SLACC/MG/1

TOWN AND COUNTRY PLANNING ACT 1990

Application by West Cumbria Mining Ltd for:
Development of a new underground metallurgical coal mine and associated development at Former Marchon Site, Pow Beck Valley and area from Marchon Site to St Bees Coast

Planning Inspectorate Reference:	**APP/H0900/V/21/3271069**
Local Planning Authority Reference:	**4/17/9007**
Date Inquiry Commences:	**7th September 2021**

PROOF OF EVIDENCE

of

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CONTENTS

Appendices in SLACC/MG/2

Appendix 1 WCM Underground Mining

Appendix 2 Kholod et al "Global methane emissions from coal mining to continue growing even with declining coal production" *Journal of Cleaner Production* 256 (2020)

Appendix 3 Supplement of Kholod et al "Global methane emissions from coal mining to continue growing even with declining coal production"

Appendix 4 House of Commons Oil and Fossil Fuel Production Report

Appendix 5 Excerpt of CCC Sixth Carbon Budget Sector Summary: Fuel Supply

1. INTRODUCTION

1.1. My name is Michael Grubb. I am a professor of Energy and Climate Change at University College London and the Deputy Director of the UCL Institute of Sustainable Resources.

1.2. I have contributed to several reports of the Intergovernmental Panel on Climate Change (IPCC), and in 2018, I was appointed as Convening Lead Author for Chapter 1 of the Sixth Assessment Report – Mitigation. I am an 'Eminent Scholar' Kyung-Hee University, Korea and from 2018 to June 2021, I was also Hub Leader (Sustainability) for the UK Research Council's Programme on *Rebuilding Macroeconomics*.

1.3. My former academic positions have included: Senior Research Associate at Cambridge University Faculty of Economics, and Professor at Imperial College London, prior to which I was head of Energy and Environment at Chatham House. I was founding Editor-in-Chief of the journal Climate Policy and served in this role from 2000 - 2016.

1.4. I have also served in government-related and other implementation roles. From 2011-2016 I was a Senior Advisor (half-time) to the UK Office of Gas and Electricity Markets (the energy regulator, Ofgem). I then Chaired the UK government's Panel of Technical Experts on Electricity Market Reform. From 2008-2011, I was a member of the UK Climate Change Committee, established under the UK Climate Change Act to advise the government on future carbon budgets and to report to Parliament on their implementation.

1.5. Previously, I served for eight years as Chief Economist at the UK Carbon Trust, the UK's lead organisation for business implementation of low-carbon strategies.

1.6. I have authored eight books, over sixty journal articles, and numerous other publications. My academic articles have been published in the journals: *Nature, the Lancet, Nature Geosciences, Climate Policy, Energy Policy*, and *Climatic Change* among others. My most recent book *Planetary Economics* brings together lessons from 25 years of research and implementation of energy and climate policies, with a full Chinese translation published in 2017.

1.7. I am giving this evidence at the request of South Lakes Action on Climate Change

(SLACC), acting as an independent expert offering my services, pro bono, based on my academic and policy experience. The evidence which I have prepared and provide for this public inquiry is true to the best of my knowledge and belief. I confirm that the opinions expressed are my true and professional opinions based on the facts I regard as relevant in connection with the inquiry.

2. SUMMARY OF EVIDENCE

2.1 I primarily consider evidence relating to emissions arising from construction and operation of the proposed mine (rather than emissions from burning of the coal). These emissions would not be trivial. The developer's proposal that they should be discounted if they represent less than 1% of future UK carbon budgets is arbitrary and, on close consideration, hugely excessive given that this would represent about 1/8th of the entire UK fossil fuel production and refining sectors and their greenhouse gas emissions – a sector comprising several hundred individual facilities.

2.2 I also find that the AECOM estimate of construction and operational emissions are incomplete, that proposals for methane capture do not provide any guarantee this will occur or prevent all such emissions, and that the commitment to purchase "emission offsets" would be wholly inadequate to negate the impact of these emissions during the lifetime of the mine, in particular, its methane emissions which have a disproportionate impact in terms of the rate of warming over coming decades and whether or when global temperatures surpass 1.5C warming.

2.3 Finally, even if all the coal could be utilised in Europe (an assumption shown to be implausible in other evidence), the AECOM estimate of saved emissions from international transport amount to only 1.1% of the emissions associated with burning of the coal being mined. The evidence of my colleague explains the economic reasons why developing the Cumbrian mine would inevitably lead to some global increase in the consumption of metallurgical coal, and the increase would only need to be 1.1% to offset the presumed savings from shipping.

2.4 In addition, there are clear geopolitical reasons why the global repercussions could be much greater. Since development of the mine would be contrary to the government's global campaign to phase out unabated coal, and the UK is amongst the most developed countries, it would inevitably undermine the global effort to curb coal in the light of increasingly dangerous rates and levels of climate change – so the level of construction and fugitive emissions associated with developing new coal mines would be amplified many times.

3. CLIMATE CHANGE - CONTEXT

3.1. Climate change is a global problem involving the actions of over seven billion people, and hundreds of millions of companies and their facilities. Most of these make individually small contributions, and yet create what are now recognised as fundamental global risks associated with climate change. Clearly, if all these companies justify their emissions on the basis that their facilities are a small proportion of national or sectoral emissions – with an arbitrary judgement of 'small' chosen to justify what they want to do - we will never even slow down climate change, let alone get close to halting it.

3.2. The UK is amongst the group of rich countries which under the foundational UN Framework Convention on Climate Change (CD8.4) and the Paris Agreement (CD8.1) agreed they should take a lead in reducing emissions; its cumulative emissions per capita have been amongst the highest globally and is amongst the pioneers of a low carbon economy, with ambitious goals. Again, it is clear, if the UK justifies new CO2-emitting industrial developments on the grounds that their emissions are only "small" – say 1% - it would be used as a reason by other countries why they should be able to do the same.

3.3. Likewise, if the UK permits new fossil fuel extraction on the basis that the emissions from the use of the of the fossil fuels can be ignored because these will simply "substitute" for fossil fuels that would otherwise be produced elsewhere, other countries will surely follow suit.

3.4. The former Secretary of State for Business, Energy and Industrial Strategy and current President for COP26, Alok Sharma, is co-leading a global campaign to phase out coal. Clearly, proceeding with a coal mine, and using as an excuse that the emissions of the mine itself would be 'small' (or indeed that the mine would supposedly be carbon neutral, due to very questionable assumptions of substitution and/or adequate offsetting), is directly contrary to the government's international position that coal must be phased out urgently. The Cumbrian mine would make the government's general position on coal and climate change obviously untenable.

4. GREENHOUSE GAS EMISSIONS OF THE MINE

4.1. The consultancy AECOM prepared a document entitled “Cumbria Metallurgical Coal Project: GHG Assessment” dated 6 May 2020 (“AECOM Report”) (CD1.147). This presents estimates of the annual greenhouse gas (GHG) emissions from the mine during construction, operation, and decommissioning. I understand that the Council relied on this and ES Chapter 19 (CD1.145) when it considered whether to resolve the grant planning permission for the proposal. The Applicant relies on the fact that the Council has previously resolved to grant permission, so it is important to consider whether the Council did so on the basis of a robust GHG assessment.

4.2. As is standard practice, GHG emissions are reported in units labelled “tCO2e” referring to “tonnes CO2 equivalent”, (para 3.11) a measure which is often used to express GHG emissions figures. For greenhouse gases other than carbon dioxide (CO2), it expresses the amount of CO2 which would warm the earth as much as the amount of that gas. The measure seeks to provide a common scale which accounts for the global warming potential of each gas.

4.3. At the outset, it will be noted that the figures reported by AECOM relate only to the direct emissions (e.g. from fuel and electricity usage at the site and fugitive methane emissions from the mine), and certain indirect emissions from e.g. the GHG emissions embedded in construction materials used at the site, from the transportation and treatment of waste, etc (see Table 5.1 describing the emissions considered, p.17). The AECOM Report excludes any emissions from the use of the coal produced by the mine, as discussed further below at section 6.

4.4. Whilst AECOM set out certain assumptions they have adopted in making their estimates (in paras 6.3, 7.6, and 8.3), they do not provide calculations or the emissions factors used to allow more detailed scrutiny of how they arrived at each of the figures reported for specific aspects of the construction, operational and decommissioning emissions (reported in Tables 6.1, 7.1 and 8.1). It is thus not possible to consider whether the emission factors used or other assumptions adopted (other than those referred to in paras 6.3, 7.6, and 8.3) are reasonable.

4.5. I have not attempted to make such calculations independently. Except as set out below in relation to specific items, in this proof of evidence, I have simply used AECOM’s estimates of the direct and indirect emissions (for items that AECOM has

calculated) without interrogating the figures further.

4.6. In terms of the scope of the assessment, it may also be noted that paragraph 3.4 relating to the "GHG study area" states that the assessment relates to "direct GHG emissions that arise as a result of the Proposed Development including construction, operation and decommissioning from within the red line boundary area" in addition to certain indirect emissions from off-site activities. However, it is not clear based on the quoted language whether the assessment covers direct emissions from the mining activities that will take place outside the red line application boundary. My understanding is that the application boundary covers only the relatively small area which will be mined onshore, but that a much larger area is expected to be mined offshore if permission is granted. If the assessment excludes direct emissions from the construction, operation, and decommissioning of the offshore areas of the mine, this would potentially significantly affect the estimates of GHG emissions which the mine will cause.[1]

i. Construction

4.7. The AECOM Report concludes that emissions during the construction of the mine will be 42,553 tCO2e per annum, for a period of 2 years (CD1.147, Table 6.1).

4.8. It may be noted that the majority (53%) of the emissions reported in the construction phase represent emissions embedded in the goods and services that will be purchased as part of the construction phase. Para 6.3 of the Report states that:

> "A bill of quantities for the construction materials is not available. Estimates of materials have been made of the buildings, rail line, the concrete culvert and concrete hardstanding, the water tank and the car park. These estimates have been based on dimensions detailed within the Project Description of the Environmental Statement (West Cumbria Mining, 2018a).

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[1] It should be noted that AECOM took a different approach to fugitive methane emissions. Based on the assumptions and figures stated by AECOM in relation to fugitive methane emissions, it appears these do include mining of the offshore areas. This is because the figures appear to have been calculated based on the tonnage of coal mined over a projection of the period during which coal will be produced (paragraph 7.6), and it is unlikely that the figure arises from the short period during which onshore mining will occur.

As other building and infrastructure elements have not yet been designed, this is only a partial calculation"

4.9. It is not clear from this language to what extent certain aspects of the project have been included in this estimate. As is clear from the fact that the existing estimate for purchased goods and services comprises a majority of the emissions arising from the construction period, embedded emissions from materials to be used in construction may be very significant. Yet some building and infrastructure elements have not yet been designed, and it appears that these have been omitted entirely. Such emissions could thus have a significant and material effect on the overall estimates.

4.10. In particular it appears that the estimate does not include steel, concrete and other materials to be used in constructing the underground drifts, as this is not listed among the aspects included in para 6.3. Chapter 5 of the ES states that during construction "Drifts will be lined with concrete to provide stability but also to seal the drifts against the inflow of water." (CD1.83, para.5.3.13). These omissions could consequentially alter the estimate for construction emissions.

4.11. It is also not clear the extent to which other aspects of the proposal may have been omitted from the AECOM calculations, including whether all above-ground structures were included, and whether other aspects of the proposal were included or not, such as: the coal handling and processing plant and associated infrastructure, the underground conveyor and associated equipment, and the rail loading facility and associated equipment. Without this information it is not possible to fully understand what GHG emissions were and were not counted and whether the estimate AECOM provides is reasonable.

ii. **Operation**

4.12. The AECOM Report concludes that emissions during the operation of the mine will be 366,564 tCO2e per annum, for each year the mine operates (CD1.147, Table 7.1)

4.13. Given the magnitude of the "purchase goods and services" figure, it appears very unlikely that concrete use for lining the drifts (if required) and laying concrete flooring, where required (as per ES Chapter 5 §5.3.73, CD1.83) has been included in this figure, in the same way this appears to have been omitted from the construction

figures as noted above.

4.14. Paragraph 7.6 of the AECOM Report (CD1.147) states that:

> "A bill of quantities of operational materials is not available. The most significant material requirement during operations is steel roof bolts. Estimates of the embodied carbon for these have been estimated. As other building and infrastructure elements have not yet been designed, this is only a partial calculation."

4.15. This gives rise to the implication that steel roof bolts are the only material that has been included in the purchase goods and services figure. Again, to the extent that significant use of concrete or other materials will be required for construction of the underground aspects of the mine, this could materially increase the GHG estimates for this phase.

4.16. Another area in which the AECOM Report appears to ignore embedded emissions is in relation to the heavy machinery that will be used during mining operations. Modern underground mining methods utilise very large machinery. For instance, the Chapter 5 of the ES (CD1.83) indicates that the machinery to be used will include one or more of the following: Bolter Miner, Continuous Miner (para 5.4.6); Shuttle Cars, Feeder Breaker (para 5.4.48), and a conveyor system capable of transporting 2,500 tonnes of coal per hour (para 5.4.47). The WCM factsheet attached as Appendix 1 indicates that WCM intends to use Bolter Miner(s) that weigh 110 tonnes and measure 13.3 m long, Continuous Miner(s) that weigh 59 tonnes, Shuttle Car(s) which are 9.3 m long, and Feeder Breaker(s) that can load up to 1,350 tonnes of coal per hour. These machines will be used over a period of approximately 25 years (see para 6.7 below), representing most or all of their useable life. Indeed, some of the machinery may need to be replaced during this period.

4.17. Certainly, the embedded emissions of such machinery cannot be ignored. Even if some of the machinery does not serve its entire useable lifetime in this particular mine, a significant proportion of the embodied emissions represented by the machines should be ascribed to these mining operations.

4.18. As will be seen from Table 7.1 fugitive methane emissions represent approximately

three quarters (73-74%[2]) of the annual operational emissions of the mine, as calculated.

4.19. I note that the AECOM Report states that "methane emissions are likely to be captured and utilised from the fifth year of operation" (CD1.147 paras 7.6 and 7.7). However, I am instructed that SLACC's legal team do not consider that any legal mechanism currently exists which would require this, and so it cannot be assumed that methane capture will take place. I understand that there is a proposed condition relating to a "Mine Gas Capture Management Scheme" but that WCM have not provided any assurances as to the minimum level of Mine Gas Capture that would be achieved as part of any emissions mitigation proposals. In any event, it is unlikely that a Mine Gas Capture mechanism would be 100% effective. It would therefore appear that there is little evidence on which to assume any particular level of methane capture will occur.

4.20. Methane is a major contributor to climate change; the IPCC Science report approved by governments on 9th August 2021 finds that methane emissions (which have been rising rapidly, with global concentrations increased by more than 150%) account for almost a third of global temperature increase to date.[3] Methane in the atmosphere has a much shorter lifetime than CO2, so the standard measure of comparison (Global Warming Potential over 100 years, GWP-100) does not reflect its much greater relative impact on the rate of climate change over the next few decades.

4.21. Global methane emissions may be decisive in whether global temperatures exceed 1.5C in next couple of decades. Developments such as the Cumbrian mine will increase the rate of warming over the coming decades. We understand that the developers now propose to 'offset' methane emissions. However, almost all forms of offsets focus on avoiding, reducing or absorbing CO2 emissions, and assess their contributions using the 100-year Global Warming Potential (GWP). They do not directly offset methane emissions. Irrespective of other concerns about offsetting, such activities would NOT substantially offset the impact of methane leakage on

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[2] CD1.147 at §7.7 says 73%. Table 7.1 states 74%. It is possible that the fugitive emissions figure in Table 7.1 includes some other fugitive GHG emissions, which could explain the difference in the figures reported, but it is not stated what these might be or how they have been calculated.

[3] CD8.32; *Figure SPM.2,* Para A2.1. For a comparison of GWPs at different time horizons see Chapter 7, Table 7.15: the GWP-20 for fossil fuel methane (comparison with CO2 impact over a 20-year horizon) is 82.5, compared to the GWP-100 value of 29.8.

climate change over the lifetime of the mine; to do this would require offset volumes several times larger than offsets purchased on the basis of 100-year GWP equivalents (See footnote).

4.22. Emissions due to the use of the coal produced by the mine are excluded from the calculations. These are discussed further below at Section 5.

4.23. It may also be noted that the calculations for operational GHG emissions in the AECOM Report proceed on the basis that the operational phase (i.e. mining operations) will proceed for a 50 year period. I understand that since the preparation of the AECOM Report, Cumbria County Council recommended a condition be added which would require that mining operations cease by no later than 31 December 2049. I further understand that the Applicant has now indicated that it accepts that such a condition should be imposed. Were permission granted, the likely duration of mining operations is therefore likely to be closer to half this duration (assuming permission is granted in 2022, and two years of construction until a point in 2024, this would involve 25-26 years of mining before the end of 2049).

4.24. From the information set out in the AECOM Report, it is not possible to determine how the annual emission figure for the operational phase might change due to the fact that when the AECOM Report was prepared, this was done on the basis that the life of the mine would be 50 years. Certain figures might be higher due to the fact that the overall emissions for the life of the mine (certain aspects of which may be relatively fixed) are now spread over only half as many years. Other figures appear to have been calculated based on normal operations over the course of time, such as e.g. staffing levels or electricity use, and therefore shortening the duration may not materially affect the annual emissions estimate.

4.25. I understand that the Applicant is updating the Environmental Statement associated with the proposal, including in relation to GHG emissions, but that this update has not been provided to date. Once this information becomes available, I will be able to provide further comment. But at this stage, it may be simply be noted that the operational phase emissions estimates appear likely to change when accounting for the updated duration of the mining operations.

iii. Decommissioning

4.26. The AECOM Report concludes that emissions during the decommissioning of the mine will be 17,907 tCO2e per annum, for a period of 1 year (CD1.147, Table 8.1).

4.27. It may be noted that fugitive methane emissions are not calculated or included in the estimates for any period after coal mining ends. However, this is not necessarily a valid assumption.

4.28. Recent research, for instance, indicates that fugitive methane emissions from closed coal mines (i.e. those no longer in operation) may be significant. It was estimated by one recent paper that fugitive emissions from closed mines represented approximately 17% of fugitive methane emissions from all open and closed coal mines, and that this figure was likely to rise to approximately 23% by 2050 as more coal mines close (Appendix 2; Tables S13 and S13 in Appendix 3).

4.29. As far as I am aware, the description of the decommissioning process does not mandate that fugitive methane will be fully captured or that the drifts will be entirely sealed to try to prevent its escape from the mine (ES Chapter 5, CD1.83), and so it should not be assumed that fugitive methane emissions will cease from the date when mining stops. In any event, research has found that seals are not always effective at preventing atmospheric methane emissions over time (Appendix 2 p. 5).

5. AECOM ESTIMATES

5.1. Based on the above, it appears that certain omissions/assumptions in the AECOM analysis mean that there is significant uncertainty surrounding the figures reported for the GHG emissions during construction, operation, and mine decommissioning. In many cases, these figures are likely underestimates of the actual GHG emissions that will arise from the proposed mine.

5.2. As above, it is not possible independently to calculate these emissions figures based on the information which is publicly available, and I have not attempted to do so.

5.3. Certainly, however, the repeated assertions in ES Chapter 19 (CD1.145) and the AECOM Report (CD1.147) that the estimates represent a “worst case” scenario do not appear to be justified on the information available.

6. END USE EMISSIONS

6.1. As has been noted above, AECOM does not include any estimate for the GHG emissions from the use of the coal produced by the mine. This is on the basis of the "perfect substitution" argument; i.e. that the coal from the new mine will 'substitute' for coal which would otherwise be produced by mines elsewhere, so that no GHG emissions increase will occur.

6.2. This proof of evidence does not seek to address that argument in detail. My colleague Professor Paul Ekins has responded robustly to the assumption of "perfect substitution" as contrary to normal economic logic, and I strongly support his arguments on this, including that the assertations in response by the Applicant/Dr Bristow do not in any way amount to plausible reasons to suspend normal economic reasoning – namely, that increasing supply (especially if it is deemed to be competitive) normally also helps to stimulate non-zero increase in demand.

6.3. In addition to these clear economic arguments however, and consistent with my opening observations, one should not overlook the political dimension. For the UK to proceed with a new coal mine (metallurgical or not) despite our position on climate change, international responsibilities as a developed country, cumulative emissions to date, and mature steel consumption, would clearly undermine efforts to slow the development of coal mines anywhere. The fact that this mine is proposed for coking coal production, rather than coal for energy, does not lessen the harmful impact political impact – that is too fine a distinction to prevent accusations of hypocrisy on the part of the UK.

6.4. Hence it is inevitable that proceeding with the Cumbrian mine would increase supply elsewhere (along with the associated emissions from other mines, and transport), create commercial pressure to keep blast furnaces operating to utilise the supply, and depress the global price of metallurgical coal, making it harder for low carbon steel technologies to compete. These are additional reasons to reject the idea that emissions from the coal in use should be neglected.

6.5. Since the Applicant has not identified any valid reason to assume that introducing an additional supply of coal will lead to an equivalent level of curtailed production at other coal mines elsewhere in the world, I set out below the potential emissions from the

end use of the coal to be produced by the proposed mine.

6.6. A reasonable estimate of the GHG emissions from the end use of the 2.78 million tonnes per year of metallurgical coal due to be produced by the mine can be arrived at as follows:

a) The Department for Business, Energy & Industrial Strategy (BEIS) publishes conversion factors each year for the purposes of annual GHG reporting by UK and international organisations.

b) The most recent conversion factors were published on 2 June 2021 (CD8.33). The 2021 conversion factor for coking coal is 3,165.24 Kg CO2e per tonne of coking coal.

6.7. As the proposed mine is projected to produce 2.78 million tpa coking coal, this results in 8.80 million tCO2e per annum. (This figure differs slightly from the figure set out in the SLACC statement of case because updated conversion factors have been produced since the statement was produced.) If the mine were to produce for a period of 25 years, that would result in total GHG emissions from the end use of the coal in the range of 220 million tonnes of CO2e over the life of the mine.

7. SHIPPING EMISSIONS

7.1. The AECOM Report presents a calculation for emissions it is stated would be "displaced" due to reduced shipping distances. The assertion is that since (it is posited) the coal is substituting for coal which would otherwise be shipped from the USA, reduced shipping distances will lead to reduced GHG emissions from transatlantic shipping of the substituted coal. The AECOM Report calculation indicates that these displaced emissions would equate to 98,341 tpa CO2. (CD1.147 para 7.10, 50-year figure divided to provide an annual calculation).

7.2. First, it may also be noted that if more coal is shipped outside the UK than was assumed, or if any of the coal is shipped beyond Europe, the calculation is likely to overestimate the 'displaced emissions' due to reduced shipping distances. Other evidence submitted to this inquiry indicates why it is implausible to assume that the Cumbrian mine will only supply steel plants in the UK and Europe.

7.3. Even if this figure were a reasonable estimate (which I do not accept), the shipping emissions amount to 1.12% of the emissions that would be caused by combustion of the coal produced by the mine.

7.4. Thus, if any more than approximately 1.1% of the coal (over the lifetime of the mine) were not subject completely substituting other production and in fact led to additional coking coal use, this would eclipse the claimed displaced emissions due to reduced shipping.

7.5. A simple calculation can be done to provide an indicative comparison of the potential emissions displaced by reduced shipping distances (taking as given the AECOM calculations in this regard) compared with additional emissions from end use of the coal from the mine that would arise at different levels of substitution. This is accomplished by simply reducing the displaced shipping emissions by the level of coal which is not subject to substitution (For example, if 10% of coal is additional rather than subject to substitution, the shipping emissions displaced will be, as a reasonable approximation, 90% of what would otherwise be expected) and calculating the

emissions from the additional coal use using the method set out above..

7.6. Table 1 sets out this simple calculation for various levels of substitution.

Percentage coal not subject to substitution	**Shipping emissions displaced (AECOM)**	**Additional GHG emissions from coal use**	**Net impact (tpa CO2e)**
1%	97,357	87,994	-9,364
1.5%	96,866	131,991	35,125
2%	96,374	175,987	79,613
3%	95,391	263,981	168,590
5%	93,424	439,968	346,545
10%	88,507	879,937	791,430
20%	78,673	1,759,873	1,681,201
50%	49,170	4,399,684	4,350,513
75%	24,585	6,599,525	6,574,940
100%	0	8,799,367	8,799,367

Table 1

7.7. As can be seen, for instance, if 2.0% of the coal were not subject to substitution (i.e. “only” 98% substitution took place) this would result in additional GHG emissions of approximately 80,000 tonnes CO2e per annum.

7.8. If the figure were 10% (i.e. 90% of the coal was subject to substitution), this would result in additional GHG emissions equating to approximately 790,000 tonnes CO2e per annum.

7.9. Under certain scenarios, eg. if other regions agree to close coal mines and halt development of new mines whilst the UK proceeds anyway, the Cumbrian mine would in effect be supporting extension of steel blast furnace lifetimes, implying much higher substitution. If half of the coal is substituted for and half is additional to the market, this would lead to additional GHG emissions of approximately 4.35 million tonnes CO2e per annum.

8. AECOM GHG SIGNIFICANCE FACTOR

8.1. The AECOM Report (CD1.147) (and ES Chapter 19, which appends it, CD1.145) adopts a "GHG Significance criteria" of 1% of total annual UK Carbon Budgets. AECOM and the applicant thus assert that if GHG emissions from the proposed budget equate to 1% or more "of total emissions across the relevant 5-year UK Carbon Budget period in which they arise," such GHG emissions are considered to be of a high magnitude, and thus of "major adverse significance." (Table 3.1 and 3.2). If the emissions across the relevant 5-year UK Carbon Budget are less than 1% of total emissions across the 5-year UK Carbon Budget period, this is considered to be of "low" magnitude, and thus of "minor adverse significance." (Id.).

8.2. Ultimately I understand that it is a matter for the Inspector (and the Secretary of State) to consider how GHG emissions should weighed in the balance when considering the planning merits of the proposed mine.

8.3. However, I would make certain observations about the appropriateness of a criterion of 1% as advocated by AECOM:

8.3.1. Only the very largest projects in the UK with the greatest GHG emissions would reach the significance criterion adopted by AECOM. AECOM indicated in its Response to SLACC's objections (CD1.70), for instance, that the "Drax Re-power" - a proposal to repower the largest power station in the UK - would meet the criteria, but did not cite any other examples.

8.3.2. SLACC's objection letter of 21 June 2020 (CD3.5) also noted (page 25) that all industry accounts for roughly 21% of total UK GHG emissions. Approximately 39% of these emissions result from "petroleum refining, fossil fuel production and fugitive emissions." Thus, any single fossil fuel production project which reached the 1% threshold advocated by AECOM would be generating emissions of roughly 1/8th of the entire UK sector which, according to a recent House of Commons Committee report

(Appendix 4) contains:

a) 207 offshore oil fields

b) 115 offshore gas fields

c) 8 surface coal mines, and

d) 6 oil refineries

e) (no information was listed on the number of onshore oil and gas wells)

8.3.3. Further, according to the most recent government data (which relates to the year 2018) Cumbria's total CO_2 emissions (including all industry, commercial, and agricultural emissions; domestic gas and electricity use, road and rail transport, and other emissions) – i.e. the emissions from every home, factory, farm and other business in the County – totalled just 1.08% of total UK carbon emissions in 2018.[4] The proposed mine would thus have to almost double the GHG emissions from all sources Cumbria-wide to reach the AECOM significance factor.

8.3.4. In a document dated 3 September 2020, responding to SLACC's objections (CD1.70), AECOM justified its selection of the significance criteria in part because "sectoral and local carbon budgets were not available as an alternative to the use of the UK Carbon Budgets." However, it noted that:

> "Although there are no sectoral budgets, the Committee on Climate Change does provide sectoral emissions allocations that underpin the development of the UK Carbon Budgets. In 'sense checking' our judgement set out above, we have also had regard to the examination of the worst-case GHG emissions from the Proposed Development (i.e. by not excluding methane emissions that will be captured) against the total allotted emissions for 'industry'. On that basis the emissions reach

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4 BEIS, UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2018. Cumbria's total figure is **3,745.9** versus **344,824.3** for UK total (see full dataset tab, available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/894787/2005-18-uk-local-regional-co2-emissions.xlsx - note I have provided a link because the table format in Excel means it can only sensibly be viewed electronically).

0.435% of the industry allocation during the 5th Carbon Budget. These industry allotments are based upon the more conservative 'central' scenario."

8.3.5. Since that time, the Climate Change Committee has published sectoral emissions calculations allocations that underpin the development of the Sixth Carbon Budget, covering the years 2033-2037. These "emissions calculations allocations" (as AECOM terms them) associated with the Sixth Carbon Budget project total emissions from coal mines (both open and closed) to be 0.6 $MtCO_2e$ per annum from 2021-2025, 0.5 $MtCO_2e$ per annum from 2026-2039, and 0.4 $MtCO_2e$ per annum from 2040-2050.[5] The CCC report on the Fuel Supply sector (of which coal mines are a part) indicates that 0.4 MtCO2e per annum are generated by closed coal mines.[6] Thus, these projections indicate that open coal mines are expected to generate no more than 0.2 $MtCO_2e$ (i.e. 200,000 tCO_2e) per annum from 2021-2025, no more than 0.1 $MtCO_2e$ (i.e. 100,000 tCO_2e) per annum from 2026-2039, and no emissions at all from open mines beyond 2040.

8.3.6. As noted above, the AECOM Report concludes that emissions during the operational phase of the mine will be 366,564 tCO_2e per annum (CD1.147 para 7.7). Thus, from the start of mine operations, the Applicant's own estimate of operational emissions would eclipse the Climate Change Committee projections for GHG emissions from all operational coal mines.

8.3.7. Lord Deben, chair of the Climate Change Committee himself noted that the mine was projected to increase UK emissions by a level greater than all the annual emissions the Climate Change Committee have projected from all open UK coal mines in – extraordinarily – raising concern about the proposed mine with Secretary of State Jenrick (CD8.13).

8.3.8. It may also be noted that Lord Deben indicated that the opening of this mine would "increase global emissions and have an appreciable impact on the

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5 https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-Charts-and-data-in-the-report.xlsb, "Fuel Supply", data associated with figure 6.3. Again a link is supplied because the datasets in excel are required to be viewed electronically.

6 Appendix 5 page 38.

UK's legally binding carbon budgets." (CD8.13)

8.4. For all of these reasons, my view is that it would not be reasonable to adopt a significance criterion which does not consider construction and operational GHG emissions to be of major adverse significance unless they equal or surpass 1% of total UK carbon budgets over a 5-year period. Indeed compared to the vast majority of individual facility emission sources in the UK – even including other fossil fuel operations, as noted – the projected Cumbria emissions is an extraordinary large number.

8.5. However, I would also note that even applying the proposed AECOM significance criteria:

8.5.1. The Carbon Budget Order 2021 sets the carbon budget for the sixth budgetary period (2033-2037) at 965 $MtCO_2e$. 1% of this figure is approximately 9.7 $MtCO_2e$.

8.5.2. As noted above, end use emissions of the 2.78 Mtpa coking coal would equate to 8.80 $MtCO_2e$ per annum, or 44 $MtCO_2e$ over the 5-year budget period. Thus the gross emissions from the end use of the coal would equate to 4.56% of the Sixth Carbon Budget, well over the 1% threshold.

8.5.3. When adding in the Applicant's calculated annual operational emissions, the total emissions (five years' end use plus operational emissions) would equate to 4.75% of the UK carbon budget during the Sixth Carbon Budget period.

9. CONCLUSION

9.1 This evidence has primarily considered the scale and implications of emissions from the mine during its construction and operation. I find no grounds for the developer's proposed threshold that these should be treated as "low" magnitude, and thus of "minor adverse significance", if they are less than 1% of UK carbon budgets. On the contrary, in a country with over a million individual businesses, and hundreds of individual fossil fuel facilities and with ambitious targets for steep emission reductions, adding 1% of our total national carbon budget from a single new facility would be a very big number.

9.2 Moreover, the emission estimates offered around construction and operational emissions look to be incomplete. There are particular concerns around methane leakage, provisions to capture the methane are not compelling, and the promise to "offset" methane leakage through purchasing external emission credits are unconvincing, particularly in relation to the large role of methane in affecting the near-term rate of climate change and in the context of ambitious targets, e.g. whether and when global temperatures rise above 1.5C.

9.3 The fact that construction and operational emissions are much smaller than the emissions that would come from use of the coal itself (which by implication would be substantially outside the UK) merely underlines the extent to which proceeding with the mine would be contrary to the UK's general stance and specific stated ambitions and commitments on urgently addressing the impact of climate change.

9.4 As noted, I also work internationally and observe strenuous diplomatic efforts to curtail coal developments including in developing countries. Far from perfectly substituting for production elsewhere, the political impact of proceeding with the Cumbrian mine would increase the likelihood of mines in other countries proceeding, impeding the global effort to tackle climate change and amplifying the adverse impacts of the CO2 and methane emissions associated with the Cumbrian mine itself.

Declaration

The evidence which I have prepared and provide for this appeal reference APP/H0900/V/21/3271069 in this proof of evidence is true, and I confirm that the opinions expressed are my true opinions.