

Aputura Energy - P108 Currie – West Hermiston

Climate Change Risk Assessment

Aputura Energy

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1.0 Climate Change Risk Assessment

Climate change is already increasing the likelihood of extreme weather events, and this trend will continue to accelerate in the coming decades. Buildings and infrastructure being constructed today may therefore be exposed to unprecedented levels of climate risk and action must be taken accordingly to demonstrate resilience to future climate scenarios and the most recent UK Climate Change Risk Assessment (2022)¹. This report provides a Climate Change Risk Assessment for the proposed development of Aputura Energy's Data Centre at the co-ordinates 55.91640, -3.33000, on the south-west epe of Edinburgh to the north of Heriot-Watt University's Edinburgh campus. This report focuses on the early actions needed to consider climate change impacts experienced today (1.5°C global temperature rise, or relative concentration pathway (RCP) 1.9), and additional future climate change scenarios (3-4°C global temperature rise, RCP 6.0).

The objectives of the Climate Change Risk Assessment are as follows:

- Outline future climate scenarios.
- Identify the expected extreme weather and climate conditions arising from climate change.
- Assess the risks associated with climactic changes on the development.
- Develop recommendations to manage and reduce these impacts.
- Identify, assess, estimate, and management climate change risk in line with Edinburgh City Plan 2030.
- To align the development with NPF4 in support of the Climate Change Adaptation theme.

Cundall has been appointed to conduct this assessment for Aputura Energy - P108 Currie – Wester Hermiston at RIBA Stage 2. The climate change risks are assessed and evaluated at this stage to inform potential adaptation measures in the design.

Please note that, although the intention of this assessment is to reduce the risk to the project of a changing climate, it does not guarantee that climate change risks will not exist. The risk assessment is based on recorded historical climate data and projections for the changes of this climate into the future. Future climate projections are based on advanced computer modelling of a relatively large range (25km), and as such, localised impacts may differ from this. Specifically, in relation to wind, the UKCP18 Wind Factsheet states that local variations due to the land surface are hard to model, particularly in very exposed or sheltered locations. This can be particularly relevant in high wind speed situations where local gusts can result from small scale weather events such as thunderstorms.

1.1 Risk

Hazards x Vulnerability x Exposure = Risk

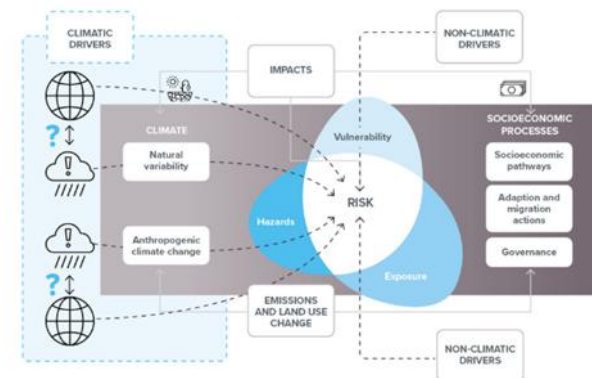


Figure 1-1: Determinants of risk (Source: IPCC 6th Assessment report)

Risk is driven by both natural and human actions and trends. While natural trends are always present, such as warmer summer temperatures in Southern Europe than Northern Europe, human actions can exacerbate these into more significant events, such as extreme heatwaves, droughts and wildfires, amongst others. Regarding geological natural hazards, it should be noted that most of these are not affected by climate change in the same manner as other natural hazards: the underlying natural drivers, such as tectonic processes causing earthquakes, are still present but the risk can be exacerbated by human drivers, such as poor structural building standards.

Likelihood and impact are assessed on a scale of Very Low to Very High as outlined in table 1-2; the exact definitions of what constituents each level of likelihood and consequence can be found in below, describes how likelihood and impact generate an overall risk rating. The assessment takes a holistic view but focuses on operational implications. Natural hazards are assessed independently of each other.

1.2 Edinburgh City Plan 2030 – Env 7 NC v6

The proposed development has been designed to fully integrate the requirements of the Edinburgh City Plan 2030, **Policy Env 7 – Sustainable Developments**. In line with this policy, the proposal demonstrates *how the building integrates measures to both mitigate and futureproof against the effects of the climate emergency, particularly with regard to the increased frequency and severity of extreme temperature and storm/rainfall/flooding events as well as sea level rise and erosion*.

Our methodology for doing so is set out in the sub-sections below.

1.3 Detailed Methodology

1.3.1 Hazard Identification

1. Review the evidence and information from relevant bodies and resources to identify and understand the expected impacts of increased extreme

weather events and climate change on the building. Relevant bodies include, but are not limited to, the following:

- a. Local authorities
 - b. Statutory bodies, e.g. DEFRA, Environment Agency, Northern Ireland Environment Agency (NIEA), Scottish Environment Protection Agency (SEPA) etc.
 - c. Technical bodies, e.g. CIBSE, UK Climate Impacts Programme (UKCIP).
2. As a guide, all adaptation plans should consider the following impacts of climate change and extreme weather events and describe how the design mitigates against them, where appropriate:
 - a. Flooding
 - b. Storms (including high winds)
 - c. Cold events
 - d. Heat waves (including temperature increases)
 - e. Drought (including reduced summer rainfall)
 - f. Milder winters
 - g. Wetter winters (including increased moisture and driving rain)
 - h. Warmer summers and increased solar radiation.
 - i. Temperature variation
 - j. Precipitation, e.g. rain and snow
 - k. Subsidence or ground movement.
 3. Identify likely hazards.

1.3.2 Hazard Assessment

1. Identify the likelihood and the magnitude or scale of the hazards identified. This includes climate change scenarios and their potential impact throughout the lifetime of different building elements.

1.3.3 Risk Estimation

1. Identify the risk presented by these hazards to the building and the likely impact of the hazards taking into account the following aspects as a minimum:
 - a. Structural stability
 - b. Structural robustness
 - c. Weather proofing and detailing
 - d. Material durability
 - e. Health and safety of building occupants and others
 - f. Impacts on building contents and business continuity.

1.3.4 Risk Evaluation

1. Evaluate the potential impact of these risks on the building.

¹ HM Government (2022). UK Climate Change Risk Assessment 2022. Available at: [UK Climate Change Risk Assessment 2022 \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/104444/uk-climate-change-risk-assessment-2022.pdf)

2. Determine the tolerable risk threshold.
3. Check the sensitivity of the risk assessment.
4. Identify areas where the risks are unacceptable to health and safety, life cycle assessment and financial terms.

1.3.5 Risk Management

1. Identify risk reduction measures.
2. Mitigate the hazards as far as is practically feasible.
3. Adapt the design and specification to incorporate the measures identified by the risk assessment in the final design.

1.4 Definitions

A range of terms are used throughout this report; the definitions of these are detailed in Table 1-1 below.

Term	Definition
Likelihood	The probability of occurrence of a hazardous climatic event
Impact	The results of realised hazards on systems (health and wellbeing, economic, social and cultural assets, services and infrastructure), incorporating the magnitude and severity of events.
Physical Risk	The potential for adverse consequences, resulting from the dynamic interaction between climate-related hazards, exposures and vulnerabilities of the affected system.
Natural Hazard	The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources.
Exposure	The presence of people; infrastructure; ecosystems; environmental functions, services or resources in places and settings that could be adversely affected.
Vulnerability	The propensity or predisposition to be adversely affected, encompassing sensitivity or susceptibility to harm and lack of capacity to cope and adapt.
Adaptation	The process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities; human intervention may facilitate this adjustment.

Table 1-1: Definitions of terms used

The likelihood rating assigned to a given risk for both location-specific likelihood and asset-specific likelihood considers: the probability of a climate-related hazardous event occurring at the asset's location (acute or chronic), as

well as the likelihood that the asset's specific exposures and vulnerabilities will lead to the realization of the risk.

Likelihood Rating	Definition
1 (Very Low)	Improbable - very low probability of occurrence within the given time horizon.
2 (Low)	Unlikely - low probability but an understanding it may occur at sometime within the given time horizon.
3 (Moderate)	Possible - moderate probability of occurrence at any time within the time horizon.
4 (High)	Probable - moderate to high probability of occurrence at any time with an expectation of occurrence at least once within the time horizon.
5 (Very High)	Expected - high probability to occur at any time and expected to occur at least once, with the potential for multiple within the time horizon.

Table 1-2: Definitions of Likelihood Ratings

The impact rating assigned to a given risk considers: the severity of the climate-related hazard, the site-specific vulnerabilities to this hazard, and any broader vulnerabilities that reflect the buildings overall importance, such as the overheating of perimeter spaces.

Impact Rating	Definition
1 (Very Low)	Minimal - very low levels of damage and/or insignificant or low operational implications.
2 (Low)	Minor - low levels of damage and/or minor operational implications; may require some adjustments for recovery.
3 (Moderate)	Moderate - manageable levels of damage and/or moderate operational implications; may require active adjustments/intervention for recovery.
4 (High)	Significant - substantial levels of damage and/or significant operational implications; may require considerable intervention for recovery.
5 (Very High)	Devastating - very high levels of damage, and/or intense operational implications; may have long-term negative effects and challenging recovery.

Table 1-3: Definitions of Impact Ratings

1.5 RIBA Stage 2 Outcome

As per the UKGBC Climate Resilience Roadmap's guidance for the Concept Design stage (RIBA Stage 2), we have assessed climate-related vulnerability, risks and impacts across the lifetime of the proposed development are evaluated

considering multiple climate scenarios. The project team is required to develop strategies to avoid, mitigate or manage impacts under these scenarios, including strategies to be integrated into the current design and future actions to be taken when there is greater certainty on impacts. The project team should also identify how the building can be made flexible and adaptable to accommodate any future actions.

1.6 Assessment Process

This assessment has been carried in a three-step process, aligning with the more detailed methodology set out above.

1. The location-specific likelihood for each natural hazard to affect the asset was assessed for two future climate scenarios pathways for global greenhouses gas emissions across three-time horizons.
2. Climate scenarios: RCP2-4.5 (a moderate emissions scenario) and RCP5-8.5 (a high emissions scenario).
3. Time horizons: 2020-2039, 2040-2059, 2060-2079.
4. The asset-specific likelihood and impact were then combined to give an overall risk rating of 1-25 in the formula of:

$$5. \text{ Risk Rating} = \text{likelihood} \times \text{Impact}$$

		Consequence				
		Very Low	Low	3Medium	High	Very High
Likelihood	Very low	1	2	3	4	5
	Low	2	4	6	8	10
	Medium	3	6	9	12	15
	High	4	8	12	16	20
	Very high	5	10	15	20	25
Key		Very Low (1)	Low (2-4)	Moderate (4-9)	High (10-16)	Very High (20-25)

Figure 1-2: Risk Rating Matrix

3. Risk mitigation / adaption recommendations and emergency plans were then specified where the location-specific likelihood was found to be Low or higher (≥ 2) for each hazard.

1.7 Risk Review

The risk assessment primarily uses data from the UK Climate Projections 2018 (UKCP18), combined with other data sources and literature analysis to review the likely climate impacts of six key climate hazards being Extreme heat, Drought & Water Scarcity, Intense Rainfall, Flood, Wind and Wildfire. Following key considerations highlights risks to be addressed during the lifespan of the project and, where possible, in the current design.

1.7.1 Key Considerations for 2050s and 2070s (Representative Concentration Pathway - RCP8.5)

The following weather effects are derived from the UKCP18 datasets as 50th percentile averages. Hence, there is a level of uncertainty associated with the specific effects as it varies between the years.

- The imperative to address escalating global temperatures necessitates the design of the building capable of managing a mean average annual increase of 1.9°C by the 2050s and 3.0°C by the 2070s.
- Projections suggest that by the 2070s, maximum summer temperatures may surge by 8.4°C compared to present-day conditions, underscoring the need to assess the capacity of existing M&E systems to accommodate heightened cooling demands.
- Average summer rainfall may decrease by 21% by the 2050s and 32% by the 2070s, increasing the risk of drought and sporadic yet intense precipitation events.
- Incremental rise in winter rainfall up to 17% by the 2070s, characterised by shorter, more intense downpours, leads to a growing risk of flash flooding. This necessitates a review and upgrade of drainage systems to accommodate these changes. Whilst fluvial and surface flooding is currently a low risk, it requires ongoing monitoring.
- Wind - There is no conclusive evidence indicating a significant impact of climate change on wind speeds and storms in the UK. However, the local wind pressures and microclimate can change over time due to the ever-growing built environment and changes in surrounding building heights; these cannot be predicted with any accuracy due to the constant construction in Greater London.
- Wildfire is considered an 'emergent risk' to the UK. The daily historic European Forest Fire Information System (EFFIS) indicates intermediate fire risk severity associated with P108 Currie - West Hermiston and its nearby vicinity.
- Building resilience becomes paramount, particularly in safeguarding critical infrastructure such as roof/basement plants and equipment, to prevent damage and ensure operational continuity.
- Evaluate building preparedness for power outages and water cuts due to extreme events to maintain functionality and safety.

Risk assessment was conducted based on RCP 8.5 scenario; future weather data is taken from an appropriate timescale that is commensurate with the intended life span of the system. Risk is expected to change over time, for the purpose of the assessment RCP 8.5 2050s data is considered as it is most appropriate as most of the elements are within lifespan of 20-50 years (boilers, chillers and façade etc). 2070s was given as representation on how risk increases over time.

1.8 Summary of Climate Risk Rating at Stage 2

Below is a summary of the risk rating overview for RCP 8.5 for the project based on the likelihood and consequence of the climate change risk after considering the current mitigation actions.

- 11 Moderate risks have been identified which are associated with extreme heat, wildfire, wind and flooding.
- A total of 26 Low risks have been identified.

Refer to the Risk Tracker (see Appendix A), which incorporates the Stage 2 design actions provided by the design team. Appendix A outlines the remaining risks at this stage. This tracker will be reviewed and updated at each subsequent design stage to monitor the effectiveness of the mitigation measures. At the conclusion of the design phase, the residual risks will be communicated

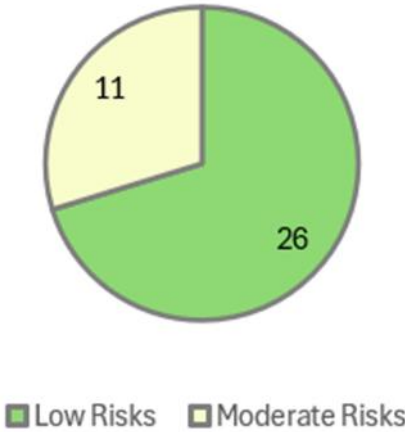
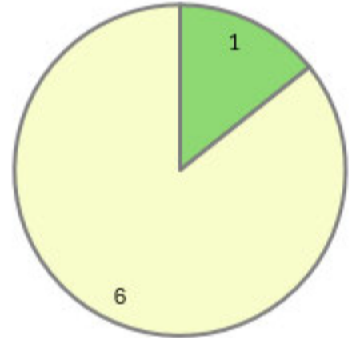
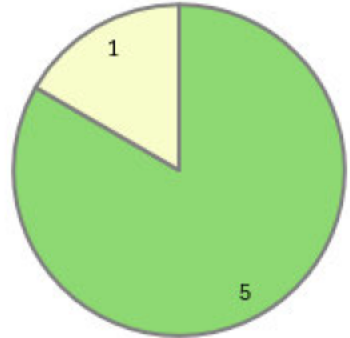


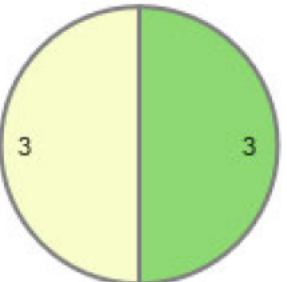
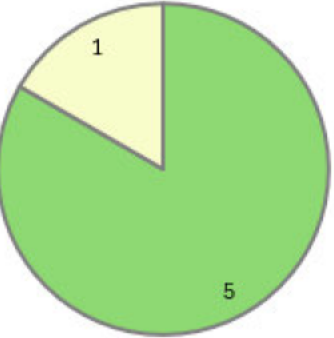
Figure 1-3: Number of risks under each category assessed during risk rating at Stage 2

1.9 Adaptation Measures for each Hazard at Stage 2

Hazard	Scottish Climate Adaptation's expected outcome at Stage 2 (PS2)	Adaptation Actions Integrated into the Design at Stage 2	Passive Survivability	Backup Power	Cooling Resilience	Nature-Based Solutions	Risk rating (2030s) Error! Bookmark not defined.
Extreme Heat	Apply CIBSE TM59, CIBSE Guide A, and Approved Document Part O to inform thermal comfort and overheating risk mitigation. Conduct stress-testing using multiple CIBSE Design Summer Year (DSY) weather files for current and future climate projections, ensuring the latest datasets are used to assess overheating risk and resilience.	Include alternative access routes in the layout to maintain operations during maintenance of heat-damaged surfaces.	✓				 1 6 ■ Low Risks ■ Moderate Risks
		Design systems to operate under higher humidity levels by excluding evaporative cooling.	✓		✓		
		Specify chillers with screw compressors to minimise derating at high ambient temperatures (up to 45 °C).	✓		✓		
		Configure chilled-water systems for higher operating temperatures (20–30 °C) to reduce energy demand and protect chillers during heatwaves.	✓		✓		
		Use non-evaporative cooling systems to eliminate humidity-related performance losses.	✓		✓		
		Select roof materials suitable for high heat exposure, as all mechanical plant is roof-mounted.	✓		✓		
		Locate electrical plant and backup generators on external gantries adjacent to the building; confirm stacking arrangements.		✓			
		Store 48 hours of fuel on-site in double-walled, fire-rated tanks with leak detection.		✓			
		Establish priority access agreements for additional fuel supply during extreme conditions.		✓			
		Select drought-tolerant plant species requiring minimal irrigation.				✓	
		Use plant species with extensive root systems to reduce soil erosion.				✓	
		Provide cooling jackets for site staff during extreme heat events.	✓				
Drought and Water Scarcity	Review risks associated with subsidence, drought, and water supply interruptions, considering climate change impacts on water demand and supply. Assess potential for alternative water sources, on-site storage, and review local water capacity and water company Drought Plans.	Include alternative access routes in the layout to maintain operations during maintenance of heat-damaged surfaces.	✓				 6 ■ Low Risks
		Design pavement with an appropriate factor of safety to reduce shrinkage risk; address asphalt depth specification at detailed design stage.	✓				
		Implement closed-loop cooling systems with occasional water top-up capability for resilience during water supply interruptions.	✓		✓		
		Provide on-site storage of potable water (via mains supply, rainwater harvesting, or greywater systems) to maintain human access during prolonged outages.	✓	✓			
		Plan for remote operational continuity of technical systems; incorporate tenant security and procedural considerations.	✓				
		Consider long-term operational planning for scenarios involving prolonged human absence (20–25-year horizon).	✓				
		Integrate Sustainable Drainage Systems (SuDS) storage ponds for reuse in cooling support.			✓	✓	
		Select drought-tolerant plant species requiring minimal irrigation.				✓	
		Use plant species with extensive root systems to reduce soil erosion.				✓	
		Provide cooling jackets for site staff during extreme heat events to mitigate health risks.	✓				

Hazard	Scottish Climate Adaptation's expected outcome at Stage 2 (PS2)	Adaptation Actions Integrated into the Design at Stage 2	Passive Survivability	Backup Power	Cooling Resilience	Nature-Based Solutions	Risk rating (2030s) Error! Bookmark not defined.
Intense Rainfall	Retain existing drainage outfalls where possible, repairing defects identified by CCTV survey. Install separate foul and surface water systems until discharge point to public sewers.	Include alternative access routes in the layout to maintain operations during maintenance of heat-damaged surfaces.	✓				 6 ■ Low Risks
		Design pavement with an appropriate factor of safety to reduce shrinkage risk; address asphalt depth specification at detailed design stage.	✓				
		Implement closed-loop cooling systems with occasional water top-up capability for resilience during water supply interruptions.	✓		✓		
		Provide on-site storage of potable water (via mains supply, rainwater harvesting, or greywater systems) to maintain human access during prolonged outages.	✓	✓			
		Plan for remote operational continuity of technical systems; incorporate tenant security and procedural considerations.	✓				
		Consider long-term operational planning for scenarios involving prolonged human absence (20–25-year horizon).	✓				
		Integrate Sustainable Drainage Systems (SuDS) storage ponds for reuse in cooling support.			✓	✓	
		Oversize or diversify SuDS to handle extreme rainfall events.				✓	
		Design site levels to ensure positive drainage of runoff to grass areas.				✓	
		Oversize stormwater drainage, ponds, and swales to cope with extreme rainfall volumes.				✓	
		Specify regular inspection and clearing of drainage infrastructure to maintain full capacity.				✓	
		Select plant species that are drought and flood tolerant and require minimal irrigation.				✓	
		Use plant species with extensive root systems to reduce soil erosion.				✓	
		Provide cooling jackets for site staff during extreme heat events to mitigate health risks.	✓				

Hazard	Scottish Climate Adaptation's expected outcome at Stage 2 (PS2)	Adaptation Actions Integrated into the Design at Stage 2	Passive Survivability	Backup Power	Cooling Resilience	Nature-Based Solutions	Risk rating (2030s) Error! Bookmark not defined.
Flood	Undertake a site-specific flood risk assessment covering all sources of flooding (river, coastal, surface water, groundwater, sewer). Apply Scottish Government climate change allowances for peak flows and rainfall intensity (currently 40% uplift for design). Confirm that the site remains at low risk (Flood Zone 1) and demonstrate that development will not increase flood risk elsewhere.	Include alternative access routes in the layout to maintain operations during maintenance of heat-damaged surfaces.	✓				 1 5 Low Risks Moderate Risks
		Design pavement with an appropriate factor of safety to reduce shrinkage risk; address asphalt depth specification at detailed design stage.	✓				
		Implement closed-loop cooling systems with occasional water top-up capability for resilience during water supply interruptions.	✓		✓		
		Provide on-site storage of potable water (via mains supply, rainwater harvesting, or greywater systems) to maintain human access during prolonged outages.	✓	✓			
		Plan for remote operational continuity of technical systems; incorporate tenant security and procedural considerations.	✓				
		Long-term operational planning for scenarios involving prolonged human absence (20–25-year horizon) to be considered at a later date.	✓				
		Integrate Sustainable Drainage Systems (SuDS) storage ponds for reuse in cooling support.			✓	✓	
		Oversize or diversify SuDS to handle extreme rainfall events.				✓	
		Design site levels to ensure positive drainage of runoff to grass areas.				✓	
		Oversize stormwater drainage, ponds, and swales to cope with extreme rainfall volumes.				✓	
		Specify regular inspection and clearing of drainage infrastructure to maintain full capacity.				✓	
		Provide one-way cross fall on roadways directed away from buildings; include additional gullies and overland flow routes to swales.				✓	
		Install ACO drainage channels at all at-grade building access points as a secondary measure.				✓	
		Elevate critical infrastructure above predicted flood levels or on raised plinths/platforms.	✓				
		Select plant species that are drought and flood tolerant and require minimal irrigation.				✓	
		Use plant species with extensive root systems to reduce soil erosion.				✓	
		Provide cooling jackets for site staff during extreme heat events to mitigate health risks.	✓				

Hazard	Scottish Climate Adaptation's expected outcome at Stage 2 (PS2)	Adaptation Actions Integrated into the Design at Stage 2	Passive Survivability	Backup Power	Cooling Resilience	Nature-Based Solutions	Risk rating (2030s) Error! Bookmark not defined.
Wind	Design in accordance with BS EN 1991-1-4:2005+A1:2010 (Eurocode 1: Actions on Structures – Wind Actions), as adopted under the Building (Scotland) Regulations. Apply the UK National Annex to Eurocode 1 for Scotland-specific parameters (e.g., wind speed maps, terrain categories). Review future climate projections to confirm wind speed assumptions remain robust for the building's design life. Supplement design with PD 6688-1-4, which provides UK guidance on applying Eurocode wind actions.	Include alternative/emergency access routes to maintain site operations during storm events.	✓				 ■ Low Risks ■ Moderate Risks
		Provide one-way cross fall on roadways directed away from buildings; include additional gullies and overland flow routes to swales.				✓	
		Install ACO drainage channels at all at-grade building access points as a secondary measure.				✓	
		Oversize or diversify Sustainable Drainage Systems (SuDS) to handle extreme rainfall events.				✓	
		Design site levels to ensure positive drainage of runoff to grass areas.				✓	
		Oversize stormwater drainage, ponds, and swales to cope with extreme rainfall volumes.				✓	
		Specify regular inspection and clearing of drainage infrastructure to maintain full capacity.				✓	
		Elevate critical infrastructure above predicted flood levels or on raised plinths/platforms.	✓				
		Select plant species that are flood tolerant and require minimal irrigation.				✓	
		Use plant species with extensive root systems to reduce soil erosion.				✓	
		Position sensitive planting and habitats away from exposed edges or high-wind corridors.				✓	
		Select wind-resistant plant species and locate them within protective woodland planting buffers on berms.				✓	
		Regularly maintain trees and shrubs to remove weak branches and reduce debris risk.				✓	
		Provide cooling jackets for site staff during extreme heat events to mitigate health risks.	✓				
Wildfire	Specify all materials in compliance with Building (Scotland) Regulations, Approved Document B, and fire consultant advice. Explore additional preventative fire-spreading measures at the next design stage. Incorporate fire breaks within green/blue roof designs at roof and terrace levels.	Include access and egress routes with alternative paths to maintain emergency access if one route is blocked.	✓				 ■ Low Risks ■ Moderate Risks
		Avoid siting critical assets on slopes where fire intensity and spread rates may be greater.	✓				
		Remove dead or dry vegetation, prune lower branches, and manage fuel loads to reduce fire risk.				✓	
		Provide supplemental watering during prolonged heat or drought to keep vegetation healthy and less flammable.				✓	
		Select plant species that are fire-resistant.				✓	
		Position sensitive planting and habitats away from exposed edges or high-wind corridors.				✓	
		Select wind-resistant plant species and locate them within protective woodland planting buffers on berms.				✓	
		Regularly maintain trees and shrubs to remove weak branches and reduce debris risk.				✓	
		Specify filtration devices rated for fine particulates (e.g., F7 filters for 1–2 microns) and consider future wildfire-driven particulate levels.	✓				
		Assess risk of gaseous contamination and particulate matter penetration under future wildfire scenarios.	✓				

2.0 Legislative Review

2.1 Introduction

This Climate Change Risk Assessment (CCRA) has been prepared to support the Stage 2 RIBA design development of the proposed data centre in Edinburgh. The assessment is structured to demonstrate alignment with the **National Planning Framework 4 (NPF4)**, the **Edinburgh City Plan 2030 (Local Development Plan)** as well as the **Scottish National Adaptation Plan**.

2.2 National Planning Framework 4 (NPF4)

The Scottish Government's National Planning Framework 4 (NPF4), adopted in February 2023, forms part of the statutory development plan and establishes planning policy to 2045. It places the global climate and nature crises at the heart of decision-making, requiring all development proposals to contribute to net zero and climate resilience objectives.

- **Policy 1 – Tackling the Climate and Nature Crises**
“When considering all development proposals, significant weight will be given to the global climate and nature crises.”
 This overarching principle ensures that planning decisions prioritise climate mitigation, adaptation, and biodiversity enhancement. This approach aligns with and advances Scotland's strategic objectives to address the climate and nature crises as set out in national policy frameworks.
- **Policy 2 – Climate Mitigation and Adaptation**
“Development proposals will be sited and designed to adapt to current and future risks from climate change.”
 The CCRA evaluates site-specific climate risks (e.g., extreme heat, water stress, flooding) and recommends design and operational strategies to ensure resilience over the asset's lifecycle.

The six spatial principles underpinning NPF4 (Just Transition, Conserving Assets, Local Living, Compact Urban Growth, Rebalanced Development, and Rural Revitalisation) inform the Local Development Plan (LDP) spatial strategy. The proposed site falls within the Edinburgh City Plan 2030², which aligns with these principles and the city's Climate Ready Edinburgh Plan (2024–2030)³, aiming for a net zero and climate-adapted city by 2030.

2.2.1 Key Policy Connections to Policy 2

NPF4 requires integrated consideration of related policies to deliver climate resilience. The following Policies are relevant to the data centre development:

Policy	Policy Intent / Outcomes	CCRA Alignment
Policy 19 – Heat and Cooling	Buildings and places are adapted to more extreme temperatures.	Assessment of overheating risk and specification of passive cooling, efficient HVAC, and heat recovery systems.
Policy 20 – Blue and Green Infrastructure	Blue and green infrastructure integral to design; multifunctional benefits including climate mitigation, biodiversity, flood prevention, and water management.	Integration of sustainable drainage systems (SuDS), rain gardens, and landscaping to manage surface water and enhance biodiversity.
Policy 22 – Flood Risk and Water Management	Places resilient to current and future flood risk; efficient and sustainable water use; wider use of natural flood management.	While a full future flood risk assessment is out of scope, CCRA considers pluvial risk and recommends water efficiency measures and natural attenuation features.
Policy 23 – Health and Safety	Protect people and places from environmental harm; mitigate risks from hazards; promote health and wellbeing.	Ensures adaptation measures reduce heat stress, maintain air quality and safeguard operational continuity during extreme events.

Table 2-1: Additional NPF4 Policies relevant to the data centre

2.3 Edinburgh City Plan 2030

The Edinburgh City Plan 2030 sets out local planning policies that complement national objectives under NPF4, with a strong emphasis on climate resilience and sustainable development. For the proposed data centre, the most relevant policies are Policy Env 7 (Sustainable Developments) and Policy Env 8 (New Sustainable Buildings). These policies require developments to integrate climate adaptation measures, minimise greenhouse gas emissions, and adopt sustainable construction practices. The Climate Change Risk Assessment (CCRA) provides a framework to demonstrate compliance with these requirements.

Policy Env 7 – Sustainable Developments

“how the proposal integrates measures to both mitigate and futureproof the building against the effects of the climate emergency, particularly with regard to the increased frequency and severity of extreme temperature and storm / rainfall / flooding events as well as sea level rise and erosion”

The Climate Change Risk Assessment aligns with Policy Env 7 by providing a structured evaluation of climate hazards such as extreme heat, intense rainfall, and storm events, which are expected to increase in frequency and severity. The assessment informs design strategies that futureproof the building against these risks, ensuring resilience throughout its lifecycle. It also supports the policy's emphasis on long-life construction and material selection by recommending approaches that minimise embodied carbon and enable adaptability, consistent with Edinburgh's climate emergency objectives.

Policy Env 8 – New Sustainable Buildings

“where appropriate, green roofs have been provided where new roofs are of a pitch capable of supporting these and that these roofs provide wildlife habitat and water attenuation.”

The Climate Change Risk Assessment supports Policy Env 8 by highlighting the importance of ultra-high fabric efficiency and robust cooling systems to manage overheating risk under future climate scenarios. The assessment also encourages integration of green infrastructure, such as green roofs, to provide water attenuation and biodiversity benefits, thereby reducing vulnerability to extreme weather events and contributing to sustainable building performance.

2.4 Scottish National Adaptation Plan 2024-2029

The Scottish National Adaptation Plan (SNAP3) sets out actions to build resilience to climate change impacts across Scotland, emphasising nature-based solutions, critical infrastructure resilience, and integration of adaptation into design and governance. The plan identifies five long-term outcomes, including creating climate-resilient places and ensuring public services and critical infrastructure can withstand future climate risks. This assessment aligns with SNAP3 through the following adaptation outcomes and objectives:

- **Nature Connects (NC1, NC2, NC4, NC5):** recommending nature-based solutions such as SuDS and blue-green infrastructure; exploring soil health improvements; identifying opportunities to align with Edinburgh's Green Blue Network and considering proximity to the Union Canal for potential ecological enhancements.
- **Communities (C4):** Ensuring the building is designed for future climate conditions, which is the overarching aim of this assessment.
- **Public Services & Infrastructure (PS2):** Providing strategies to maintain operational continuity under extreme weather, recognising the data centre as part of Critical National Infrastructure.
- **Economy, Business & Industry (B1, B3):** Supporting the client in embedding climate risk into governance and operational planning and positioning the project as an example of innovation in adaptation.

² [Edinburgh City Plan 2030](#)

³ [Climate Ready Edinburgh Plan 2024-2030](#)

3.0 Summary

3.1 Summary of Risks

Below is a summary of the risk rating overview for the 2020s time period under RCP 8.5 for the project, based on the likelihood and consequence of the climate change risk after considering the current mitigation actions.

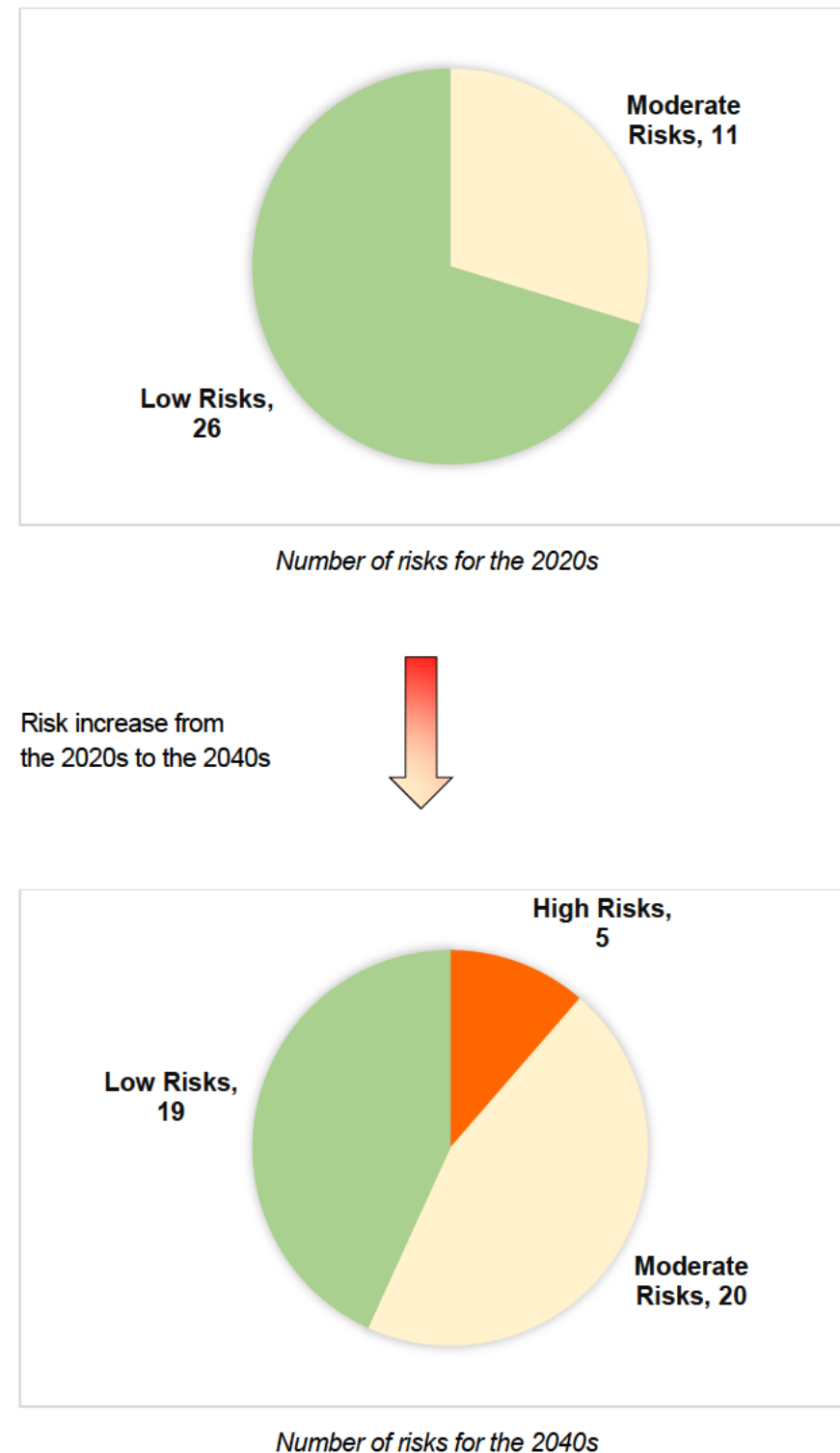
- **11 Moderate risks** have been identified which are associated with extreme heat, wildfire, wind and flooding.
- A total of **26 Low risks** have been identified.

Please note that these risks do increase over time during the later 2040-2059 (2040s) and 2060-2079 (2060s) time horizons.

The 2030s are the focus of this report, due to the 20-25 year lifespan of the on-site plant equipment. The highest risk to the given location is from the natural hazard of extreme heat, but this is effectively mitigated by good design practice, such as not using evaporative cooling, designing chilled-water to operate at higher 20-30C temperatures to protect the chillers against de-rating at higher ambient temperatures, allowing for the higher coastal humidity in the system specification, and a SUDS system across the site. The operational provision of cool jackets for on-site staff also significantly reduces the risk to human health and wellbeing; while these are intended for internal use where the ambient temperatures are always expected to be high, they may also be worn externally during heatwaves. The provision of multiple access routes and ability to operate all systems remotely also decreases the indirect risks from all natural hazards, though putting the latter into practice will depend on the operator's security protocols.

However, risks do increase during the later 2040s and 2060s time horizons, principally through cascading societal risks and increasing changes in the projected climate.

Please refer to the Risk Tracker (see Appendix A), which incorporates the Stage 2 design actions provided by the design team. This also outlines the remaining risks at this stage.



3.2 Further Recommendations to Reduce Remaining Risks

The following actions may be implemented, either as part of the current design or a future refurbishment, to increase the asset's resilience:

- Maximise the incorporation of passive design measures in the façade design, in order to reduce reliance on MEP systems and improve passive survivability.
- Finalise SuDS / drainage strategy to minimise surface water build up on terraces / roof / ground levels.
- Maximise green infrastructure throughout the development via planting and green roofs – this will take advantage of evapotranspiration in mitigating the effects of the urban island heat effect.
- Specify materials considering increases in long-term temperatures.
- Incorporate external shading structures along paths (and internal, if applicable) to protect on-site staff and materials from excessive exposure.
- Specify foundation design and materials to accommodate soil shrinkage, settlement, and seasonal moisture variation.
- Maintain alternative access routes to critical plant, hardstanding, and buried service areas to ensure operational continuity during maintenance.

Many of these actions should be considered in the next replacement cycle of on-site equipment (expected to be in approximately 20-25 years), since risks, though currently either low or moderate in the 2020s, are projected to increase in the 2040s, as shown above. The five areas of high risk are:

- Effects of Extreme Heat on the architecture.
- Effects of Extreme Heat on the structure.
- Effects of Extreme Heat on the civils & infrastructure.
- Effects of Extreme Heat on the ICT & network systems.
- Effects of Extreme Heat on the landscape & ecology.

3.3 Next Steps

The outcomes of this assessment will be evaluated for alignment against NPF4's wider sustainability framework and Edinburgh City Plan 2030, as part of the planning approval process.

Additionally, this assessment may be updated, pending any further future instruction. It is recommended that the individual actions denoted by responsible parties are monitored throughout the subsequent design stages.

Any additional information provided as the design develops may also reduce the measured risk; for example, no structural engineer is currently engaged, so nothing can be ascertained regarding the structural design.

Appendices

Appendix A Risk Tracker Summary

This is a summary of the separate risk tracker document, which has been produced as part of this assessment to underpin this report. The summary below focuses solely on the 2020s time period and the adaptation measures currently embedded in the design. More details on the remaining time periods and further adaptation measures recommended to reduce residual risk can be found in the separate document.

Hazard	Project component	Risk Description	Embedded Adaptation Measures	RIBA Stage 2		
				Likelihood	Consequence	Risk Rating 2020s
Extreme Heat	Architecture	- Overheating in buildings and outdoor spaces may increase stress on structural materials, potentially requiring more frequent maintenance of heat-affected areas. - Prolonged exposure to high temperatures and UV radiation can accelerate deterioration of façades and flexible elements such as sealants, leading to leaks. - Thermal expansion and contraction of structural elements (steel, concrete, glazing) may accelerate cracking, spalling, or joint failures, reducing service life. - Corrosion rate of facades may accelerate with temperature increase. - Large areas of flat roof may experience heat intensity in hot spots, the roof profile could change to generated 'self shading' or increase roughness to disperse roof heat.	AAH - Civils Alternative access routes are included in the layout, so operations can continue during maintenance of heat-damaged surfaces.	4	2	8 Moderate
	Structures	- Drying and shrinkage of soil due to heat and drought may compromise foundation stability, particularly where ground conditions are sensitive, and high dead loading of data centre building (1500 kg/m²). - Settlement or shrinkage of subgrade soils under heat/drought conditions may compromise foundation stability for external plant pads and surrounding hardstanding. If surface reinstatement or repair is needed in these areas, the incorporated alternative access routes ensure that operational access to critical plant is maintained.	AAH - Civils Alternative access routes are included in the layout, so operations can continue during maintenance of heat-damaged surfaces.	3	3	9 Moderate

Hazard	Project component	Risk Description	Embedded Adaptation Measures	RIBA Stage 2		
				Likelihood	Consequence	Risk Rating 2020s
	Building Services	Higher cooling demand stresses electrical and HVAC systems, Overheating of M&E equipment (elevator controllers, transformers) threatens uptime and resiliency; critical risks when operating within design parameters 24/7/365. Rooftop chillers and condensers may decrease in efficiency in extreme temperatures. Extended hot periods can strain regional energy distribution networks, increasing the risk of power outages and reduced system reliability. Design scenarios should be checked for compliance with climate change scenario, and as a minimum comply with 24/7/365. Local grid outages may exceed the capacity of back-up systems; if this is combined with access disruptions, additional fuel for the back-up systems may not arrive in time to ensure continued full functionality. Reduced generator performance – diesel and gas engines lose efficiency and rated capacity at higher ambient temperatures and altitudes, reducing resilience margins. Diesel fuel in bulk tanks (if used for backup generators) deteriorates more quickly in heat. Fuel logistics stress due to high ambient temperatures is a consideration for extended outages. Water treatment & Legionella risks - warmer water in coolign towers can increase biological growth. Indoor air quality challenges : hotter external air can carry more particulates and pollutants, clogging filters or fan walls more quickly and increasing fan energy demand.	Cundall MEP - Systems proposed in the design are not affected by higher humidity levels of the coastal location, as evaporative cooling is not included in the design and all systems are specified to operate normally within the higher humidity levels expected in the coastal location. - Chillers are specified with a compressor type (screw compressors) that are less susceptible to derating as the temperature hits 45C and above, which is significantly above the maximum worst-case temperatures predicted by current data (approx. 40C). - Designing chilled-water temperature to operate at higher 20-30C temperatures; protects the chillers against derating at higher ambient temperatures. I.e. less work to decrease to 20-30C instead of your standard 8C, especially during heatwaves. - Significant derating in rooftop chillers and condensers' efficiency are only expected above 50C; any lesser impacts are mitigated through decreasing above 30C is partly mitigated through the high-temperature chilled-water design, resilient compressor specification, and the use of non-evaporative cooling systems, which eliminates humidity-related performance losses. - Facade and roof material specification: - Roof is more important, all mechanical plant equipment is on the roof. - Electrical plant is on gantries adjacent to the building. - Back-up generators on external gantries adjacent to the building. May be stacked, check drawings. 48 hours of fuel locally stored on-site in a double-walled fire-rated tank with fuel leak detection for each tank. - Priority access of additional fuel - this is contingent on negotiations with fuel contractors, consider wider area climate risks in future. - No evaporative cooling is proposed; designs traditionally used this but this was when water stress was less well-understood and grids were less decarbonised. Clients now seek PPAs for renewable energy to supply the site. - Reduced generator performance at high ambient temperatures is less critical in this design, as generators are external and ventilated, and chillers are specified with screw compressors, which are less susceptible to derating at temperatures up to 45°C, above the predicted worst-case of ~40°C. - Negligible risk r.e. water treatment and legionella as no cooling towers or evaporative cooling are included in the design and the cooling systems use continuously circulating water, limiting temperature rise to 1–2°C and reducing biological growth potential.	4	1	4 Low
	Civils & Infrastructure	- Drying and shrinkage of soil due to heat and drought may compromise foundation stability, particularly where ground conditions are sensitive, and high dead loading of data centre building (1500 kg/m²). - Settlement or shrinkage of subgrade soils under heat/drought conditions may compromise foundation stability for external plant pads. - Buried water or fuel pipelines could expand, shift, or develop leaks under prolonged high-temperature, and need to be designed for deformation over time. - Drainage performance reduction - If periods of drought occur for cooling demands, underground pipework must be designed for extended periods of lower groundwater levels. - Flash flood scenario for stormwater attenuation to be considered.	AAH - Civils Alternative access routes are included in the layout, so operations can continue during maintenance of heat-damaged surfaces	3	3	9 Moderate

Hazard	Project component	Risk Description	Embedded Adaptation Measures	RIBA Stage 2		
				Likelihood	Consequence	Risk Rating 2020s
	ICT & Network Systems	- Underground cable derating – higher soil temperatures reduce current-carrying capacity of buried electrical cables, potentially requiring larger cross-sections or additional ducts. Could be a real issue when you're talking about such large cables and loads - Switchgear overheating – indoor MV/LV switchboards and panelboards may overheat if designed for cooler ambient baselines, leading to nuisance trips or failures. - Switchgear overheating – indoor MV/LV switchboards and panelboards may overheat if designed for cooler ambient baselines, leading to nuisance trips or failures. - Transformer derating – oil-filled and dry-type transformers may need derating in prolonged high ambient temperatures, increasing risk of overload or reduced service life. - Cable derating – high ambient air and soil temperatures reduce current-carrying capacity of electrical cables, potentially requiring upsizing of cabling or duct systems.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	4	2	8 Moderate
	Landscape & Ecology	- Vegetation may suffer from heat stress and desiccation, leading to browning and dieback. - Dry conditions and elevated temperatures heighten the risk of ignition and fire spread, particularly in unmanaged or densely planted areas. - Reduced vegetation cover increases surface runoff and erosion. - Heat emitted by infrastructure, such as power cabling, increasing the temperature of the green space immediately surrounding it, potentially altering the micro-climate and affecting vegetation health.	AAH - Landscape - Select plant species that are drought tolerant and require minimal irrigation. - Select plant species with extensive root systems to help reduce soil erosion.	4	2	8 Moderate
	Human Health & Wellbeing	- Heat stress to workers within internal areas, despite the use of cool jackets, if the cooling systems fail or are insufficient for future heatwaves. - Heat exposure for operational staff during outdoor maintenance (roof sealants) or rooftop plant work (e.g., chillers, condensers, generators) is a significant concern. Even brief exposure in direct sun can lead to heat stress if PPE is not worn. - Reduced response capability during emergencies (e.g., fire suppression or generator failure) if staff are physically stressed by high temperatures. - Heat stress risk for contractors during infrequent but essential site visits, such as civil works or IT hardware installation. - Discomfort and reduced cognitive performance in indoor technical areas (e.g., server rooms, UPS spaces, or control rooms) where residual heat from equipment makes conditions stifling, especially during dry spells when external cooling is less effective. Prolonged exposure above 26°C in Scotland can cause discomfort, fatigue, and reduced concentration, increasing the risk of errors during maintenance, emergency response, or IT operations.	Cundall MEP Cooling jackets can easily be used outside by site staff - this will mitigate the societal vulnerability of Scotland, because local people do not understand how to behave in extreme heat.	2	3	6 Moderate

Hazard	Project component	Risk Description	Embedded Adaptation Measures	RIBA Stage 2		
				Likelihood	Consequence	Risk Rating 2020s
Drought and Water Scarcity	Architecture/ Structures	- Changes to soil moisture levels due to prolonged dry conditions may result in ground movement, potentially affecting pavements and adjacent structures. - Foundations and substructures not designed for fluctuating groundwater conditions may be at increased risk of settlement or cracking.	AAH Civils - Alternative access routes are included in the layout, so operations can continue during maintenance of heat-damaged surfaces. - Pavement design to consider factor of safety to reduce shrinkage risk in the specification of asphalt depths. Address at detailed design.	1	3	3 Low
	Building Services	- Closed-loop cooling systems and water-dependent chillers may operate at reduced capacity during prolonged drought, but the system can survive for up to a month with only occasional water top-ups. Operational planning should ensure water availability or topping strategies to avoid performance degradation during extended dry periods. - Fire suppression systems may face restrictions if potable water is limited. On-site storage (mains supply, rainwater, or greywater harvesting) should be considered to maintain redundancy and reliability for a defined period, e.g., 48 hours, to mitigate short-term drought effect. - Site operations that require human presence will depend on potable water. Temporary restrictions could arise during drought if on-site storage is insufficient.	Cundall MEP - Closed-loop cooling survives. It is occasionally topped up with water. Would be fine for up to a month without additional top-up. - Without potable water, no humans could use the site, irrespective of machines continuing to operate. In this instance, on-site storage of drinking water: either supplied by mains, rainwater / greywater harvesting. - Operational continuity can be maintained remotely for technical systems, though tenant security and procedural considerations may limit full remote operation. The impact of prolonged human absence has not been standardised and should be considered in future operational planning for 20–25-year horizons. - No design standards exist for the duration of time without human access on site. This will be dictated by operational procedures for different tenants - this hasn't happened yet so the implications of different options haven't been explored. Again, something to consider in 20-25 years.	1	2	2 Low
	Civils & Infrastructure	- Persistent dry conditions can cause materials such as concrete and asphalt to lose moisture, leading to cracking, surface degradation, and reduced lifespan. - Ground shrinkage may affect the integrity of underground utilities and access routes, increasing maintenance needs and disruption potential.	AAH - Civils Sustainable Drainage Systems (SuDS) storage ponds for reuse in cooling support.	1	3	3 Low
	ICT & Network Systems	- Reduced water availability may indirectly compromise chilled-water distribution to Data halls, potentially affecting server performance and environmental control. - Long-term water stress may necessitate operational adjustments or increased monitoring to maintain system resilience. - Changes / additions to the surrounding buildings may increase local potable water demand, necessitating changes in potable water consumption over time.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	1	2	2 Low
	Landscape & Ecology	- Vegetation stress due to insufficient rainfall may result in browning, dieback, and increased irrigation demand, raising operational costs. Selecting drought-tolerant plant species that require minimal irrigation can reduce operational costs and help maintain landscape appearance during prolonged dry periods. - Prolonged dry periods can reduce biodiversity and ecosystem resilience, particularly in planted or ecologically sensitive areas. Using plant species with extensive root systems supports soil stability and helps maintain ecological function, mitigating some of the negative effects of drought. - Drought-stressed vegetation increases the site's vulnerability to wildfire, with potential secondary impacts on adjacent infrastructure and plant. Selection of drought-tolerant species and species with deep roots can reduce the amount of highly flammable vegetation and help maintain soil moisture, lowering wildfire risk and associated operational impacts.	AAH - Landscape - Select plant species that are drought tolerant and require minimal irrigation. - Select plant species with extensive root systems to help reduce soil erosion.	1	2	2 Low

Hazard	Project component	Risk Description	Embedded Adaptation Measures	RIBA Stage 2		
				Likelihood	Consequence	Risk Rating 2020s
Intense rainfall	Human Health & Wellbeing	- Limited water availability increases the risk of dehydration and heat-related stress during maintenance tasks, particularly in rooftop or plant areas. - Psychological stress may increase due to environmental degradation, visible browning of vegetation, and concerns over resource scarcity. - In Scotland people are not acclimatised to heat and generally lack knowledge of how to behave during these spells. Therefore, prolonged exposure to indoor equipment-generated heat (server rooms, UPS systems, HVAC machinery) combined with reduced cooling efficiency could lead to overheating, dizziness, fainting, and heat exhaustion. - Drier conditions may increase airborne dust and particulates around plant rooms or construction/maintenance areas, aggravating asthma or other respiratory sensitivities.	Cooling jackets can easily be used outside - this will mitigate the societal vulnerability of Scotland, where local people do not understand how to behave in extreme heat (unlike, for example, Greece or Central / Southern Spain).	1	2	2 Low
	Architecture/ Structures	- Intense rainfall may exceed the capacity of drainage systems, leading to surface water flooding across the site and potential water ingress into the building envelope. - Overwhelmed guttering and downpipes can result in uncontrolled water flow, increasing the risk of façade damage and internal damp. - Intense rainfall for longer periods of time can increase roof loading, particularly on flat roofs, potentially compromising structural integrity if not adequately designed.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	1	3	3 Low
	Building Services	"Rooftop equipment and 'loading' may be damaged by ponding or direct exposure to intense rainfall, affecting critical systems such as HVAC and electrical infrastructure. - Failure of drainage systems can lead to water ingress into ground floor and basement areas, damaging mechanical and electrical equipment, finishes, and furnishings. - Regional flooding may disrupt utility services, increasing the risk of service outages and operational downtime. - Fire suppression and alarm panels may fail as a result of water ingress. - Electrical and mechanical plant in low-lying areas is at risk from backflow or seepage."	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	1	4	4 Low
	Civils & Infrastructure	- Intense rainfall can overwhelm site drainage and guttering systems, causing water to spill onto access routes and overflow into the public realm. - Saturated or dried-out ground combined with surface flooding may reduce accessibility, especially if this occurs along the A71 access road. - Saturated or dried-out ground combined with surface flooding may increase wear on external infrastructure, requiring more frequent maintenance.	AAH Civils - Resilient SuDS design: Oversize or diversify Sustainable Drainage Systems to handle extreme rainfall events. - Design of levels such that runoff to grass areas is positively drained. - Oversized stormwater drainage, ponds, and swales to cope with extreme rainfall volumes. - Specify Regular inspection and clearing of drainage infrastructure to ensure systems operate at full capacity.	1	3	3 Low
	ICT & Network Systems	Fibre ducts flood, disrupting connectivity.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	1	4	4 Low
	Landscape & Ecology	- Overloaded SuDS causes soil erosion and loss of vegetation. - Saturated soils may lead to compaction, decreasing the ground's ability to absorb water and thereby increasing the risk of excessive surface water run-off. - Saturated soils may lead to compaction, damaging plant roots and reducing long-term site resilience. - Previously drought-stressed vegetation may die or fail to recover after heavy precipitation events, reducing ecosystem resilience.	AAH - Landscape - Select plant species that are drought and flood tolerant and require minimal irrigation. - Select plant species with extensive root systems to help reduce soil erosion. - Resilient SuDS design: Oversize or diversify Sustainable Drainage Systems to handle extreme rainfall events.	1	2	2 Low

Hazard	Project component	Risk Description	Embedded Adaptation Measures	RIBA Stage 2		
				Likelihood	Consequence	Risk Rating 2020s
	Human Health & Wellbeing	- Flooded access routes hinder safe movement of operational staff. - Staff performing emergency response or maintenance may face slip hazards or stress from prolonged exposure to wet environments.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	1	3	3 Low
	Architecture/ Structures	- Flooding may lead to water ingress into ground floor, causing damage to finishes, furniture, and structural components. - Prolonged inundation can compromise the structural integrity of foundations and lower-level building elements, particularly in older or poorly protected buildings. - Repeated exposure to floodwaters may accelerate material degradation and increase long-term maintenance needs.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	2	2	4 Low
	Building Services	- Floodwater ingress into plant rooms, basements, or service areas can damage mechanical, electrical, and plumbing (MEP) systems, resulting in service outages. - Essential systems such as HVAC, lighting, and power distribution may be disrupted or permanently damaged, requiring costly repairs or replacements. - Regional flooding may affect utility supply networks.	AAH - Civils One way cross fall on roadways directed away from buildings, additional gullies provided in addition to overland flow routes to swales. ACO drainage channels to be provided at all access points to buildings which are at-grade as a secondary measure.	1	3	3 Low
	Civils & Infrastructure	- Flooding and surface water ponding may render manholes, service trenches, and underground utilities inaccessible, delaying maintenance and emergency response. However, the resilient SuDS design, including oversized or diversified Sustainable Drainage Systems, reduces the likelihood of ponding by handling extreme rainfall events effectively. - Access routes to and around the building may be obstructed or damaged, affecting site operations and occupant safety. The site elevation strategy helps maintain operational access and occupant safety. - Overflowing drainage systems may contribute to wider public realm flooding and infrastructure stress, but regular inspection and clearing of drainage infrastructure ensures systems operate at full capacity, minimising the probability of overflow. - Rising groundwater or surface water may damage underground ducts, cable trenches, and service conduits, however, elevation strategies and well-maintained drainage reduce the risk of water ingress. - Generators, fuel tanks, and condensers located in low-lying yards may flood, leading to loss of backup power or cooling capacity. By implementing raised platforms and site elevation, critical systems are protected against predicted flood levels, maintaining resilience during extreme events.	AAH - Civils - Resilient SuDS design: Oversize or diversify Sustainable Drainage Systems to handle extreme rainfall events. - Site elevation strategy: Place critical infrastructure above predicted flood levels or on raised plinths/platforms. - Specify Regular inspection and clearing of drainage infrastructure to ensure systems operate at full capacity.	1	3	3 Low
	ICT & Network Systems	- Ground-level UPS, switchgear, and power distribution units may be disabled by floodwater. - Moisture ingress may accelerate corrosion in fibre or copper cabling and connectors. - Cooling or power failures due to flooding may indirectly compromise server performance.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	2	3	6 Moderate
	Landscape & Ecology	- Waterlogging and surface ponding in landscaped areas may damage planting, reduce ecological function, and increase the risk of erosion. - Saturated soils may lead to root rot and biodiversity loss. - Flooded perimeters may reduce natural flood absorption capacity. - Erosion or sedimentation may affect planted areas or SuDS performance.	AAH - Landscape - Select plant species that are flood tolerant and require minimal irrigation. - Select plant species with extensive root systems to help reduce soil erosion. - Resilient SuDS design: Oversize or diversify Sustainable Drainage Systems to handle extreme rainfall events.	2	2	4 Low

Hazard	Project component	Risk Description	Embedded Adaptation Measures	RIBA Stage 2		
				Likelihood	Consequence	Risk Rating 2020s
Wind	Human Health & Wellbeing	- Staff may be stranded if access is blocked, impacting operational continuity. - Evacuation routes may be compromised, creating health and safety risks during emergency response. - Emergency maintenance staff may face hazards in flooded areas.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	2	1	2 Low
	Architecture/ Structures	- Strong wind events may cause building sway, particularly in taller structures, affecting internal comfort and occupant perception of safety. - External façade elements may produce nuisance noise or vibrate under wind pressure, potentially leading to wear or detachment. - Unsecured external items (e.g. furniture, signage, debris) may be projected against the building envelope or rooftop, causing physical damage. - Surrounding high-rise developments may alter local wind regimes, increasing turbulence and the potential for wind-related damage.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	1	2	2 Low
	Building Services	- Roof-mounted equipment such as HVAC units and solar panels may be vulnerable to wind uplift or impact damage, affecting system performance. - Extended wind events may disrupt regional energy distribution, increasing the risk of power outages and service interruptions within the building. - Wind-driven rain may infiltrate service areas, particularly if building envelope integrity is compromised.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	2	3	6 Moderate
	Civils & Infrastructure	- High winds may obstruct transport networks through fallen trees, debris, or damaged infrastructure, affecting site accessibility and logistics. - External service routes and access points may be temporarily unusable or hazardous during wind events, delaying maintenance and emergency response.	AAH - Civils Alternative/emergency access routes to maintain site operations during storm events.	2	3	6 Moderate
	ICT & Network Systems	- Rooftop satellite dishes, antennas, or point-to-point radio equipment may become misaligned or detached, leading to disruption of connectivity. - Prolonged vibration or oscillation caused by high winds can place stress on fibre joints and terminations, increasing the risk of micro-fractures and subsequent signal degradation.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	2	3	6 Moderate
	Landscape & Ecology	- Trees and large vegetation may be uprooted or broken, posing safety hazards and potentially damaging nearby structures or infrastructure. - Roosting habitats and sensitive planting may be harmed by wind stress or debris impact, reducing ecological value and biodiversity. - Wind erosion may affect exposed soil or landscaped areas, leading to degradation and increased maintenance needs.	AAH - Landscape - Plant species to be wind resistant, located within protective woodland planting buffers to the exterior of the site on berms. - Regularly maintain trees and shrubs to remove weak branches and reduce debris risk. - Position sensitive planting and habitats away from exposed edges or high-wind corridors.	2	2	4 Low
	Human Health & Wellbeing	- Flying debris and falling trees during wind events may pose direct physical safety risks to occupants and passers-by. - Disruption to transport and utilities may limit access to essential services, particularly for vulnerable individuals. - Noise and movement caused by wind may affect sleep quality, mental wellbeing, and perceived safety. - Inequities in building resilience and access to safe outdoor spaces may exacerbate health risks for certain population groups.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	2	1	2 Low

Hazard	Project component	Risk Description	Embedded Adaptation Measures	RIBA Stage 2		
				Likelihood	Consequence	Risk Rating 2020s
Wildfire	Architecture/ Structures	- Embers carried by wind during wildfire events may ignite flammable building materials or accumulate in vulnerable areas such as gutters, posing a fire risk. - Direct exposure to fire or extreme heat can compromise the structural integrity of building elements, reducing their ability to maintain strength and stability. - Smoke and soot deposition may affect external finishes and reduce air quality near the building envelope.	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	2	3	6 Moderate
	Building Services	- Airborne particulate matter (PM1–PM2.5) from nearby wildfires can degrade indoor air quality and affect sensitive IT equipment and HVAC systems. Standard F7 filters, which capture 1–2 micron particles, may partially mitigate this risk. However, high-intensity wildfire events could produce particulate levels that exceed the filter's capacity. Current average particulate levels are generally within safe limits, but future wildfire activity in higher-risk areas, as identified in 2025 research, could increase concentrations and risk exceeding Class 8 air cleanliness targets (Fujitsu guidance). Gaseous contamination from wildfires could also affect indoor air quality and equipment safety (Fujitsu guidance). - Wildfire-related interruptions to the local electricity supply may affect lighting, heating, cooling, and critical IT systems, even if priority supply contracts or other redundancy measures are in place. - Overloading or premature activation of fire suppression systems during wildfire events could reduce their capacity to protect critical infrastructure. - Diesel fuel tanks and generator housings may be at risk if fires breach their bunded containment areas, potentially causing ignition or spillage hazards. - Rooftop infrastructure, including chillers and exhaust stacks, may be damaged by airborne embers or radiant heat, which could affect cooling and ventilation performance.	Cundall MEP - Standard filtration devices, rated in terms of % of particulate matter that it can filter out. Standard fine F7 filter would filter 1-2 microns; table of values has been shared by Cundall MEP. - Current design considers the current average level of particulates. - Future potential levels are not considered; any areas of higher wildfire vulnerability near the site, combined with 2025 research showing that wildfires drive a much higher level of pollution than previously thought, may pose a risk over future timescales. - Danger levels of PM particulates getting through the filters and gaseous contamination provided by Cundall MEP.	2	2	4 Low
	Civils & Infrastructure	- Wildfires may damage nearby infrastructure such as roads, bridges, and utility lines, which could affect access to and from the site. - Emergency response and maintenance activities may be delayed due to hazardous conditions or restricted access. - Heat and fire exposure may degrade surface materials and underground utilities, increasing repair needs.	AAH - Civils - Access and egress routes with alternative paths to maintain emergency access if one route is blocked. - Avoid siting critical assets at slopes where fire intensity and spread rates may be greater.	2	2	4 Low
	ICT & Network Systems	- Fibre cables and roadside ducting may be damaged or destroyed if verges ignite. - Smoke and soot ingress into external control panels may impair functionality	No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	2	1	2 Low
	Landscape & Ecology	- Wildfires can destroy green infrastructure, including rooftop gardens, planted areas, and surrounding vegetation. - Burned vegetation may lead to soil erosion, nutrient loss, and long-term disruption of biodiversity and ecological balance. - Poorly maintained green features may increase fire risk if vegetation dries out during prolonged heat or drought periods. - Perimeter vegetation may act as a fire path, enabling spread towards the facility.	AAH – Landscape - Remove dead or dry vegetation, prune lower branches, and manage fuel loads to reduce fire risk. - Provide supplemental watering during prolonged heat or drought to keep vegetation healthy and less flammable. - Plant species to be fire resistant.	2	1	2 Low

Hazard	Project component	Risk Description	Embedded Adaptation Measures	RIBA Stage 2		
				Likelihood	Consequence	Risk Rating 2020s
	Human Health & Wellbeing	• Disruption to utilities and services may affect access to clean air, water, and safe shelter during wildfire events. • Psychological stress may increase due to perceived danger, evacuation, or property damage. • Staff may be exposed to smoke, particulates, and hazardous air quality, impairing health and limiting safe working outdoors. • Evacuation routes may be obstructed by wildfire or emergency response vehicles.	▪ No input from design team received; design is not yet at a sufficiently advanced stage for drawings, specifications, etc to yield sufficient information.	2	2	4 Low

