

Tween Bridge Solar Farm

Environmental Statement Appendix 16.4: Climate Change Adaptation Assessment

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms
and Procedure) Regulations 2009

APFP Regulation 5(2)(a)

Document Reference: 6.3.16.4

August 2025

Revision 1

Report

Tween Bridge Solar Farm

Climate Change Resilience Assessment

For RWE Renewables UK Solar and Storage Ltd

21 August 2025

Document Control

Project Title:	Tween Bridge Solar Farm
Project Number:	J10-14055B-10
Client:	RWE Renewables UK Solar and Storage Ltd
Principal Contact:	Henri Scanlon (Pegasus Group)
Document Title:	Climate Change Resilience Assessment
Document Number:	J10-14055B-10-03-F
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Revision History

01	20/06/2025	Report issued
02	11/07/2025	Updated in response to comments
03	21/08/2025	Updated for revised Order Limits



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1 Introduction

- 1.1 This report has been prepared by Air Quality Consultants Ltd (AQC), on behalf of RWE Renewables UK Solar and Storage Ltd, and presents an assessment of the proposed Tween Bridge Solar Farm in relation to the effects of climate change on the Scheme, in terms of its resilience to future changes to climate.

2 Legislation, Planning Policy and Guidance

- 2.1 A summary of the relevant legislation, policy and technical guidance applicable to climate change resilience is set out below. Appendix A1 provides further detail.
- National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2024);
 - Climate Change Act 2008 (HMSO, 2008) and (2050 Target Amendment) Order 2019 (HMSO, 2019);
 - The National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting (Defra, 2023);
 - The Institute of Sustainability and Environmental Professionals (ISEP, formerly Institute of Environmental Management and Assessment (IEMA)) Environmental Impact Assessment (EIA) Guide To: Climate Change Resilience and Adaptation 2020 (2020);
 - Doncaster Local Plan 2015-2035 (Doncaster Council, 2021); and
 - Yorkshire and Humber Climate Action Plan (Yorkshire & Humber Climate Change Committee, 2024).

3 Assessment Methodology

- 3.1 The assessment methodology for the climate resilience assessment considers the recommendations in the ISEP (formerly IEMA) *Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation* (2020) and has been adapted to ensure the assessment is proportionate to the Scheme.
- 3.2 The assessment of climate change resilience and adaptation relates to how the Scheme, once complete and operational, will be impacted by climate change and outlines measures that have been included within the Scheme to mitigate these impacts, where required.
- 3.3 The resilience to climate change assessment seeks to establish the potential for significant effects of climate change on the Scheme during construction, operation, and decommissioning.
- 3.4 Climate change by its nature occurs over many decades and future changes, as modelled by the Met Office (the 2018 UK Climate Projections known as 'UKCP18'), consider climate change up to 2100. The focus of the assessment is the future when changes in climate are expected to have occurred. This means that the construction works, which are near-term (2028-2032) are less susceptible as the effects of climate change relative to the current baseline are greatest over longer time horizons (e.g. 2050 to 2100).
- 3.5 The Scheme is planned for a 40-year lifetime. ISEP (formerly IEMA) guidance (2020) advises that UKCP18 projections for the 2080s should be used, however as the Scheme will be decommissioned from 2069, the assessment uses projections for the 2060s-2080s which covers the appropriate time horizon. The assessment uses the Representative Concentration Pathway (RCP) 8.5 projections (high

emissions scenario) (Defra, BEIS, Met Office Hadley Centre & Environment Agency, 2022a) as a worst-case scenario, which aligns to over 4 degrees of global average warming.

- 3.6 In terms of mitigation to climate change, this is principally a function of the design of the Scheme, which needs to anticipate future risks and build in appropriate adaptation measures as required. There is, therefore, an important focus on embedded measures to address future climate change.
- 3.7 The assessment therefore starts by establishing potential receptors, potential climate risks and considers the significance of that risk through an assessment of likelihood and consequence, taking into account embedded design measures for the Scheme.

Assumptions and Limitations

- 3.8 This assessment provides a broad indication of the potential impacts of climate change on the Scheme based on a qualitative assessment and professional judgement using knowledge of similar schemes. The UKCP18 projections (Defra, BEIS, Met Office Hadley Centre & Environment Agency, 2022a) are the most up-to-date projections of climate change for the UK.
- 3.9 UKCP18 provides probabilistic projections of future climate for a range of emissions scenarios. Future GHG emissions, and the resulting pathway, is uncertain. A precautionary approach, consistent with ISEP (formerly IEMA) guidance (2020), has therefore been adopted by selecting a high emissions scenario (RCP 8.5) to ensure that all potential risks are addressed. The central estimate (50th percentile) projections have been utilised.
- 3.10 The embedded mitigation/adaptation measures are based on information provided by the Applicant's Project Team and supporting documents. The determination of significance has been undertaken under the assumption that industry design standards will be adhered to where detailed design information is unavailable.

Assessment Criteria

- 3.11 The assessment is carried out over four steps, as follows, in accordance with the ISEP (formerly IEMA) guidance (2020).

Step 1: Identify Receptors

- 3.12 During this stage, relevant receptors in the Scheme which may be affected by climate change (e.g. changes in average weather conditions and extreme events) are identified.
- 3.13 ISEP (formerly IEMA) guidance (2020) describes that the assessment should consider the susceptibility and vulnerability of the receptors to future climate change. The guidance provides examples of 'low', 'moderate' and 'high' susceptibility and vulnerability but is not prescriptive in defining a scale for overall receptor sensitivity, which is determined with professional judgement. For the purposes of this assessment, all receptors included in the assessment are considered to be of 'high' sensitivity, which is worst-case.

Step 2: Identify Potential Impacts of Climate Change on Receptors and Confirm Mitigation

- 3.14 This stage comprises identification of potential impacts on changes in a range of climate variables (or hazard) on the receptors identified in Step 1. This is undertaken using professional judgement, with reference to supporting reports where appropriate, including ES technical chapters, appendices and figures [Document Reference 6.1.0 to 6.4.17.1] and other supporting reports [Document Reference

7.1 to 7.11], and identifies the design measures incorporated within the Scheme to inherently mitigate the impacts.

Step 3: Assess the Significance of Effects of Climate Change on Receptors

- 3.15 This step assesses the significance of each hazard (using definitions in Table 3-3) based on scoring the likely consequence and likelihood of that hazard arising, using a five-point scale described in Table 3-1 and Table 3-2.
- 3.16 The assessment of significance and scoring of likelihood and consequence are based on ISEP (formerly IEMA) guidance (2020). The scoring of likelihood and consequence terminology has been taken from the ISEP (formerly IEMA) guidance and is not directly transposable to whether an effect is considered to be significant or not.

Table 3-1: Qualitative Description of Consequence

Measure of Consequence	Description
Negligible	No damage to the Scheme, minimal adverse effects on health, safety and the environment or financial loss. Little change to service and disruption lasting less than one day.
Minor Adverse	Localised disruption or loss of service. No permanent damage, minor restoration work required: disruption lasting less than one day. Small financial losses and/or slight adverse health or environmental effects.
Moderate Adverse	Limited damage and loss of service with damage recoverable by maintenance or minor repair. Disruption lasting more than one day but less than one week. Moderate financial losses. Adverse effects on health or the environment.
Large Adverse	Extensive damage and severe loss of service. Disruption lasting more than one week. Early renewal of 50-90% of the Scheme. Permanent physical injuries and/or fatalities. Major financial loss. Significant effect on the environment, requiring remediation.
Very Large Adverse	Permanent damage and complete loss of service. Disruption lasting more than one week. Early renewal of the Scheme >90%. Severe health effects or fatalities. Extreme financial loss. Very significant loss to the environment requiring remediation and restoration.

Table 3-2: Qualitative Description of Likelihood

Measure of Likelihood	Description
Very High	The event occurs multiple times during the lifetime of the Scheme e.g., approximately annually.
High	The event occurs several times (approximately 12 events) during the lifetime of the Scheme.
Medium	The event occurs limited times (approximately 4 events) during the lifetime of the Scheme.
Low	The event occurs once during the lifetime of the Scheme.
Very Low	The event may occur once during the lifetime of the Scheme or may not occur at all.

- 3.17 These determinants are combined to assess the significance of effects on receptors, as shown in Table 3-3. The assessment is qualitative and uses professional judgement based on knowledge of similar schemes, engagement with the Applicant's Project Team, and a review of relevant literature.
- 3.18 The assessment of significance follows the approach outlined in ISEP (formerly IEMA) guidance (2020) and takes embedded mitigation/adaptation into account. Embedded mitigation/adaptation has been identified through consultation with the Applicant's Project Team and supporting documents.

Table 3-3: Significance of Effects Matrix

Likelihood of Hazard Occurring	Consequence of Hazard Occurring				
	Negligible	Minor Adverse	Moderate Adverse	Large Adverse	Very Large Adverse
Very High	Not Significant	Significant	Significant	Significant	Significant
High	Not Significant	Significant	Significant	Significant	Significant
Medium	Not Significant	Not Significant	Significant	Significant	Significant
Low	Not Significant	Not Significant	Not Significant	Significant	Significant
Very Low	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

Step 4: Establish Further Adaptation Measures and Determine Residual Effects

- 3.19 In the fourth step, further adaptation measures for any significant effects are identified through expert opinion, based on knowledge of similar schemes, and any residual effects of climate change on receptors are assessed using the criteria set out in Table 3-1 to Table 3-3.

4 Current Climatic Conditions

- 4.1 The assessment of the resilience of the Scheme to the impacts of climate change has been informed by regional scale information on historic and projected change in climate variables, and other studies undertaken relevant to the Scheme (such as **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**).
- 4.2 Baseline conditions have been defined by potential climate risks identified in the UK's Third Climate Change Risk Assessment (HM Government, 2022) and the Key Climate Projections: Headline Findings (Defra, BEIS, Met Office Hadley Centre & Environment Agency, 2022b). These are based on the 2018 UK climate projection dataset (UKCP18).
- 4.3 There has been a significant human influence on the observed warming in the UK annual temperature since 1950. Statistical results from extreme value analysis suggest that the UK daily maximum and minimum temperature extremes have increased by just over 1°C since the 1950s, and that heavy seasonal and annual rainfall events have also increased.
- 4.4 Table 4-1 sets out the current understanding of climate hazards within the Order Limits, based on the assessments within relevant technical reports and other supporting information submitted as part of the DCO Application.

Table 4-1: Current Climate Change Hazards

Climate Hazard	Current Baseline
Fluvial Flooding	ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1] identifies the Scheme as being located within Flood Zone 3, meaning that there is a high probability of flooding from fluvial and tidal sources (greater than a 1% annual probability of occurrence for fluvial sources, greater than 0.5% annual probability for tidal sources). Mitigation measure include raising the lowest edge of all panels and infrastructure 100mm above modelled flood levels. The residual flood risk is therefore low.
Pluvial (Surface Water Flooding)	As stated within ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1] , the Environment Agency (EA) Surface Water Flood Map shows that the Site itself is at 'very low likelihood of surface water flooding.
Groundwater Flooding	ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1] states that, on the basis that the topography is not considered conducive to groundwater flooding, the risk of groundwater flooding is low.
Drought	Yorkshire Water operate a Drought Plan (Yorkshire Water, 2022) which sets out the plan to maintain customer water supplies in the event of drought.
Extreme Weather Events	South Yorkshire is susceptible to winter storms (typically winds and rain) and summer heatwaves in recent years. Severe winter snow and ice events are infrequent but do occur.

5 Future Climatic Conditions

- 5.1 Climate modelling completed by the Met Office (UKCP18) (Defra, BEIS, Met Office Hadley Centre & Environment Agency, 2022b) is forecasting drier hotter summers, warmer wetter winters and more frequent extreme weather events due to climate change.
- 5.2 Table 5-1 outlines the future climate projections for South Yorkshire, using UKCP18 RCP 8.5 projections (50th percentile) relative to the 1981 – 2000 baseline. The high emissions scenario was used to adopt a 'worst case' estimate of climate projections for the 2020-2039 time horizon for construction works (planned 2028-2032) and the 2060-2079 time horizon for operation (the Scheme will be decommissioned between 2069 and 2073).

Table 5-1: Climate Projections for London Based on UKCP18 – RCP8.5 (50th Percentile)

Climate Variable	Construction Time Horizon 2020-2039	Operation Time Horizon 2060-2079
Mean Winter Rainfall	+4%	+10%

Climate Variable	Construction Time Horizon 2020-2039	Operation Time Horizon 2060-2079
Mean Summer Rainfall	-3%	-19%
Mean Winter Temperature	+0.9°	+1.7°
Mean Summer Temperature	+1.2°	+3.2°

- 5.3 It can be seen from the data in Table 5-1 that the future climate at the Site in both the construction and operational periods is likely to have warmer, wetter winters, and hotter, drier summers. These will increase the potential for a range of events such as heatwaves, drought, and flooding linked to high winter rainfall.
- 5.4 Extreme weather events such as winds and storms are also considered relevant for the Scheme. Climate change predictions indicate increasingly erratic weather patterns that are likely to lead to extreme weather events. These include heavy rainfall events which will likely increase the risk to the Site from pluvial flooding, and high wind and storm events.
- 5.5 The climate hazards relevant to and considered in the assessment are as follows:
- hotter summers with extreme temperatures (heatwaves).
 - wetter winters including extreme rainfall (pluvial and groundwater flooding).
 - drier summers (drought).
 - increased wind and storms.

Snow and Ice

- 5.6 According to UKCP18 projections, a decrease in both falling and lying snow across the UK relative to the 1981 – 2010 baseline is expected by the end of the century. In general, the decreases are largest in low-lying regions. As such, increased snow and ice is not considered a relevant climate hazard for the Scheme.

6 Likely Effects on the Scheme and their Significance

- 6.1 The assessment has followed the four-step process identified earlier, as detailed further below.

Step 1: Identify Receptors

- 6.2 The key receptors identified for inclusion in the climate change resilience assessment are:

Construction:

- Construction infrastructure and equipment (e.g. site offices, compounds, machinery); and
- Construction site staff/personnel.

Operation:

- Renewable energy infrastructure (e.g. solar PV modules, BESS units and inverters);
- Site staff/personnel; and

- Habitats and biodiversity.

Decommissioning:

- Decommissioning infrastructure and equipment (e.g. site offices, compounds, machinery);
- Decommissioning site staff/personnel; and
- Habitats and biodiversity.

6.3 Note that while habitats and biodiversity are a feature of the existing Order Limits, they are not considered as a sensitive receptor during construction, as construction has no climate resilience imposed impacts on these existing habitats. The completed Scheme includes a range of retained and enhanced habitat and biodiversity features, and as such impacts of future climate change on these receptors are considered relevant for the operational phase of the Scheme. Habitats and biodiversity are judged to be relevant receptors during decommissioning, as it is expected that the habitats and biodiversity enhanced and managed through the lifetime of the Scheme will be retained beyond the end of the Scheme's lifetime.

Step 2: Identify Potential Impacts of Climate Change on Receptors and Embedded Mitigation

6.4 A number of potential impacts of climate change on the Schemes' receptors were identified. The results are detailed in Table 6-1 (construction), Table 6-2 (operation) and Table 6-3 (decommissioning) below, and include embedded mitigation that is anticipated to be incorporated within the design of the Scheme.

Table 6-1: Climate Hazards and Mitigation – Construction phase

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
Hotter Summers. Extreme Temperatures (Heatwaves)	Construction infrastructure and equipment	Overheating of electrical equipment	Included within the Outline Construction Environmental Management Plan (CEMP) [Document Reference 7.1] . Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. Specific responsibilities are included in the Outline CEMP [Document Reference 7.1] . Electrical construction equipment and plant will be stored away from direct sunlight when not in use.
		Overheating of machines and site offices	Included within the Outline CEMP [Document Reference 7.1] . Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather. Air conditioning to be used where required.
	Construction site staff/personnel	Risk of overheating to workers	Included within the Outline CEMP [Document Reference 7.1] . Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather. Specific responsibilities are included in the Outline CEMP [Document Reference 7.1] . Air conditioning in cabs of powered machinery to protect operators.
		Increased heat stress/ heat exhaustion for workers.	
Wetter Winters, Extreme Rainfall	Construction infrastructure and equipment	Viability of and access to sites (such as heavy rain resulting in surface water flooding of local roads, sources of power supply or inundation of sites).	Included within the Outline CEMP [Document Reference 7.1] . Contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding. Infrastructure flood resilience detailed in ES Chapter 10: Water Resource [Document Reference 6.1.10] . Specific responsibilities are included in the Outline CEMP [Document Reference 7.1] .
	Construction site staff/personnel	Risk of injury or threat to life from flooding	Included within the Outline CEMP [Document Reference 7.1] . Contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding. Infrastructure flood resilience detailed in ES Chapter 10: Water Resource [Document Reference 6.1.10] , including temporary construction drainage system development, and temporary attenuation, as needed. Specific responsibilities are included in the Outline CEMP [Document Reference 7.1] .
Drier Summers, Drought	Construction infrastructure and equipment	Water shortages for site works	The Outline CEMP [Document Reference 7.1] includes water management measures, that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction.

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
	Construction site staff/personnel	Water shortages for staff welfare	The Outline CEMP [Document Reference 7.1] includes water management measures, that provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction.
Wind and Storms	Construction infrastructure and equipment	Damage to site offices, compounds or partially installed components resulting in delays to programme and associated costs and/or unacceptable safety risks	Included within the Outline CEMP [Document Reference 7.1] . Contractors will monitor weather forecasts and receive Environment Agency flood warnings and alerts, and plan works accordingly, protecting resources from any extreme weather conditions. Specific responsibilities are included in the Outline CEMP [Document Reference 7.1] .
		High winds increasing dust (and other debris)	Dust management is included in the Outline CEMP [Document Reference 7.1] including measures to protect against wind whipping and dust resuspension. Detailed example measures are provided in ES Appendix 14.5 – Construction Mitigation [Document Reference 6.3.14.5] .
	Construction site staff/personnel	Increased potential for slips, trips and falls	Included within the Outline CEMP [Document Reference 7.1] . Contractors will monitor weather forecasts and receive Environment Agency flood warnings and alerts, and plan works accordingly, protecting resources from any extreme weather conditions. Health and Safety Manager will be responsible for the monitoring and controlling of health and safety compliance and related rules and regulations on-site. Health and safety plans developed for construction activities will be required to account for potential climate change impacts on workers. Specific responsibilities are included in the Outline CEMP [Document Reference 7.1] .

Table 6-2: Climate Hazards and Mitigation – Operation and Maintenance

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
Hotter Summers. Extreme Temperatures (Heatwaves)	Renewable energy infrastructure (solar PV modules, BESS units and inverters)	Overheating of electrical equipment	Included within the Outline Operational Environmental Management Plan (OEMP) [Document Reference 7.2] . All structures will be designed to relevant standards and specifications. Cooling systems used on BESS systems will accommodate suitable peak ambient temperatures accounting for inter-year variability and future climate change. It is anticipated that maintenance and servicing will include the inspection, repair, adjustment, altering, removal, reconstruction, refurbishment replacement or improvement of equipment to ensure the continued effective operation of the Scheme.
	Site staff/personnel	Increased heat stress/ heat exhaustion for workers	Measures to protect staff welfare during heat waves are included within the Outline OEMP [Document Reference 7.2] . This includes planning work around extreme heat where possible.
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	Habitat protection and enhancement to include natural habitats for the area. Active management will improve resilience to future climate changes. Measures to protect and enhance habitats and biodiversity are included within the Outline Landscape Ecological Management Plan (OLEMP) [Document Reference 7.6] and ES Chapter 7 Ecology and Nature Conservation [Document Reference 6.2.7] .
Wetter Winters, Extreme Rainfall	Renewable energy infrastructure (solar PV modules, BESS units and inverters)	Surface water flooding and standing waters.	Included within the Outline OEMP [Document Reference 7.2] . Contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding. Infrastructure flood resilience detailed in ES Chapter 10 Water Resources [Document Reference 6.2.10] . This includes raising the solar PV modules, and implementing sustainable urban drainage systems.
		Deterioration of structures or foundations due to increase in soil moisture levels.	
		Damage to surfaces/ exposed utilities from increased drying/wetting and increase frost penetration	
	Site staff/personnel	Risk of injury or threat to life from flooding	It is anticipated that maintenance and servicing will include the inspection, repair, adjustment, altering, removal, reconstruction, refurbishment replacement or improvement of equipment to ensure the continued effective operation of the Scheme.

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	Habitat protection and enhancement to include natural habitats for the area. Active management will improve resilience to future climate changes. Measures to protect and enhance habitats and biodiversity are included within the OLEMP [Document Reference 7.6] and ES Chapter 7 Ecology and Nature Conservation [Document Reference 6.2.7] .
Drier Summers, Drought	Renewable energy infrastructure (solar PV modules, BESS units and inverters) and Site access	Water shortages	Procedures to consider water efficiency measures are included within the Outline OEMP [Document Reference 7.2] . Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. All structures and components will be designed to relevant standards and specifications. It is anticipated that maintenance and servicing will include the inspection, repair, adjustment, altering, removal, reconstruction, refurbishment replacement or improvement of equipment to ensure the continued effective operation of the Scheme
		Deterioration of structures or foundations due to decrease in soil moisture levels	
	Landscaping and biodiversity	Damage to plants and biodiversity and potential to affect growth rates of habitats	
Wind and Storms	Renewable energy infrastructure (solar PV modules, BESS units and inverters)	Surface water flooding and standing waters	Included within the Outline OEMP [Document Reference 7.2] . Contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding. Infrastructure flood resilience detailed in ES Chapter 10 Water Resources [Document Reference 6.2.10] . All structures and components will be designed to relevant standards and specifications. It is anticipated that maintenance and servicing will include the inspection, repair, adjustment, altering, removal, reconstruction, refurbishment replacement or improvement of equipment to ensure the continued effective operation of the Scheme.
		Deterioration of structures or foundations due to increase in soil moisture levels	
	Site staff/personnel	Increased potential for slips, trips and falls	
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	

Table 6-3: Climate Hazards and Mitigation – Decommissioning phase

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
Hotter Summers. Extreme Temperatures (Heatwaves)	Decommissioning infrastructure and equipment	Overheating of electrical equipment	Included within the Outline Decommissioning Environmental Management Plan (DEMP) [Document Reference 7.3] . Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. Specific responsibilities are included in the Outline DEMP [Document Reference 7.3] . Electrical decommissioning equipment and plant will be stored away from direct sunlight when not in use.
		Overheating of machines and site offices	Included within the Outline DEMP [Document Reference 7.3] . Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather. Air conditioning to be used where required.
	Decommissioning site staff/personnel	Risk of overheating to workers	Included within the Outline DEMP [Document Reference 7.3] . Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather. Specific responsibilities are included in the Outline DEMP [Document Reference 7.3] . Air conditioning in cabs of powered machinery to protect operators.
		Increased heat stress/heat exhaustion for workers.	
Wetter Winters, Extreme Rainfall	Decommissioning infrastructure and equipment	Viability of and access to sites (such as heavy rain resulting in surface water flooding of local roads, sources of power supply or inundation of sites).	Included within the Outline DEMP [Document Reference 7.3] . Contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding. Specific responsibilities are included in the Outline DEMP [Document Reference 7.3] .
	Decommissioning site staff/personnel	Risk of injury or threat to life from flooding	Included within the Outline DEMP [Document Reference 7.3] . Contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding. Specific responsibilities are included in the Outline DEMP [Document Reference 7.3] .
Drier Summers, Drought	Decommissioning infrastructure and equipment	Water shortages for site works	The Outline DEMP [Document Reference 7.3] includes water management measures, that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during decommissioning.

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
	Decommissioning site staff/personnel	Water shortages for staff welfare	The Outline DEMP [Document Reference 7.3] includes water management measures, that provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during decommissioning.
Wind and Storms	Decommissioning infrastructure and equipment	Damage to site offices, compounds or components resulting in delays and associated costs and/or unacceptable safety risks	Included within the Outline DEMP [Document Reference 7.3] . Contractors will monitor weather forecasts and receive Environment Agency flood warnings and alerts, and plan works accordingly, protecting resources from any extreme weather conditions. Specific responsibilities are included in the Outline DEMP [Document Reference 7.3] .
		High winds increasing dust (and other debris)	Dust management is included in the Outline DEMP [Document Reference 7.3] including measures to protect against wind whipping and dust resuspension.
	Habitats and biodiversity	Damage to habitats from decommissioning equipment or partially decommissioned components due to storm events	Contractors will monitor weather forecasts and receive Environment Agency flood warnings and alerts, and plan works accordingly, thus minimising the risk to habitats of damage from decommissioning activities during any extreme weather conditions. Specific responsibilities are included in the Outline DEMP [Document Reference 7.3] . Mitigations include conducting updated surveys prior to works, and measure to reduce air, water, dust, silt, light and noise pollution to avoid disturbance to sensitive species.
	Decommissioning site staff/personnel	Increased potential for slips, trips and falls	Included within the Outline DEMP [Document Reference 7.3] . Contractors will monitor weather forecasts and receive Environment Agency flood warnings and alerts, and plan works accordingly, protecting resources from any extreme weather conditions. Health and Safety Manager will be responsible for the monitoring and controlling of health and safety compliance and related rules and regulations on-site. Health and safety plans developed for decommissioning activities will be required to account for potential climate change impacts on workers. Specific responsibilities are included in the Outline DEMP [Document Reference 7.3] .

Step 3: Assess the Significance of Effects of Climate Change on Receptors

6.5 Table 6-3 (construction), Table 6-4 (operation), and Table 6-5 (decommissioning) detail the assessment of the climate risks identified in Step 2 above. This takes into account projections of future climate change in the period up to 2039 for construction, up to 2079 for operation, and up to 2073 for decommissioning, as well as mitigation designed into the Scheme and to be included within the **Outline CEMP [Document Reference 7.1]**. It should be noted that precautionary judgements have been made to allow for a conservative assessment.

Table 6-3: Climate Resilience Assessment – Construction Phase

Climate Hazard	Receptor	Potential Impact	Likelihood	Consequence	Significance
Hotter Summers, Extreme Temperatures (Heatwaves)	Construction infrastructure and equipment	Overheating of electrical equipment	Very Low	Negligible	Not Significant
		Overheating of machines and site offices	Medium	Negligible	Not Significant
	Construction site staff/personnel	Risk of overheating to workers	Medium	Negligible	Not Significant
		Increased heat stress/ heat exhaustion for workers.	Low	Negligible	Not Significant
Wetter Winters, Extreme Rainfall	Construction infrastructure and equipment	Viability of and access to sites (such as heavy rain resulting in surface water flooding of local roads, sources of power supply or inundation of sites).	Medium	Minor Adverse	Not Significant
	Construction site staff/personnel	Risk to life from flooding	Very Low	Moderate Adverse	Not Significant
Drier Summers, Drought	Construction infrastructure and equipment	Water shortages for site works	Very Low	Minor Adverse	Not Significant
	Construction site staff/personnel	Water shortages for staff welfare	Very Low	Moderate Adverse	Not Significant
Wind and Storms	Construction infrastructure and equipment	Damage to site offices, compounds or partially installed components	Low	Minor Adverse	Not Significant

Climate Hazard	Receptor	Potential Impact	Likelihood	Consequence	Significance
		resulting in delays to programme and associated costs and/or unacceptable safety risks			
		High winds increasing dust (and other debris)	Medium	Negligible	Not Significant
	Construction site staff/personnel	Increased potential for slips, trips and falls	Very Low	Minor Adverse	Not Significant

Table 6-4: Climate Resilience Assessment – Operation and Maintenance

Climate Variable	Receptor	Potential Impact	Likelihood	Consequence	Significance
Hotter Summers, Extreme Temperatures (Heatwaves)	Renewable energy infrastructure (solar PV modules, BESS units and inverters)	Overheating of electrical equipment	Low	Minor Adverse	Not Significant
	Site staff/personnel	Increased heat stress/ heat exhaustion for workers	Low	Negligible	Not Significant
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	Low	Minor Adverse	Not Significant
Wetter Winters, Extreme Rainfall	Renewable energy infrastructure (solar PV modules, BESS units and inverters)	Surface water flooding and standing waters.	Medium	Minor Adverse	Not Significant
		Deterioration of structures or foundations due to increase in soil moisture levels.	Low	Minor Adverse	Not Significant
		Damage to surfaces/ exposed utilities from increased drying/wetting and increase frost penetration	Low	Minor Adverse	Not Significant
	Site staff/personnel	Risk to life from flooding	Very Low	Moderate Adverse	Not Significant
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	Low	Negligible	Not Significant
	Renewable energy	Water shortages	Low	Minor Adverse	Not Significant

Climate Variable	Receptor	Potential Impact	Likelihood	Consequence	Significance
Drier Summers, Drought	infrastructure (solar PV modules, BESS units and inverters) and Site access	Deterioration of structures or foundations due to decrease in soil moisture levels	Low	Minor Adverse	Not Significant
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	Low	Minor Adverse	Not Significant
Wind and Storms	Renewable energy infrastructure (solar PV modules, BESS units and inverters)	Surface water flooding and standing waters	Medium	Minor Adverse	Not Significant
		Deterioration of structures or foundations due to increase in soil moisture levels	Low	Minor Adverse	Not Significant
	Site staff/personnel	Increased potential for slips, trips and falls	Very Low	Moderate Adverse	Not Significant
	Landscaping and biodiversity	Damage to plants and biodiversity and potential to affect growth rates of habitats	Very Low	Negligible	Not Significant

Table 6-5: Climate Resilience Assessment – Decommissioning Phase

Climate Hazard	Receptor	Potential Impact	Likelihood	Consequence	Significance
Hotter Summers. Extreme Temperatures (Heatwaves)	Decommissioning infrastructure and equipment	Overheating of electrical equipment	Very Low	Negligible	Not Significant
		Overheating of machines and site offices	Medium	Negligible	Not Significant
	Decommissioning site staff/personnel	Risk of overheating to workers	Medium	Negligible	Not Significant

Climate Hazard	Receptor	Potential Impact	Likelihood	Consequence	Significance
		Increased heat stress/ heat exhaustion for workers.	Low	Negligible	Not Significant
Wetter Winters, Extreme Rainfall	Decommissioning infrastructure and equipment	Viability of and access to sites (such as heavy rain resulting in surface water flooding of local roads, sources of power supply or inundation of sites).	Medium	Minor Adverse	Not Significant
	Decommissioning site staff/personnel	Risk to life from flooding	Low	Moderate Adverse	Not Significant
Drier Summers, Drought	Decommissioning infrastructure and equipment	Water shortages for site works	Very Low	Minor Adverse	Not Significant
	Decommissioning site staff/personnel	Water shortages for staff welfare	Very Low	Moderate Adverse	Not Significant
Wind and Storms	Decommissioning infrastructure and equipment	Damage to site offices, compounds or components resulting in delays and associated costs and/or unacceptable safety risks	Low	Minor Adverse	Not Significant
		High winds increasing dust (and other debris)	Medium	Negligible	Not Significant

Climate Hazard	Receptor	Potential Impact	Likelihood	Consequence	Significance
	Habitats and biodiversity	Damage to habitats from decommissioning equipment or partially decommissioned components due to storm events	Low	Minor Adverse	Not Significant
	Decommissioning site staff/personnel	Increased potential for slips, trips and falls	Low	Minor Adverse	Not Significant

Step 4: Establish Further Adaptation Measures and Determine Residual Effects

- 6.6 Table 6-3, Table 6-4, and Table 6-5 show that there are no likely significant effects in relation to climate change resilience during construction, operation, or decommissioning.
- 6.7 Measures will need to be developed as part of the detailed CEMP, DEMP, OLEMP and OEMP in order to ensure the construction works and the Scheme during operation are appropriately resilient to future climate change.

7 Summary & Conclusions

- 7.1 The resilience of the Scheme to climate change has been assessed. Four key climate hazards have been identified, these being:
- hotter summers with extreme temperatures (heatwaves);
 - wetter winters including extreme rainfall (pluvial and groundwater flooding);
 - Drier summers and drought; and
 - increased wind and storms.
- 7.2 The assessment considers the recommendations in the ISEP (formerly IEMA) *Guide to Climate Change Resilience and Adaptation* (2020) and was adapted to ensure the assessment was proportionate to the Scheme. It utilised the most up-to-date published projections of climate change for the UK, and adopted a precautionary approach whereby a high-emissions scenario was selected (as suggested by ISEP (formerly IEMA)).
- 7.3 Resilience and adaptation measures for the Scheme have been provided by the Applicant's Project Team and taken from detailed information within the planning submission documents. Further measures will be developed within the detailed production of the CEMP, DEMP, LEMP and OEMP documents.
- 7.4 The assessment has identified that there are no significant effects in relation to climate change resilience during construction, operation, or decommissioning.

8 References

- Defra (2023) *The National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting*, [Online], Available: https://assets.publishing.service.gov.uk/media/64ba74102059dc00125d27a7/The_Third_National_Adaptation_Programme.pdf.
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- HM Government (2022) *UK Climate Change Risk Assessment 2022*, [Online], Available: <https://assets.publishing.service.gov.uk/media/61e54d8f8fa8f505985ef3c7/climate-change-risk-assessment-2022.pdf> [2025].
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- Yorkshire & Humber Climate Change Committee (2024) 'Yorkshire and Humber Climate Action Plan'.
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9 Glossary

AQC	Air Quality Consultants
BESS	Battery Energy Storage Systems
CEMP	Construction Environmental Management Plan
HMSO	His Majesty's Stationery Office
IEMA	Institute of Environmental Management and Assessment
ISEP	Institute of Sustainability and Environmental Professionals
NPPF	National Planning Policy Framework
OEMP	Operational Environmental Management Plan
PV	Photovoltaic
UKCP18	UK Climate Projections 2018

A1 Legislation, Planning Policy and Guidance

A1.1 In preparing the assessment, consideration has been given to the requirements of national and local planning policies.

Legislation and National Planning Policy

National Planning Policy Framework

A1.2 The NPPF (Ministry of Housing, Communities and Local Government, 2024) sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which (8c) is an environmental objective:

"to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy".

A1.3 Part 14 of the Framework is entitled "Meeting the challenge of climate change, flooding and coastal change" and sets out the strategy for minimising the climate change effects of new development. Paragraph 163 states that:

"The need to mitigate and adapt to climate change should also be considered in preparing and assessing planning applications, taking into account the full range of potential climate change impacts."

A1.4 Paragraph 164 describes that

"New development should be planned for in ways that:

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through incorporating green infrastructure and sustainable drainage systems

b) help to reduce greenhouse gas emissions through its location, orientation and design".

A1.5 Paragraph 165 describes further that "to help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers".

A1.6 In determining planning applications, Paragraph 166 of the NPPF states that "local planning authorities should expect new development to:

- a) *comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and*
- b) *take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption."*

A1.7 Paragraph 168 further states: "When determining planning applications for all forms of renewable and low carbon energy developments and their associated infrastructure, local planning authorities should:

- a) *not require applicants to demonstrate the overall need for renewable or low carbon energy, and give significant weight to the benefits associated with renewable and low carbon energy generation and the proposal's contribution to a net zero future;*
- b) *recognise that small-scale and community-led projects provide a valuable contribution to cutting greenhouse gas emissions;*
- c) *in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site."*

Climate Change Act 2008 (2050 Target Amendment) Order 2019 and Carbon Budget Order 2021

- A1.8 The overarching Act in relation to climate is the Climate Change Act 2008 (HMSO, 2008), which was amended in June 2019 (HMSO, 2019). The Act introduces a legally binding target to reduce the UK's GHG emissions to zero net carbon (i.e. 100% below 1990 levels) by 2050. It also provides for a Climate Change Committee (CCC) with power to set out carbon budgets binding on the Government for five-year periods.
- A1.9 The Carbon Budget Order 2021 came into force in June 2021 (HMSO, 2021). It sets a legal obligation to meet the targets of the Climate Change Act 2008 and subsequent amendment to cut GHG emissions by 78% by 2035.
- A1.10 The first three carbon budgets set out a binding 38% CO₂e reduction relative to 1990 levels by 2020, and the UK Government subsequently adopted the fourth (2023-2027), fifth (2028-2032) and sixth (2033-2037) carbon budgets to reduce CO₂e by 52% relative to 1990 levels by 2025, by 58% relative to 1990 levels by 2030, and by 78% relative to 1990 levels by 2035, respectively.
- A1.11 The CCC also produces annual reports to monitor the progress in meeting these carbon budgets. As a consequence of the enactment of the Climate Change Act, a raft of policy at national and local level has been developed aimed at reducing carbon emissions.

The National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting

- A1.12 The National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting (Defra, 2023) sets out UK Government's response to the third Climate Change Risk Assessment (HM Government, 2022), showing the policies and actions UK Government is, and will be, implementing and taking to address the risks and opportunities posed by a changing climate. The programme is focussed on three main themes: "action", "information" and "coordination" and states: "The UK Government's vision for adaptation is for a country that effectively plans for and is fully adapted to the changing climate, with resilience against each of the identified climate risks."

- A1.13 The Programme forms part of the five-yearly cycle of requirements laid down in the Climate Change Act 2008 to drive a dynamic and adaptive approach to building the UK's resilience to climate change.

ISEP (formerly IEMA) (2020) EIA Guide to: Climate Change Resilience and Adaptation

- A1.14 This document is seen as a reference point for considering climate change within EIA. This guidance gives a 7-step process toward building climate resilience into a project or development.

Local Planning Policy

Doncaster Local Plan 2015-2035

- A1.15 Strategic objectives 17 and 18 set out the Borough's climate change mitigation and adaptation ambitions
- A1.16 Policy 58 sets out the Low Carbon and Renewable Energy Strategic Policy, which aims to increase the supply of low carbon and renewable energy generated in the Borough. Policy 58 states:
- A1.17 *The Council aims to increase the supply of low carbon and renewable energy generated in the Borough, in accordance with the principles set out below: A) Proposals will be supported which give priority to: 1. community energy schemes that are in full or part community ownership; 2. biomass and energy crop schemes especially to the north and south east of the main urban area, for example mixed woodland, single species short rotation forestry and largescale forestry, outside of areas of high quality arable farmland; 3. heat or power generation from light, water, waste and other low carbon heat sources; 4. landfill and sewage gas energy generation schemes; 5. wind power projects which meet the criteria of Policy 59; and 6. micro-renewable energy technologies and decentralised heat and power systems within new development. B) In all cases, low carbon and renewable energy proposals will be supported where they: 1. have undertaken community engagement and demonstrate how they will deliver environmental, social and economic benefits; 2. have no unacceptable adverse effects on local amenity and air quality, and include appropriate stand-off distances between technologies and sensitive receptors, such as residential areas; 3. allow the continued safe and efficient operation of Doncaster Sheffield Airport; 4. would have no unacceptable adverse effects on highway safety and infrastructure; 5. have no unacceptable adverse impacts, including cumulative impacts, on the built and natural environment (including landscape character, and historic and nature conservation assets, such as Thorne and Hatfield Moors); and 6. reclaim the site to a suitable and safe condition and use (such as agriculture or nature conservation) within a defined and agreed period should the development cease to be operational. C) Proposals will be supported which facilitate the delivery of combined heat and power (CHP), combined cooling, heat and power (CCHP) and district heating networks where there is sufficient heat density/demand or anchor loads. Development within or adjacent to Heat Opportunity Areas will be expected to incorporate infrastructure for district heating where feasible, and to connect to existing systems where available.*

Yorkshire and Humber Climate Action Plan

- A1.18 Sets out the actions for the region, including transforming energy systems by the rapid deployment of renewables.



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