

APPENDIX 9.1 CLIMATE CHANGE RESILIENCE ASSESSMENT

Construction Stage

A summary of potential climate change resilience (CCR) impacts during the construction stage of the Proposed Development is provided in Table 1 below. In line with the Institute of Environmental Management and Assessment (IEMA) guidance, embedded mitigation measures (existing design measures) have been considered.

Table 1 Construction Climate Change Resilience Impacts

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
Increased frequency and intensity of extreme weather events: Intense rainfall events	Receptor: Buildings receptors Extreme rainfall events could result in the erosion of stockpiles and resultant silting of drainage assets. This could result in secondary impacts such as localised flooding.	As specified within the Demolition and Construction Management and Phasing plan Framework, a Site Waste Management Plan (SWMP) would be developed prior to the commencement of demolition and construction. This should include specific measures to avoid and minimise the potential for contamination impacts. The contractor would prepare a Traffic Management Plan, which would consider prefabrication off-site and 'just-in-time' deliveries. This would help minimise stockpiling on-site and ensure the workplace does not become congested. As detailed within ES Chapter 7: Air Quality, stockpiles would be covered, seeded or fenced. In addition, soil stockpiles will be revegetated as soon as practicable to stabilise surfaces. De-watering of the Site will be undertaken by the principal contractor if required. As specified within the Demolition and Construction Management and Phasing plan Framework, a Construction Management Plan (CMP) will be developed by the principal contractor, prior to demolition and construction works on-site, to address adverse construction risks in more detail. It has been assumed that the CMP and SWMP would contain measures to appropriately store and regularly remove waste materials, with due regard to the potential for mobilisation into surface drainage. Best practice measures for stockpile management would be utilised. For example, control measures and dust suppression techniques, screening and covering of stockpiles, and the installation of appropriate wheel and body wash facilities	Likelihood level: Unlikely Consequence level: Low as a result of partial disruption across elements of the site lasting less than a day. Impact Magnitude: Low	Not Significant. Additional Mitigation not required assuming all measures are undertaken. Existing design and mitigation measures are appropriate to account for climate change/extreme weather.

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
		It has been assumed that the CMP would contain measures for the protection of construction materials that are stored on-site to minimise damage by weather and reduce erosion. These measures will also include appropriate storage, handling and management of construction materials with due regard to the potential for mobilisation into surface drainage. It has been assumed that surface water management during demolition and construction would be considered within the CMP. It has also been assumed that site drainage, including surface run-off and dewatering effluents, would be discharged to sewers where reasonably practicable and relevant permissions would be obtained from the sewerage undertaker. Additionally, it has been assumed that site drainage would meet the requirements for effluent and flood risk standards required by the sewerage undertaker. It has been assumed the relevant sections of BS6031: Code of Practice for Earthworks for the general control of site drainage would be followed.		
	Receptor: Buildings receptors Extreme rainfall events could affect the ability to undertake certain demolition / construction activities leading to programme delays (e.g. pouring of concrete and asphalt).	It has been assumed that works on-site would be undertaken in accordance with the provisions of the Construction (Design and Management) (CDM) Regulations 2015. Furthermore, it has been assumed that in line with best practice construction measures, more vulnerable activities such as the construction of earthworks would take place in appropriate weather conditions (taking into account construction programme timescale constraints). This would reduce the likelihood of weather delays to these activities and would be implemented via the CMP.	Likelihood level: Unlikely Consequence level: Low due to partial disruption across site lasting less than a day. Impact Magnitude: Low	Not significant. Additional mitigation not required. It has been recommended that more vulnerable activities should be undertaken during appropriate weather conditions and that poor weather conditions be accounted for within the CMP.
	Receptor: Environmental and human health receptors Extreme rainfall events could spread contaminated soil during ground excavations to nearby environmental receptors, which could affect local soil and water quality.	A Ground Conditions Assessment prepared by Ian Farmer associates in 2016 confirmed that there was a very low risk to end users of the site from soil contamination and to groundwater. MCC Environment Health noted this assessment was still sufficient, suggesting the soil is unlikely to be contaminated. However, a post-demolition investigation has been recommended. There is the potential that materials within the ground may pose a risk to construction workers (direct contact/ingestion and inhalation), neighbours (from dust emissions), and controlled waters over a temporary short-term basis, during the excavation	Likelihood level: Possible Consequence level: Low as a result of health and safety impacts. Impact Magnitude: Low	Not Significant. Additional mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
	Secondary impacts could include harm to site personnel.	and driving through made ground materials. During the redevelopment of the Site it would be necessary to implement measures to protect construction workers from exposure to any contaminated material which is encountered as well as to protect controlled waters. It has been assumed these measures would be incorporated into the CMP. Wheel and vehicle wash facilities would be in place to ensure delivery wagons leave the Site clean. It is assumed further mitigation measures to reduce the risk of spreading contaminants during the earthworks phase will be included in the CMP, but are not limited to: - Made ground beneath the footprint of the proposed building will be removed in order to accommodate the proposed basement, thus removing any associated contamination; and - Where made ground remains beneath proposed areas of soft landscaping, 600m clean soil cover should be anticipated at this stage (to be confirmed on completion of the post-demolition investigation).		
Increased frequency and intensity of extreme weather events: Intense rainfall events	Receptor: Human health receptors Wetter winters and increased frequency of intense rainfall events could result in increased groundwater levels, creating unsafe conditions for construction workers undertaking below ground excavations.	The Floor Risk Assessment (FRA) states that the Site is at high risk from groundwater flooding. The FRA states that groundwater levels will be continually monitored to establish the risk of inundation of excavations. Suitable measures including pumping/dewatering will be employed as necessary. Risk of groundwater flooding should be considered within a Health and Safety Plan. This should include hazards, e.g. flooding to excavations, working near/ within drainage features as well as adequate and safe access to and egress from the site both for workers and emergency services. Workers on-site should be informed of risks and their mitigation.	Likelihood level: Possible Consequence level: Low as a result of health and safety impacts relating to heat stress. Impact Magnitude: Low	Not Significant. Additional mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.
Increased frequency and intensity of extreme weather events: Heatwaves	Receptor: Human health receptors Heatwaves and higher temperatures could impact on-site personnel welfare, for example, causing heat stress and unsafe working conditions.	It is assumed that all works on-site would be undertaken in accordance with the provisions of the Construction (Design and Management) (CDM) Regulations 2015. The Principal Contractor will produce a Construction Phase Health and Safety Plan. The risk of heat stress to site personnel working outdoors should be managed through this plan, e.g. provision of necessary personal protective equipment (PPE) and toolbox talks to highlight risks of heatstroke.	Likelihood level: Possible Consequence level: Low as a result of health and safety impacts relating to heat stress.	Not Significant. Additional mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
			Impact Magnitude: Low	
	Receptor: Human health receptors Heatwaves, higher temperatures and drought conditions could increase dust generated during demolition and construction activities which could impact site personnel.	As stated within the ES Chapter 7: Air Quality, the Site is of medium risk of dust, and therefore the control of dust emissions from construction-sites relies upon good site management and mitigation techniques to reduce emissions of dust and limit dispersion. Recommended dust mitigation measures for high-risk sites (provided by the Institute of Air Quality Management (IAQM) guidance) would be detailed within the Site's Dust Management Plan (DMP). This will be secured by means of an appropriately worded planning condition. Other mitigation measures would potentially include: • Undertake daily site inspections; • Record and take action for all dust complaints; • Plan the site layout to ensure dust generating activities are far from receptors; • Solid barriers around dusty activities; • Appropriately store materials and ensure materials that are delivered are enclosed; • Use of water assisted dust sweepers and inspection of haul routes; • Remove materials that have a potential to produce dust from site as soon as possible; and • Ensure adequate water supply on-site for effective dust suppression. The Principal Contractor will produce a Construction Phase Health and Safety Plan and a CMP. The risk of increased dust generation and its impacts on-site personnel will be addressed through these plans.	Likelihood level: Unlikely Consequence level: Low as a result of health and safety impacts. Impact Magnitude: Low	Not Significant. Additional Mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.
	Receptor: Buildings receptors Heatwaves and higher temperatures could affect the ability to undertake certain demolition/ construction activities leading to programme delays.	It has been assumed that all works on-site would be undertaken in accordance with the provisions of the Construction (Design and Management) (CDM) Regulations 2015. In line with best practice construction measures, more vulnerable activities such as construction of earthworks would take place in appropriate weather conditions (taking into account construction timescale constraints). This will reduce the likelihood of hot weather delays to these activities. For the purposes of this assessment, it has been assumed these measure will be implemented via the CMP.	Likelihood level: Possible Consequence level: Low as a result of disruption to construction programme lasting less than a day. Impact Magnitude: Low	Not Significant. Additional mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
Extreme weather events: Windstorms	Receptor: Buildings receptors Winds gusts could result in the damage of stockpiles.	Where stockpiles exist on-site, best practice measures for stockpile management would be utilised. In addition, the following measures would be implemented: Prefabrication off-site would be considered, which would help to minimise stockpiling on-site; Covering, seeding, fencing or damping down stockpiles; - Deliveries would generally be 'just-in-time' to avoid storing large volumes of materials. Any construction materials that are stored on-site would be protected to minimise damage by weather; - Skips would be covered to prevent dust and debris blowing around the site; and - Solid screens would be placed around stockpiles. It has been assumed that these measures and other best practice measures would be implemented as part of the CMP. ES Chapter 7: Air Quality notes that the re-vegetation of exposed stockpiles would occur as soon as practicable, or use of hessian, mulch or tackifiers where this is not possible.	Likelihood level: Unlikely Consequence level: Low as a result of partial disruption across elements of the site lasting less than a day. Impact Magnitude: Low	Not Significant. Additional Mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.
Extreme weather events: Windstorms and wind gusts	Receptor: Human health receptors Windstorms could cause wind gust conditions and create unsafe conditions for on-site personnel and pedestrians within the vicinity of the site.	During the demolition and construction stage, health and safety measures would be implemented to ensure that the construction workers are adequately protected from wind conditions. For example, minimising stock piling and positioning in a manner that reduces risk of dust arising through wind action.	Likelihood level: Unlikely Consequence level: Low as a result of health and safety impacts. Impact Magnitude: Low	Not Significant. Additional Mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.
	Receptor: Buildings receptors Windstorms could cause the wind gust conditions and damage or disrupt on-site crane operations.	It has been assumed that the CMP would include best practice and mitigation measures for operating tall cranes during high winds and the contractor would be required to implement all relevant conditions on operating procedures, and other relevant commitments.	Likelihood level: Unlikely Consequence level: High as a result of damage to construction equipment, with indirect health and safety impacts Impact Magnitude: Medium	Not Significant. Additional Mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
	Receptor: Buildings receptors Windstorms could cause the wind gust conditions and result in damage to hoarding.	As committed to in the Demolition and Construction Management and Phasing plan Framework, hoarding would be providing during the demolition and construction works. Hoarding locations and specifications would be identified and agreed prior to the commencement of demolition and construction. The Principal Contractor will produce a Construction Phase Health and Safety Plan as well as a CMP. This should ensure that hoardings would be erected and removed securely.	Likelihood level: Unlikely Consequence level: Low as a result of partial disruption across elements of the site lasting less than a day. Impact Magnitude: Low	Not Significant. Additional Mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.

Operational Stage

A summary of potential CCR impacts during the operational stage of the Proposed Development is provided in Table 2 below. In line with IEMA guidance, embedded mitigation (existing design measures) have been considered.

Table 2 Operation Climate Change Resilience Impacts

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
Increased frequency and intensity of extreme weather events: Intense rainfall events	Receptor: Buildings receptors Human health receptors Wetter winters and increased frequency of intense rainfall events could result in the overwhelming of drainage assets. This could result in secondary impacts such as localised flooding or mobilisation of contamination.	A Flood Risk Assessment (FRA) and Drainage Strategy (DS) has been prepared and considers the flood risk to the Proposed Development and downstream receptors. According to the FRA the Site is within Flood Zone 1 and therefore has a low probability of river or sea flooding. The EA Flood Warning Information Service Long Term Flood Risk Map shows the majority of the site area is at a Very Low risk of surface water flooding, with an area at 'Low risk' area along the northern site boundary, and a small area of 'High' flood risk within the planning boundary. It is considered that the drainage strategy will include the necessary water treatment precautions to ensure compliance with CIRIA C753 guidance. In addition, attenuation measures will be required to accommodate the necessary volumes generated up to the 100 year +40% Climate Change (cc) event. The FRA outline the following attenuation measures: - Blue roof with landscaped features on building D1 (temporary attenuation). - Infiltration via tree pits. Other sustainable Drainage Systems (SuDS) are to be considered, as outlined in the drainage strategy (DS). This includes large drainage channels/ rills, tanked attenuation, below-ground geocellular storage, tank soakaways, porous paving, and retention basins. The DS confirms that the foul drainage system would be designed in accordance with the following: - Building Regulations 2010 Drainage and Waste Disposal Approved Document; and - BS EN 752:2017 Drain and sewer systems outside buildings. A maintenance schedule would be developed following relevant CIRIA guidance to plan long term maintenance and any monitoring required.	Likelihood level: Unlikely Consequence level: Medium as a result of partial disruption lasting more than one day but less than one week. Impact Magnitude: Low	Not Significant. Additional Mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
		The landscape RIBA Stage 3 report produced by Layer Studio confirms that the scheme would incorporate: - Permeable surfacing. - Rain gardens to the north and northwest of the D1 building. - Attenuation within tree pit infrastructure.		
	Receptor: Buildings receptors Wetter winters and increased frequency of intense rainfall events could result in increased groundwater levels.	The FRA states that the Site is at high risk from groundwater flooding. However, there are no permanent underground structures. A Health and Safety Plan should be developed at operation to allow for safe access to and egress from the site for emergency services. This should be confirmed following post demolition ground investigations which will further characterise the groundwater regime for the Site.	Likelihood level: Possible Consequence level: Low as a result of no underground structures proposed. Impact Magnitude: Low	Not Significant. Additional mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.
Increased frequency of extreme weather events: Intense rainfall events	Receptor: Buildings receptors Human health receptors Increased frequency of intense rainfall events could result in increased river levels leading to flooding within the vicinity of the site.	According to the FRA, the Site is shown by the Environment Agency Flood Map for Planning to be within Flood Zone 1 and therefore has a low 0.01% per year probability of river or sea flooding. Attenuation measures will be required to accommodate the necessary volumes generated up to the 100 year +40% Climate Change (cc) event. The FRA outline the following attenuation measures: - Blue roof with landscaped features on building D1 (temporary attenuation). - Infiltration via tree pits. A maintenance schedule would be developed following relevant CIRIA guidance to plan long term maintenance and any monitoring required. The landscape RIBA Stage 3 report produced by Layer Studio confirms that the scheme would incorporate: - Permeable surfacing; - Rain gardens to the north and northwest of the D1 building. - Attenuation within tree pit infrastructure.	Likelihood level: Unlikely Consequence level: Medium as a result of partial disruption across elements of the site lasting more than one day but less than one week. Impact Magnitude: Low	Not Significant Additional Mitigation not required. Existing design and mitigation measures are appropriate to account for climate change.
Increased frequency and intensity of extreme	Receptor: Environmental receptors Increased frequency and severity of extreme heat	The landscape RIBA Stage 3 report produced by Layer Studio confirms that the scheme would incorporate a diverse tree planting palette. This would increase overall resilience to disease and climate change.	Likelihood level: Possible Consequence level: Medium due to cost	Not Significant. Additional Mitigation not required. Existing design and mitigation measures are

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
weather events: Heatwaves	events (i.e. heat waves) could result in the landscape design being compromised (e.g. tree and shrubs die).	It is recommended that drought-resistant vegetation is planted to minimise water use. Drought management, e.g. watering regimes, should also be specified.	implications of replacing plants. Impact Magnitude: Low	appropriate to account for climate change/ extreme weather. It has been recommended that drought resistant vegetation and watering regimes are explored.
	Receptor: Buildings receptors Increased frequency and severity of extreme heat events (i.e. heat waves) could result in overheating of mechanical and electrical equipment.	As the Proposed Development is office space, it will be comfort cooled using air-conditioned units with no openable windows. It is anticipated that ventilation of the office and ground floor reception areas would be provided by an efficient mechanical with heat recovery ventilation system. All units would include a summertime bypass mode to ensure heat recovery does not contribute to overheating. Ventilation in plant rooms would be compliant with approved Document Part F of the building regulations and consider overheating. These would be naturally ventilated where possible. As specified in the Design and Access Statement, building orientation and facades are designed to reduce solar gain and therefore cooling requirements. External shading would be included on southern façade to reduce heat stress. In addition the Design and Access Statement, specifies the cooling fan coil units would be implemented to provide cooling on a zonal basis and air Handling Units (AHU's) are specified to allow for future changes in demand, e.g. increasing the AHU's speed.	Likelihood level: Unlikely Consequence level: Low as a result of disruption across elements of the site lasting less than a day. Impact Magnitude: Low	Not Significant. Additional Mitigation not required.

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
	Receptor: Human health receptors High temperatures and heatwaves could result in overheating and unsuitable conditions e.g. discomfort for building occupants in the residential element of the proposed development.	As the Proposed Development is office space, it will be comfort cooled using air-conditioned units with no openable windows. It is anticipated that ventilation of the office and ground floor reception areas would be provided by an efficient mechanical with heat recovery ventilation system. All units would include a summertime bypass mode to ensure heat recovery does not contribute to overheating. Ventilation in plant rooms would be compliant with approved Document Part F of the building regulations and consider overheating. These would be naturally ventilated where possible. As specified in the Design and Access Statement, building orientation and facades are designed to reduce solar gain and therefore cooling requirements. External shading would be included on southern façade to reduce heat stress. In addition the Design and Access Statement, specifies the cooling fan coil units would be implemented to provide cooling on a zonal basis and air Handling Units (AHU's) are specified to allow for future changes in demand, e.g. increasing the AHU's speed.	Likelihood level: Unlikely Consequence level: Medium as a result of disruption across elements of the site lasting more than a day and health and safety implications. Impact Magnitude: Medium	Not Significant. Additional Mitigation not required.
Increased frequency and intensity of high temperatures: Drought conditions.	Receptor: Buildings and human health receptors Prolonged periods of drought could affect potable water availability.	The Environmental Standards Statement, which supports this planning application, notes that there would be use of flow and time restricted taps, sinks and showers. The following BREEAM credits are being targeted for the Proposed Development with regards to water: - WAT 01 Water Consumption – 3 out of 5 credits targeted for water efficient sanitary ware, demonstrating a 40% improvement over baseline fittings. - WAT 02 Water Monitoring – water metering strategy comprising water-consuming plant or building areas consuming 10% or more of the buildings total water demand, fit easily accessible sub-meters or install water monitoring equipment integral to the plant or area. - WAT 03 Leak detection - installation a leak detection system capable of detecting a major water leak. Low flow fittings would be used to minimise water consumption. Water tanks with a daily turnover would be implemented to minimise impacts of any disruptions in water supply.	Likelihood level: Unlikely Consequence level: Low as a result of disruption across elements of the site lasting less than a day health and safety implications. Impact Magnitude: Low	Not Significant. Additional mitigation not required. Existing design and mitigation measures are appropriate to account for climate change/ extreme weather.
Extreme weather events:	Receptor: Buildings receptors	A Desktop Wind Assessment, which was undertaken for Didsbury Technology Park masterplan (which included the Proposed	Likelihood level: Unlikely	Not Significant. Additional mitigation not required. Existing

Climate Change Trend	Climate (Change) Impact on Receptor	Existing Design and Mitigation Measures	Impact Magnitude	Significance and Additional Mitigation Required
Windstorms and wind gusts	Windstorm events could cause damage to the proposed development. This could include damage to roof sheeting, wall cladding. This could also create unsafe conditions for users.	Development), found that the Proposed Development is expected to be suitable for pedestrian activities throughout the year. The Proposed Development building structure is to be designed in accordance with BS EN 1991-4 to provide sufficient stability for design wind loads. It should also be noted that although the UKCP18 climate data identifies trends for near surface wind speeds for the second half of the 21st century (accompanied by an increase in frequency of winter storms over the UK) any increase will be modest compared to interannual variability for the PPE-15 (perturbed parameter ensemble)¹. It has not been considered that climate change would impact the predicted wind microclimate conditions in and around the Proposed Development. The structural design would account for appropriate wind loading at the detailed design stage.	Consequence level: Medium as a result of partial disruption across elements of the site lasting less than a day and health and safety implications. Impact Magnitude: Low	design and mitigation measures are appropriate to account for climate change/ extreme weather.

¹ UKCP18, 2018. Factsheet: Wind. Available at: <https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-fact-sheet-wind.pdf>. [Accessed 01/02/2022]