Dean Moor
Solar Farm

Environmental Statement: Chapter 9 – Climate Change

on behalf of **FVS Dean Moor Limited**

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DEAN MOOR SOLAR FARM

ENVIRONMENTAL STATEMENT

CHAPTER 9 – CLIMATE CHANGE

PLANNING INSPECTORATE REFERENCE EN010155

PREPARED ON BEHALF OF FVS DEAN MOOR LIMITED

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, Regulation 5(2)(a)

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9 Environmental Statement (ES) Chapter 9: Climate Change

9.1 Introduction

9.1.1 This chapter of the Environmental Statement (ES) reports on the assessment of the likely significant effects of the Proposed Development on the environment with respect to climate change resulting from the impact of the Proposed Development on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.

9.1.2 This chapter is supported by the following appendices **[REF: 6.3]**:

- Appendix 9.1: Dean Moor Solar ATC Data Summary;
- Appendix 9.2: Dean Moor Construction Emissions Factor Toolkit;
- Appendix 9.3: Dean Moor Solar Carbon Calculations;
- Appendix 9.4: Mean Air Temperature Anomaly;
- Appendix 9.5: Average Annual Precipitation Anomaly;
- Appendix 9.6: Maximum Summer Temperature Anomaly;
- Appendix 9.7: Summer Precipitation Anomaly;
- Appendix 9.8: Minimum Winter Temperature Anomaly;
- Appendix 9.9: Winter Precipitation Anomaly; and
- Appendix 9.10: Annual Cloud Anomaly.

9.1.3 This chapter is supported by the following figure **[REF: 6.2]**:

- Figure 9.1: Dean Moor UK Climate Projection 25km grid square.

9.2 Legislation and Planning Policy Context

Legislation

Climate Change Act 2008

9.2.1 The Climate Change Act 2008[1] ('The Climate Change Act') set a legal duty to reduce greenhouse gas ('GHG') emissions, in particular carbon dioxide ('CO_2') by 80% by 2050. The Climate Change Act 2008 (2050 Target Amendment) Order 2019[2] amended this to increase the target for

[1] HM Government (2008) Climate Change Act 2008 c 27.

[2] HM Government (2019). The Climate Change Act 2008 (2050 Target Amendment) Order 2019.

reducing GHG emissions by 100% from the 1990 baseline ('net zero') by 2050.

9.2.2 This is now the overarching carbon reduction obligation for the UK Government. Carbon budgets set incremental limits on the amount of GHG emissions for the UK over a defined five-year period, with the most recent sixth carbon budget being aligned to achieving net zero by 2050.

Planning Policy

National Planning Policy

9.2.3 Section 4.10 of overarching National Policy Statement ('NPS') for Energy ('EN-1') (2024)[3] sets out matters concerned with climate change adaptation, stating that:

'Climate change is already altering the UK's weather patterns and this will continue to accelerate depending on global carbon emissions. This means it is likely there will be more extreme weather events. As well as climatic and seasonal changes such as hotter, drier summers and warmer, wetter winters, there is also a likelihood of increased flooding, drought, heatwaves, and intense rainfall events, as well as rising sea levels, increased storms and coastal change. Adaptation is therefore necessary to deal with the potential impacts of these changes that are already happening.'

9.2.4 EN-1 goes on to recommend steps for an applicant to take as part of a proposal, stating that *'applicants should take reasonable steps to maximise the use of nature-based solutions alongside other conventional techniques.'*

9.2.5 Furthermore, an applicant's ES should set out how proposals will take account of the projected impacts of climate change adaptation, in accordance with the EIA Regulations and:

'Applicants must consider the direct (e.g. site flooding, limited water availability, storms, heatwave and wildfire threats to infrastructure and operations) and indirect (e.g. access roads or other critical dependencies impacted by flooding, storms, heatwaves or wildfires) impacts of climate change when planning the location, design, build, operation and, where appropriate, decommissioning of new energy infrastructure.

The ES should set out how the proposal will take account of the projected impacts of climate change, using government guidance and industry standard benchmarks…

Applicants should demonstrate that proposals have a high level of climate resilience built-in from the outset and should also demonstrate how proposals

[3] Department for Energy Security & Net Zero (2024) Overarching National Policy Statement for Energy (EN-1)

can be adapted over their predicted lifetimes to remain resilient to a credible maximum climate change scenario.'

9.2.6 EN-1 also sets out measures and recommendations to address (GHG) climate change mitigation as a generic impact.

9.2.7 EN-1 states that *'All proposals for energy infrastructure projects should include a GHG assessment as part of their ES'* which should include:

- *'A whole life GHG assessment showing construction, operational and decommissioning GHG impacts.*
- *An explanation of the steps that have been taken to drive down the climate change impacts at each of those stages.*
- *Measurement of embodied GHG impact from the construction stage.*
- *How reduction in energy demand and consumption during operation has been prioritised in comparison with other measures.*
- *How operational emissions have been reduced as much as possible through the application of best available technology for that type of technology.*
- *Calculation of operational energy consumption and associated carbon emissions.*
- *Whether and how any residual GHG emissions will be (voluntarily) offset or removed using a recognised framework.*
- *Where there are residual emissions, the level of emissions and the impact of those on national and international efforts to limit climate change, both alone and where relevant in combination with other developments at a regional or national level, or sector level, if sectoral targets are developed.'*

9.2.8 The NPS for Renewable Energy Infrastructure (EN-3)[4] highlights the UK Government's commitment to solar energy as a key part of the strategy for low-cost decarbonisation of the energy sector and the transition to net zero.

9.2.9 The *'Powering Up Britain'*[5] Policy Paper sets a target to increase solar deployment by 2035 (up to 70 gigawatt ('GW')), against a baseline of 14GW solar installed as of 2021.

9.2.10 Furthermore, the British Energy Security Strategy[6] highlights that the Secretary of State should consider the positive role that large-scale

[4] Department for Energy Security & Net Zero (2024) Overarching National Policy Statement for Renewable Energy Infrastructure (EN-3)

[5] HM Government (2023) Powering Up Britain

[6] HM Government (2023) Policy paper British energy security strategy

renewable projects play in the mitigation of climate change, the delivery of energy security and the urgency of meeting net zero.

9.2.11 The Climate Change Committee ('CCC') report on progress in reducing emissions[7] outlines that an average annual deployment rate of 4.3GW is required to deliver 70GW of solar by 2035.

Local Planning Policy

9.2.12 As of 1 April 2023, Allerdale Borough Council (ABC) merged with Copeland Borough Council and Carlisle City Council to become Cumberland Council (the Council), which is now the administrative authority where the Site is located. The Site is located within the former administrative boundary of ABC.

9.2.13 The ABC Local Plan is considered relevant to the Proposed Development, as there are no new planning policies that have been adopted following the formation of the Council in April 2023. The Council has inherited the ABC Local Plan.

9.2.14 The ABC Local Plan (Part 1) – Strategic and Development Management Policies[8] was adopted in July 2014 and sets out a vision for ABC until 2029. The following policies are considered most relevant to the climate change assessment:

Strategic Objective Climate Change and Sustainability

- *'SO1a Reduce Allerdale's carbon footprint and support a low carbon future.*
- *SO1b Ensure a comfortable, resilient and liveable environment across Allerdale by ensuring development adapts to, and mitigates the effects of climate change. […]*
- *SO1e Support and encourage construction methods that seek to reduce energy consumption, use renewable energy sources, minimise waste and encourage recycling.*
- *SO1f Promote renewable and low carbon energy production in the Plan Area.*
- *SO1g Sustainable and effective use and re-use of land and buildings and protect the most versatile agricultural land from development.'*

[7] Climate Change Committee (2023). Progress in Reducing Emissions 2023 Report to Parliament.

[8] Allerdale Borough Council (2014). The Allerdale Local Plan (Part 1) - Strategic and Development Management Policies.

Policy S19 Renewable Energy and Low Carbon Technologies

'The Council will seek to promote and encourage the development of renewable and low carbon energy resources given the significant wider environmental, community and economic benefits. Proposals where impacts (either in isolation or cumulatively) are, or can be made acceptable will be permitted.'

9.2.15 Further policies within the ABC Local Plan such as S22 Transport Principles, S24 Green Infrastructure, S29 Flood Risk and Surface Water Drainage, DM12 Sustainable Construction, and DM17 Trees, Hedgerows and Woodland are considered relevant to climate change mitigation and adaptation. However, these policies are captured in respective technical chapters in this ES.

9.2.16 In March 2020, ABC agreed an action plan[9] for tackling climate change. The motion adopted by ABC to address climate change set targets to ensure emissions from its estate and activities are carbon neutral by 2030. At the same time ABC ratified commitment to the Zero Carbon Cumbria Partnership and its net zero target for the whole county by 2037. In doing so, it committed to putting in place policies for ABC to support the Government's statutory obligation to achieve net zero by 2050.

9.3 Assessment Methodology

General Approach

9.3.1 'Climate' is generally understood to mean the weather conditions prevailing over a long period of time and climate change refers to changes in recorded long term climate trends, which is anthropogenically driven. As a topic for the assessment within EIA, climate change is relatively new. Guidance is evolving and there is no prescribed way in which climate change should be incorporated into an ES, however, some guidance has been prepared by the IEMA, discussed further below. It sets out the two main approaches that can be taken to determine a project's climate change impact. These involve identifying:

a. The direct and indirect influence of the Proposed Development on climate change resulting from GHG emissions (climate change mitigation); and

[9] Allerdale Borough Council (2022). The Council's action plan to address climate change

b. The vulnerability of the Proposed Development to climate change (climate change adaptation/ resilience).

9.3.2 The approach to climate change resilience therefore differs from the EIA methodology set out in Chapter 2 – EIA Methodology **[REF: 6.1]**. The methodology followed is set out below and is considered appropriate for this topic.

Climate Change Mitigation

IEMA Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance[10]

9.3.3 IEMA have published guidance (the 'IEMA GHG Guidance') to seek to assist practitioners with addressing GHG emissions assessment and mitigation in EIA. The guidance indicates that a 'good practice' approach is advocated where GHG emissions are always considered and reported but at varying degrees of detail depending on the project.

9.3.4 The IEMA GHG Guidance places a much more prominent role for mitigation within the EIA. It is no longer an element to be considered towards the later stages of the EIA process. Instead, mitigation should be considered from the outset and throughout the project's lifetime.

9.3.5 The guidance sets out that there are several different assessment methods available for measuring and quantifying the GHG emissions associated with the built environment, ranging from general guidance to form standards for the use of an EIA. The IEMA GHG Guidance recognises that *'qualitative assessments are acceptable, for example: where data is unavailable or where mitigation measures are agreed early on in the design phase with design and engineering teams'.*

9.3.6 IEMA guidance emphasises the need for proportionality in the context of national, sector and local GHG emissions. Given the nature of the application, a qualitative approach to assessing the GHGs of the Proposed Development has been undertaken in relation to GHG emissions from construction works.

[10] IEMA (2022). Assessing Greenhouse Gas Emissions and Evaluating their Significance.

9.3.7 The guidance outlines that an EIA must give proportionate consideration to whether and how a development will contribute to net zero by 2050. Therefore, the crux of significance is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions, but whether it contributes to reducing GHG emissions relative to a comparable baseline, consistent with a trajectory towards net zero by 2050. Notwithstanding, likely significant effects from the nature and magnitude of GHGs from the Proposed Development are still relevant for purposes of the EIA, under Schedule 4 of the EIA Regulations.

Approach to the Assessment of Climate Change Mitigation

9.3.8 This part of this assessment considers the direct and indirect effects of the Proposed Development on climate change. The GHG Protocol[11], which sets globally standardised frameworks for the measurement and management of GHGs, defines direct and indirect emissions as follows:

a. Direct GHG emissions are emissions from sources that are owned or controlled by the operator. Examples include vehicular emissions, plant use (such as generators and Non-Road Mobile Machinery) and independent on-site energy generation (oil, gas, and diesel); and
b. Indirect GHG emissions are emissions that are a consequence of the construction, operational, or decommissioning activities of the Proposed Development but are a result of procurement and/ or activities controlled by another entity. Examples include energy generation, and the manufacture of materials used in the construction process (known as 'embodied' carbon).

Assessing Construction Vehicle GHG Emissions

9.3.9 The climate change impact is assessed as the difference between the carbon emissions associated with the baseline and that associated with the construction of the Proposed Development. The Study Area for carbon emissions assessment is defined by the Site Location Plan (Figure 1.1) **[REF: 6.2]** and the Study Area for the Transport Statement ('TS') (Appendix 2.5) **[REF: 6.3]** which utilises the transport network assessed.

9.3.10 The baseline conditions of the Site are based on the trip rates and existing published data sets (Appendix 9.1 Dean Moor Traffic Flows). The baseline for the Site is defined as the current carbon emissions arising from

[11] GHG Protocol

vehicles in the study area. In terms of transport-related emissions, whilst forecasting can be carried out to project potential increases in traffic flows, and, by inference, the impact on CO_2 levels, the impact of technological changes is harder to infer. This includes the introduction and uptake of electric vehicles. Hence, the assessment in this broadly assumes a conservative uptake of electric vehicles ('EV'), other than assumptions which are inherent in the Emissions Factors Toolkit (EFT V12.1)[12] utilised for the assessment (Appendix 9.2 Dean Moor Emissions Factor Toolkit).

9.3.11 As the Proposed Development would generate minimal vehicle movements once operational, only a construction phase vehicular emissions assessment has been undertaken. As shown in the Scoping Report and corresponding Scoping Opinion (Appendices 2.1 and 2.2) **[REF: 6.3]**, an assessment of vehicular emissions during the decommissioning phase has also been scoped out on the basis that effects would be no greater than the construction phase and the decommissioning phase is too far in the future to be able to accurately predict traffic flows and emissions.

Traffic Flow Data

9.3.12 A full analysis of the traffic data relevant to climate change is included in the TS (Appendix 2.5). The management of traffic during the construction phase is available from the Outline Construction Traffic Management Plan ('OCTMP') (Appendix 5.2) **[REF: 6.3]**.

9.3.13 As the distances to be travelled by vehicles associated with the Proposed Development is unknown, the most recent UK average journey distance is defined by the National Travel Survey[13] provided by the Department for Transport as 10.46km (6.5 miles). This is utilised as a constant factor across the assessment.

9.3.14 To assess the effect of the Proposed Development during the construction period, the average peak construction traffic flows from Section 4.2 of the

[12] DEFRA, August 2024, Emissions Factors Toolkit v12.1. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/ Accessed October 2024

[13] National Statistics. National Travel Survey: 2023 data tables, Table NTS0303d. [Online]. Available at: https://www.gov.uk/government/statistics/national-travel-survey-2023 Accessed October 2024

OCTMP have been utilised in the EFT assessment. These average peak construction traffic flows are associated with the delivery and installation of solar PV panels across the course of the construction programme, based on an 18-month construction programme and a 5.5 day working week. The values used in the EFT assessment are shown in section 9.5, Table 9.9.

Vehicle Emissions Factors

9.3.15 To calculate construction phase vehicular emissions a comparison was made between the baseline traffic flow projection and the additional traffic due to the Proposed Development. The road type utilised in the EFT assessment was 'England – Not London' and 'Rural' to reflect the Sites location. The EFT guidance[14] defines Rural (Not London) as *'for roads that are not motorways or similarly fast flowing roads outside urban areas.'*

Construction Works

9.3.16 A qualitative assessment of the Proposed Development's impacts on climate change by its potential to emit GHGs during the construction phase has been included. This is based on professional judgment and understanding of construction phase sources of emissions.

Operational Emissions and Carbon Reductions

9.3.17 An assessment of likely carbon savings realised through the provision of renewable solar energy has been undertaken for the duration of the lifespan of the Proposed Development (modelled to be 40 years). This assessment is based on the stated maximum export of renewable electricity (from the Proposed Development, which is outlined in Chapter 3 – Site and Development Description) **[REF: 6.1]**.

9.3.18 The carbon factor (or carbon intensity)[15] of the future electricity grid is derived from the DESNZ valuation of energy use and greenhouse gas emissions for appraisal[16].

[14] DEFRA. Emissions Factors Toolkit v12.1 User Guide (August 2024). Available at: https://laqm.defra.gov.uk/wp-content/uploads/2024/08/EFTv12.1-user-guide-v1.pdf Accessed October 2024

[15] Measurement of CO_2 produced per unit (kWh) of electricity produced in the UK in 2024.

[16] DESNZ (2023). Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal, Table 1. Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal Accessed October 2024

9.3.19 The efficiency of solar energy as an energy generation type is taken from the Government Digest of United Kingdom Energy Statistics ('DUKES')[17] which provides a 'load factor' (a proxy value for utilisation). This is a national figure and does not consider localised irradiation levels, nor Site-specific attributes. Therefore, this assessment is considered a reasonable assessment of the potential carbon reductions compared to the future baseline scenario.

9.3.20 To calculate the carbon saving (tCO_2e/year) the MWh/Year is calculated by multiplying hours in a year (8,766) by the stated maximum output of the Proposed Development (150MW). This is then multiplied by 'load factor' to give a MWh/Year / Load Factor value, which is then multiplied by the carbon factor outlined above. The calculation is as follows:

Annual Energy Output (MWh) = Maximum Export Capacity (MW) x Load Factor x Total hours in a Year

Annual Carbon Reduction (tCO_2e) = Annual Energy Output (MWh) x Carbon Factor

9.3.21 To calculate the carbon saving (tCO_2e/year) from displacing purely fossil fuel sources, the same calculation outlined in the paragraph above is undertaken. However, the carbon factor used is an average between kg of CO_2e per kWh from natural gas and coal. These sources were chosen as the dominant fossil fuel sources in the UK electricity generation mix. It should be noted that the values from this method are not used in determining the significance of effect in this chapter as it is considered that a baseline made up of fossil fuel sources only is not a true representation of the current UK electricity generation mix baseline.

9.3.22 Calculations for carbon savings from the Proposed Development are provided in Appendix 9.3: Dean Moor Carbon Calculations.

Temporal Scope

9.3.23 The assessment assumes a Proposed Development completion year of 2027, (see Chapter 5 Construction and Decommissioning Methodology

[17] Department for Energy Security and Net Zero (2024) Available at: https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes Accessed October 2024

and Phasing for information) **[REF: 6.1]**. The data available to allow an assessment of GHG emissions from vehicle movements associated with the construction of the Proposed Development is limited to the modelling scenarios assessed in the TS (Appendix 2.5).

9.3.24 As outlined above, the Proposed Development has an operational lifespan of 40 years. The carbon savings from renewable energy generation will therefore be calculated per annum, and for the 40-year lifespan. The projected carbon factor for 2027 has been used in the assessment of operational carbon reduction. The generation-based emissions factor has been used as a measurement of GHG emissions per unit of electricity generated and the grid average column is used in the calculations for foot printing.

Spatial Scope

9.3.25 The data available to allow an assessment of GHG emissions from vehicle movements associated with the construction of the Proposed Development is aligned with the study area of the TS (Appendix 2.5). The study area covers three road links surrounding the Site, which was considered an acceptable approach by the Council, as outlined in the TS. The study area links are included in Appendix 9.1: Dean Moor Traffic Flows.

9.3.26 For the assessment of operational emissions and carbon reductions, savings at the local (the Council) and regional (Cumbria) scale will be made, based on recorded GHG emissions from different sources (as shown in Tables 9.3 and 9.4). Emission savings will also be contextualised against the national, regional, and local carbon budgets.

Significance Criteria

9.3.27 In the absence of any significance criteria or a defined threshold, it might be considered that all carbon emissions are significant, and beneficial effects only arise if there is a net loss in GHG emissions. The IEMA GHG Guidance outlines that it is essential to provide context for the magnitude of GHG emissions reported in the ES in a way that aids evaluation of effects. The impacts have therefore been defined as either negligible,

beneficial, or minor, moderate, or major adverse as set out in Table 9.1 below. As per the IEMA GHG Guidance, when evaluating significance, all new GHG emissions contribute to an adverse environmental effect. However, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative, or negligible.

9.3.28 IEMA provide examples of significance criteria, which are outlined in Table 9.1. These examples have been utilised alongside professional judgement for assessing the impact of the Proposed Development at the national level.

9.3.29 The IEMA GHG Guidance states that the significance of the impact of GHG emissions should be determined by whether a project contributes to reducing GHG emissions relative to a comparable baseline, consistent with a trajectory towards net zero by 2050. The net zero trajectory is mandated within the relevant carbon budget through which the specific activity falls.

9.3.30 Effects that are described as 'minor' or 'negligible' are determined to be 'Not Significant' and effects that are described as 'moderate', or 'major' are determined to be 'Significant'.

Table 9.1: IEMA GHG Guidance Emissions Significance Criteria

Effect Significance	Description of Criteria
Beneficial	*'The project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.'*
Negligible	*'The project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.'*
Minor	*'The project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with*

Effect Significance	Description of Criteria
	minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.'
Moderate	*'The project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.'*
Major	*'The project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.'*

UK Carbon Budgets

9.3.31 Carbon Budgets are a five-year statutory cap on total GHGs, introduced under the Climate Change Act (as amended). The Climate Change Act originally targeted an 80% reduction in GHGs by 2050 until it was amended in 2019; therefore, the first five carbon budgets (with the fifth budget running from 2028-2032) are aligned to the 80% reduction.

9.3.32 The sixth carbon budget is aligned to the new objective of achieving a 100% reduction in GHGs and covers the period from 2033-37. As the sixth carbon budget is the most recently adopted budget (enacted through the Carbon Budget Order 2021[18]), the sixth carbon budget is utilised within this ES Chapter for operational assessments, whilst the fourth Carbon Budget (2023-2027) has been adopted for the construction phase assessments, as the construction phase is anticipated to take place entirely within this carbon budget.

Local Carbon Budgets

9.3.33 To provide context for the Proposed Development and the contribution it makes to climate change, national and local 'carbon budgets' have been utilised alongside professional judgment and the IEMA GHG Guidance.

[18] HM Government (2021). The Carbon Budget Order 2021.

9.3.34 The Tyndall Centre carbon budget tool[19] scales down the UK national carbon budget between LPAs, to show how each LPA can make its 'fair' contribution towards a 1.5-degree warming trajectory and net zero.

9.3.35 Table 9.6 in section 9.4 presents the ABC CO_2 only budget in the format of the 5-year carbon budget periods in the Climate Change Act. To align the 2020 to 2037 carbon budget with the budget periods in the Climate Change Act, estimated CO_2 emissions for ABC for 2018 and 2019 have been based on DESNZ provisional national emissions data for 2018 and assuming the same year on year reduction rate applied to 2019.

9.3.36 A carbon budget for Cumbria has also been aggregated using the Tyndall Centre tool by combining the six LPAs[20] that have merged to form the two unitary authorities in Cumbria (Cumberland Council and Westmoreland and Furness Council). Table 9.7 presents the Cumbria carbon budget in the format of the 5-year carbon budget periods in the Climate Change Act.

UK GHG Statistics

9.3.37 DESNZ[21] reports on energy and emissions projections by source, and reports on local and regional GHG emissions. This has allowed the collection of baseline data for the period 2005-2022 for the Council, as well as Cumbria and nationally.

9.3.38 The local and regional GHG emissions presented in Tables 9.3 and 9.4 differ from the PEIR as the DESNZ dataset has been updated following PEIR publication to account for the formation of the Council in April 2023.

Climate Change Resilience (Adaptation)

IEMA: Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation[22]

9.3.39 The Guide to Climate Change Resilience and Adaptation (June 2020) ('the 2020 IEMA Guidance') provides a framework for the effective

[19] Tyndall Centre for Climate Change Research (2023). Available at: [redacted]/ Accessed October 2023

[20] Allerdale, Barrow-in-Furness, Carlisle, Copeland, Eden, and South Lakeland

[21] DESNZ 2024. Available at: https://www.gov.uk/government/statistics/uk-local-authority-and-regional-greenhouse-gas-emissions-statistics-2005-to-2022 Accessed October 2024

[22] IEMA June 2020: IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation

consideration of climate change resilience and adaptation in the EIA process in line with the EIA Regulations.

9.3.40 A step-by-step method presented within this guidance is set out below and has been incorporated within this chapter:

- *'Step 0 – Building climate resilience into the project by considering incorporating resilience during the designs stage and by identifying appropriate mitigation measures;*
- *Step 1 – Scoping for the EIA; e.g. identify the climate change projections for use in the assessment and identify key climatic variables relevant to the project;*
- *Step 2 – Defining the future (climate) baseline; define future conditions using selected climate change projections (i.e. increase in rainfall, increase in mean summer temperature and wind strength);*
- *Step 3 – Identifying and determining sensitivity of receptors;*
- *Step 4 – Reviewing and determining magnitude of the effect; consider probability and consequence to determine the magnitude of the effect;*
- *Step 5 – Determination of significance;*
- *Step 6 – Developing additional adaptation / EIA mitigation measures;*
- *Step 7 (Development permitted) – Monitoring and adaptive management by implementing mitigation measures.'*

9.3.41 The 2020 IEMA Guidance also introduced the concept of 'In-Combination Climate Impacts' ('ICCI'). An ICCI is when a projected future climate impact (e.g., increase in temperatures) interacts with an effect identified by another topic and exacerbates its impact. The ICCI have been assessed throughout the relevant chapters within this ES and are summarised at section 9.5.

9.3.42 The 2020 IEMA Guidance stresses that climate change should be an integrated consideration within the impact assessment, by undertaking an assessment that is *'proportional to the evidence base available to support any assessment'* and focusses on impacts *'specific to project'*. Assessments in line with this guidance are to be proportionate in their approach and not include superfluous assessment that does not address likely material issues.

Approach to the Assessment of Climate Change Resilience (Adaptation)

9.3.43 The vulnerability of the Proposed Development to climate change considers effects on any development and infrastructure as a receptor (this is referred to in IEMA Guidance (2020) as 'Climate Change Resilience and Adaptation'). A high-level climate change risk and resilience assessment has been undertaken to identify the potential risks of climate change on the Proposed Development and to highlight design measures to increase its resilience and adaptation to climate hazards, such as extreme hot and cold weather, intense rainfall, high winds, and storm events.

9.3.44 In line with 2020 IEMA Guidance, this chapter utilises climate projections using the 'worst case scenario' of future weather projections, and therefore Representative Concentration Pathway ('RCP')[23] 8.5 scenarios are used. RCP 8.5 refers to the concentration of carbon that delivers global warming at an average of 8.5 watts per square meter across the planet. The RCP 8.5 pathway delivers a temperature increase of about 4.3˚C by 2100, relative to pre-industrial temperatures and is considered a 'worst-case scenario'. The 2020 IEMA Guidance sets out that the use of the high emissions scenarios (Met Office UKCP18 RCP8.5)[24] is generally recommended, unless the case can be made for using a different, lower emissions scenario.

9.3.45 Climate projections have been derived from the UKCP18 50th Percentile[25] Climate Projections at 25km grid square 312500, 512500 (where the Site is located, as shown in Figure 9.1 Dean Moor UK Climate Projection 25km grid square) using baseline 1981-2000 scenario RCP 8.5.

9.3.46 This worst-case scenario assumes a 'business-as-usual' pathway through a combination of assumptions about high population levels, relatively slow income growth with modest rates of technological change and energy

[23] Established by the Intergovernmental Panel on Climate Change (IPCC).

[24] Met Office (2018) UKCP18 Guidance: Representative Concentration Pathways Accessed From: UKCP18 Guidance: Representative Concentration Pathways.

[25] The 50th percentile is chosen as it is the average from the typical plume which shows the 5th, 10th, 25th, 50th, 75th, 90th and 95th percentiles for the chosen emissions scenario.

intensity improvements, leading in the long term to high energy demand and GHG emissions in absence of climate change policies.

9.3.47 Considering the nature and location of the Proposed Development, the following climate related parameters/ hazards are also considered to have the potential to impact upon the operation of the Proposed Development:

- Wind (speed, direction and gustiness);
- Temperature;
- Precipitation; and
- Cloud cover.

9.3.48 This part of the chapter assesses the effects of climate change on the Proposed Development by:

a. Establishing the existing baseline conditions (1991-2020 as the latest published data set);
b. Determining future baseline conditions by reviewing UK climatic projections (2018) up to 2077 (rationale for temporal scope explained below) (including identifying sensitive receptors);
c. Assessing the likely significant effects of the Proposed Development, with embedded mitigation measures incorporated, on the established baseline and future conditions;
d. Identification of additional mitigation measures; and
e. Assessment of residual effects.

Spatial Scope

9.3.49 Scientific evidence shows that the climate is changing; however, there are significant uncertainties in the spatial occurrence within the climate projections utilised in this assessment (25km grid square where the Site is located) (Figure 9.1). The UKCP18 are not predictions or forecasts but simulations of potential scenarios of future climate under a range of hypothetical emissions scenarios and assumptions and therefore cannot be treated as exact or factual.

Temporal Scope

9.3.50 In considering future climate change scenarios, managing climate change resilience and adaptation, the 2020 IEMA guidance recommends the use

of the UKCP platform[26]. The latest UKCP is UKCP18 which provides updated observations and climate change projections up to 2100 in the UK; therefore, this assessment assumes projections for 2077 as the most far-reaching projection and is considered to be appropriate for the design life of the Proposed Development (modelled to be 40 years following the earliest possible completion of the Proposed Development in 2027). However, 2077 accounts for any possible delays to the Proposed Development regarding construction and connection to the DNO. This is therefore considered to be a worst-case scenario.

9.3.51 As the construction phase is anticipated to be 18 months, it is considered that changes in the climate that may give rise to potential significant effects are not anticipated to manifest in this timeframe. Therefore, a climate resilience assessment during the construction phase of the Proposed Development has been scoped out of this chapter and is only undertaken for the operational phase. An assessment of climate resilience has also been scoped out for the decommissioning phase due to uncertainties of projecting climate in 40 years within a 12-month period (the anticipated timeframe of the decommissioning phase).

Defining Significance and Significance Criteria

9.3.52 This chapter draws on recognised climate change projections, existing guidance, and emerging good practice, as well as relevant information presented in this ES to ensure that appropriate project mitigation and risk management is included in the Proposed Development design. In particular, this chapter draws upon the findings of Chapter 8 – Biodiversity **[REF: 6.1]**, as well as the Flood Risk Assessment ('FRA') (which includes the Outline Drainage Strategy 'ODS')) (Appendix 2.4) **[REF: 6.3]**, the OCTMP (Appendix 5.2), and the TS (Appendix 2.5).

9.3.53 An assessment of the effect significance regarding the Proposed Development's vulnerability to climate change is provided qualitatively with the most significant risks and opportunities for the project identified using professional judgement. The criteria for identifying the vulnerability of a

[26] DEFRA (2023). UK Climate Projections User Interface. Available at: [redacted] Accessed October 2023

receptor are outlined in Chapter 2 – EIA Methodology and, for the purposes of this chapter, the sensitivity of receptors to change is considered as high. The climate change risk assessment is included in Table 9.2 below.

9.3.54 This view has been taken given the longevity of the lifespan of the Proposed Development (modelled to be 40 years) and in consideration with the uncertainty of the projected pathway of climate change. Professional judgement is drawn as to whether climate changes (taking into account the future baseline) are likely to lead to a significant effect on the Proposed Development or not.

Consultation

9.3.55 The consultation process for the Proposed Development is set out in Chapter 2 – EIA Methodology.

9.3.56 The comments provided by the Planning Inspectorate in their Scoping Opinion (Appendix 2.2) **[REF: 6.3]**, and where these are addressed is set out in Table 9.2 below.

Table 9.2: Planning Inspectorate EIA Scoping Opinion Comments

Ref	Topic	Summary of Consultation Response	Response to Consultee
3.5.1	*'Impact of the provision of renewable energy on climate change – construction and decommissioning'*	*'The Inspectorate is content to scope this matter given that no energy will be transported to the national grid during construction or decommissioning.'*	Scoped out of this ES Chapter.
3.5.2	*'Vulnerability to climate change – construction and decommissioning'*	*'The Inspectorate is content to scope this matter out during construction on the basis that climatic conditions are unlikely to change over the construction period (18 months). With regard to decommissioning, the Applicants attention is drawn to ID 3.5.4 below.'*	Scoped out of this ES Chapter.
3.5.3	*'Carbon emissions associated with vehicle movements – operation and decommissioning'*	*'The Inspectorate is content that carbon emissions associated with the anticipated operational phase vehicle visits are unlikely to result in significant effects and agrees to scope this matter out of further assessment. Limited information*	The Applicant has scoped out operational vehicle movements on the basis that vehicle emissions associated with the anticipated 1-

Ref	Topic	Summary of Consultation Response	Response to Consultee
		has been provided regarding the decommissioning phase; however, the Inspectorate considers that carbon emissions from vehicle movements would be no greater than those assessed within the construction phase. With regard to a decommissioning phase assessment, the Applicants attention is drawn to ID 3.5.4 below.'	2 operational vehicle trips per week are expected to be negligible. An assessment of vehicular emissions during the decommissioning phase has also been scoped out on the basis that effects would be no greater than the construction phase and the decommissioning phase is too far in the future to be able to accurately predict traffic flows and emissions. Further information is available from Chapter 5 - Construction and Decommissioning Methodology and Phasing, Appendix 5.2 (OCTMP) and Appendix 2.5 (TS).
3.5.4	*'Decommissioning phase assessment'*	*'The Scoping Report proposes to scope out an assessment of the decommissioning phase on the basis that there are uncertainties surrounding this phase. The Inspectorate would expect to see a Decommissioning Plan, agreed with the Local Authority, secured through the inclusion of an outline Decommissioning Plan or similar with the Application. The ES should clearly set out if and how impacts to/from climate change are to be assessed for the decommissioning phase.'*	As requested, it has been considered if climate change will have an impact on the decommissioning phase and it has been scoped out of the climate change assessment. An assessment of vehicular emissions during the decommissioning phase has also been scoped out on the basis that effects would be no greater than the construction phase and the decommissioning phase is too far in the future to be able to accurately predict traffic flows and emissions.

Ref	Topic	Summary of Consultation Response	Response to Consultee
			The climate resilience assessment has also scoped out decommissioning on the basis that climatic conditions are unlikely to change over the decommissioning phase (approximately 12 months). A Framework Decommissioning Management Plan ('FDMP') at Appendix 5.4 **[REF: 6.3]** (a DMP suite will be secured via a DCO Requirement).
3.5.3	*'Greenhouse gas emissions (GHG) and design flexibility'*	*'Where flexibility is being sought on the types of panels or batteries within the Proposed Development, the ES should present a worst-case assessment for the options under consideration.'*	The limitation of a quantifiable assessment of GHG from the types of panels used is presented in paragraph 9.3.57 below. As outlined in section 6.2 of the OCTMP (Appendix 5.2), the Applicant has committed to preferring suppliers that are members of best practice schemes such as FORS and CLOCS. In addition, the Applicant will seek to use local suppliers if deemed efficient and appropriate and if they meet the standards for materials and operations. This will contribute to a reduction of embodied carbon GHG emissions during construction.

9.3.57 Following statutory consultation on the PEIR, no comments have been received in relation to climate change that require consideration within this ES chapter.

Limitations and Assumptions

Climate Change Mitigation (GHG Emissions)

9.3.58 The assessment of climate change and GHG emissions is based on available best practice information. A limitation of the assessment is that there is currently a lack of knowledge on the sourcing of materials to be used as part of the Proposed Development (such as the sourcing of solar PV panels). A quantitative GHG assessment of the embodied carbon of materials used has therefore not been undertaken and it is also not possible to quantify a worst-case scenario. This approach is pursuant to Schedule 4, Paragraph 6, of the EIA Regulations 2017, which states that an ES should include:

'A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.'

9.3.59 The initial modelling of carbon emissions for vehicles during construction is based on professional judgement (further information from the OCTMP (Appendix 5.2)), as real-time carbon emissions associated with the Proposed Development are not available.

9.3.60 It is noted that in February 2025 the statutory report for the seventh carbon budget (2038 to 2042) has been presented to Secretary of State pursuant to Section 34 of the Climate Change Act 2008[27]. However, as this carbon budget is yet to be enacted through the Carbon Budget Order, it has not been utilised for this assessment.

9.3.61 There are inherent assumptions and limitations with adopting local carbon budgets for contextualisation. Local carbon budgets are assumed from the UK national carbon budget and local carbon budgets are not legally binding. Furthermore, carbon budgets are across a 5-year period, whereas

[27] Climate Change Committee (2025). The Seventh Carbon Budget.

the construction and operational GHG assessment only compares the effects from emissions for one year within a carbon budget.

9.3.62 Local carbon budgets do not distinguish carbon emissions into different sectors (domestic, transport, industrial and commercial) as is the case in the DESNZ data. Therefore, emissions from construction phase transport, for example, will be compared against the entire ABC carbon budget, as opposed to an allocated transport budget based on transport emission sources.

9.3.63 The assessment of operational carbon savings has used a carbon factor projection for 2027 (the proposed opening year of the Proposed Development) from DESNZ. It should be noted that the assessment of operational carbon reductions therefore overestimates the annual carbon reduction figure reported, by virtue of the carbon factor reducing every year of the operational lifespan of the Proposed Development, due to the decarbonisation of the grid. Notwithstanding, it is important to note that the Proposed Development is a contributing factor in the carbon factor reducing as the Proposed Development itself would contribute to the decarbonisation of the grid once operational.

9.3.64 The assessment of the operational carbon savings from the Proposed Development is based on several assumptions, including that the energy created would only be distributed locally (i.e., within the historic administrative boundary of the Council or the region of Cumbria).

Climate Change Resilience (Adaptation)

9.3.65 The UKCP18 climate change projections are not climate change predictions as they include a degree of uncertainty. As stated in the UKCP18 Science Overview Report[28].

'While the global and regional projections of future climate use the latest climate models and are diverse they cannot cover all potential future climate outcomes out to 2100 (or beyond in the case of sea level) …'

[28] Met Office (2022). UKCP18 Science Overview Report.

9.3.66 The 21st century projections presented in this report are produced for the RCP climate change scenarios. The results are therefore subject to any inherent limitations of the assumed emissions scenarios including:

'The probabilities represent the relative strength of evidence supporting different plausible outcomes for UK climate, based on the climate models, physical insight, observational evidence and statistical methodology used to produce them. However, they may not capture all possible future outcomes, because, for example, some potential influences on future climate are not yet understood well enough to be included in climate models.'

9.3.67 The assessment of the Proposed Development's direct contributions to climate change, and the resultant resilience of the Proposed Development has been based on the information available at the time of writing. A qualitative appraisal of resilience to climate change is provided for the Proposed Development.

9.3.68 The following disciplines identified in other ES topic chapters and other supporting documents, are considered potentially sensitive to climate change:

- Landscape and Visual **[REF: 6.1]**;
- Biodiversity **[REF: 6.1]**;
- Ground Conditions **[REF: 6.1]**; and
- Flood Risk Assessment and Outline Drainage Strategy **[REF: 6.3].**

9.4 Baseline Conditions

Climate Change Mitigation (GHG Emissions)

9.4.1 The current GHG emissions of the Council are provided in Table 9.3 below. A breakdown of GHG emissions from the four main sources for the Council are provided from 2005-2022, utilising the most recent dataset. GHG emissions for the region of Cumbria are also provided in Table 9.4 below.

9.4.2 Overall, carbon emissions in the Council have steadily declined in the period 2005-2022. There has been a downward trend in GHG emissions across all the main four sources of emissions in the Council, with commercial emissions decreasing approximately 65% over the 16-year period.

9.4.3 Domestic emissions in the Council have declined approximately 48% in this same period. Similarly in Cumbria, domestic emissions have declined approximately 48% in the period between 2005-2022. In 2022, per capita emissions in the Council were slightly lower than Cumbria at 8.3 tCO_2e, compared to 9.8 tCO_2e.

Table 9.3: GHG Emissions in the Council 2005-2022

Year	Industry Total (kt CO_2e)	Commer-cial Total (kt CO_2e)	Domestic Total (kt CO_2e)	Transport Total (kt CO_2e)	Grand Total* (kt CO_2e)	Population ('000s, mid-year estimate)	Per Capita Emissions (tCO_2e)
2005	708.7	462.2	784.7	560.8	3,759.4	270.5	13.9
2006	724.3	454.5	784.3	560.4	3,723.2	272.3	13.7
2007	694.0	445.8	759.2	562.6	3,609.7	273.9	13.2
2008	682.3	430.0	758.3	553.2	3,537.3	274.2	12.9
2009	640.0	372.8	703.0	537.4	3,334.5	274.0	12.2
2010	636.6	385.3	755.5	529.6	3,351.6	273.9	12.2
2011	619.5	341.4	655.7	522.5	3,141.1	274.5	11.4
2012	611.1	393.5	692.8	517.7	3,219.1	274.3	11.7
2013	494.2	396.5	681.3	514.5	3,082.1	273.6	11.3
2014	381.1	307.4	580.6	522.5	2,752.1	273.7	10.1
2015	461.8	303.4	565.3	533.5	2,866.5	274.2	10.5
2016	339.2	188.3	524.2	549.3	2,587.1	275.5	9.4
2017	337.7	162.0	505.9	545.2	2,574.1	275.5	9.3
2018	320.8	187.0	500.9	549.2	2,555.8	275.3	9.3
2019	350.4	165.2	481.8	546.1	2,501.9	275.4	9.1
2020	312.8	161.7	470.6	443.5	2,365.3	274.9	8.6
2021	324.1	159.3	471.2	474.5	2,385.5	273.8	8.7
2022	270.0	163.6	409.4	471.4	2,282.9	275.4	8.3

** includes sectors not shown in the table (Public Sector, Land Use and Land Use Change and Forestry, Agriculture and Waste Management)*

Table 9.4: GHG Emissions in Cumbria 2005-2022

Year	Industry Total (kt CO_2e)	Commercial Total (kt CO_2e)	Domestic Total (kt CO_2e)	Transport Total (kt CO_2e)	Grand Total* (kt CO_2e)	Population ('000s, mid-year estimate)	Per Capita Emissions (tCO_2e)
2005	1,628.1	913.4	1,484.0	1,443.6	7,828.7	497.0	15.8

Year	Industry Total (kt CO_2e)	Commercial Total (kt CO_2e)	Domestic Total (kt CO_2e)	Transport Total (kt CO_2e)	Grand Total* (kt CO_2e)	Population ('000s, mid-year estimate)	Per Capita Emissions (tCO_2e)
2006	1,623.2	919.5	1,485.7	1,440.2	7,736.4	498.8	15.5
2007	1,599.6	863.2	1,437.4	1,457.9	7,488.4	500.8	15.0
2008	1,496.5	880.2	1,435.5	1,411.7	7,310.8	500.9	14.6
2009	1,324.6	686.0	1,328.3	1,360.6	6,731.5	500.8	13.4
2010	1,408.3	789.6	1,428.0	1,345.2	6,962.8	500.2	13.9
2011	1,310.2	637.5	1,241.3	1,328.6	6,417.5	499.8	12.8
2012	1,355.2	785.9	1,313.8	1,306.9	6,654.5	498.8	13.3
2013	1,219.1	762.0	1,284.9	1,309.9	6,450.9	497.3	13.0
2014	1,082.9	621.6	1,096.7	1,333.2	5,946.4	497.3	12.0
2015	1,149.0	594.4	1,073.4	1,367.0	6,048.7	498.7	12.1
2016	939.7	428.4	990.9	1,412.8	5,587.9	501.4	11.1
2017	917.3	357.5	954.3	1,429.5	5,506.6	502.2	11.0
2018	879.3	401.2	944.0	1,412.9	5,473.0	502.5	10.9
2019	887.5	349.1	905.9	1,402.4	5,321.9	503.1	10.6
2020	791.1	320.4	881.7	1,115.4	4,930.3	502.8	9.8
2021	853.6	342.8	889.7	1,203.7	5,065.9	500.8	10.1
2022	790.8	323.8	777.2	1,207.4	4,934.0	503.0	9.8

** includes sectors not shown in the table (Public Sector, Land Use and Land Use Change and Forestry, Agriculture and Waste Management)*

UK and Local Carbon Budgets

9.4.4 Table 9.5 below shows the current adopted UK Carbon Budgets up to 2037. This sets the maximum amount of GHG that the UK can legally emit.

Table 9.5: UK Carbon Budgets

Carbon Budget	Total Budget ($MtCO_2e$)
3rd (2018-2022)	2,544
4th (2023-2027)	1,950
5th (2028-2032)	1,725
6th (2033-2037)	965

9.4.5 Tale 9.6 below shows the local carbon budgets for ABC up to 2037.

Table 9.6: ABC Carbon Budgets

Carbon Budget	Total Budget ($MtCO_2e$)
3rd (2018-2022)	2.7
4th (2023-2027)	1.5
5th (2028-2032)	0.8
6th (2033-2037)	0.5

9.4.6 Table 9.7 below shows the carbon budget for the Cumbria region up to 2037.

Table 9.7: Cumbria Carbon Budgets

Carbon Budget	Total Budget ($MtCO_2e$)
3rd (2018-2022)	16.9
4th (2023-2027)	8.6
5th (2028-2032)	4.3
6th (2033-2037)	2.1

Climate Change Resilience (Adaptation)

Current Climate Conditions

9.4.7 This section summarises current climate conditions for the local area based on historic weather data and information about extreme weather events. This information presented below presents average weather conditions along with exceptional weather occurrences. To maintain relevance to current weather trends the displayed information has been calculated using data collected over the past three decades. This climate profile is taken from the closest available data source to the Site[29], which is the St Bees Head (Cumbria) climate station, approximately 11.6km southwest from the Site.

9.4.8 Climate averages (1991-2020) for the weather station indicate the following:

- Average annual maximum temperature was 11.85°C;
- Warmest month on average was July (mean maximum temperatures of 17.66°C);

[29] Met Office (2025). Location-specific long-term averages. Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gctqjsxwu Accessed in October 2023

- Coldest month on average was February (mean minimum temperature of 2.43°C);
- Average total annual rainfall was 1109.40 mm (approximately 17% below the Regional (North West of England) average);
- Wettest month on average was October (average monthly rainfall of 132.33 mm); and
- Driest month on average was April (average monthly rainfall of 60.09 mm).

9.4.9 The number of sunshine hours at the St Bees Head weather station is unavailable from the Met Office data.

Future Baseline Conditions

Climate Change Mitigation (GHG Emissions)

9.4.10 Should the Proposed Development not come forward, GHG emissions from vehicle movements at the study area utilised in the TS (Appendix 2.5) would decrease as the proportion of electric vehicles in use would increase.

9.4.11 However, the benefits of solar renewable energy generation to the local area, as well as in contributing towards the UK's statutory obligation to reach net zero by 2050 would not be adopted.

Climate Change Resilience (Adaptation)

Future Climate Conditions (up to 2077)

Table 9.8: 50th Percentile Climate Projections at 25km grid square 312500, 512500 using baseline 1981-2000 scenario RCP 8.5

Date	Climate Variable 50th Percentile						
	Mean air temp anomaly * at 1.5 m (Â°C)	Annual precipitation rate anomaly (%)	Max Summer air temp anomaly at 1.5 m (Â°C)	Avg. Summer precipitation rate anomaly (%)	Min Winter air temp anomaly at 1.5 m (Â°C)	Avg. Winter precipitation rate anomaly (%)	Total Cloud anomaly (%)
2024	0.75	2.97	0.88	-3.80	0.73	6.57	-0.26
2037	1.07	4.13	1.24	-7.14	1.07	9.70	-0.67
2050	1.51	5.23	1.82	-12.61	1.52	14.19	-1.12
2067	2.25	5.89	2.92	-20.00	2.22	20.85	-2.31

Date	Climate Variable 50th Percentile						
	Mean air temp anomaly * at 1.5 m (Â°C)	Annual precipitation rate anomaly (%)	Max Summer air temp anomaly at 1.5 m (Â°C)	Avg. Summer precipitation rate anomaly (%)	Min Winter air temp anomaly at 1.5 m (Â°C)	Avg. Winter precipitation rate anomaly (%)	Total Cloud anomaly (%)
2077	2.78	6.58	3.72	-24.23	2.65	26.32	-3.29

** Anomaly refers to the change compared to the baseline. The projections are not absolute values.*

9.4.12 Climate projections in Table 9.8 above show a continuous increase in annual air temperature over the next 50 years. Annual precipitation is also projected to increase over this time.

9.4.13 The projections suggest that summers will become warmer and drier, with an expected increase in maximum summer temperatures and a significant decline in summer precipitation over the lifespan of the Proposed Development. Natural variations may mean that cooler and/or wetter summers will occur.

9.4.14 Winters are projected to become milder and significantly wetter over the next 50 years. Natural variations may mean that cooler and/or drier winters may still occur.

9.4.15 The climate projections also indicate that cloud cover could slightly decrease over the lifespan of the Proposed Development.

9.4.16 The full datasets for the climate projections can be viewed in Appendices 9.4-9.10 of this chapter.

9.4.17 Winds associated with major storm events can be some of the most damaging and disruptive events for the UK with implications for property, power networks, road and rail transport and aviation. Calm periods with little wind, particularly over prolonged periods, can affect air quality whilst winds from a particular direction can be a critical factor in the spread of particulates. Both cases are also examples where a combination of factors such as wind, temperature and precipitation can exacerbate their impacts (e.g., air quality issues tend to be worse under conditions of light winds and higher temperatures).

9.4.18 Changes in wind speeds are not currently available at the regional level and there remains considerable uncertainty in the projections with respect to wind speed; however, there are small changes in projected wind speed. Across the UK, near surface wind speeds are expected to increase in the second half of the 21st century with winter months experiencing more significant impacts of winds. This is accompanied by an increase in frequency of winter storms over the UK. However, the increase in wind speeds is projected to be modest. There are no compelling trends in storminess as determined by maximum gust speeds from the UK wind network over the last four decades[30].

9.5 Likely Significant Effects

Embedded Mitigation

Climate Change Mitigation (GHG Emissions)

Construction Phase

9.5.1 Detailed information on construction traffic routing and usage of construction vehicles will be confirmed at a later stage and secured through a DCO Requirement. Therefore, there are no embedded mitigation measures in relation to construction vehicle emissions.

Operational Phase

9.5.2 As the generation of renewable energy will result in a beneficial effect by virtue of reducing reliance on fossil fuels, no embedded mitigation measures, other than the inherent generation of solar renewable energy as part of the Proposed Development, are considered necessary.

Construction Phase

Climate Change Mitigation (GHG Emissions)

Construction Vehicle Emissions

9.5.3 The increase in road traffic on the local road network is attributable to the Proposed Development during the 18-month construction phase.

[30] Royal Meteorological Society (July 2018): International Journal of Climatology; State of the UK Climate 2017.

Table 9.9: Construction Traffic Flows

Variable	Average Peak Daily Construction Flows	
	HGV	LGV
24-hour Average Annual Daily Traffic (AADT) of the Proposed Development*	20 HGV Trips (40 movements)	8 LGV Trips (16 movements)
Link Length	10.46km	
Road Type	England – Not London, Rural	
Average Vehicle Speed**	Posted Speed Limits – 63.82 kph	

*Trips are two-way **Based on the posted speed limit of the road link (Appendix 9.1)

9.5.4 The construction of the Proposed Development will result in an increase in vehicle movements on the local road network. As shown in Table 9.9 above, there is a projected daily average peak of around 40 HGV movements and 16 LGV movements, equalling 56 additional daily traffic movements on the local road network.

9.5.5 In total, average construction traffic flows represent 115.80 tCO_2/year of vehicular emissions locally. This accounts for 0.0000045% of the UK's 4th carbon budget (2,544 $MtCO_2e$). Globally, the increase in emissions is not considered significant. Furthermore, this accounts for 0.0043% of ABC's 4th carbon budget (2.7 $MtCO_2e$). The timescales for the uplift in emissions to occur are fixed to the construction period (likely 18 months) and are therefore not considered permanent.

Construction Works

9.5.6 The enabling and land clearance activities required for the construction of the Proposed Development are set out in Chapter 5 Construction and Decommissioning Methodology and Phasing. Construction will result in direct GHG emissions released from the disturbance of soil on Site.

9.5.7 The temporary construction office and welfare facilities for construction workers and temporary lighting on the Site will (as a worst-case scenario) require electricity from energy generators that use fossil fuels. This will result in direct GHG emissions generated from the burning of fossil fuels to deliver electricity to the Site.

9.5.8 Embodied carbon emissions result from extracting raw materials, processing them, assembling them into usable products and transporting them to the Site for use during construction. It is noted that a large proportion of GHG emissions from a development may be accounted for within Scope 3 embodied carbon. The embodied carbon associated with the Proposed Development will be heavily influenced by the type and amount of material required to construct the Proposed Development.

9.5.9 Construction waste will need to be managed in line with the waste hierarchy, with preference of prevention, reuse, recycling and recovery before disposal to landfill. All phases of waste management will result in GHG emissions.

9.5.10 As outlined in Chapter 5 Construction and Decommissioning Methodology and Phasing, it is estimated that there could be up to approximately 150 workers on-Site during the peak construction period, although with the average much lower across most of the construction phase (between 50-80 per day). There will be GHG emissions associated with the transport of construction workers to the Site whether they are in petrol, diesel or electric vehicles.

9.5.11 In line with IEMA GHG Guidance and the significance criteria displayed in Table 9.1, the uplift in vehicular movements and emissions as a result of construction of the Proposed Development would result in a **minor adverse** effect, which is **not significant**.

Operational Phase

Climate Change Mitigation (GHG Emissions)

9.5.12 Whilst operational, the Proposed Development will generate electricity from solar irradiation and export this to the local Distribution Network Operator ('DNO') grid. In line with EN-3, the Proposed Development is scaled to maximise its generating efficiency. The Proposed Development will have a maximum export capacity of 150MW.

9.5.13 The generation of electricity from the Proposed Development will displace the generation of electricity from other conventional power sources,

including fossil fuel reliant sources. In 2027, the average emission of carbon dioxide equivalent is projected to be 0.067 $kgCO_2e/kWh$[31]. Using a load factor of 10.2%, if these emissions were avoided as a result of the Proposed Development, then a saving of approximately 8,986.03 tCO_2e per annum would occur. This is a saving of approximately 359,441.2 tCO_2e over the 40-year lifespan of the Proposed Development.

9.5.14 In displacing fossil fuel reliant sources in isolation, the average emission of carbon dioxide equivalent of natural gas and coal in 2024 was estimated at 0.249945 $kgCO_2e/kWh$[32]. Using a load factor of 10.2%, if these emissions were avoided as a result of the Proposed Development, then a saving of approximately 33,522.57 tCO_2e per annum would occur. This is a saving of approximately 1,340,902.8 tCO_2e over the 40-year operational lifespan of the Proposed Development.

9.5.15 Table 9.10 below shows the carbon reduction savings as a % from the generation of solar renewable energy from the Council's domestic emissions and total emissions in 2022, as outlined in Table 9.3, and domestic and total emissions from Cumbria in 2022, as outlined in Table 9.4.

Table 9.10: Emission Saving Comparisons between The Council and Cumbria

Emission Saving (tCO_2e)	The Council % Domestic Saving	The Council % Total Saving	Cumbria % Domestic Saving	Cumbria % Total Saving
8,986.03	2.2%	0.4%	1.2%	0.18%

Table 9.11: Emissions Saving from the Proposed Development Contextualised against National, Regional and Local Carbon Budget

Emission Saving (tCO_2e)	% of 6th UK Carbon Budget	% of 6th Cumbria Carbon Budget	% of 6th ABC Carbon Budget
8,986.03	0.0009%	0.43%	1.8%

[31] Department for Energy Security and Net Zero (2023). Table 1, Column J, Row 29. Available from: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal Accessed October 2024

[32] Department for Energy Security and Net Zero (2024). Greenhouse gas reporting: conversion factors 2024. Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2024 Accessed October 2024

9.5.16 In line with the IEMA Guidance outlined in Table 9.1, the carbon saving at the local level would comprise a **major beneficial** effect that is **significant**. The Proposed Development is considered to have to have a **minor beneficial** effect at the national level and is in keeping with the trajectory to net-zero by 2050.

Decommissioning Phase

9.5.17 As stated in paragraph 9.3.10, an assessment of vehicular emissions during the decommissioning phase has been scoped out and is therefore not considered further.

Climate Change Resilience (Adaptation)

9.5.18 Table 9.12 below shows the climate change risk assessment for the Proposed Development with embedded mitigation measures accounted for.

Table 9.12: Climate Change Risk Assessment

Climate Conditions / Hazard	Receptor	Receptor Sensitivity	Potential Impact (with embedded mitigation)	Significance
Long Term Changes to Climate Norms	Infrastructure	High	Infrastructure may require more maintenance and repair as changes to climatic norms cause increased stress on, for example, below-ground cables. The sensitivity is classified has high as efficiently working infrastructure is fundamental to the operation of the Proposed Development.	Negligible
	Future Users of the Site (e.g., workers)		Future site users, such as workers are categorised as a highly sensitive receptor as workers are susceptible to climate extremes. Therefore, their health & safety must be managed. The climate is expected to become drier and hotter in summers and wetter and milder in winters in the area where the Proposed Development is located (Table 9.8). Workers may therefore be at more risk during periods of climatic extremes, such as working in high temperatures. This can be mitigated through thermal shading from the various planting and landscaping as part of the Proposed Development as outlined in the Parameter Plan (Figure 3.4) [**REF: 6.2**] and the Landscape Strategy Plan (Figure 7.6.1-7.6.5) [**REF: 6.2**].	Minor Adverse
	The Natural Environment (Ecology, Landscaping and Planting)		A total of five European designated Sites were recorded within 10km of the Site boundary. The closest being the River Derwent and Bassenthwaite Lake Special Area of Conservation ('SAC') 1.2km east. This SAC is hydrologically linked to the Site by the Thief Gill watercourse which flows northwards through the Site. A single nationally designated site, the River Derwent and Tributaries Site of Special Scientific Interest ('SSSI'), which underpins the SAC, lies 1.2km to the east. Area C contains a series of watercourses. The main watercourse, Thief Gill, flows northwards from the southern boundary through a steep-sided gorge, before discharging off-Site via a culvert under the road on the eastern boundary. Thief Gill is then joined by two smaller watercourses where it becomes an EA watercourse. A smaller watercourse flows down the western boundary of the southern part of Area C where it is joined by another watercourse flowing west from one of the coniferous plantation woodland blocks. The watercourses appear (visually) to have poor water quality. The bed material is primarily cobbles, gravel, and silt, with the cobbles being well-impacted into the substrate.	Minor Adverse

Climate Conditions / Hazard	Receptor	Receptor Sensitivity	Potential Impact (with embedded mitigation)	Significance
			Dean Moor County Wildlife Site ('CWS') is partially within Area C and is designated for its acidic moorland habitats. As outlined in Chapter 8 – Biodiversity, the Site supports two notable habitats: lowland dry acid grassland and hedgerows. There is also a localised area of peat in the northwest of Area C. A peat survey for the Proposed Development is provided at Appendix 10.3 **[REF: 6.3]**. The Site also supports a range of species such as bats, otters, water voles, breeding birds, wintering birds, and reptiles. Further information is available from Chapter 8 – Biodiversity. The flora and fauna identified above could be considered highly sensitive to long-term changes in climate. The embedded mitigation included as part of the Proposed Development comprises: • The layout of the Work Number **[REF: 2.3]** (particularly Work No. 6), corresponding Parameter Plan (Figure 3.4) and the Landscape Strategy Plan (Figure 7.6.1-7.6.5) allows for all sensitive habitats to be retained such as ponds, watercourses, woodland, hedgerows and small areas of scrub, and swamp. • Removal of woodland, trees, hedges will be avoided, other than limited clearance to enable access, where required. The removal of habitats will be done sympathetically; • Infrastructure will be sited in grassland areas of low ecological value; • To avoid direct impacts, the Proposed Development's design will incorporate appropriate buffers between infrastructure and sensitive habitats, such as watercourses and woodland (as outlined in Chapter 3 – Site and Proposed Development Description). Buffer strips of existing poor value habitat incorporated within the layout will be under-sown with a species rich mix; • Impacts to peat deposits will be managed through design, with no solar development (Work No. 1) or permanent structures being situated on areas of identified peat (as identified in Appendix 10.3). This will also prevent adverse effects on the degradation of peat as a source of carbon sequestration.	

Climate Conditions / Hazard	Receptor	Receptor Sensitivity	Potential Impact (with embedded mitigation)	Significance
			The Landscape Strategy Plan (Figure 7.6.1-7.6.5) outlines the landscaping and planting that can be implemented across the Site, which would mitigate the potential effect on ecology due to long-term climactic changes to be non-significant.	
	Flood Risk		Several ordinary watercourses provide land drainage and flow across the southern part of the Site, most significant among them being the 'Thief Gill'. These flow through the Site from the south and west combining and flowing towards the north-east corner of Area C, as shown on Figure 3.3. There are no flood defences in the vicinity of the Site. As shown in the FRA (Appendix 2.4), peak river flow and sea level rise, as a result of climate change, are not anticipated to pose a significant risk to the Site, as the Site is located at a significant distance from the fluvial floodplain and there is no tidal influence. The Site is entirely in Flood Zone 1, which is considered to be the lowest risk zone of fluvial flooding. The adjacent areas of Flood Zone 2 and 3 are confined to a narrow corridor of floodplain along the upper reaches of the main river watercourses. No detailed modelling is available, and it is considered that the risk from peak river flow climate change is negligible given the offset from the risk area and the form of the Proposed Development. As shown on Table 9.8, annual precipitation in the area where the Site is located is projected to increase by approximately 6.5% across the operational lifespan of the Proposed Development. However, as the Site is in the lowest risk zone for fluvial flooding and is at a very low-low risk of flooding from sources such as surface water. tidal, groundwater, and sewers, the effect from long-term climate change is considered to be Minor Adverse and not significant.	Minor Adverse
Heatwaves	Infrastructure	High	Infrastructure may require more maintenance and repair as changes to climatic norms may cause increased stress infrastructure during periods of intense heat on, for example, solar arrays, and Grid Connection Infrastructure. According to Solar Energy UK[33], solar panel performance falls by 0.34 percentage points for every degree that the temperature rises above 25°C. Therefore, the generating capability of the Proposed Development may be slightly affected during periods of heatwaves. However, baseline climate data shows the mean maximum temperature is 17.66°C and Table 9.8 shows projected maximum summer temperatures may increase by over 2.5°C over the next 50 years. Although	Minor Adverse

[33] Solar Energy UK (2023). Fact check: Solar power works best in the summer

Climate Conditions / Hazard	Receptor	Receptor Sensitivity	Potential Impact (with embedded mitigation)	Significance
			natural variations will result in summer day temperatures over 25°C, this will not significantly affect the generating capability of the Proposed Development. As shown in Table 9.8, cloud cover is anticipated to slightly decrease over the Proposed Development's lifespan, therefore the longer days and clearer skies may mean solar power generates more electricity during the summer.	
	Future Users of the Site (e.g., workers)		As shown in Table 9.8, summer temperatures are anticipated to increase, and heatwaves will become more frequent placing workers at potential risk. The Proposed Development's green and blue infrastructure (outlined in Figure 7.6.1-7.6.5) provide a level of thermal cooling during heatwaves.	Minor Adverse
	The Natural Environment (Ecology, Landscaping and Planting)		Whilst not a consequence of the Proposed Development, periods of extreme heat may cause stress or fatality for flora and fauna that the Site currently supports. The Dean Moor CWS acidic moorland habitat towards the south of the Site may be prone to wildfires during extreme heat. The composition of soil and vegetation that makes the CWS unique may also be affected by heatwaves. Lowland dry acid grassland and hedgerows could also be at risk of stress and/or fatality during periods of extreme heat. This would also have indirect effects on the fauna that use these habitats. Without appropriate landscape management, which is set out in the Outline Landscape and Ecological Management Plan ('OLEMP') (Appendix 7.7) **[REF: 6.3]** this effect is considered to be significant.	**Moderate Adverse**
Low Rainfall / Drought	Infrastructure	High	Periods of low rainfall and drought may increase the formation and suppression of dust in the air as ground on the Site dries out. Dust deposition on solar panels may adversely affect the generating capability of the Proposed Development. In regard to ground instability, Chapter 10 - Ground Conditions does not identify any potential significant effects with respect to low rainfall / drought conditions.	Minor Adverse

Climate Conditions / Hazard	Receptor	Receptor Sensitivity	Potential Impact (with embedded mitigation)	Significance
	Future Users of the Site (e.g., workers)		Site workers will be on-Site infrequently, with minimal visits for general maintenance (1-2 visits per month) and are therefore not considered to be at risk from periods of low rainfall and drought whilst on-Site.	Negligible.
	The Natural Environment (Ecology, Landscaping and Planting)		Whilst not a direct consequence of the Proposed Development periods of low rainfall and drought could reduce or terminate the flow into the River Derwent and Bassenthwaite Lake SAC and the SSSI. Furthermore, low rainfall could reduce the water quality of the Thief Gill (that flows through Area C) by increasing dust deposition into the watercourse and reducing the oxygen content of water. Without further mitigation, this effect is considered to be significant.	**Moderate Adverse**
Heavy Rainfall & Flooding	Infrastructure	High	Chapter 10 - Ground Conditions identifies a high potential for landslides/slope instability, as there are several steep sloping areas of the Site, particularly in the south of Area C. These areas would be particularly vulnerable during times of heavy rain and pose a risk to infrastructure. As outlined in Chapter 10 - Ground Conditions, the likelihood of effects (damage) due to ground conditions will be reduced through a final design (informed by additional engineering studies including further ground investigation (such as a geotechnical survey), further information is of which is available from the OCEMP (Appendix 5.1) **[REF: 6.3]**. This will result in layout optimisation of the Proposed Development to locate the structures away from compressible ground. The impact on the solar PV arrays will be accommodated through selection of appropriate materials, and methodologies for installation informed by standard testing such as geotechnical surveys (informed by the results of a future ground investigation and modelling undertaken by the PV array framework designer). Despite the Proposed Development being considered 'Essential Infrastructure', the main risk of flooding is from surface water runoff in an extreme rainfall event. The solar arrays will be raised significantly above any shallow surface water flood levels (the minimum height from the ground level is 0.7m) and therefore are not susceptible to flooding. Impacts to other ancillary structures are not anticipated as these will comprise either prefabricated metal containers or GRP kiosks placed on a compacted aggregate subbase and/or	Negligible

Climate Conditions / Hazard	Receptor	Receptor Sensitivity	Potential Impact (with embedded mitigation)	Significance
			concrete pad, i.e., these structures will be able to tolerate as degree of differential ground movement without affecting operation. The potential of significant effects on ground instability due to climatic changes is therefore reduced. The FRA (Appendix 2.4) outlines that surface water drainage measures for the Proposed Development is split into two strategies, solar development area and substation. For solar PV, the array installation will not require hardstanding at ground level, so the ground cover in the solar development area will stay the same as before. Also, the PV array facades will include gaps for rainwater to fall off in various locations to prevent sheeting and erosion. The Proposed Development will include targeted SuDS to address specific areas of new impermeable surfacing that would otherwise give rise to a potential increase in surface water runoff. The majority of the Proposed Development built area will be occupied by solar PV arrays. The impact of these arrays is negligible with the only intrusion being the piling of the array framework posts. Further information is available from Appendix 2.4. Due to the low current flood risk and the low magnitude of impact that the Proposed Development has on the current drainage regime, the risk of flooding to infrastructure, with embedded mitigation applied, is not considered to be significant.	
	Future Users of the Site (e.g., workers)		The Proposed Development will not be 'occupied', and only occasional maintenance visits are required for landscape maintenance and equipment repairs.	Negligible
	The Natural Environment (Ecology, Landscaping and Planting)		Whilst not a direct impact of the Proposed Development, periods of flooding or heavy rainfall may also adversely affect flora and fauna on-Site. As identified, the River Derwent and Bassenthwaite Lake SAC is hydrologically connected to the Site by the Thief Gill watercourse which flows northwards through Area C. Periods of heavy rainfall and high volumes of surface flows may have an impact on botanical diversity and habitat quality of watercourses on-Site and the protected sites that are hydrologically connected. This could occur through heavy rainfall and flooding carrying enhanced levels of pollutants and sediments into the Thief Gill on-Site and subsequently into protected sites.	**Moderate Adverse**

Climate Conditions / Hazard	Receptor	Receptor Sensitivity	Potential Impact (with embedded mitigation)	Significance
			Without additional mitigation, the effects on watercourses and their ecological status during periods of heavy rainfall and flooding could be significant.	
	Flood Risk		Although EA surface water flood mapping indicates that most of the Site has a 'Very Low' risk of surface water flooding, there are areas of 'Low' to 'High' surface water flood risk present along the Thief Gill, other ordinary watercourses, and the pond within the Site, consistent with the depressions in the local topography. The Proposed Development therefore incorporates mitigation to manage the flood risk impacts identified to have a medium or high risk. As outlined in the FRA (Appendix 2.4), the surface water drainage strategy has been developed based on the DEFRA 'Non-statutory technical standards for sustainable drainage systems' to ensure that the Site does not increase flood risk to the Site or elsewhere. For each of the land uses within the Site, the Site will incorporate appropriate mitigation so as to mimic the existing greenfield runoff mechanism and, therefore, it is not considered necessary to undertake further attenuation measures. The solar panel arrays will be set on supports and raised above the ground (to a minimum of 0.7m); therefore, any rainfall will be able to flow between/underneath the panels and either percolate or flow overland towards the existing drainage receptors. As the drainage strategy will mimic the existing greenfield baseline, it is not anticipated that the introduction of the Proposed Development will adversely affect flood risk on-Site, or in the surrounding area. Therefore, the anticipated effect is considered negligible.	Negligible

9.6 Mitigation Measures

Construction Phase

Climate Change Mitigation (GHG Emissions)

Construction Vehicle Emissions

9.6.1 The OCTMP (Appendix 5.2) sets out a range of proposed mitigation measures that will contribute to a reduction in construction vehicle emissions, which will be implemented through the CTMP to be secured by a DCO Requirement. Measures include (but are not limited to) delivery scheduling, re-use of materials on-Site, smart procurement, and the implementation of a Framework Construction Worker Travel Plan ('FCWTP'). Further information is available from Appendix 5.2.

9.6.2 It is impossible to accurately quantify the emissions reductions that would occur following the use of the measures outlined above, however, it is assumed that some or all of these measures would contribute to a reduction in construction vehicle GHG emissions.

Construction Works

9.6.3 All construction activity will be governed by a CEMP to be agreed prior to construction and secured as a DCO Requirement. Compliance with the CEMP measures (as outlined in the OCEMP (Appendix 5.1)) will be mandatory for the Principal Contractor appointed for those delivering subsequent phases of the Proposed Development.

9.6.4 The mitigation measures will cover, plant and processes, materials, waste and air quality during construction. The Applicant will seek to use local suppliers if deemed efficient and appropriate and if they meet the Principal Contractor's standards for materials and operations. Measures that will reduce GHG emissions during construction include, for example, avoiding or minimising the use of diesel or petrol powered generators, no unnecessary idling of engines, maintenance of plant equipment to check they are operating optimally, only using construction plant that operates with fuel when necessary, and efficient use of materials to reduce waste in

line with the waste hierarchy. The implementation of the CEMP will also reduce Scope 3 emissions during the construction phase, although this cannot be accurately quantified at this stage of the application.

Operational Phase

Climate Change Mitigation (GHG Emissions)

9.6.5 As the Proposed Development results in a significant beneficial effect through displacing GHG emissions entering the atmosphere by producing renewable energy, no additional mitigation measures are proposed.

Climate Change Resilience (Adaptation)

Infrastructure

9.6.6 During periods of climatic extremes, such as high temperatures and a changing norm towards higher temperatures as outlined in Table 9.8, the safeguarding of infrastructure will be assessed at detailed design and secured by a DCO Requirement. Risk assessments will be undertaken to manage risks from future climate change in accordance with nationally accepted standards and guidance. Furthermore, as outlined in the Outline Operational Management Plan ('OOMP') (Appendix 3.1) **[REF: 6.3]** the maintenance of the Proposed Development will include regular cleaning of solar panels during periods of low rainfall and drought, to ensure panels are operating at their maximum efficiency.

9.6.7 As outlined in the FRA (Appendix 2.4), all proposed access tracks will be constructed of permeable materials, so that the runoff from the tracks will mimic greenfield conditions.

9.6.8 Grid Connection Infrastructure (Work No. 2) and Associated Works (Work No. 3) will be provided with targeted SuDS which are likely to include a 300mm granular sub-base with a void ratio of at least 30%, providing sufficient attenuation storage for a 1 in 100-year storm event plus an appropriate allowance for climate change. Detailed drainage measures will be provided through a Drainage Strategy that will be secured by a DCO Requirement.

Future Users of Site

9.6.9 The climate is expected to become drier and hotter over the Proposed Development's lifespan (Table 9.8). Due to long term climatic changes, and during periods of heatwaves, it is anticipated that workers/operators would have health and safety procedures in place to avoid working in extreme conditions. Furthermore, Site visits during periods of extreme heatwaves can be easily avoided and re-scheduled to safeguard workers.

9.6.10 Maintenance visits will be scheduled to avoid periods of elevated flood risk. No maintenance operatives will be on-Site during periods of elevated flood risk and access to the Site will be restricted. These measures will be secured through the Operational Management Plan, which will be substantially in accordance with the OOMP (Appendix 3.1).

The Natural Environment

9.6.11 Prior to the operation of the Proposed Development, a Grazing Management Plan ('GMP') will be put in place (to be secured through a DCO Requirement). The aim of the GMP will be to enhance the habitats on-Site through a reduction in grazing pressure. This will enable more natural upland habitats to re-establish. The GMP will set out how stock will be controlled across the Site, how many livestock units will be utilised, and what remedial measures will be implemented should overgrazing or poaching of watercourses be identified. An outline GMP ('OGMP') is provided as part of the OLEMP (Appendix 7.7).

9.6.12 Planting proposals that are shown on Figure 7.6.1-7.6.5 will be managed in the future in compliance with a LEMP which will be substantially in accordance with the OLEMP (Appendix 7.7), to secure the successful long-term establishment of the mitigation proposals.

9.6.13 Mitigation measures are incorporated into the OLEMP to account for susceptibility of the landscape planting to pests, diseases, and climate change. The implementation of the LEMP will ensure that new and retained planting is appropriately managed during periods of climate

extremes such as heatwaves and heavy rainfall, ensuring the resilience and survival of planting and subsequently habitats on-Site.

Flood Risk

9.6.14 The ODS, within the FRA (Appendix 2.4) contains measures that will shape the detailed design of surface water drainage solutions. The final strategy for adoption of SuDS and the SuDS maintenance plan, including a maintenance schedule and details of easements and outfalls for the drainage system, will be produced at detailed design, and secured via a DCO Requirement.

9.6.15 Long term management of surface water drainage assets, including any SuDS components, is essential to ensure they continue to function to their design standard. As such, a management and maintenance plan will be developed to ensure the systems continue to work effectively.

9.6.16 As outlined in the FRA (Appendix 2.4), appropriate seeded vegetation will be provided below and between rows of the solar panels to act as a level spreader/energy dissipater and to promote low erosivity sheet flow during operational phase of the Proposed Development. The vegetation will be managed in accordance with the LEMP, and will either be mowed or used for light grazing, further details of which will be available in the LEMP and/or the GMP to be secured through a DCO Requirement. The grassland will not only grow between array gaps; it will also extend to all ground under the arrays. This means that, excluding the access tracks and ancillary buildings, the majority of the Site will be a fully vegetated species-rich grassland which can be a positive improvement compared to the current intensively grazed land and patchy cover.

9.7 Residual Effects

Construction Phase

Climate Change Mitigation (GHG Emissions)

9.7.1 In accordance with the IEMA GHG Guidance outlined in Table 9.1, the anticipated residual effects have been classified.

9.7.2 With regards to construction emissions, through the implementation of measures within the OCEMP (Appendix 5.1) and the OCTMP (Appendix 5.2), a **minor adverse** effect is expected, which is **not significant**.

Operational Phase

Climate Change Mitigation (GHG Emissions)

9.7.3 The Proposed Development will result in a **major beneficial** effect with respect to the displacing of carbon emissions through the generation of renewable electricity at a local level within the Council. This is a **significant beneficial** effect.

9.7.4 At the national level, the Proposed Development will result in a **minor beneficial** effect with respect to the displacing of carbon emissions, which is **not significant**.

Climate Change Resilience (Adaptation)

Infrastructure

9.7.5 The residual effect on infrastructure due to climate change is considered **negligible** and **not significant**.

Future Site Users

9.7.6 Following the implementation of embedded and additional mitigation measures identified, the residual effects on future site users due to climate change is considered **negligible** and **not significant**.

The Natural Environment

9.7.7 Following long-term management and maintenance of planting, landscaping and ecology, the residual effect on the natural environment from climatic changes over the Proposed Development's lifespan is considered **negligible** and **not significant**.

9.7.8 The residual effect of environmental quality of surface water on-Site and polluting substances on surface water quality and the receiving waterbody (i.e., the Thief Gill and the River Derwent and Bassenthwaite Lake SAC) is considered **negligible-minor adverse** and **not significant**.

Flood Risk

9.7.9 Following embedded mitigation measures outlined in Table 9.12 and implementation of the detailed drainage regime, the residual effect on flood risk is considered **negligible** and **not significant**.

9.8 Cumulative Effects

9.8.1 The cumulative impact of carbon emissions arising from global human activity is high. This is due to the nature of climate change as a global, cumulative problem.

9.8.2 There is a range of cumulative schemes outlined in Chapter 2, Table 2.6, including employment uses, industrial uses, residential and renewable energy generation projects. These projects have been sourced from the Council's planning portal, at a radius of 10km from the Site, as outlined in Chapter 2 - EIA Methodology. The assessment of cumulative effects below is a qualitative assessment as detail regarding climate mitigation and adaptation for these cumulative schemes was unavailable.

Construction Phase

Climate Change Mitigation (GHG Emissions)

9.8.3 Construction of the cumulative schemes is likely to result in GHG emissions owing to the scale and type of these schemes (energy, industrial and employment uses). It is assumed that all these schemes will be managed in accordance with a CEMP and/or CTMP, and the likelihood of cumulative schemes being constructed concurrently is low. In line with Table 9.1, it is assumed that all cumulative schemes will adhere to best practice and policy requirements, in line with a net zero trajectory, therefore the cumulative effect will likely be **minor adverse** and **not significant** at the local level.

Operational Phase

Climate Change Mitigation (GHG Emissions)

9.8.4 Of the 15 cumulative schemes identified in Chapter 2 – EIA Methodology, Table 2.6, two schemes are related to renewable energy generation;

4/23/2198/0F1 is for two micro wind turbines and so would have a negligible impact on renewable energy generation. Lostrigg Solar, which is adjacent to the Site to the north is currently in pre-application stage. The cumulative scheme is a proposed solar farm with over 50MW of capacity.

9.8.5 The residential, employment and industrial schemes identified are of a size and scale that they could feasibly be powered by the renewable energy generated by the Proposed Development and Lostrigg Solar (for example the number of new homes across all cumulative schemes is approximately 838). Therefore, in combination with the Proposed Development, when balanced out with the operational emissions that would be associated with cumulative schemes, there is likely to be a **moderate beneficial** (**significant**) effect at the local level and a **negligible** (**not significant**) effect at the national level with respect to climate change mitigation.

Climate Change Resilience

9.8.6 It is assumed that the cumulative schemes identified would achieve policy compliance with regards to facets of climate resilience as appropriate, such as BNG and flood risk modelling accounting for climate change projections. Therefore, **negligible** (**not significant**) cumulative resilience effects are anticipated with the Proposed Development's operational phase.

9.9 Summary

9.9.1 To reflect the requirements of the EIA Regulations, an assessment has been undertaken of the potential effects of the Proposed Development on climate change. This includes the effects of the Proposed Development on climate change (climate change mitigation) and the vulnerability of the Proposed Development to climate change (climate change adaptation/resilience).

9.9.2 The assessment has been undertaken in accordance with published guidance on considering climate change in EIA and consequently reviews how climate change has been considered at the current stages of project

progression and assessment, as well as how future assessment will be conducted.

9.9.3 Construction of the Proposed Development is likely to result in GHG emissions from direct and indirect sources. This includes emissions from construction vehicles used during the construction phase. The assessment of GHG emissions from construction vehicle movements is anticipated to be minor adverse and not significant, following implementation of additional mitigation measures included within the CTMP (as outlined in the OCTMP, Appendix 5.2).

9.9.4 During the operation of the Proposed Development, there will be a potential carbon saving resulting from the export of renewable electricity to the local distribution network, in lieu of the current energy mix, which include fossil fuels and renewable sources. This is anticipated to be a carbon saving of approximately 8,986.03 tCO_2e per annum. This is a saving of approximately 359,441.2 tCO_2e over the 40-year operational lifespan of the Proposed Development. This is a major beneficial effect at the local level, which is significant and a minor beneficial effect at the national level, which is not significant.

9.9.5 If displacing only fossil fuel sources, the Proposed Development is anticipated to result in a carbon saving of approximately 33,522.57 tCO_2e per annum. This is a saving of approximately 1,340,902.8 tCO_2e over the 40-year operational lifespan of the Proposed Development.

9.9.6 UKCP18 Projections for the 25km grid square where the Site is located (Figure 9.1) (Table 9.8) project that summers are going to get drier and hotter, whereas winters will get wetter and milder. The Proposed Development is host to receptors of varying sensitivity to climate change, such as future users, infrastructure, the natural environment, and flood risk.

9.9.7 The Proposed Development is considered resilient to projected climate change. This is particularly with the proposed surface water drainage

regime as set out in the FRA. Residual effects on infrastructure, future site users, the natural environment and flood risk are not significant.

9.9.8 Table 9.13 contains a summary of the preliminary assessment of the likely significant effects of the Proposed Development.

Table 9.13: Table of Significance – Climate Change

Potential Effect	Nature of Effect	Significance	Secondary / Tertiary Additional Mitigation	Geographical Importance						Residual Effect
				I	UK	E	R	UA	L	
Construction Phase (Climate Change Mitigation)										
Construction Emissions	Permanent	Minor Adverse (Not Significant)	A CEMP and CTMP to be substantially in accordance with the measures in the OCEMP and OCTMP	X						Minor Adverse (Not Significant)
Operational Phase (Climate Change Mitigation)										
Effect of renewable energy generation on climate change mitigation.	Permanent	**Major Beneficial (Significant)**	N/A	X						**Major Beneficial (local level) (Significant)** Minor Beneficial (national level) (Not Significant)
Operational Phase (Climate Change Resilience)										
Effects of climate change on infrastructure	Permanent	Minor Adverse – Negligible (Not Significant)	Design specifications of infrastructure including solar arrays, Grid Connection Infrastructure, cabling, etc. will be confirmed through DCO Requirements. Drainage design to be secured by a DCO Requirement.	X						Negligible (Not Significant)
Effects of climate change on future site users	Permanent	Minor Adverse – Negligible (Not Significant)	Future Site users to adhere to health & safety procedures whilst working on-Site. An Operational Management Plan to be secured by a DCO Requirement and be substantially in accordance with the OOMP.	X						Negligible (Not Significant)

Potential Effect	Nature of Effect	Significance	Secondary / Tertiary Additional Mitigation	Geographical Importance						Residual Effect
				I	UK	E	R	UA	L	
Effects of climate change on the natural environment (Ecology, Landscaping and Planting)	Permanent	Moderate-Minor Adverse (Significant)	Implementation of a LEMP and a GMP, to be substantially in accordance with the measures outlined in the OLEMP and OGMP. Flood design specifications to be secured by DCO Requirement.	X						Negligible-Minor Adverse (Not Significant)
Effects of climate change on flood risk	Permanent	Minor Adverse – Negligible (Not Significant)	Detailed drainage design to be secured by a DCO Requirement. A GMP to be secured by DCO Requirement.	X						Negligible (Not Significant)
Cumulative Effects										
Construction Phase										
Construction Vehicle Emissions	Permanent	Minor Adverse (Not Significant)	Implementation of a CEMP and a CTMP.	X						Minor Adverse (Not Significant)
Operational Phase										
Climate Change Mitigation (GHG Emissions)	Permanent	**Moderate Beneficial (Local Level (Significant)** Negligible (National Level) (Not Significant)	N/A	X						**Moderate Beneficial (Local Level (Significant)** Negligible (National Level) (Not Significant)
Climate Change Resilience	Permanent	Negligible (Not Significant)	Other cumulative schemes to achieve policy compliance with regards to facets of climate resilience, such as BNG and flood risk.	X						Negligible (Not Significant)

Nature of Effect * Permanent or Temporary Short-term, Medium-term, or Long-term

Significance** Major/ Moderate/ Minor/ Negligible Beneficial/ Adverse

Geographical Importance *** I = International; UK = United Kingdom; E = England; R = Regional; UA = Unitary Authority; L = Local

Residual Effects **** Major / Moderate / Minor / Negligible Beneficial / Adverse