combined action of a number of projects with the scheme on the receptor.

5.6 Applicant's definition of "cumulative" in ES, Chapter 15

88 APP-053, 15.3.5 defines cumulative effects are follows:

> *"Based on the outcomes of the scoping process, the cumulative effects assessment considers two forms of impact:*
>
> - ***Combined impacts:** combinations of impacts that have been identified in Chapters 5 to 13, which, when acting together, are considered likely to result in a new or different likely significant effect, or an effect of greater significance, than any one of the impacts on their own.*
> - ***Cumulative impacts:** Scheme impacts which, when considered together with the impacts associated with other planned developments, could result in a new or different likely significant effect or an effect of greater significance than the Scheme in isolation."*
>
> (my emphasis)

The second bullet refers to project-based cumulation, and the definition is similar to the one in the EIA Methodology chapter. For carbon emissions the receptor is the global atmosphere, and this definition is clear that the scheme impacts should be considered with the impacts of other planned developments on the receptor.

89 Where climate is considered in Chapter 15, at 15.9.2, it is only for the adaptation aspect of in-combination climate change impact (ICCI) assessment.

90 ES, Chapter 15 (on 'Assessment of Cumulative Effects') does not consider the cumulative effects of greenhouse gas emissions (i.e. the climate mitigation aspect of considering 'climate' effects) indicating that no genuine attempt to assess cumulative impacts of the scheme on GHGs was undertaken.

5.7 The Applicant's definition of "cumulative" for greenhouse gas emissions in their response

91 At RESP-8.121, 3.2.1, the Applicant defines "cumulative" as follows:

> *"Cumulative effects of the Scheme - The consideration of the GHG emissions impact of the Scheme with other relevant committed developments included within the traffic model for the Scheme."*
>
> (my emphasis, and definition/reference codes added)

92 Each of the above definitions are similar although they use a different phrase referring to other projects (e.g. "different projects", "planned developments" and "relevant committed developments"). This last definition is more specific to operational carbon emissions, and it specifically introduces the traffic model as the means for defining the scope of the other projects. However, I will show below that just including other projects in the traffic modelling is not enough. The configuration of the traffic model has to be done in a way that can both generate solus and cumulative assessments of the scheme with other projects. The next section shows how the configuration of the traffic model is key.

5.8 The Applicant's future year traffic forecasting – solus or cumulative?

93 The crux of which developments have been included in the traffic modelling, and whether they have been assessed for cumulative impact for GHGs is given in section 4 "Future Year Traffic Forecasts" of the Applicant's Transport Assessment Report (APP-254; also referred to as appendix 7.3 of the Applicant's documents)

94 APP-254, 4.1.1 defines the purpose of section 4 as "*to identify the **performance** of the highway network in the future, both 'with' and 'without' the Scheme*". I accept that performance here may include aspects of the transport network of interest to highways engineering[20], and my review does not seek to address the success, or not, of this aspect of the transport assessment. The performance issues that this approach to the modelling is designed to answer are listed at APP-254, 4.4.1 (e.g. "*Are all three junction improvements economically justified?", "What is the optimum layout option at Little Eaton?"*).

95 However, at the outset, I flag the concern that performance-oriented transport modelling does not correctly assess the cumulative impacts of GHGs of the Scheme when differential emissions are extracted. Put simply, and as explained below, an additional complementary approach to the modelling is needed to properly assess cumulative carbon impacts when differential emissions are being used.

96 APP-254, 4.2.1 explains in overview the difference between the "Do Minimum" and "Do Something" models. The difference is that the "Do Minimum" model does not include

[20] As an aside, it is concerning to read the assumption "traffic growth occurs into the future" in APP-254, 4.2.1. This is in contradiction to the SoS's own department policies of modal shift to public transport, cycling and walking, and of freight from road to more sustainable alternatives, such as rail, cargo bikes and inland waterways, as in the Transport Decarbonisation Plan (TDP) and the Government's Net Zero Strategy.

"*improvements to the Kingsway, Markeaton and Little Eaton junctions*", ie the A38 Derby Junctions scheme itself, whereas the "Do Something" model does. **This indicates that any derived DS-DM data (i.e. differential data) on carbon emissions will reflect an assessment of the scheme in isolation, or "solus"[21], only**. All of the other "planned changes to the highway network" set out at 4.3.4 and the specifically modelled development sites set out at 4.3.8 have been factored into the "Do Minimum" model i.e. into the "baseline".

97 This is all evident from APP-254. APP-254, 4.2.1 is clear that "*Transport interventions that are more than likely to be implemented*" are included in the Do Minimum model. This may be correct for assessing the performance of introducing the scheme into the highway network, as above. **However, the effect of this modelling assumption for differential GHG assessment is that the cumulative impacts of the scheme with the other transport interventions cannot be determined.**

98 Table 2 shows the different complementary approaches which are needed to derive differential solus and cumulative GHG impact assessment. A ✓ means included in the model version whilst a × means not included.

	Performance oriented (ie as in APP-254)		EIA Regs compliance oriented (for impact assessment of GHGs)		
Model configuration name	DM (Perf, baseline)	DS (Perf, all)	DM (GHG, baseline)	DS (GHG, scheme)	DS (GHG, all)
2015 Baseline Highway network	✓	✓	✓	✓	✓
A38 Derby scheme	×	✓	×	✓	✓
Planned changes to the highway network	✓	✓	×	×	✓
Forecast changes in trip demand	✓	✓	×	×	✓

Table 2

99 In Table 2, I identify 5 "Model configurations" and give each a name. I now introduce a subtle issue which is that solus and cumulative are terms which may be applied to both the absolute emissions and differential emissions. The issue here is that the Applicant has only made a differential emissions assessment, and they derived the data by "DS (Perf, all) - DM (Perf, baseline)". The chart above shows that the only difference between these two is the introduction of the scheme by itself, and therefore this is a solus differential emissions assessment.

100 "DS (GHG, scheme) – DM (GHG, baseline)" is also a differentiation in which the scheme is introduced. If these two models existed, and the Applicant has never referred

[21] Solus means, here, "alone; separate" as in the first definition in the Collins on-line dictionary https://www.collinsdictionary.com/dictionary/english/solus. Solus and cumulative impacts in EIA assessment are explored in Pearce v BEIS [2021] EWHC 326 (Admin).

to them, then the resulting differential emissions assessment would also be solus. I would expect different numbers to arise from this differentiation because the rest of the model is configured differently in each case.

101 A cumulative, differential emissions case only arises when "DS (GHG, all) – DM (GHG, baseline)" is performed, because then the increment is the scheme itself and the cumulative effects of "planned changes to the highway network" and "forecast changes in trip demand". This is a case which the Applicant has not performed.

102 The models "DS (Perf, all)" and "DS (GHG, all)" are to all intents and purposes the same, and they include all the different model elements. These models are cumulative in the sense that they contain all the different model elements, but for assessment, they are only cumulative when used in an absolute emissions assessment, as I perform in section 9 of this document.

103 The Applicant is making the mistake of assuming that because they have a model run which involves all elements (ie the scheme, and "planned changes to the highway network" and "forecast changes in trip demand") that this makes their assessment cumulative. However, the existence of such a model does not necessarily render assessments **which are derived from it** cumulative. In the case of the Applicant's assessment, on the "Performance oriented" side of Table 2, before making the assessment, the applicant differentiates the data, and in so doing, they produce solus differential emissions data which is then fed into their assessment.

104 This is nub of the Applicant's error in claiming that they have performed a cumulative assessment. In saying cumulative assessment "*is inherent within the methodology followed in the Environmental Statement*" [RESP-8.121, 3.2.5], they are partially correct, but fundamentally wrong in its application. They are correct that the "DS (Perf, all)" model is potentially cumulative. It can provide a cumulative assessment when the absolute emissions are carried forward into the assessment as I do in section 9 of this statement. However, by differentiating the data to generate a solus differential emissions figure for assessment, the application performs a solus assessment – which is why they are fundamental wrong in their application of the data from the model run.

105 The performance-oriented DS model ie DS (Perf, all) in the application only provides a measure of the additional GHG emissions of the scheme in solus, when differentiated with DM (Perf, baseline) where all the other planned changes to the highway network (and resulting forecast changes in trip demand) having been factored into the DM "baseline".

106 It is important to note that the "DM (GHG, baseline)" model reflects the current environmental situation "on the ground", and therefore, it is close in configuration to the Validated Baseline Model (2015).

These points will be important in section 9 when I consider what a full EIA compliant assessment of solus and cumulative impacts of GHGs would look like.

107 Figures 4.1 and 4.2 in APP-254 show the model configurations for DM (Perf, baseline) and DS (Perf, all) with Figure 4.2 clearly showing the introduction of the A38 Derby Junction scheme introduced as a solus incremental change between DM and DS, as reproduced below:

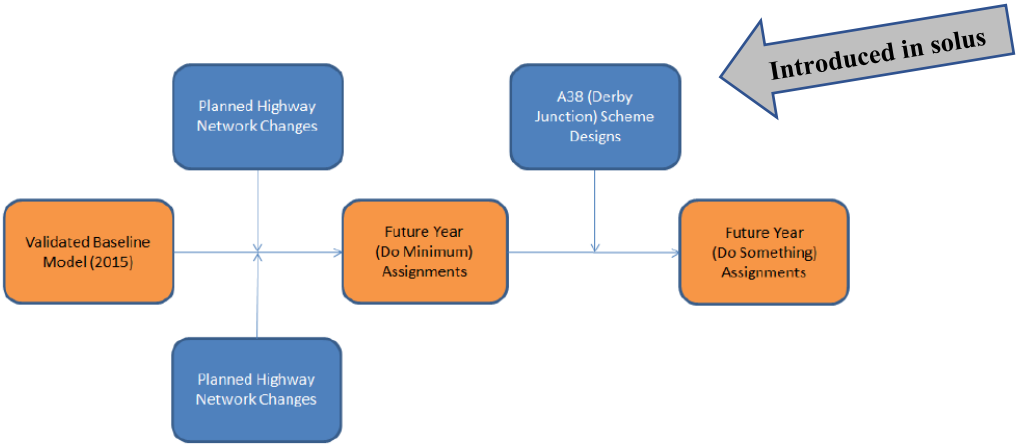


Figure 4.2: Production of the 'Do-Something' (2039) traffic model

108 By contrast, the three model versions specified in Table 2 for "DM (GHG, baseline)", "DS (GHG, scheme)" and "DS (GHG, all)" provide the basis for both solus and cumulative assessment for differential emissions. If the Applicant wanted to do assessment on differential emissions, then these are the models which I say the Applicant should have run, but they have not done so . This would have enabled the Applicant to make a differential emissions assessments and comply with EIA Regs, Schedule 4, Para 5 (e) in enabling an impacts assessment of "*the cumulation of effects with other existing and/or approved projects*".

109 However, as I have previously stated, an assessment against absolute emissions is far preferrable, and provides a much more sensitive environmental assessment of carbon emissions in cumulation. I provide such an indicative assessment in Section 9 of this document.

110 The three "EIA Regs compliance oriented (for impact assessment of GHGs)" on the right-hand side of Table 2 also comply with the intentional projects based spatial scoping required by LA_103_3, LA_104_2, LA_104_3, LA_104_4, LA_104_5, LA_104_9. They also meet the Applicant's own definitions of cumulative from the Applicant's EIA Methodology and Chapter 15 definitions respectively as above.

111 The performance-oriented DM and DS models in APP-254 (which the Applicant is relying on for its assessment) meet none of the above compliances, and by contrast only allow for only a solus (i.e. non-cumulative) assessment of the differential GHG emissions associated with the scheme to be performed.

Just for clarity, I should point out 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. I am saying that, if differential emissions that are derived from different model runs, are to be used for carbon assessment, then the additional models, which I identify as EIA Regs compliance oriented, need to be run in order to capture cumulative effects. Overall as I stress elsewhere assessment of absolute carbon emissions is a far more reliable and sensitive approach, and I would not advocate using differential emissions based assessment.

5.9 The Applicant's "inherently cumulative" claim in RESP-8.121, 3.2.5

112 In this context, RESP-8.121, 3.2.5 makes the claim that the consideration of the Scheme for GHG emissions is somehow inherently cumulative, as follows:

> *"The consideration of the cumulative effects of the Scheme with other existing and/or approved projects is inherent within the methodology followed in the Environmental Statement through the inclusion of the Scheme and other locally committed developments within the traffic model (see paragraph 15.3.27 of the cumulative effects chapter of the Environmental Statement, and paragraph 4.3.8 of the Transport Assessment."*

113 I have already explained above that the Applicant is partially correct, but fundamentally wrong in the application of this statement. Simply, the applicant, with their transport model which in the DS case I call "DS (Perf, all)" have generated a potentially cumulative transport model. However, in progressing to an assessment based on differential emissions, and by differentiating against "DM (Perf, baseline)" a model which includes the "planned changes to the highway network" and "forecast changes in trip demand", they create a solus assessment of impacts.

~~114~~

115 Therefore, the statement above in response to the SoS is false.

116 In terms of the two cross-references that the Applicant gives. Firstly, I have referred to 4.3.8 of the Transport Assessment already above. In short, 4.3.8 lists non-transport interventions such as planned developments in the relevant local plans, and other road schemes in the study area. The Transport Assessment is quite clear that these interventions have been factored into the baseline "Do Minimum" assessment ie the "DM (Perf, baseline)". However, these developments will add trip demand from new homes, and the planned road schemes. These trips should be assessed as sourcing an increment of road-use GHG emissions between the "DS (GHG, scheme)" and "DS (GHG, all)" model in Table 2. In other words, for differential emission assessment, they should not be assessed as contributing GHG emissions to the Scheme when assessed in solus (which is what the Application does in the ES, Chapter 14 assessment) but instead they should be assessed as contributing GHG emissions alongside the Scheme as part of a cumulative assessment of these emissions (which the Applicant has not done).

117 The second reference the Applicant gives to it is in Chapter 15 of the ES at 15.3.7. Here, a general statement in given:

> *"As the influence of other development projects already forms an inherent part of the traffic forecasts upon which the assessments of the Scheme's effects within these topics have been based, by default cumulative effects are included and reported within their operational assessments. Thus the operational effects as reported within Chapter 5: Air Quality and Chapter 9: Noise and Vibration are effectively cumulative impact assessments in that they take account of all potential traffic generated by future development proposals. This also applies to the conclusions drawn where other topics have relied on the results of these assessments, for example biodiversity (see Chapter 8: Biodiversity)."*

118 It is worth noting about this statement that the Applicant doesn't mention the assessment of greenhouse gas emissions.

5.10 Applicant's spurious truism definition of "cumulative" as applied to UK carbon budgets by the Applicant

119 RESP-8.121, 3.2.5 says:

> *"UK Carbon Budgets, used to put emissions from the Scheme into context, are inherently cumulative as they consider emissions across all sectors of the economy."*

120 This tries to add everything up possible to get the largest possible divisor in comparisons (although it omits some as below). The segment "*UK Carbon Budgets are inherently cumulative as they consider emissions across all sectors of the economy*" is a spurious truism, but only in part. It is only a "**part**" truism because the carbon budgets don't contain all emissions anyway: notably aviation, shipping and consumptions emissions are not accounted for in the UK 4th and 5th carbon budgets. It is **spurious**, because it states the obvious and beyond that has no relevance to the assessment of cumulative impacts of carbon emissions for purposes of this scheme, and/or to making relevant definitions of "cumulative" compliant with the regulations and guidance. It is obvious that the sum of all possible emissions (notwithstanding the ones omitted as just noted) is cumulative, but it tells us no more than the fact that counting (or summing) the apples in one's shopping basket is inherently cumulative.

121 The segment "*used to put emissions from the Scheme into context*" describes the comparison that the Applicant makes, but it does not, in itself, attach any validity to the Applicant's approach, nor to the context or comparison involved. This comparison is antithetical to good science, and "loses the signal in the noise"[22]. It is not consistent with the EIA Guidance[23] (that I describe later in more detail) which for example states:

[22] The same point is made by Prof Phil Goodwin at bullet 25 in https://transportactionnetwork.org.uk/wp-content/uploads/2021/03/Witness-statement-of-Phil-Goodwin-23-10-2020-16-03-2021_Redacted.pdf

[23] Section 4.4.2, "*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*", https://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf.

> *"Judging an impact's magnitude and significance must be context-specific. For an individual project — e.g. a road project — the contribution to GHGs may be insignificant on the global scale,* ***but may well be significant on the local/regional scale, in terms of its contribution to set GHG-reduction targets.****" (my emphasis)*

5.11 Applicant's definition of "cumulative" for construction greenhouse gas emissions

122 ES, Chapter 14, APP-052, 14.6.2 states the study area for construction carbon emissions to be "*the area of construction works falling within the Scheme boundary*". This is an "inherently solus" definition of study area. APP-052, 14.3.1 confirms that only a solus assessment is made (and ES, Chapter 14 does not mention "cumulative" in any case). No update has been made to this in RESP-8.121 as 3.2.3 and 3.2.4 refer only to APP-052, 14.3.1.

123 Construction emissions are a significant part of the overall GHG footprint of schemes being implemented in the next few years, within the context of the climate emergency. For example, RESP-8.121, Table 2-2, notwithstanding my concerns about the inconsistencies and errors in the data outlined in section 2, shows the summed emissions over the 3CB, 4CB, 5CB and 6CB to 2037 as 130,858 tCO2e, and differential operation emissions as 51,315 tCO2e over the same period. The construction emissions are 72% of the total, and the proportion of construction emissions is even higher if the period to the 2030 UK NDC is considered.

124 Note, that for this period when construction emissions are dominant, the Net Zero Strategy states that:

> *"Our potential pathway also indicates residual emissions from domestic transport could need to fall by around 34-45% by 2030 and 65-76% by 2035, relative to 2019 levels (see figure 21)."*

125 It should be noted that interventions such as electric vehicles and modal shift which effect operation emissions have no impact on construction emissions. So these policies do not have any effect to reducing the largest part of the differential carbon footprint of schemes, such as the A38 Derby Junctions, in the short- and medium-term.

126 Despite the very evident importance of construction emissions, the Applicant has only assessed them in solus. I stated above that the construction and operation emissions should be assessed over the same study area. This was because sub-types of GHGs require the same study areas because they need to be assessed against the same accounting area in the final assessment of impact. Assuming, the Applicant's study area for operation emissions, discussed above, then there should at least be indicative estimates for both the construction and operation emissions on the 12 schemes listed at APP-254, 4.3.4, and these should be included in the cumulative carbon assessment.

5.12 Applicant's definition of "cumulative" for land-use "greenhouse gas emissions" by the Applicant

127 In section 6 below I explain that there are various sub-types of carbon emissions associated with the Scheme and set out that the applicant appears to have failed to assess the following categories: the land-use emissions from land clearance, carbon sequestration gained and end of life emissions (which the Applicant scoped out).

128 It should be noted that in terms of the land-use emissions, APP-052, Table 14.14, the Applicant reports emissions due to "Land clearance (loss of carbon sink)" – this corresponds to "Future loss of ability to sequester carbon from habitats lost during construction" in my definitions at Table 3 in section 6 below. The estimate is 4,027 tCO2e. It is not clear whether this assessment also includes the sub-type "Carbon released in land-clearance" (eg: from carbon rich soils or woodland destroyed)", or is just referring to the loss of future sequestration.

129 These correspond to sub-sets of PAS-2080 module A-5, and PAS-2080 module D, respectively as explained in the text under Table 3 below in section 6 of this report. These ecologically based carbon emissions are not necessarily restricted to engineering boundaries of the scheme, and in any case as a GHG sub-type they should be assessed against the study area as other types of GHGs. The only reference to the study area for the "Future loss of ability to sequester carbon from habitats lost during construction" sub-type is the same definition for construction emissions at APP-052, see at 14.6.1 and 14.6.2.

130 As above the study area for land-use emissions should be the same as for all GHG emissions. Assuming, the Applicant's study area for operation emissions, discussed above, then there should at least be indicative estimates for the land-use emissions on the 12 schemes listed at APP-254, 4.3.4, and these should be included in the cumulative carbon assessment.

5.13 Applicant's cumulative assessment for climate change vulnerability (different to that for GHG emissions)

131 I note that in Section 3, Part 2 of the RESP-8.121 the Applicant has extended its original assessments to consider cumulative climate vulnerability effects at both local and regional scales (RESP-8.121, section 3.2.14).

132 The climate vulnerability assessments in RESP-8.121 are in my view superficial and unreliable, but they at least show that the Applicant is able to present (and has now presented) local and regional cumulative assessments for climate vulnerability. However, none such local and regional assessments have been provided for assessment of GHGs.

5.14 Conclusions on cumulative assessment so far

133 The relevant definitions and guidance from the Design Manual for Roads and Bridges (DMRB) and EIA Regs, Schedule 4, Para 5 (e) have been described, and discussed in the context of solus and cumulative EIA Assessment of the environmental factor/receptor of GHG emissions from the scheme.

134 Three different definitions of cumulative have been found in the Applicants response to the SoM, the Applicant's EIA Methodology and Chapter 15 of the ES on cumulative assessment.

135 Examination of the Transport Assessment clearly shows that the relevant developments and other road schemes in the study area of the Transport Assessment are included in the "Do Minimum" baseline assessment and as a result, there is no assessment/data to reflect the cumulative carbon emissions impacts of these schemes along with the A38 scheme itself. These schemes are as listed at APP-254, 4.3.4:

> *"a. Land at Hackwood Farm – junction at Station Road and Radbourne Lane coded as a roundabout from a priority junction.*
>
> *b. Hollybrook Way – traffic signals coded at Chain Lane, Burton Road, Pastures Hill and Hillsway junction (2024).*
>
> *c. Rykneld Road – traffic signal junctions coded at Rykneld Way (2024).*
>
> *d. Kingsway Hospital – roundabout at access to Kingsway Retail Park recoded as a signalised roundabout (2024).*
>
> *e. Land West of Mickleover – Etwall Road/Hospital Lane junction recoded as a roundabout to accommodate the new development's access (2024).*
>
> *f. East Midlands Intermodal Park – westbound on-slip recoded to include new roundabout and junction configuration (2024).*
>
> *g. Wyvern Way/Derwent Parade – roundabout recoded as traffic signals (2024).*
>
> *h. Lily Street Farm, Derby Road, Alfreton – new traffic signal junction (2024).*
>
> *i. T12 link Road – additional link road coded in model (2024).*
>
> *j. South Derby Link Road (2031).*
>
> *k. East Midlands Gateway – changes to junction 24 of the M1, A50 A453 link road, Kegworth Bypass (2024).*
>
> *l. Land North of Mansfield Road, Breadsall Hill Top – priority junction recoded as a roundabout for development access (2024)."*

136 I have explained how the transport modelling may be extended to produce assessment of the cumulative impacts for carbon for differential emissions. However, so far this does not extend to all sub-types of carbon and assumes the study area in the Application. These are now discussed.

137 <u>The Applicant has not carried out a cumulative assessment of carbon emissions.</u> As I have explained despite generating a traffic model that may be used for cumulative assessment <u>of absolute emissions</u> (and which I will demonstrate in indicative form in section 9 of this statemen), by differentiating it with a baseline model which included planned developments and future road schemes in the study area, they have only performed a solus assessment of differential emissions.

138 Therefore, the Applicant has not provided a satisfactory response to SoM, point 2, 2nd bullet which requests representations on:

> *"The direct, indirect and cumulative likely significant effects of the development on climate, including greenhouse gas emissions and climate change adaptation, in light of the requirements set out in the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations') and in light of paragraphs 5.17 and 5.18 of the National Policy Statement for National Networks (NPSNN');"*

139 As the Applicant has not provided a satisfactory response, and there is significant missing information, I believe that EIA Regulation 20 should be engaged.

6 SUB-TYPES OF CARBON EMISSIONS

140 Emeritus Professor of Transport Policy, Phil Goodwin[24], has outlined 5 main ways in which increasing road capacity increases CO2 emissions[25], 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

141 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"

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

[24] 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

[25] Witness statement, Prof Phil Goodwin, for case CO/2003/2020, https://transportactionnetwork.org.uk/wp-content/uploads/2021/03/Witness-statement-of-Phil-Goodwin-23-10-2020-16-03-2021_Redacted.pdf, section 6

142 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".

143 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

144 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.

145 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[26],[27].

[26] 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.

[27] 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], https://www.thamescrossingactiongroup.com/wp-content/uploads/2020/12/6.3-ES-Appendix-15.1-Carbon-and-Energy-Plan.pdf

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[28].

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[29].

146 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."*

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

7 WHAT STUDY AREA? LOCAL AND REGIONAL SPATIAL SCALE

148 First, it is necessary for me to introduce the EIA guidance

7.1 EIA Guidance documents

149 The EU Commission website hosts an official webpage for the EIA Directive[30], which lists a number of Guidance documents.

[28] 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.

[29] 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. https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010056/TR010056-000221-6.2%20Environmental%20Statement%20-%20Chapter%2014%20-%20Climate.pdf

[30] https://ec.europa.eu/environment/eia/eia-support.htm

150 Following the enactment of the reviewed EU EIA Directive "DIRECTIVE 2014/52/EU" in 2014, three guidance documents were published in 2017 on the screening[31], scoping[32] and EIA report writing[33] stages.

151 Each of these 2017 guidance documents state that they "*aim[s] to help Developers and consultants alike prepare good quality Environmental Impact Assessment Reports and to guide competent authorities and other interested parties as they review the Reports. It focuses on ensuring that the best possible information is made available during decision-making".*

152 Under "Climate change mitigation: Project impacts on climate change" on page 39 of the report, it states:

> *"The assessment should take relevant greenhouse gas reduction targets at the* ***national, regional, and local levels*** *into account, where available. The EIA may also assess the extent to which Projects contribute to these targets through reductions, as well as identify opportunities to reduce emissions through alternative measures."*

153 Whilst for cumulative effects[34] at page 50:

> *"[They] can arise from … the interaction between all of the different Projects in the same area;"*
>
> *"… can occur at different temporal and spatial scales. The spatial scale can* ***be local, regional or global****, while the frequency or temporal scale includes past, present and future impacts on a specific environment or region.*" (our emphasis)

154 The guidance is promoted by the EU and identifies that Competent Authorities reviewing the EIA Report and using the information for decision-making, as one of its target audiences.[35]

155 From the same official webpage for the EIA Directive, further 2013 guidance is provided on "*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*". This guidance predates the 2014 Directive and was produced during the time of the 2011 EIA Directive "DIRECTIVE 2011/92/EU". The guidance was implemented for the European Commission under Study Contract No 07.0307/2010/580136/ETU/A3 with Members of the Commission Group of EIA/SEA

[31] https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Screening_final.pdf

[32] https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf

[33] https://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

[34] https://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf, PDF page 52

[35] See "HOW TO USE THIS GUIDANCE DOCUMENT" section

National Experts and staff from three Directorate-General of the Commission[36]. It reflects the view of the Commission services of the best EIA practice, including those with transposed national regulations like the UK.

156 Section 4.4.2 of this guidance states:

> *"Judging an impact's magnitude and significance must be context-specific. For an individual project — e.g. a road project —* ***the contribution to GHGs may be insignificant on the global scale, but may well be significant on the local/regional scale, in terms of its contribution to set GHG-reduction targets.****"* (my emphasis)

The Applicant claims that the results of its appraisal of differential emissions against national budgets is an insignificant effect. Without prejudice to my position that the Applicant is wrong on this point, even if that is the Applicant's view, the guidance rightly suggests that carbon emissions assessed at a local/regional scale may well be significant. Later, I show that appraisal of absolute emissions against both national budgets and sub-regional budgets is significant.

157 I have not been able to find any UK specific guidance relating to the EIA Regs that would provide different advice to the existing guidance on the official EU Commission webpage for the EIA Regs. It is therefore rational to apply guidance which was written to "*focus[es] on ensuring that the best possible information is made available during decision-making"* under the EIA Directive within the UK. Failure to even consider such guidance, as is the case in the Environmental Statement, would be irrational.

158 I will show in section 10.2 of this statement that the NPS NN invokes the EIA Regs at NPS NN sections 4.15 and 4.16 (see also Appendix A). The Applicant has ignored two separate guidance documents, hosted on the official EU Commission EIA Regs webpage, which each recommend assessment of carbon emissions at the local and regional level, as well as national level, within Environmental Statements. In not even considering, nor giving regards to, this guidance, the Applicant has failed to comply with NPS NN 4.15 and 4.16.

159 The EIA guidance advocates strongly that carbon assessment is done for the scheme itself and cumulation of effects of the scheme with other existing and/or approved projects, at

[36] https://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf. The front page states "This document benefited from Study Contract No 07.0307/2010/580136/ETU/A3, implemented for the European Commission by

> Milieu Ltd, Collingwood Environmental Planning Ltd and Integra Consulting Ltd. The main authors were: Jennifer McGuinn and Guillermo Hernandez from Milieu Ltd; Ric Eales, William Sheate and Jonathan Baker from Collingwood Environmental Planning; and Jiri Dusik from Integra Consulting. Maria Partidario of the Technical University of Lisbon and Helen Byron of the Royal Society for the Protection of Birds/Birdlife UK provided advice. Additional contributions about climate change were collected during the JASPERS workshops (March-April 2012). The text was also revised by Jiri Dusik. Members of the Commission Group of EIA/SEA National Experts (in particular, Paolo Boccardi, Susanna Eberhartinger-Tafill, Paul Fortuin, Aurora Hernando Garcinuno, Anna Kieniewicz, Gabrielle McKeown, Koen Maertens, Tadhg O'Mahony, Martine Moris, Kees Van Muiswinkel, Rainer Persidski, Claire Piens, Matthias Sauer, Roel Teeuwen, Adrian Vecino Varela) and staff of the European Commission's Directorate-General for Climate Action (Vaidotas Kuodys, Sami Zeidan), Directorate-General for Humanitarian Aid and Civil Protection (Yordanka Mincheva, Thomas de Lannoy) and Directorate-General for Environment (Stephanos Ampatzis, Szilvia Bosze, Marco Fritz, Milena Novakova and Przemyslaw Oginski) also Contributed"

the local and regional scale, as well as at the national scale. The guidance aims to ensure "*that the best possible information is made available during decision-making".*

160 This is further supported by the guidance to use more than one criterion in environmental assessment. This is 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[37] 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:"*

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

7.2 Local and regional study areas

162 Local and regional assessment requires a choice of study area which aligns to carbon budget baseline data. Local authority areas provide such an area.

163 Local authority areas have their own carbon budgets, targets, and monitoring, and the Dept of Business and Industrial Strategy (BEIS) have historic emissions records by sector (ie Industrial, Domestic, Transport, and Land-use) since 2005. Further, indicative allocations can be made to local authorities from national carbon budgets by grandfathering or dividing up the national carbon budget by population, and emissions sector proportions.

164 It is rational, then, for transport schemes to be assessed within the local authority boundaries where existing benchmark information is available ie based on these local authority areas. A meaningful local, or regional, assessment is only possible if it is based on a spatial scale and area which corresponds to known and reliable carbon budgets.

165 For the scheme, RESP-8.121, Appendix A gives a map with a red dotted line indicating the "boundary of detailed modelling". The same map is given in the Transport Assessment at APP-254, Figure 3.1. The text explains at APP-254, 3.1.5 "*the local traffic model, built to support the appraisal of the Scheme, covers a broad enough area such that it can identify the traffic impacts of the Scheme on both the local and strategic road networks.*" And at 3.1.7, "*this modelled area included the whole of the Derby unitary authority area, the M1 between junction 28 and junction 24 to the east, and towns such as Alfreton, Heanor, Ilkeston, Sandiacre and Borrowash. Strategic and major roads*

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

were also included in this area of detailed modelling including: the A38(T) north-south corridor, A52, A52(T), A610, A6, A516, A5111 and A50(T)."

166 This study area also covers a very small area of north-east Leicestershire, containing the M1 Junction 24, and a small western edge of Nottinghamshire containing the M1. A significant area of Derbyshire including the Derby City Council (DCiC), the Derby unitory authority area, area is included.

167 The modelled study area is discussed further in section 9 and it is based upon a "*whole traffic model study area*" which corresponds to about 36% of the West and East Midland area (on the basis of transport carbon footprint). In section 9 of this document, I produce an indicative assessment of absolute carbon emissions against a number of baselines and targets, including the Net Zero Strategy transport delivery pathway, and UK Carbon budgets, and science based carbon budgets from the Tyndall Centre, over the "*whole traffic model study area*". Given the size of the study area, this comprises a sub-regional assessment (ie between a local and regional assessment in scale).

8 ASSESSING IMPACTS: THE DIFFERENCE BETWEEN ABSOLUTE EMISSIONS AND DIFFERENTIAL EMISSIONS

168 Carbon budgets are expressions of absolute carbon emissions, and Appendix F provides a greater introduction. A carbon budget can be considered as being like a financial budget, with units of carbon rather than currency. However, a fundamental difference is that there are no overdraft facilities, nor national deficits, nor quantitative easing mechanisms from central banks, for a carbon budget. Overspend and deficit on a carbon budget equates to generating more extreme climate impacts in the future. Once a CO2 budget is spent, it cannot be recovered, and the laws of physics determine the consequences for the planet and for humanity[38]. Carbon budgets are explained in more detail in Appendix F.

169 The UK carbon budgets are expressed in terms of absolute emissions, and therefore it is appropriate to compare carbon impacts of the development in terms of absolute emissions – a like-for-like comparison.

170 The absolute carbon emissions expressed by the "Do Something" modelling of the scheme convey the carbon impact to the study area with the scheme included in solus. The study area is discussed further in Section 8.

171 The recent Net Zero Strategy lays out the necessity of rapid decarbonisation across the whole UK, with reductions in domestic transport emissions of 34-45% by 2030 and 65-

[38] Greenhouse gas removals (GGR) and negative emissions technologies may provide extremely costly, speculative, and unproven at scale methods which proxy for an "overdraft facility". Even if these work, they would be like paying back a loan at a huge interest rate**. Currently they do not exist at any significant scale.** See, Kevin Anderson , John F. Broderick & Isak Stoddard (2020): A factor of two: how the mitigation plans of 'climate progressive' nations fall far short of Paris-compliant pathways, Climate Policy, DOI: 10.1080/14693062.2020.1728209, Appendix A "*However, there is wide recognition that the efficacy and global rollout of such technologies are highly speculative, with a non-trivial risk of failing to deliver at, or even approaching, the scales typically assumed in the models. … Whilst the authors of this paper are supportive of funding further research, development and, potentially, deployment of NETs, the assumption that they will significantly extend the carbon budgets is a serious moral hazard (Anderson & Peters, 2016).*"

76% by 2035 against 2019 levels. The study area can be considered as a sub-unit of the UK economy, which can be considered as a whole in its own right. The scheme adds further emissions, so reductions are required elsewhere in the energy and economic area defined by the study area network. If those reductions can't be made, then impact to the UK's decarbonisation, or national carbon budgets, would be expressed by the scale of the absolute carbon emissions involved.

172 I now progress to assessing the carbon impact of the Scheme.

9 THE CARBON IMPACT OF THE DEVELOPMENT (POINT 2, 1ST BULLET)

174 On the first bullet, the Secretary of State requests further representations on:

> *"The carbon impact of the development; the implications if any, of the development in relation to the Paris Agreement and the UK's nationally determined contribution under the Paris Agreement, the 2050 net zero target in the Climate Change Act 2008, and carbon budgets set under the 2008 Act (including the sixth carbon budget as set out in the Carbon Budget Order 2021); and, whether the increase in carbon emissions resulting from the development is so significant that it would have a material impact on the ability of the Government to meet its carbon reduction targets;"*

175 Previous sections have reviewed:

- Inconsistencies and errors between Applicant's Environmental Statement and response to the SoM
- Cumulative assessment in the Environmental Statement and at the Planning Examination
- Solus and cumulative assessment of GHG emissions
- Sub-types of carbon emissions
- What study area? Local and regional spatial scale
- Assessing impacts: the difference between absolute emissions and differential emissions

and I can now respond to the SoM on the topic of the carbon impact of the development and the implications, as requested.

9.1 The study area for absolute road-user emissions data is not clear

176 In considering the carbon impacts, it is necessary to know what the relevant study area was for the modelling which generated the data presented in the ES and response. However, the Applicant has not made it entirely clear what the area is being used.

177 ES, Chapter 14, [APP-052], 14.6.3 states that the operation emissions have been calculated from the "*whole traffic model study area*", and refers to ES, Chapter 4, [APP=-42], 4.2.14 which states:

> *"Operational phase traffic modelling: as detailed in the Transport Assessment Report [TR010022/APP/7.3],* ***a traffic model covering the strategic and local road network was developed to forecast future traffic flows, both with and without the Scheme (taking into account future development patterns).*** *Modelling outcomes have been used in order to determine the potential effect of the Scheme operation on the environment surrounding the Scheme (e.g. noise, air quality, severance, driver stress, water quality effects), as well as Scheme effects upon air quality along Stafford Street during Scheme operation (refer to Chapter 5: Air Quality)."*

Although, this section doesn't list greenhouse gas emissions, I assume due to the reference that this is the model from which GHGs are calculated.

178 The Transport Assessment, APP-254, 3.1.4 explains the evolution of the transport model:

> *"The highway network contained within the SATURN model is based on the **Derby Area Transport Model (DATM)**, which was commissioned by DCiC and has been continuously maintained and improved since 2006. For the purpose of modelling the housing growth planned in and around the Derby area, DCiC extended DATM into adjacent districts to cover the Greater Derby area. This version of the highway network is referred to as the **Greater Derby Transport Model (GDTM).**"*

179 Then at APP-254, 3.1.6:

> *"For this study, **the GDTM model was extended** to cover other parts of Great Britain. Given that the A38 is part of the SRN, it was important to represent the full length of strategic trips. In this regard, the traffic model is able to represent potential transfers into the A38 corridor from competing strategic routes, for example, the route using the A42/M42/M1 for strategic trips between Birmingham and Leeds."*

Again, I assume that this extended model equates to the "*whole traffic model study area*".

180 The boundary of detailed modelling is given by the map at APP-254, Figure 3.1. This is the same map as at RESP-8.121, Appendix A with a red dotted line indicating the "boundary of detailed modelling". This map covers *part of the joint Derbyshire, Leicestershire and Nottinghamshire transport system*.

181 From the above, I assume that the "*whole traffic model study area*" is not the same as this detailed modelling area referred to at APP-254, Figure 3.1.

As I can find no map corresponding to the "*whole traffic model study area*", I have no clear understanding of which parts of the country are included within it.

182 However, in order to make an indicative calibration of the study area for my impacts assessment which follows below, I have analysed the absolute carbon emissions data: this gives an idea of the scale of the "*whole traffic model study area*",

183 APP-052, Table 14.15 reports DM and DS data for the road user emissions for 2024 and 2039 as 7,934,497 tCO2e and 8,882,177 tCO2e respectively. A similar order of magnitude is reported at RESP-8.121, Table 2-2 where the DS operation emissions to 2037 are given as 101,240,659 tCO2e, the annual average of which over 13 years (2025-2037 ,inclusive) is 7,787,743 tCO2e. (Note, the RESP-8.121, Table 2-2 figure cannot be precisely matched to the APP-052, Table 14.15, and this would appear to relate to the inconsistencies between the two, already reported in Section 3).

184 The APP-052, Table 14.15 data shows that the annual road user emissions for between 2024 and 2039 are of the order of 8 to 9 MtC02e (megatonnes or millions of tonnes). I now compare the scale of these emissions to the "UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2019" published by BEIS[39].

185 Table 4 gives the 2019 BEIS data for road transport sub-sectors across Derbyshire County Council (DCoC), Derby City Council (DCiC), Leicestershire, and Nottinghamshire, all within the East Midlands area.

tCO2e	BEIS 2019 A-roads	BEIS 2019 Motorways	BEIS 2019 Minor roads	BEIS 2019 roads total
DCoC	794,920	421,128	576,403	1,792,451
DCiC	150,586	-	204,516	355,102
Leicestershire	625,734	708,247	504,164	1,838,145
Nottinghamshire	892,084	256,218	524,971	1,673,273
Total				**5,658,971**
East Midlands	4,881,174	1,882,406	3,181,274	**9,944,854**
West Midlands	3,967,412	3,492,571	4,043,799	**11,503,782**
For comparison				
Whole traffic model study area (2024)				**7,934,497**
Whole traffic model study area (2039)				**8,882,177**

Table 4

186 For context, the whole East Midlands region is also given which also brings in Lincolnshire, Rutland and Northants, and also the West Midlands.

187 The data in Table 4 shows that "*whole traffic model study area*" modelled at around 8,000,000tCO2e at the beginning of the 2024-2039 period corresponds to an area, as defined by size of transport carbon footprint, of around 80% of the East Midlands.

188 Note that the detailed study area is significantly smaller than the combined areas DCoC, DCiC, Leicestershire, and Nottinghamshire from the map at APP-254, Figure 3.1, and therefore can be expected to have an absolute transport carbon footprint significantly less than 5,658,971 tCO2e which is the BEIS 2019 footprint of these areas combined.

189 The Applicant appears not to provide a map of the "*whole traffic model study area*", but it is likely that it extends westwards to include part of the West Midlands region too, and possibly northwards too to meet the performance requirement to model longer strategic trips between Birmingham and Leeds.

[39] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/996057/2005-19_UK_local_and_regional_CO2_emissions.xlsx, downloaded October 20th 2021 (website: https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019)

190 In the absence of a map, I have made the best guess at the scale of the transport model, above, and proceed on the basis of the assumptions above.

9.2 Assessing impacts: local, regional and national scales

191 As discussed in section 7.1 of the statement, the EU guidance advocates local and regional scales of assessment. The traffic model study area provides something between the two, a sub-regional assessment, that most likely overlaps at least two sub-regions, parts of the East and West Midlands.

192 Whilst I would recommend that a local assessment of cumulative carbon emissions is made which possibly could be based on the detailed study area, I continue here with the available data to make an indicative sub-regional carbon impacts assessment.

193 This assessment can only be indicative due to the assumptions which I have to make. However, I am largely looking at the order of magnitude, in a general, ballpark sense rather than the precise figures to make this assessment.

9.3 Cumulative assessment using absolute carbon emissions

194 In section 5, I explain at length the difference between solus and cumulative assessment, and how it is sensitive to whether absolute emissions or differential emissions are being used in the assessment.

195 The applicant's DS traffic model, which I refer to as "DS (Perf, all)" to distinguish it from other possible configurations of the traffic model, provides for cumulative assessment when the absolute emissions derived from it are fed into the assessment. Just for clarity, when it is differentiated with a baseline (ie "DS (Perf, baseline)") which itself contains the planned developments and road projects in the area, the resulting differential emissions are solus and the resulting assessment is, therefore, solus too. This is all explained in section 5.

196 The assessments in this section all use the absolute emissions from "DS (Perf, all)", and therefore they are cumulative, and as such meet the requirements of the EIA Regs and the DMRB as also outlined in section 5.

9.4 Sub-regional assessment of cumulative impacts of absolute carbon emissions against the Net Zero Strategy

197 The Net Zero Strategy provides a delivery pathway for domestic transport which specifies the necessary carbon emissions reductions for 2030 and 2035 from 2019. The 2030 figures relates to an "increase of ambition" on the 5th carbon budget 2028-2032[40] which is consistent "with the action required to meet the UK's 2030 NDC".

[40] Net Zero Strategy, technical Annex, page 307 of main NZS document, bullets 8 and 9

198 ES Chapter 14, Table 14.15 gives the DS figures for the carbon emissions generated in the study area for 2024 and 2039. By a process of linear interpolation, pro-rata figures may be obtained for any year between these two years. The internal expansion of the traffic network and the generated emissions may not follow an exact linear path but such an approach is reasonable for the purpose on an indicative, ballpark assessment. Similarly, pro-rata figures may be obtained in the years leading up to 2024. These similarly won't be precise but provide a reasonable ballpark assumption.

199 I have calculated the pro-rata figures for 2019, 2030 and 2035. 2019 is the reference year for the NZS delivery pathway, and 2030 and 2035 are the years of interest along it. The pro-rata derived figures are shown for these years in Table 5 along with the source data years from ES, Chapter 14, Table 14.15.

tCO2e	2019	2024	2030	2035	2039
"DS (Perf, all)" = "DS (GHG, all)"	***7,618,604***	**7,934,497**	***8,313,569***	***8,629,462***	**8,882,177**

Table 5

200 In Table 2 in section 5 of this statement, I laid out a specification of the models required for an EIA Regs compliance oriented impact assessment of GHGs. I now repeat a sub-set of the Table for context, as Table 6.

	EIA Regs compliance oriented (for impact assessment of GHGs)		
	DM (GHG, baseline)	DS (GHG, scheme)	DS (GHG, all)
2015 Baseline Highway network	✓	✓	✓
A38 Derby scheme	×	✓	✓
Planned changes to the highway network	×	×	✓
Forecast changes in trip demand	×	×	✓

Table 6

201 Table 6 shows the three models from which ideally I would have the output data. However, only "DS (Perf, all) is available which is the same as "DS (GHG, all)" (see section 5). Table 5 provides the absolute emissions data to assess, and I now take this data forward into Table 7 below which shows what the data for a full assessment might look like.

202 The "<not available>" data from models runs which do not exist is shown.

	2019	2030	2035
"DM (GHG, baseline)"	<not available>	<not available>	<not available>
"DM (GHG, baseline)" against 2019		**?** %	**?** %
"DS (GHG, scheme)"	<not available>	<not available>	<not available>
"DS (GHG, scheme)" against 2019		**?** %	**?** %
"DS (GHG, all")	7,618,604	8,313,569	8,629,462
"DS (GHG, all)" against 2019		9.1%	13.3%
NZS lower bound	7,618,604	5,028,278	2,666,511
NZS lower bound against 2019		-34.0%	-65.0%
NZS upper bound	7,618,604	4,190,232	1,828,465
NZS higher bound against 2019		-45.0%	-76.0%

Table 7

203 It would be very helpful, for an assessment to also have the absolute road-user emissions data associated with the DM (GHG, baseline) and DS (GHG, scheme) models, but the Applicant has either never run these, or not made them available.

204 Whilst ES, Chapter 14, Table 14.15 would indicate a 9.1% and 13.3% increase in road-user emissions across the study for the years 2030 and 2035, respectively relative to 2019 levels. This has to be set against NZS delivery pathway which corresponds to a fall in residual emissions from domestic transport emissions (excluding aviation and shipping) by around 34-45% by 2030 and 65-76% by 2035, relative to 2019 levels.

205 The NZS delivery pathway is the Government's most recent policy for delivery of both the UK NDC under the Paris Agreement and the 6th carbon budget. The assessment above would indicate that the shortfall – an emissions gap - in meeting the 2035 target is between 78% (65%+13%) and 89% (76%+13%) of the entire 2019 transport footprint across the study area.

206 Policies in the Transport Decarbonisation Plan (TDP), and some local policies, might contribute some reductions towards closing the emissions gap identified. However, it is clear that the emissions gap is of such a quantum that projected policies will get nowhere near to closing it.

207 This is why it would be helpful to have the "DM (GHG, baseline)" and "DS (GHG, scheme)" modelling too, because then it would be possible to determine how much of the emissions gap comes from the A38 Derby Junctions scheme in solus and how much with the scheme in cumulation of other planned projects and road schemes.

208 It is also wholly unreasonable to expect that the identified emissions gap can be offset by extra emission reductions from other sectors in the study area, or from transport in other areas, either the West and East Midlands themselves, or wider nationally.

9.5 Scaling to enable assessment against national carbon budgets

209 It should be remembered that this is also a large study area, in terms of transport emissions footprint falling between the categories of local assessment (which, for example, might be the Derby Unitary authority area, or the Detailed Study area) and regional assessment (which might, for example, be the combined West Midlands and East Midlands area). An indication of the relative size of the study area comes from the indicative figure derived above for the study area of 7,618,604 tCO2e in 2019 which I have calculated is 36% of the combined BEIS West Midlands and East Midlands transport emissions footprint in 2019.

210 This 36% figure is a helpful scaling factor to take into the next stage where I compare the absolute emissions generated in the study area with the scheme against the national carbon budgets. Whilst it would be more usual to scale on a population basis, the 36% figure derived from relative carbon footprints is again adequate for a ballpark assessment.

9.6 Sub-regional cumulative assessment of absolute carbon emissions from the Scheme

211 Table 8 shows the assessment. In this case, the linear interpolation data for each year between 2024 and 2039, as illustrated in Table 5 above, has been used to calculate the absolute road-user carbon emissions in the study area for each of the 5th and 6th carbon budgets which respectively correspond to the 5-year periods 2028-2032 and 2033-2037.

212 Note: The opening date of the Scheme is not clear as has been discussed at Section 3 and may have changed between the ES and the Applicant's response to the SoS. For these reasons, I cannot calculate the absolute transport emissions for the 4th carbon budget, and therefore it is not presented in Table 8.

	tCO2e	**5CB (2028-2032)**	**6CB (2032-2037)**
	UK CCC budget	**1,725,000,000**	**965,000,000**
	"Whole traffic model study area" Derived from DS (2024) data, APP-052, Table 14.15 (study area)		
	Absolute Emissions / Do-Something (study area)	**41,567,845**	**43,147,312**
A	% of Study Area budget (all sectors)	42.08%	78.07%
B	% of Study Area budget (transport sector)	115.88%	215.02%
C	% of Study Area Tyndall budget (all sectors)	201.77%	432.29%
D	% of Study Area Tyndall budget (transport sector)	555.70%	1190.58%
	Differential DS-DM emissions (study area)	**19,085**	**22,343**
E	% of Study Area budget (all sectors)	0.02%	0.04%
F	% of Study Area budget (transport sector)	0.05%	0.11%
G	% of Study Area Tyndall budget (all sectors)	0.09%	0.22%
H	% of Study Area Tyndall budget (transport sector)	0.26%	0.62%

Table 8

213 The difference between the Climate Change Committee (CCC) and Manchester Tyndall Carbon budgets is explained in Appendix F. The CCC budget[41] is focussed more on meeting the national, politically set, net zero-target of 2050 via an array of policy interventions. The Manchester Tyndall budget translates the IPCC global carbon budgets for a "well below 2°C and pursuing 1.5°C" global temperature target, and the equity principles enshrined in the United Nations Paris Agreement, and splits it between sub-national areas using different allocation regimes. It provides a science-based budget that is aligned to compliance with the Paris agreement.

214 Appendix G gives the Tyndall Centre carbon budget for the East Midlands area. The relevant science-based carbon budgets which are in the underlying spreadsheet for my calculations are shown in Table 9, and have been directly taken from the relevant webpages[42]. The "all sectors" benchmarks for the figures at rows C and G are derived directly from this data, reduced by the 36% factor (based on the study area transport carbon footprint as explained above).

MtCO2	West Midlands	East Midlands
4th Carbon Budget	62.5	57.6
5th Carbon Budget	30.6	27.4
6th Carbon Budget	15.0	13.1

Table 9: Tyndall Centre Science-based carbon budgets

215 The national carbon budgets at the top of Table 8 are reduced down to relevant comparators for the study area as follows. For the "all sectors" benchmark at rows A and E, they are scaled down to the West and East Midland by population, then they are further scaled down to the study area by the 36% factor (based on the study area transport carbon footprint as explained above).

216 The" transport sector" benchmarks at rows B, D, F and H, the "all sector" data is scaled down by the transport sector percentage across West and East Midlands. This is 36.3% on the BEIS 2019 data – just for clarity, this is a **different percentage** to the 36% quoted above (actually 35.5%) which is the proxy for population in the study area. By coincidence, they both round to 36%.

217 Key results are:

- By the 6th carbon budget, absolute transport emissions in the study area account for 78% of the available 6th carbon budget across all sectors. This comparison shows that, very limited emission space is left for any other sectors such as industry, domestic, agriculture and land-use, and very considerable amounts of carbon would need to be offset somewhere else. The transport sector is using over nearly twice its share of the budget (215%) as compared to the 5th carbon budget (115%). The Transport Assessment says that an assumption in the

[41] Latest version is given in the 6th Carbon Budget document set: https://www.theccc.org.uk/publication/sixth-carbon-budget/

[42] https://carbonbudget.manchester.ac.uk/reports/EM/ and https://carbonbudget.manchester.ac.uk/reports/WM/

modelling is that "traffic growth occurs into the future" at APP-254, 4.2.1. The Applicant has provided no policies to mitigate against the corresponding rise in emissions, and although some may be expected in the Transport Decarbonisation Plan, these are inadequate to deal with the traffic and carbon emissions growth projected by the modelling.

- The science-based carbon budgets from the Tyndall Centre provide a much more realistic model of the carbon budgets necessary to comply with the Paris Agreement (see Appendix F). As can be seen from Table 9, the available carbon in the budgets reduces rapidly in the period up to 2037: the rates of year-on-year reduction is -13.3% in the West Midlands and -13.8% in the East Midlands[43]. These budgets indicate that even, soon after the opening of the scheme, during the 5th carbon budget, the transport demands in the study area use 555% of the available science-based transport budget, and by the 6th carbon budget this has increased to 1190%.

218 The same budget comparisons to the differential DS-DM emissions (rather than absolute DS emissions), a similar method to that used by the Applicant but in this case against the study area rather than the entire UK economy, are given for contrast at rows E-H. It can be seen how the sensitivity of the assessment is severely limited when differential emissions are used. Much greater real-world information like the actual impact on the budgets for the study area is gained by using absolute carbon emissions.

9.7 National comparison

219 Using the same pro-rated data as in Table 5, the absolute emissions for the scheme for each carbon budget may be calculated, as shown below. Again, the 4th carbon budget is not presented because I cannot calculate the 4CB absolute carbon emissions without knowing the scheme opening date.

	tCO2e	**5CB (2028-2032)**	**6CB (2032-2037)**
	UK CCC budget	**1,725,000,000**	**965,000,000**
	Absolute Emissions / Do-Something (study area)	41,567,845	43,147,312
A	% of UK carbon CCC budget	2.410%	4.471%
	Differential DS-DM emissions (study area)		
B	% of UK carbon CCC budget	0.0011%	0.0023%
C	Sensitivity factor absolute emissions cf differential DS-DM emissions	2,178	1,931

Table 10

220 In contrast to the claims made by the Applicant that the transport carbon emissions in the study area with the scheme are very small, the comparison to absolute carbon emissions

[43] https://carbonbudget.manchester.ac.uk/reports/EM/ and https://carbonbudget.manchester.ac.uk/reports/WM/

shows that the share of the total UK economy emissions of the transport model study area is very significant, rising from 2.4% to 4.5% between the 5th carbon budget and 6th carbon budget.

221 I conclude that the scheme in the whole transport model study area does have a significant impact on the ability to meet UK carbon emissions budgets and targets. This has been demonstrated in several ways in this section:

- **The huge emissions gaps demonstrated with respect to meeting both the 2030 and 2035 delivery pathways from the Net Zero Strategy (Table 7 above).**
- **Major overshoot of both "all sector" and "transport sector" UK (CCC) budgets, for the relevant sub-regional area, from the 4th, 5th and 6th carbon budgets (Table 8 above).**
- **Increasing share of the whole UK economy budget (Table 10 above).**

9.8 Sensitivity of different assessments

222 The conclusions in the previous section are only possible by using absolute carbon budgets. Apart from providing more sensitive data, absolute carbon emissions are the right measure as I have outlined in section 1.5 because they measure the real impact on the global atmosphere and the resulting global heating.

223 For the 6th carbon budget, there is a range in sensitivity between the comparison of the Applicant's differential data with the whole UK carbon budget of 0.0023%, and the study area, or sub-regional, comparison of absolute transport emissions against the Tyndall Centre transport budget of 1190%. These assessment methods vary by a factor of 514,217, or over 5 orders of magnitude.

When I assessed absolute emissions in Table 10 against the whole UK economy, compared to the Applicant's differential figure, the variation was around a factor of 2000 for the 5th and 6th carbon budgets.

224 **The Tables, and these factor figures, show that the Applicant's method is on the extreme, lowest end of the sensitivity range.** As different aspects are introduced into the assessment, the sensitivity increases as follows:

- Use absolute emissions rather than differential emissions, as shown above, sensitivity increase by around a factor of 2000 in this case.
- Assess against transport sector rather than all sectors.
- Assess locally or regionally, or in this case sub-regionally. As the study area region is around 5.7% by indicative population share, this improves sensitivity by around a factor 17.5. It also provides information is relevant to local transport planning.

10 DIRECT, INDIRECT AND CUMULATIVE LIKELY SIGNIFICANT EFFECTS OF THE DEVELOPMENT ON CLIMATE (SOM, POINT 2, 2ND BULLET)

10.1 Summary of evidence that cumulative emissions assessment been not done on the A38 Derby Junctions scheme

225 In section 5, I have already shown that cumulative assessment has not been performed by the Applicant in the Environmental Statement. Apart from the technical arguments concerning the traffic modelling and the use of differential emissions, there are a number of other reasons to support this conclusion. These include:

- Cumulative assessment is not mentioned in ES, Chapter 14 on Climate.
- Cumulative assessment of greenhouse gas emissions is not mentioned in ES, Chapter 15 on cumulative assessment.
- The Applicant told the Examining Authority at the Examination that they had not done cumulative assessment and saw no reason to do it.
- The ExA recorded this is the Recommendations Report and the Applicant has not challenged this position.

226 It is only in their response to the SoS that they have claimed that they have done cumulative assessment. And this is on the basis that cumulative assessment is inherent in the traffic model. I have shown in section 5 that this does mean the impact assessment itself is cumulative if the absolute emissions output from the traffic model are differentiated with absolute emissions from another model run where the planned development and road projects in the area have been included in the baseline. In this case, which is the case that the Applicant has performed, the resulting assessment is solus.

227 Therefore EIA Regulation 20 should engage so that the Environmental Statement may be completed to comply with the EIA Regs.

228 I now lay out the relevant parts of the NPS NN regime and the EIA Regs, and other matters that have not been covered so far.

10.2 NPS regime (including NPS NN) requirements for environmental assessment

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

230 The NPS NN **directly invokes** the EIA Regulations ("EIA Regs") at NPS NN 4.15 and 4.16. There is no dispute that the NPS regime is expected to be fully compliant with the

EIA regime (and these same invocations are common to other NPSs[44]). I note that the Courts are willing to enforce this as in Pearce v BEIS [2021] EWHC 326 (Admin)[45].

231 The text of NPS NN 4.15, below, is directly "cut and paste" from the wording in the EIA Regs themselves.

> *"All proposals for projects that are subject to the European Union's Environmental Impact Assessment Directive and are likely to have significant effects on the environment, must be accompanied by an environmental statement (ES), describing the aspects of the environment likely to be significantly affected by the project. The Directive specifically requires an environmental impact assessment to* ***identify, describe and assess effects on human beings, fauna and flora, soil, water, air, climate, the landscape, material assets and cultural heritage, and the interaction betIen 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, cumulative, 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. Further guidance can be found in the online planning portal.*** *When examining a proposal, the Examining Authority should ensure that likely significant effects at all stages of the project have been adequately assessed. Any requests for environmental information not included in the original environmental statement should be proportionate and focus only on significant effects. In this NPS, the terms 'effects', 'impacts' or 'benefits' should accordingly be understood to mean likely significant effects, impacts or benefits."* (my emphasis)

232 NPS NN 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 Ill as those already in existence). …"* (my emphasis)

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

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[44] For example, section 4.12 and 4.13 of "Airports National Policy Statement; section 4.2 of the Overarching National Policy Statement for Energy (EN-1) although this invokes the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (SI 2009 No. 2263) ("the **2009** Regulations") rather than the more recent Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017 No. 572) ("the **2017** Regulations").

[45] Pearce v BEIS, 149: "Here the Claimant has succeeded in establishing a breach of the 2009 Regulations, as well as a domestic error of public law (irrationality) and a breach of the duty to give reasons (which straddles both EU and domestic law, the 2009 Regulations and the PA 2008)".

> "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."

234 The EIA Regs require cumulative assessment of environmental factors, including "climate", meaning both "greenhouse gas emissions" and "impacts relevant to adaptation" by EIA Regs, Schedule 4, Para 4 and EIA Regs, Schedule 4, Para 5 (f).

235 As the NPS NN invokes the EIA Regs, as above, it also requires cumulative assessment of "climate", meaning both "greenhouse gas emissions" and "impacts relevant to adaptation".

10.3 The Applicant conflicts their own EIA Methodology

236 APP-042, the Environmental Impact Assessment Methodology, section 4.1.21, "Table 4.1: NPSNN – Requirements relating to EIA" sets out the requirement of NPS-NN 4.15 and 4.16 (see Appendix A). It directly quotes NPS-NN 4.15 and 4.16.

237 For NPS-NN 4.15, the Applicant's response under "Where addressed" is "This ES has been prepared in accordance with the EIA Regulations". And for NPS-NN 4.16 for cumulative assessment, the Applicant's response is "Refer to Chapter 15: Assessment of Cumulative Effects".

238 APP-042 makes it clear that the Applicant knows the requirements of the NPS NN. However, the statement "This ES has been prepared in accordance with the EIA Regulations" appears to be *self-certification* by the Applicant. I have provided clear evidence in this statement that cumulative assessment, as required by the EIA Regs, has not been performed for "greenhouse gases" as sub-factor of "climate" as a factor under the EIA Regs. These self-certifying statements are patently not true as evidenced below, and in section 5.

10.4 No "Cumulative" climate effects considered in APP-052

239 In addition to conflicting with the Applicant's own Environmental Impact Assessment Methodology [APP-042], as above, the lack of cumulative assessment, as demonstrated by section 5 and other evidence in this statement, of "greenhouse gas emissions" conflicts with the EIA Scoping information presented in the Application.

240 Under the "Aspect Based Scoping Tables" in the Planning Inspectorate Scoping Opinion [APP-166], section 4.10 "Climate", cumulative impacts are **not** scoped out.

241 Under APP-166, section 4.11 "Cumulative effects", it is noted that "*No matters have been proposed to be scoped out of the assessment*". Cumulative assessment of "climate", both "greenhouse gas emissions" and "impacts relevant to adaptation", were therefore **not** scoped out of the Environmental Statement.

10.5 "Cumulative" effects for climate vulnerability (adaptation) are added in RESP-8.121

242 At this point, I note that section 3, Part 2 of the response [RESP-8.121] presents a cumulative assessment of climate vulnerability effects and find no significant effects. Critically, this is considered at both local and regional scales.

243 This statement makes no further comment on the legitimacy, or accuracy, of the Part 2 assessment, although I note below that it is not consistent with the definition of "cumulative" given in RESP-8.121.

244 However, it should be noted that in the cases of both "greenhouse gas emissions" and "impacts relevant to adaptation", that the original Environmental Statement did not attempt cumulative assessment, and RESP-8.121 attempts to demonstrate it as an after-thought. This is despite the clear requirements of the NPS-NN, the Applicant's stated EIA Methodology, and no factors being scoped out for cumulative assessment being scoped out in the EIA Scoping.

10.6 The Applicant defines different study areas for construction and operation emissions

245 APP-052, sections 14.6.1 – 14.6.3 is entitled "Study Area" for "GHG impact assessment". In fact, it defines **two distinct study areas** for three broad types of carbon emissions:

1. (direct and indirect) construction emissions, and
2. road-user emissions, and
3. operation emissions from lighting and maintenance.

246 APP-052, section 14.6.2 defines the study area for construction emissions as the "spatial coverage of the assessment is, therefore, the area of construction works falling **within the Scheme boundary**".

247 For the two types of operation emissions, APP-052, section 14.6.3 states:

> "The study area for the assessment of GHG emissions arising during Scheme operation includes both direct emissions arising from energy use within the Scheme boundary, but also emissions from road-users which are presented **for the whole traffic model study area.**"

248 By definition, the study area at APP-052, section 14.6.2, **precludes by definition** cumulative assessment of carbon emissions from *"other existing and/or approved projects"* as the EIA Regs require, as this specified study area can only ever contain a single project. This definition, limited to scheme boundary, also conflicts with the single definition of "cumulative" at RESP-8.121, 3.2.1 which defines the area defined by the traffic model for the Scheme, apparently for all types of greenhouse gas emissions and for the climate adaptation assessment.

249 Construction emissions should be assessed in cumulative across the whole study as I explain it in section 5 (36% of the West and East Midland's area).

10.7 Missing cumulative construction emissions

250 If the definitions at RESP-8.121, 3.2.1 is applied to construction emission, then APP-053, section 15.3.25 makes it clear what "*other existing and/or approved projects"* should be considered:

> "Full details of the other development projects included within the traffic model (covering developments in Amber Valley, Derby City, Erewash, North West Leicestershire and South Derbyshire), and the factors applied during the modelling process, are presented within the Transport Assessment Report [TR010022/APP/7.3]. **These developments include a number of minor highway junction alterations, as well as local authority and Highways England schemes (including changes to junction 24 of the M1, the A50 A453 link road, Kegworth Bypass, the T12 link Road, the South Derby Link Road).** Construction of these road improvement schemes have been scoped out of the cumulative effects assessment on the basis that they are minor changes that would not result in likely significant effects, or the projects are located well outside of the defined 2km study area."

251 The ad-hoc scoping out in the last paragraph is not consistent with the formal scoping information laid out above.

11 SIGNED

Dr Andrew Boswell,
Climate Emergency Policy and Planning, October 26th, 2021