

The Printworks, High Road West

Sustainability and Energy Statement

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1 Executive Summary

This Sustainability and Energy Statement had been prepared by BuroHappold on behalf of Goodsynd Tottenham Limited ('the Applicant') in support of the planning application for the redevelopment of the project "The Printworks, High Road West", located at 819 - 829 High Road (Printworks) within the London Borough of Haringay ('LBH').

1.1 Key Measure Summary

Energy and Carbon

The energy strategy for the development has been defined using the Lean, Clean, Green energy hierarchy set out in London Plan 2021 policy SI2 and associated guidance. Table 1-1 sets out the key measures within the design strategy for the development to reducing carbon emissions in operation. Analysis has been carried out to assess the energy and carbon reductions of the proposed buildings against two scenarios, with either onsite heat pumps or a connection to a District Energy Network if this is available.

Following the energy hierarchy, the development achieves an improvement over the Part L 2021 notional building of 10% with a connection to a DEN and 17% with onsite heat pumps. All residual regulated carbon emissions will be offset via a cash-in-lieu payment. The improvements over Part L 2021 are the maximum feasible to achieve with onsite measures when balancing scheme requirements for thermal comfort, acoustics, daylighting and low carbon heating amongst others.

Table 1-1 Key energy and carbon reduction measures

Energy hierarchy step	Design measures
Lean	Façade configuration and specification designed to balance winter passive solar gains but avoid summer overheating
	Building fabric specification lower than Part L notional building
	Low air permeability targeted
	High efficiency mechanical ventilation with heat recovery
	High efficiency lighting (LED) and controls
Clean	Connection to District Energy Network to provide low carbon heat for space heating and domestic hot water
	Option for interim onsite Air Source Heat Pumps if a DEN connection is not available
Green	Photovoltaic arrays proposed on roof areas where feasible for renewable electricity generation
Net Zero	Residual regulated carbon emissions for both residential and non-residential units will be offset by a cash-in-lieu payment to achieve net zero regulated emissions
Seen	The metering strategy for all buildings will be designed in line with building regulations and GLA's 'Be Seen' guidance to ensure the building energy consumption can be interrogated and controlled

Table 1-2 Scenario A: Predicted Carbon Dioxide Emissions saving after each stage of the Energy Hierarchy using DEN

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	1.4	5%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	1.6	5%
Total Cumulative Savings	3.0	10%
Annual savings from off-set payment	27.5	-
(Tonnes CO₂)		
Cumulative savings for off-set payment	826	-
Cash in-lieu contribution (£)	78,441	

Table 1-3 Scenario B: Predicted Carbon Dioxide Emissions saving after each stage of the Energy Hierarchy using ASHP

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	2.2	5%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	5.7	12%
Total Cumulative Savings	7.8	17%
Annual savings from off-set payment	38.3	-
(Tonnes CO₂)		
Cumulative savings for off-set payment	1,148	-
Cash in-lieu contribution (£)	109,090	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development

Cooling and Overheating

The risk of overheating has been mitigated through passive design measures and by applying the cooling hierarchy, as set out in Policy SI 4 of the London Plan 2021. An efficient façade design has been pursued that minimises solar gains which could enable the student bedrooms to be naturally ventilated without overheating with the provision of sufficient free areas from window openings. However, Part O acoustic comfort requirements mean that it is not possible to open the bedrooms windows at night-time, leading to overheating during peak temperatures. A mixed mode cooling strategy is therefore pursued, with a priority for opening windows, supported by MVHR and with the provision of active cooling systems to address peak temperatures when the windows cannot be opened. The design measures implemented are set out in Table 1-4.

Table 1-4: Cooling Hierarchy: Design measures implemented

Cooling hierarchy step	Design measures
Reduce the amount of heat entering the building	An efficient façade design using low glazing to wall ratios of 31.5%, low g-values of 0.3 and the use of window reveals for shading.
Minimise internal heat generation	Pipework services will be provided with adequate insulation to limit the internal heat gains during the production of domestic hot water. The selection of efficient LED lighting and systems will be used throughout the development.
Manage heat with thermal mass	There is no exposed thermal mass internally. High thermal mass is mostly beneficial if combined with a night-purge ventilation which is not possible for the site given acoustic constraints.
Passive ventilation	Openable windows are incorporated to allow for natural ventilation during the day. Due to acoustic constraints under Part O, the windows cannot be opened during night-times, creating overheating risk during peak temperatures.
Mechanical ventilation	Mechanical ventilation with heat recovery (MVHR) is proposed for the student rooms including a summer by-pass mode to allow for free cooling of the space using external air. MVHR systems will be designed and sized to meet whole unit background ventilation requirements when window opening is not possible.
Active cooling	The restrictions on window openings in the bedroom at night-time create the risk of overheating during peak temperatures. This risk cannot be satisfactorily mitigated solely through MVHR. The provision of air conditioning is therefore proposed as a necessary last resort at night times when cooling requirements cannot be met through opening windows and MVHR.

1.2 Policy Compliance

The compliance matrix in the table below has been produced to summarise and provide clarity on the performance of the development against the requirements of building regulations and planning policy. The proposed development is compliant with almost all policy requirements. Where compliance is not achieved this is due to significant design constraints from the building typology and local area as summarised in the Notes column.

Notably, the GLA Energy Assessment Guidance cover note (June 2022 update) recognises that non-residential developments may find it more challenging to achieve significant on-site reduction beyond Part L 2021. In such instances, the GLA requires a demonstration of the alignment to the energy hierarchy to minimise emissions as far as possible before offsetting. It is therefore entirely appropriate for a development to fall below the 35% improvement, providing that it follows this approach. This guidance is a material consideration as part of the overall planning balance which supports the approach followed in this case.

Table 1-5: Policy compliance matrix

Document	Policy	Performance target	Compliance	Notes
LBH Strategic Policies 2013 with alterations adopted July 2017	SP4 Working towards a low carbon Haringey	Achieve minimum BREEAM rating of 'Very Good', with aspiration for 'Excellent'	Yes	As set out in Sustainability Statement
		Site-wide net-zero carbon (regulated)	Yes	Cash-in-lieu carbon offset payment calculated using GLA Carbon Emissions Reporting Tool
		Promote low- and zero-carbon energy generation	Yes	Proposed connection to existing Energetik DEN and roof-mounted PV array
LBH Development Management DPD (July 2017)	DM22 Decentralised Energy	Promote provision and use of Decentralised Energy Network infrastructure	Yes	Proposed connection to existing Energetik DEN
London Plan 2021	SI 2 Minimising greenhouse gas emissions	15% reduction in carbon emissions (against Part L 2021 Baseline) through energy efficiency measures alone (Lean)	No	Unfeasible due to high domestic hot water load for building typology and active cooling required for Part O compliance.
		Overall 35% reduction in carbon emissions (against Part L 2021 Baseline) through on-site measures	No	Unfeasible to achieve as carbon emissions reductions from DEN are not accounted for in methodology.
		Maximise on-site renewable energy generation	Yes	Maximum feasible area of roof-mounted PV array proposed
		Net-zero carbon' (regulated) through offset of residual carbon emissions	Yes	Cash-in-lieu carbon offset payment calculated using GLA Carbon Emissions Reporting Tool
	SI 3 Energy Infrastructure	Select heat source in accordance with the Heating Hierarchy to prioritise decentralised energy networks	Yes	Connection to existing Energetik DEN proposed
	SI 4 Managing heat risk	Reduce the potential for internal overheating and reliance on air conditioning systems	Partial	Acoustic constraints under Part O mean mechanical cooling is required

2 Introduction

The purpose of this Sustainability and Energy Statement is to describe the updated sustainability and energy objectives and deliverables for the design, construction and operation of the project, including the legislative requirements for the site and stakeholders involved. It should be read alongside the full suite of planning documentation.

2.1 Development Description

(i) Full planning application:

Full planning application for the demolition of existing buildings and structures to the rear of 819-829 High Road; the demolition of 829 High Road; and redevelopment for purpose-built student accommodation (Sui Generis) and supporting flexible commercial, business and service uses (Class E), hard and soft landscaping, parking, and associated works. To include the change of use of 819-827 High Road to student accommodation (Sui Generis) and commercial, business and service (Class E) uses.

(ii) Listed building consent:

Internal and external alterations to 819/821 High Road (Grade II), including reinstatement of hipped roof, demolition works to the rear, façade and related external works, internal alterations and associated works.

2.1.1 Existing Areas and use

- Existing Floorspace: 2,774 sqm (GIA) / 2,951 sqm (GEA)

Existing Listed Buildings

- 819-821: Grade II listed.
- 823-829: Locally listed.

2.1.2 Proposed Areas and use

- Total site area: 3,598 m²
- Total: 287 student bedspaces
 - New build: 276 student bedspaces (222 cluster units, 54 studio units)
 - High Road (existing): 11 student bedspaces (9 cluster units, 2 studios).
 - Area total: 9,347 sqm (GEA) / 8,612 sqm (GIA)
- Commercial floorspace: 238 sqm (GEA) / 216 sqm (GIA)

Full details of the Proposed Development can be found in the Planning Statement and Design and Access Statement that accompany this submission.

3 Policy

This policy section outlines some of the key national, strategic and local policy frameworks relating to energy, carbon and sustainability.

Strategic planning in London is a shared responsibility of the Mayor of London, London Boroughs and the City of London Corporation. The London Plan (2021) is the spatial development strategy for London, produced by the Greater London Authority (GLA) on behalf of the Mayor of London. Every London Borough Local Plan must be in general conformity with the London Plan.

The Site is located in the London Borough of Haringey and as such any development proposal will be determined against the LBH development plan and the new London Plan (2021), and other relevant material considerations, such as supplementary planning documents (SPDs). For sustainability, a key guidance document is the Haringey Local Plan, as illustrated in Figure 3-1 Summary of planning policy framework of the GLA and Local Policy.



Figure 3-1 Summary of planning policy framework of the GLA and Local Policy

3.1 National Energy Policy and Guidance

3.1.1 The United Nations Paris Climate Agreement

The Paris Agreement is a major international climate action agreement to which the UK is signatory. The 196 countries under the agreement have committed to limit global warming to 2°C over pre-industrial levels and aim to safely adapt to any consequences of climate change. The UK ratified this in 2016.

While countries may set their own policies and targets (NDCs), these are assessed as to their level of ambition and to their progressive approach, and must be tracked and published. The UK updated its NDC in 2022, committing to reduce emissions by at least 68% by 2030 against a 1990 baseline.

3.1.2 The National Planning Policy Framework, NPPF

The NPPF consolidates previously issued documents called Planning Policy Statements (PPS) and Planning Policy Guidance Notes (PPG). A greater focus is now placed on the dissemination of energy policy within regional development frameworks.

Within the NPPF's planning guidance relating to energy is set out in section 14 – “meeting the challenge of climate change, flooding and coastal change”.

3.1.3 Climate Change Act

The Climate Change Act 2008 established a legally binding target to reduce the UK's greenhouse gas emissions by at least 80% below 1990 levels by 2050. To drive progress and set the UK on a pathway towards this target, the Act introduced a system of carbon budgets which provide legally binding limits on the amount of emissions that may be produced in successive five-year periods, beginning in 2008.

The first three carbon budgets were set in law in May 2009 and require emissions to be reduced by at least 34% below base year levels in 2020. The fourth carbon budget, covering the period 2023–27, was set in law in June 2011 and requires emissions to be reduced by 50% below 1990 levels. The fifth carbon came into force in July 2016, limiting the budget for 2028–2032 of is 1,725 mega tonnes of carbon dioxide equivalent. This correlates to the reduction of 57% in greenhouse gas emissions compared to 1990 levels.

3.2 UK decarbonisation context

The UK became the first major economy in the world to pass laws to end its contribution to global warming by 2050. The target requires the UK to bring all greenhouse gas emissions to net zero by 2050, compared with the previous target of at least 80% reduction from 1990 levels.

Electricity grid decarbonisation

The carbon intensity of electricity in the UK has been reducing from 0.519 kg CO₂/ kWh to 0.136 kg CO₂/ kWh as per Building Regulations Part L 2013 and Part L 2021. This is due to the closure of coal fired power stations and the increase in renewable energy. As a result, electricity is becoming a more feasible lower carbon fuel source compared to traditional gas combustion. This is also resulting in Gas fired CHP engines not providing the long-term carbon savings shown previously and going forward will be a high carbon technology based on Part L. These changes result in a difference in Part L carbon reductions shown by recent developments and for new ones coming forward now.

3.3 Policy and Regulation Changes

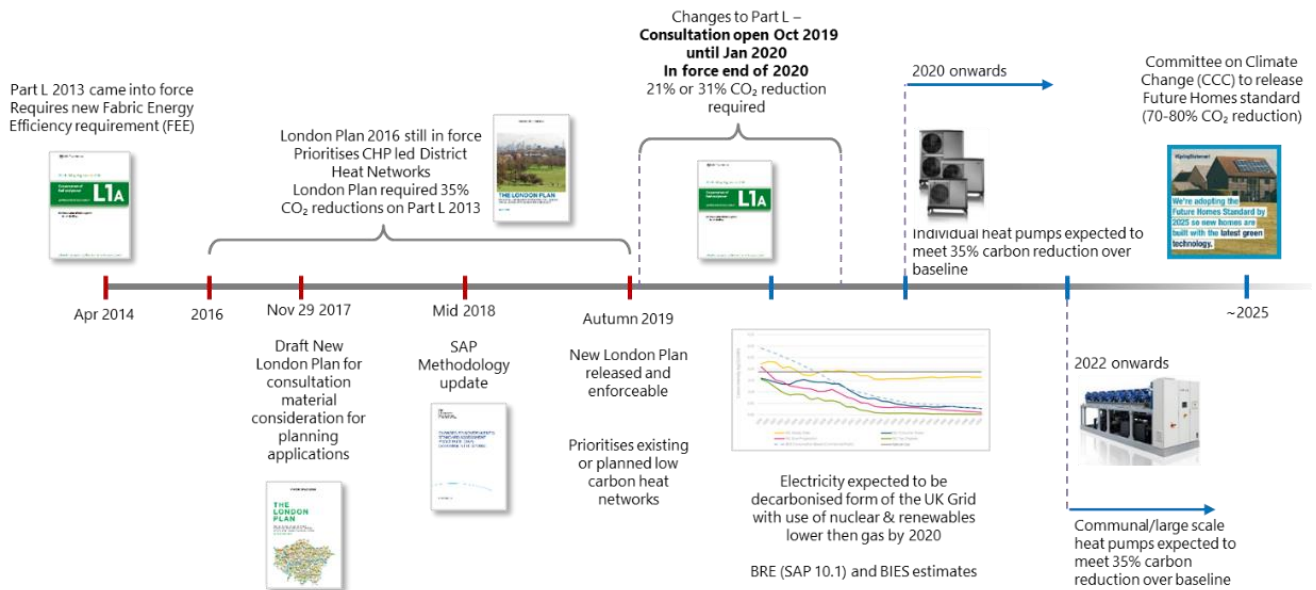


Figure 3-2 UK Past and future UK carbon regulations

The image shows the changing policy and regulatory landscape since 2014. The Future Homes Standard in 2025 was consulted upon in 2020. No further updates on the process have been provided to date. It was outlined by BEIS that district heat networks (DHN), heat pumps and electric heating, along with improved fabric will meet these future emissions reductions targets. The consultation report stated:

"2.9 The CCC stated in its report Net Zero: The UK's contribution to stopping global warming that achieving the net zero target will require the full decarbonisation of buildings by 2050. There are a number of existing low carbon heating technologies with the potential to support the scale of change needed. We anticipate that low carbon heating may be delivered through heat pumps, heat networks and in some circumstance's direct electric heating."

3.3.1 Building Regulations Part L 2021

Part L of the 2021 Building Regulations relates to the Conservation of Fuel and Power in both new construction dwellings (Part L1) and non-domestic buildings (Part L2). These documents stipulate a minimum level of efficiency that buildings must be constructed to. The guide to the regulations (Approved Documents) must be read in conjunction with other supporting documents, such as the National Calculation Methodology (NCM) Modelling Guide 2021.

Compliance with these regulations is demonstrated through thermal modelling analysis. For domestic buildings this is demonstrated through SAP (Standard Assessment Procedure calculations) and for non-domestic buildings dynamic simulation energy modelling or SBEM (Simplified Building Energy Model) is required.

The Proposed Development comprises student accommodation and retail units, for which Part L2 applies to both uses.

3.4 Regional Policy

The Mayor of London formally adopted the London Plan on March 4th 2021. This new London Plan now forms part of the development plan, against which development proposals in London are assessed against.

Policies surrounding sustainability are summarised below.

Policy GG2 Making the best use of land

To create successful sustainable mixed-use places that make the best use of land, those involved in planning and development must enable the development of brownfield land; prioritise sites which are well-connected by existing or planned public transport; aim to secure net biodiversity gains where possible; and plan for good local walking, cycling and public transport connections.

Policy GG3 Creating a healthy city

Developments should seek to improve London's air quality; reduce public exposure to poor air quality; improve access to quality greenspaces; provide new green infrastructure; provide new spaces to play; and ensure that buildings are well-insulated and ventilated.

Policy GG6 Increasing efficiency and resilience

To help London become a more efficient and resilient city, those involved in planning and development must support the move to a low carbon circular economy and ensure that buildings and infrastructure are designed to adapt to a changing climate.

Policy G5 Urban greening

Major development proposals should contribute to the greening of London by including urban greening and incorporating high quality landscaping, green roofs, green walls and nature based sustainable drainage.

Policy SI1 Improving air quality

Development proposals must be at least air quality neutral and use design solutions to prevent or minimise increased exposure to existing air pollution.

Policy SI2 Minimising greenhouse gas emissions

Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- 1) be lean: use less energy and manage demand during construction and operation.
- 2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
- 3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.
- 4) be seen: monitor, verify and report on energy performance.

A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major developments. Residential development should achieve **10 per cent**, and non-residential development should achieve **15 per cent** through energy efficiency ("Lean") measures. However, the cover note to the GLA's Energy Assessment Guidance (June 2022 update) does acknowledge that non-residential developments may find it more challenging to achieve significant onsite carbon reductions beyond Part L 2021 to meet both the energy efficiency target and the minimum 35 per cent

improvement. In such cases, development should demonstrate alignment to the energy hierarchy to minimise emissions as far as possible before offsetting.

The GLA requires that zero-carbon is achieved once on-site emissions have been reduced. The remaining carbon emissions (typically 65%) are offset through a cash in lieu payment to Haringey in this instance. The money is used to fund carbon reduction projects in the Haringey boundary. This payment has to account for 30 years of carbon emissions at a fixed rate of cost and carbon intensity.

Policy SI3 Energy infrastructure

Major development proposals within Heat Network Priority Areas should have a communal low temperature heating system

- 1) the heat source for the **communal heating system should be selected in accordance** with the following heating hierarchy:
 - a. connect to local existing or planned heat networks
 - b. use available zero-emission or local secondary heat sources (in conjunction with heat pump, if required,
 - c. use low emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network)
 - d. use ultra-low NOx gas boilers
- 2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements of policy SI1 (A)
- 3) where a heat network is planned but not yet in existence the development should be **designed for connection at a later date.**

Policy SI4 Managing heat risk

Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure. Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the cooling hierarchy.

Policy SI5 Water infrastructure

In order to minimise the use of mains water, water supplies and resources should be protected and conserved in a sustainable manner. Residential developments should achieve mains water consumption of less than 105 litres per person per day and non-residential development should achieve the BREEAM Excellent minimum standard according to credit Wat 01.

Policy SI7 Reducing waste and supporting the circular economy

Resource conservation, waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal will be achieved by the Mayor, waste planning authorities and industry working in collaboration.

Developments should have adequate, flexible, and easily accessible storage space and collection systems that support, as a minimum, the separate collection of dry recyclables (at least card, paper, mixed plastics, metals, glass) and food.

Referable applications should promote circular economy outcomes and aim to be net zero-waste.

Policy SI12 Flood risk management

Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.

Policy SI13 Sustainable drainage

Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible

Policy T5 Cycling

Development should facilitate and encourage cycling and reduce car dependency and the health problems it creates.

Policy T6 Car parking

Car parking should be restricted in line with levels of existing and future public transport accessibility and connectivity. New residential development should not exceed the maximum parking standards. All residential car parking spaces must provide infrastructure for electric or UltraLow Emission vehicles. At least 20 per cent of spaces should have active charging facilities, with passive provision for all remaining spaces.

3.4.2 Resulting Energy and Carbon Approach

Zero carbon implies that the target for developments is to reduce regulated carbon dioxide emissions down to zero. This London Plan requires at least 35% reduction in regulated carbon dioxide emissions against Part L 2021 to be achieved on-site; the remaining regulated carbon dioxide emissions – to 100% – are to be offset off-site, see Figure 3-3, as per the New London Plan (2021). The GLA's cover note to the Energy Assessment Guidance (June 2022) does however note that "non-residential developments may find it more challenging to achieve significant onsite carbon reductions beyond Part L 2021 to meet both the energy efficiency target and the minimum 35 per cent improvement". In such cases, development should demonstrate alignment to the energy hierarchy to minimise emissions as far as possible before offsetting.

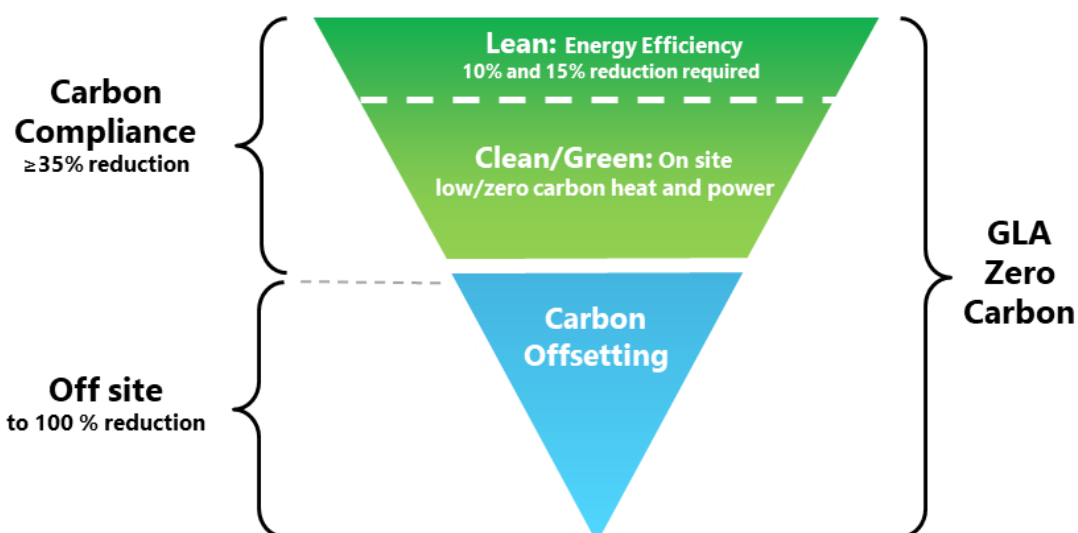


Figure 3-3 Zero carbon requirements

The New London Plan (2021) **Policy SI2** shows that the GLA are concentrating on a fabric first approach, meaning they will expect to see how the fabric specification has been pushed as much as possible before accepting (i.e. triple glazing).

On-site regulated carbon dioxide emissions are to be reduced by means of a combination of measures, following the structure outlined in the GLA Energy Hierarchy:

- **Be Lean:** reduce energy demand by improving the building's fabric efficiency and ventilation system, and reducing lighting consumption to meet the 10% reduction for residential and 15% reduction for non-residential. As noted above, GLA guidance acknowledges that these reductions may not be possible for all non-residential schemes working towards Part L 2021.
- **Be Clean:** exploit local energy resources where feasible and supply energy efficiently.
- **Be Green:** install and use power generated by renewable energy sources on-site.
- In line with the GLA Guidance (Policy SI3, 9.3.8), renewable energy sources are to be installed regardless of whether the on-site 35% reduction target has been already achieved with the previous steps of the Energy Hierarchy. An exception can be made in cases where it can be demonstrated that renewable technologies are not technically feasible or economically viable for the considered development.
- Off-site carbon offsetting can be achieved through two main strategies:
 - Investing in existing local properties in the area, improving energy efficiency or installing renewable energy in order to generate an equivalent carbon reduction.
 - Cash in lieu payment to the LBH

3.5 Local Policy – LBH Development Plan

The LBH local plan currently encompasses two main documents to set out a number of policies applicable to developments in the Haringey area. The local plan sets out goals across all elements of sustainability and energy spectrum. These policies are typically in alignment with the New London Plan (2021).

3.5.1 Strategic Policies 2013 – 2026

SP4 Working towards a Low Carbon Haringey

Over the lifetime of the Local Plan, reducing energy use in buildings and working towards a low carbon borough will be one of the key challenges facing Haringey. The Council will promote the measures outlined below to reduce carbon emissions from new and existing buildings.

1. In line with London Plan policy, the Council **will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:**
 - a. From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO₂ emissions in line with Code for Sustainable Homes Level 4 energy standards and should aim to achieve Level 6. All new residential development shall be zero carbon from 2016 onwards

- b. From 2011 onwards all new non-residential development shall be built to at least BREEAM “very good” standard and should aim to achieve BREEAM “excellent” or the current nationally agreed standard. All new non-residential development shall be zero carbon from 2019.
2. The Council will promote low- and zero-carbon energy generation through the following **measures**:
 - a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network
 - b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible
 - c. Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area
 - d. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from onsite renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.

SP5 Water Management and Flooding

The Council will require all development in Haringey to be water efficient during construction and operation and to reduce all forms of food risk. All development shall:

- Improve the water environment, water quality and drainage systems
- Minimise water use and illustrate how development would contribute to general and flash flooding
- Take account of flood risk vulnerability classification as set out in Annex 3 of the NPPF and will apply the NPPF Sequential Test and Exception Test
- Implement measures to prevent (or mitigate as last resort) local surface water and downstream flooding
- Implement Sustainable Drainage Systems from strategic to individual site level to improve water attenuation, quality and amenity
- Restore and enhance the Blue Ribbon Network including Pymmes Brook, Moselle Brook, the River Lee and its tributaries, deculverting wherever feasible, to improve water quality and amenity of these waterways and to help reduce food risk (in line with London River Action Plan)
- Require higher resilience and levels of flood protection for critical infrastructure to ensure the protection of essential services such as water and power.

SP6 Waste and Recycling

The Council supports the objectives of sustainable waste management set out by the Government in PPS10 Planning for Sustainable Waste Management and the Mayor's London Plan. To achieve these, the Council shall:

- Safeguard existing waste sites unless compensatory provision is made
- Maximise self-sufficiency in waste management capacity

- Seek to minimise waste creation, increase recycling rates in relation to commercial, industrial and municipal waste in order to achieve the Mayor's recycling targets
- Address waste as a resource and look to disposal as the last option, in line with the Mayor's waste hierarchy
- Require integrated, well-designed recycling facilities to be incorporated into all new developments
- Monitor changes in the stock of waste management facilities, waste arisings, and the amount of waste recycled, recovered and going for disposal
- Continue working with its partners in the North London Waste Authority to adopt the North London Waste Plan (NLWP) which has identified locations suitable for waste management facilities to meet the London Plan apportionment of 1.9 2.1m tonnes and the Haringey apportionment of 237,000 182,000 tonnes.

Haringey will require Site Waste Management Plans for all major applications to identify volume and types of demolition and construction waste and to demonstrate how waste will be minimised and managed during construction and occupation. New waste management facilities will be required to take into account and minimise pollution and nuisance issues. This is addressed in more detail in the Development Management Policies document.

SP7 Transport

Delivering regeneration and access

In line with London Plan policies, the Local Implementation Plan (LIP) and the Mayor's Transport Strategy, the Council will work with its partners to promote the following key infrastructure proposals to support Haringey's regeneration and local/strategic access to London, employment areas and local services;

- The Council, in cooperation with neighbouring boroughs, will seek to reduce the impact of larger lorries in local residential areas and town centres and investigate the feasibility of a freight distribution hub
- Improvements to the Piccadilly, Victoria and Northern Lines including new trains, new signalling and new control centres
- Improvements to overground routes along West Anglia, East Coast (Great Northern) and Barking - Gospel Oak line that service the centre and east of the borough
- Access and interchange improvements to overground stations at Alexandra Palace, Finsbury Park, Haringay, Hornsey White Hart Lane, Northumberland Park, South Tottenham, and Bruce Grove
- Improvements to interchanges at Tottenham Hale and Seven Sisters
- Improvements to the Tottenham Gyratory
- Improvements to east - west bus routes as well as promoting new east - west routes.

Delivering action on Climate Change and quality and healthy Places

In line with the London Plan, the Council will work with its partners to promote the following travel demand management schemes to tackle climate change, improve local place shaping and public realm, and environmental and transport quality and safety by:

- Minimising congestion and addressing the environmental impacts of travel

- Promoting public transport, walking and cycling (including minimum cycle parking standards)
- Promoting road safety and pedestrian movement particularly in town centres and close to local services
- Promoting car sharing and establishing car clubs
- Seeking to locate major trip generating developments in locations with good access to public transport and so better integrate transport and land use planning
- Adopting maximum car parking standards and car free housing wherever feasible
- Seeking to mitigate the impact of road-based freight and promote alternatives
- Supporting measures to influence behavioural change such as promoting low carbon vehicles
- Requiring the submission of transport assessments and travel plans for large scale proposals in line with TfL guidance.

3.5.2 Development Management DPD 2017

Key Development Management DPD policies related to Energy and Sustainability have been highlighted in full below:

DM19 Nature Conservation

1. Development proposals on sites which are, or are adjacent to, internationally designated sites, Sites of Special Scientific Interest, Local Nature Reserves, Sites of Importance for Nature Conservation or Ecological Corridors, should protect and enhance the nature conservation value of the site.
2. Development that has a direct or indirect adverse impact upon important ecological assets, either individually or in combination with other development, will only be permitted where:
 - a. The harm cannot be reasonably avoided
 - b. It has been suitably demonstrated that appropriate mitigation can address the harm caused.

DM21 Sustainable Design, Layout and Construction

1. All new development, including building and landscape works, will be expected to consider and implement sustainable design, layout and construction techniques. Proposals should:
 - a. Apply the energy hierarchy to minimise energy use in order to meet, and if possible, exceed, minimum carbon dioxide reduction requirements
 - b. Apply the cooling hierarchy to reduce the potential for overheating and limit reliance on mechanical air conditioning systems
 - c. Maximise opportunities to enhance biodiversity on-site, including through appropriate landscaping, Sustainable Drainage Systems, living roofs and green walls
 - d. Wherever possible, use building materials with high environmental performance ratings
 - e. Seek opportunities for locally sourced labour.

2. The Council will support appropriate measures to sustainably retrofit existing homes and non-residential buildings.
3. Proposals that fail to demonstrate adequate consideration for sustainable design, layout and construction techniques will be resisted.
4. Consideration will be given to the use of carbon offset payments, to be secured by planning obligations, where it can be demonstrated that proposals are unable to meet carbon dioxide emission reduction targets on-site.

DM22 Decentralised Energy

1. Subject to other policy requirements, proposals that contribute to the provision and use of Decentralised Energy network infrastructure will be supported.

Communal energy systems

1. All development that incorporates site-wide communal energy systems should examine opportunities for extending such systems, irrespective of whether it is connected to a DE network.
2. All development that incorporates site-wide communal energy systems should optimise opportunities for extending such systems beyond the site boundary to supply energy to neighbouring existing and planned future developments.

Existing and planned future DE networks

1. All development proposals should prioritise connection to existing or planned future DE networks.
2. All major development located within 500 metres of an existing DE Network, and minor new-build development located within 25 metres, will be expected to secure connection to that network subject to demonstration of technical feasibility and financial viability.
3. All major development located within 500 metres of a planned future DE Network, which is considered by the Council likely to be operational within 3 years of a grant of planning permission, will be expected to secure connection to that network subject to demonstration of technical feasibility and financial viability.

DE network 'connection zones'

1. All major development located within 500 metres of a DE network 'connection zone' should be designed for connection to a DE network.
2. All minor new-build development located within 25 metres of a DE network 'connection zone' should be designed for connection to a DE network.

Customer charters

1. Where site-wide communal and district heating systems are operational, the Council will strongly encourage heat and energy service providers to enter into customer charters with domestic and micro-business customers.

DM23 Environmental Protection**Air Quality**

1. All development proposals should consider air quality and be designed to:
 - a. Improve or mitigate the impact on air quality in the Borough; and
 - b. Improve or mitigate the impact on air quality for the occupiers of the building or users of the development.
2. Air quality assessments will be required for all major development and other development proposals, where appropriate.
3. Where necessary, adequate mitigation must be provided.

DM25 Sustainable Drainage Systems

1. All proposals for new development must seek to manage surface water as close to its source as possible in line with the London Plan drainage hierarchy.
2. The Council will require Sustainable Drainage Systems (SuDS) to be sensitively incorporated into new development by way of site layout and design, having regard to the following requirements:
 - a. All major development proposals will be required to reduce surface water flows to a greenfield run-off rate for a 1 in 100-year critical storm event
 - b. All minor development proposals should aim to achieve a greenfield run-off rate and, at a minimum, achieve a 50 per cent reduction on existing site run-off rates
 - c. All other development should seek to achieve a greenfield run-off rate and include at least one 'at source' SuDS measure resulting in a net improvement in water quantity or quality discharging to a sewer
 - d. For all development where a greenfield run-off rate cannot be achieved justification must be provided to demonstrate that the run-off rate has been reduced as much as possible.
3. Where Sustainable Drainage Systems are implemented, they will be expected to:
 - a. Meet the requirements set out in the Council's relevant local standards and guidance, or national standards where agreed
 - b. Incorporate measures identified in the Surface Water Management Plan
 - c. Be designed to maximise biodiversity and local amenity benefits, and where appropriate, ensure that SuDS techniques provide for clean and safe water at the surface
 - d. Improve water quality
 - e. Function effectively over the lifespan of the development.
4. Where SuDS cannot be implemented due to site constraints (such as land contamination or space limitations) robust justification must be provided along with proposed alternative sustainable approaches to surface water management.

4 Sustainability Statement

This section of the report describes how the Proposed Development responds to relevant policy and requirements relating to sustainability.

4.1 Site location

The site is located within the London Borough of Haringey, North West of the existing Tottenham Hotspur Stadium, as per Figure 4-1. A number of existing buildings occupy the site for demolition to enable the construction of the proposed scheme.

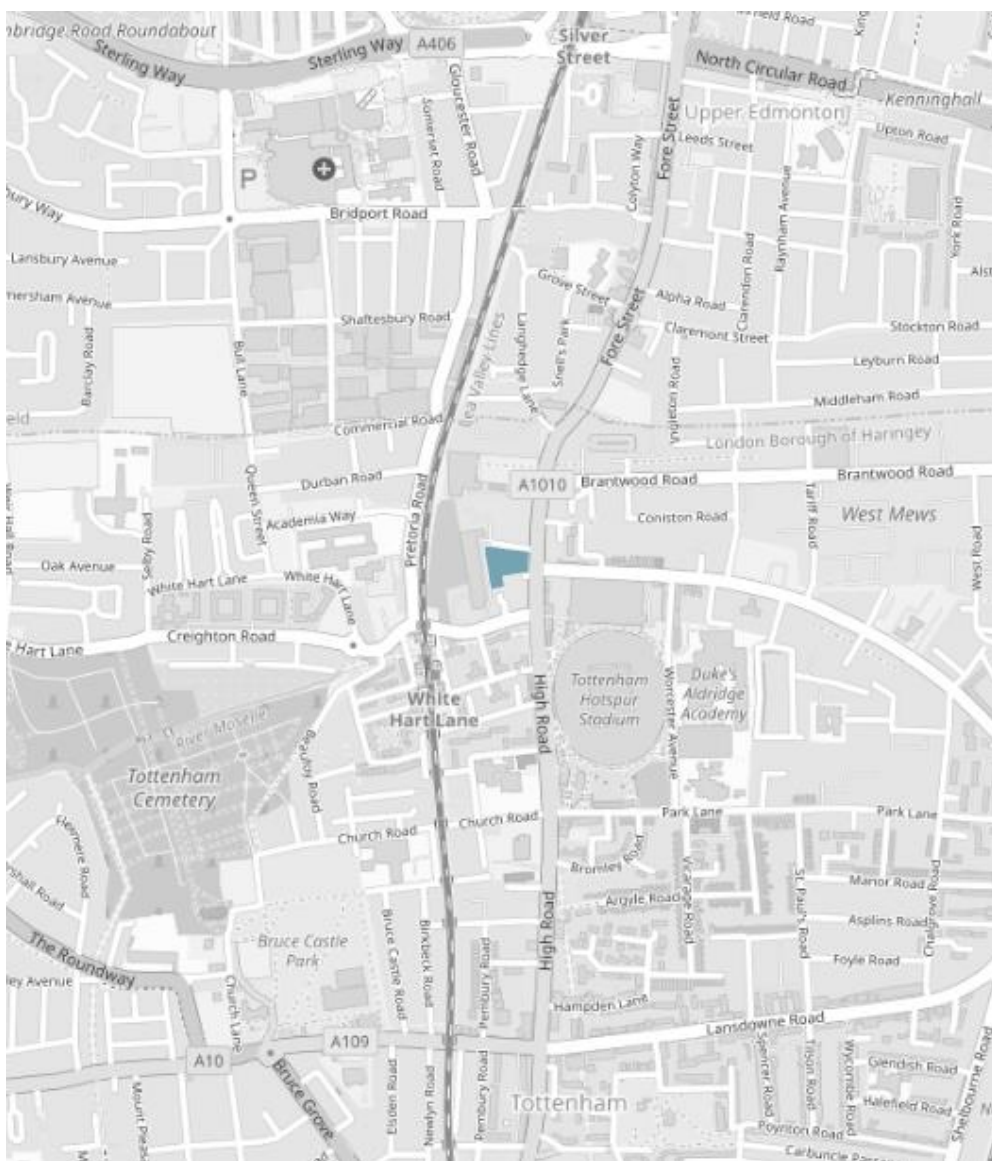


Figure 4-1 Site location

4.2 Transport

The Proposed Development supports travel by sustainable modes and encourages active travel. The Proposed Development is well served by Public Transport and the public realm proposals improve connections for residents and employees to key public transport nodes. The Proposed Development has a low car parking provision for residents with spaces provided for those with mobility impairments and a limited provision for other residents. Secure cycle parking is provided for residents and employees in line with the minimum standards set out in the London Plan 2021. Additional cycle parking, consistent with the London Plan requirements, is conveniently located in publicly accessible locations for visitors. The public realm proposals open the Proposed Development sites up improving permeability through the creation of attractive and interesting routes to support active travel.

4.3 Health and wellbeing

The Proposed Development includes a range of design features that benefit wellbeing and contribute towards creating a healthy city and local environment:

- There is no gas combustion on site with heating provided by either a District Energy Network connection or onsite Air Source Heat Pumps.
- Air intakes for mechanical ventilation to the building will be appropriately located to minimise intake of polluted air and will be fitted with appropriate filters to contribute towards providing good indoor air quality.
- Low volatile organic compound materials will be used during fit-out to contribute towards providing good indoor air quality.
- Natural daylight considerations
 - Student accommodation has generally been designed to provide good access to natural daylight, with appropriately sized windows and a general floor-to-ceiling height of 2.5 metres, whilst being arranged around a central landscaped amenity space.
 - Daylight and sunlight design principles from the Mayor of London's Housing Supplementary Planning Guidance (March 2016) and BRE209, '*Site Layout Planning for Daylight and Sunlight – A guide to good practice*' (Dr P Littlefair, second edition, 2011) have been followed in the course of designing the development.
 - Interim daylight and sunlight assessments were undertaken to help inform the design.
- A number of landscaped areas are proposed across the development, providing socialising space across different levels, i.e. Ground and some roof levels.
- The building is well insulated and includes double glazing. The mechanical ventilation system will ensure that a good level of fresh air can be provided year-round, with no risk of cold draughts in the winter. This will avoid the risks of health problems associated with damp and cold.
- An Air Quality Neutral Assessment has been undertaken to ensure the development does not lead to further deterioration of existing air quality
- The Air Quality Assessment and Site Construction Management Plan propose measures to mitigate potential dust emissions during construction
- A detailed air quality assessment has been undertaken that assesses the suitability of the site for the proposed sensitive uses and determines the impact associated with operational traffic emissions generated by the development, appropriate mitigation measures have been recommended for implementation where potentially significant effects have been identified

4.4 Materials and Waste

Waste will be stored separately by the residential and commercial users. Waste will be segregated within in each unit and taken to communal waste stores at ground floor level. Residents will not be required to travel over 30m (horizontal distance) to reach their allocated waste store.

Waste will be separated into residual, mixed dry recyclable and food waste streams by all users. Space for bulky waste storage is provided for the residents. Commercial users will also separately collect glass waste. Strategies for responsibly managing specialist waste, such as cooking oil and batteries, have been developed. Commercial waste will be collected daily by a commercial waste contractor and residential waste will be collected weekly by Haringey.

Waste Management Plans have been developed for all sites and these include details for the efficient disposal of all waste types. The plans also include strategies for reducing waste generation and recommendations for the ongoing review of the waste management plans.

There will be a commitment to maintaining the waste management plan and reporting on waste figures throughout the lifetime of the development. There will also be a commitment to promoting the waste hierarchy and the landlord will be encouraged to utilise waste reduction measures for any waste they manage or generate.

The Proposed Development is committed to embedding Circular Economy principles within the design, to keep materials and services at their highest value possible. The steering approach for the development will be to:

- Design all areas for longevity, ease of maintenance and disassembly
- Retain and refurbish a portion of existing buildings on-site
- Recycle, re-use or recover construction, demolition and construction waste
- Minimise operational waste and provide adequate space for recyclables
- Specific measures that have already been integrated into the design, and commitments for the next stages, are detailed further in the Circular Economy Statement.

4.5 Embodied carbon

The Proposed Development is not required by local policy to undertake a Whole Life Carbon Assessment, but measures have been taken through the design to minimise the whole life embodied impacts of the scheme. The brownfield site is currently poorly utilised with an events venue to the rear of 819-821 High Road surrounded by car parking and loading spaces.

Re-use of the single-story existing structure onsite into the scheme is not feasible given the structural requirements from the change of use and additional stories for the proposed development. However, a number of structural and façade options have been considered to minimise the upfront embodied impacts of the scheme. Low carbon products and materials will also be selected where possible to further reduce carbon impacts from procurement.

4.6 Water Consumption

The Proposed Development will seek to minimise the use of mains water in order to conserve water resources. To drive efficiency in water consumption, low flow fixtures and fittings will be selected that meet minimum standard for BREEAM Excellent in credit Wat 01 Water Consumption.

4.7 Flood Risk and Drainage

A Flood Risk Assessment has been undertaken for the project, which demonstrates that the Proposed Development will be safe from flooding from all sources, for the full design life, and not increase flood risk elsewhere, in accordance with the National Planning Policy Framework, Policy SP5 of the London Borough of Haringey (LBH) Strategic Policies DPD and Policy DM24 of the LBH Development Management DPD.

Under the Surface Water Drainage Strategy for the Proposed Development, surface water is proposed to be discharged to the Thames Water surface water sewers at a restricted rate equivalent to the greenfield run-off rate for the site, using below ground attenuation, in accordance with the requirements of Policy SI13 of the London Plan. The Drainage Strategy includes an allowance for a 40% increase in peak rainfall intensity in accordance with the latest Environment Agency guidance for climate change.

4.8 Biodiversity

This highly urban site is currently dominated by buildings and hardstanding as part of the mixed commercial and residential properties that surround the site.

The site is considered to be of low ecological value due to the very limited semi-natural habitats present, which currently comprise sparse areas of ephemeral vegetation and no areas of open green space.

The soft landscaping will enhance the biodiversity on site and contribute to the greening of LBH and Greater London through the recommended incorporation of native tree and shrub planting, and ornamental planting which will aim to integrate species on the Royal Horticultural Society's 'Plants for Pollinators' list, where possible.

The proposed soft landscaping designs are yet to be confirmed however significant improvements to the current baseline conditions are expected, which will subsequently benefit biodiversity within the development.

4.9 Climate Resilience

The Proposed Development has been designed to be resilient to a changing climate. The flood risk assessment and drainage strategy include allowances for climate change. The inclusion of external green space will reduce the urban heat island effect.

The overheating risk of the Proposed Development has been assessed using weather data from CIBSE TM52, the data used takes account of climate and is representative up to 2050 in a high warming scenario. Further detail on this assessment is in Section 6 Overheating and Cooling.

4.10 Energy and CO₂ Emissions

The Proposed Development will minimise energy consumption and CO₂ emissions through following the GLA energy hierarchy. A low carbon District Energy Network is used to provide heating and hot water to the building and overall the scheme reduces CO₂ emissions **by 10%** compared to the baseline. If a connection to the DEN is not available from day one, onsite Air Source Heat Pumps will be used as an interim heating solution. Under the scenario, the scheme reduced emissions by **by 16%** compared to the baseline. An offset payment will be made for the remaining emissions.

The GLA's Energy Assessment Guidance cover note (June 2022) acknowledges that non-residential developments working towards Part L 2021 may not be able to achieve a 35% onsite reduction. The guidance specifically highlights

the presence of low carbon heating for the non-domestic notional building meaning that carbon savings are more difficult to achieve for the heating system.

In addition, the residential nature of student accommodation means that the Proposed Development is limited in the onsite carbon reductions that can be achieved in comparison to the non-domestic notional building. For example, the relatively high hot water demand compared to other non-domestic use-types limits the savings that can be made from water heating. Active cooling is also required to meet night-time thermal comfort requirements for the student bedrooms while also complying with the acoustic requirements set out by Part O of Building Regulations.

Full details of the energy strategy can be found in Section 5 Energy Statement.

4.11 Landscape Design

4.11.1 Climate Sensitive Design

The proposals are being developed with climate sensitive design in mind, including;

- Sustainable urban drainage systems introduced to capture rainwater and slow discharge rates, through the use of permeable paving, rainwater gardens and bio-retention tree pits
- Street tree planting with linked tree pits and below ground cellular systems to create additional rainwater attenuation
- High number of trees along the streets and within spaces creating a good canopy across the site helping cool the air and in turn reducing the heat island effect
- The introduction of certain tree and hedging species within the landscape that are known to capture micro pollutants in the air particularly from the surrounding road network to improve air quality.
- Responding to the microclimate of the site considering the aspect, daylight and shelter from the wind when designing the spaces.

4.11.2 Carbon Offsetting Considerations

The landscape proposals have been developed with carbon offsetting in mind including:

- Careful specification of materials with consideration of percentage of recycled content, avoiding heavily processed materials such as plastics, considering longevity, durability and suitability of materials.
- Natural materials such as FSC wood which has less embodied carbon to be used within the street furniture
- Maximise the quantum of green spaces and incorporate trees and woody plant species that are known for their carbon sequestration properties.

4.12 BREEAM

BREEAM (Building Research Establishment's Environmental Assessment Method) was the world's first sustainability rating scheme for the built environment and has contributed much to the strong focus in the UK on sustainability in building design, construction, and use. BREEAM is now an international standard that is locally adapted, operated and applied.

There are 8 different environmental performance categories in BREEAM. Within each environmental performance category, there are a number of credits which developments are assessed against. Where evidence is provided demonstrating that the criteria of the credit have been met, the appropriate number of credits can be awarded. A weighting is applied to account for the varying importance of the different categories and then the category totals are

added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent or Outstanding. The performance standard for each rating is summarised in Table 4-1 **BREEAM rating benchmarks**.

Table 4-1 BREEAM rating benchmarks

Outstanding	Excellent	Very Good	Good	Pass
≥ 85%	≥ 70%	≥ 55%	≥ 45%	≥ 30%

A BREEAM pre-assessment has been carried out following BREEAM UK New Construction Version 6.1. According to the Haringey Sustainable Design and Construction SPD and Local Plan, the council require a minimum of 'Very Good' to be achieved for non-residential buildings with an aspiration for Excellent where feasible. Figure 4-2 BREEAM **pre-assessment score** demonstrates that a BREEAM Very Good score of 58.5% should be readily achievable for the development based on low risk credits and credits achieved. This score can be elevated past the 70% 'Excellent' threshold if a number of process-based BREEAM credits are dealt with via additional appointments for RIBA Stage 2. Note that the individual targeted credits may vary between the pre-assessment and final certification score, and that the feasibility of achieving Excellent will be continually reviewed as the project progresses.

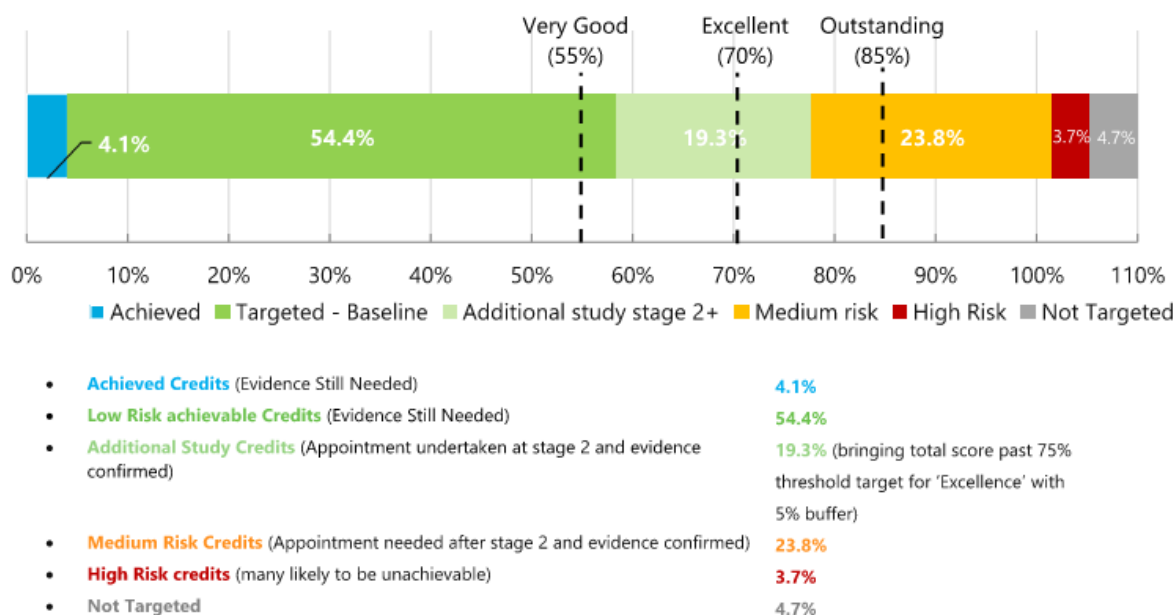


Figure 4-2 BREEAM pre-assessment score

1.1.1 Pre-assessment tracker

A BREEAM pre-assessment tracker for the project can be found in the BREEAM Report issued alongside this statement. The tracker should be considered a live document. Note that the individual targeted credits may vary between the pre-assessment and final certification score, and that the feasibility of achieving Excellent will be continually reviewed as the project progresses.

4.13 Policy Compliance

The compliance matrix in the table below has been produced to summarise and provide clarity on the performance of the development against the requirements of building regulations and planning policy. The proposed development is compliant with almost all policy requirements. Where compliance is not achieved this is due to significant design constraints from the building typology and local area as summarised in the Notes column.

Notably, the GLA Energy Assessment Guidance cover note (June 2022 update) recognises that non-residential developments may find it more challenging to achieve significant on-site reduction beyond Part L 2021. In such instances, the GLA requires a demonstration of the alignment to the energy hierarchy to minimise emissions as far as possible before offsetting. It is therefore entirely appropriate for a development to fall below the 35% improvement, providing that it follows this approach. This guidance is a material consideration as part of the overall planning balance which supports the approach followed in this case.

Table 4-2: Policy compliance matrix

Document	Policy	Performance target	Compliance	Notes
LBH Strategic Policies 2013 with alterations adopted July 2017	SP4 Working towards a low carbon Haringey	Achieve minimum BREEAM rating of 'Very Good', with aspiration for 'Excellent'	Yes	As set out in Sustainability Statement
		Site-wide net-zero carbon (regulated)	Yes	Cash-in-lieu carbon offset payment calculated using GLA Carbon Emissions Reporting Tool
		Promote low- and zero-carbon energy generation	Yes	Proposed connection to existing Energetik DEN and roof-mounted PV array
LBH Development Management DPD (July 2017)	DM22 Decentralised Energy	Promote provision and use of Decentralised Energy Network infrastructure	Yes	Proposed connection to existing Energetik DEN
London Plan 2021	SI 2 Minimising greenhouse gas emissions	15% reduction in carbon emissions (against Part L 2021 Baseline) through energy efficiency measures alone (Lean)	No	Unfeasible due to high domestic hot water load for building typology and active cooling required for Part O compliance.
		Overall 35% reduction in carbon emissions (against Part L 2021 Baseline) through on-site measures	No	Unfeasible to achieve as carbon emissions reductions from DEN are not accounted for in methodology.
		Maximise on-site renewable energy generation	Yes	Maximum feasible area of roof-mounted PV array proposed
		Net-zero carbon' (regulated) through offset of residual carbon emissions	Yes	Cash-in-lieu carbon offset payment calculated using GLA Carbon Emissions Reporting Tool
	SI 3 Energy Infrastructure	Select heat source in accordance with the Heating Hierarchy to prioritise decentralised energy networks	Yes	Connection to existing Energetik DEN proposed
	SI 4 Managing heat risk	Reduce the potential for internal overheating and reliance on air conditioning systems	Partial	Acoustic constraints under Part O mean mechanical cooling is required

5 Energy Statement

5.1 Introduction

The project design is following the energy hierarchy; Lean, Clean, Green. This approach aims to minimise energy consumption from the outset with low energy, passive measures and efficient systems before the deployment of low and zero-carbon technologies.



Figure 5-1 Energy Hierarchy

Table 5-1 Key energy and carbon reduction measures

Energy hierarchy step	Design measures
Lean	Façade configuration and specification designed to balance winter passive solar gains but avoid summer overheating
	Building fabric specification lower than Part L notional building
	Low air permeability targeted
	High efficiency mechanical ventilation with heat recovery
	High efficiency lighting (LED) and controls
Clean	Connection to District Energy Network to provide low carbon heat for space heating and domestic hot water
	Option for interim onsite Air Source Heat Pumps if a DEN connection is not available
Green	Photovoltaic arrays proposed on roof areas where feasible for renewable electricity generation
Net Zero	Residual regulated carbon emissions for both residential and non-residential units will be offset by a cash-in-lieu payment to achieve net zero regulated emissions
Seen	The metering strategy for all buildings will be designed in line with building regulations and GLA's 'Be Seen' guidance to ensure the building energy consumption can be interrogated and controlled

5.2 Energy Hierarchy Methodology

Predicted carbon emissions have been taken from computer modelling software (SBEM methodology), in line with guidance outlined in the document entitled Energy Planning, GLA guidance on preparing energy assessments, 2022.

The GLA energy hierarchy has been adhered to and each stage, 'Lean', 'Clean' and 'Green' has been explored. The following report sections explain the inputs outlined the table below, and the expected site wide impact of each stage.

The heating strategy for the development is dependent on the availability of a connection to a District Energy Network. Discussions with an operator of an existing DEN to the north using waste to energy indicate that a connection is possible for the scheme with the extension of this network. The preferred strategy for the development is therefore connection to the DEN from completion and this is presented below as 'Scenario A: DEN'. However, if the connection is not available during construction, the development will be reliant on onsite Air Source Heat Pumps until the DEN becomes available. This is presented below as 'Scenario B: ASHP'.

Table 5-2 Summary of modelling assumptions through the energy hierarchy

	Model assumptions and inclusions
Baseline – Building Regulations Notional Development (as generated by Part L software)	Baseline Target / Dwelling Emission Rate (TER / DER) is modelled as a reference 'compliant' building, with the following features: • Notional fabric and glazing areas • Scenario A: Heat generation via Energetik DEN as per actual building • Scenario B: Heat generation via heat pump as per actual, using notional COP • Cooling via CHW Chillers
Lean - Energy efficiency measures applied	Improved energy efficient model, with the following features: • Improved building fabric including triple glazing and enhanced air tightness • Energy efficiency measures as required to achieve compliance on Part L 2021 • Heat generation via DEN (Scenario A) or Heat pump (Scenario B) for space heating and DHW in line with Building Regulations requirements for 'Lean' inputs • Cooling via CHW Chillers
Clean - Connecting to District Heat Network (DHN)	• Connection to the existing Energetik heat from waste District Energy Network with heat carbon intensity of 0.015 kgCO₂/kWh
Green - Renewable Energy Technology	• Maximise PV coverage across the usable roof area

The cooling hierarchy strategy is addressed as part of the 'Overheating' section of this report.

5.3 Baseline Demand and CO₂ Emissions

Baseline energy demands have been estimated in line with the methodology set out in Section 0. Models have been created based on specific design geometry and systems, in line with the GLA's guidance for preparing energy statements.

5.3.1 Unregulated emissions

Unregulated emissions have been taken from typical BRUKL report equipment demands and allocated on a per metre squared basis. These demands are assumed to be provided by electricity in all instances, regardless of typology, with the relevant carbon factor applied to provide the assumed emissions. They are assumed not to change between each stage of the energy hierarchy.

5.3.2 'Baseline' predicted energy demand

Table 5-3 'Baseline' predicted energy demands

Scenario	Baseline energy demand (kWh/m ² /year)					
	Space heating	Hot water	Cooling	Auxiliary	Lighting	Unregulated Electricity
Scenario A: DEN	18.37	24.32	2.04	14.09	7.53	26.95
Scenario B: ASHP	5.99	7.31	2.04	14.09	7.53	26.95

5.3.3 'Baseline' Carbon Emissions

Table 5-4 'Baseline' predicted carbon emissions (using IESVE)

Scenario	Baseline Regulated Carbon Emissions	
	kg CO ₂ /m ² /year	Tonnes CO ₂ /year
Scenario A: DEN	3.35	30.53
Scenario B: ASHP	5.06	46.11

5.4 Demand reduction – 'Lean'

This section outlines the strategic demand reduction and energy efficiency measures integrated in the Proposed Development and their impacts on energy demand and carbon reductions. The values provided are indicative fabric and services specifications which will be reviewed throughout the design process.

5.4.1 Lean Fabric and system improvement

This section discusses the passive design measures that will be incorporated into the detailed design of the Proposed Development. Good practice building fabric specification can significantly reduce the heating and cooling demands and loads of the building. The recommended fabric thermal efficiency requirements summarised in Table 5-5 and compared with requirements from Part L 2021. These inputs have been used to generate the Lean outputs which have been used to show potential demand reduction and subsequent carbon emission reduction over baseline demands.

Table 5-5 Target fabric and glazing specifications

Element	Part L 2021 Notional Building Values	Proposed Building Values	Unit
Exposed and ground floors	0.15	0.11	W/m ² K
Roof	0.15	0.11	W/m ² K
External Wall	0.18	0.14	W/m ² K
Windows (U-Value)	1.40	1.00	W/m ² K
Windows (G-Value)	0.28	0.30	
Air permeability	3	3	m ³ /hr/m ² @50Pa
Thermal bridging	10% degradation of u-value	25% degradation of u-value	

Table 5-6 Building services modelling values

Element	Value	Unit	Notes
Ventilation Specific Fan Power (SFP)	1.0	W/l/s	Values provide are from HVAC calculations
Ventilation heat recovery efficiency	85.4	%	Value from PCDB
Lighting	100	%	Energy efficient lighting to be specified

Table 5-7 Building energy modelling inputs and notional values

Element	Scenario A- DEN			Scenario B- ASHP		
	Student housing spaces	Commercial spaces	Amenity Spaces	Student housing spaces	Commercial spaces	Amenity Spaces
Heating	SCoP: 0.84	SCoP: 0.84	SCoP: 0.84	SCoP: 2.82	SCoP: 2.67	SCoP: 2.67
Hot Water	SCoP : 0.89	SCoP : 0.94	SCoP : 0.94	SCoP: 2.82	SCoP: 2.82	SCoP: 2.82
Cooling	SEER: 4.21	SEER: 4.21	SEER: 4.21	SEER: 5.52	SEER: 5.52	SEER: 5.52
Ventilation	SFP: 1.0 W/l/s Heat recovery: 85%			SFP: 1.0 W/l/s Heat recovery: 85%		
Controls	Demand control Ventilation			Demand control Ventilation		
Lighting	Lamp Efficacy - 115 lm/W (LED)			Lamp Efficacy - 115 lm/W (LED)		
	Occupancy sensing only in circulation areas (auto-on-off) No daylight dimming	No Occupancy sensors. Daylight Dimming applied		Occupancy sensing only in circulation areas (auto-on-off) No daylight dimming	No Occupancy sensors. Daylight Dimming applied	

5.4.1.1 Windows and Glazing

The Proposed Development is to use triple glazing, across the entirety of the façade. This is expected to contribute towards the Lean reductions, along with the following glazing specifications.

- Transmittance factor (G-value): 0.30 for windows
- Frame factor (FF): 32.8% frame factor used for windows in standard bedrooms and 7% for other windows
- Triple glazing U-value: 1.0 W/m²K

5.4.1.2 Thermal envelope and air tightness

Building insulation will be designed to improve upon the permitted limiting fabric values proposed by the Part L 2021 Regulations, see Table for residential units and for non-residential units. Heat losses will be further reduced through increased airtightness. The design team are targeting an air permeability of 3.0 m³/m².hr for all floors. This level of infiltration is a significant improvement and is achievable through high performing facade, advanced construction techniques and attention to detail and a rigorous air permeability testing regime.

5.4.1.3 Ventilation

The ventilation strategy for residential units is based on standalone apartment based Mechanical Ventilation with Heat Recovery (MVHR) systems, with a boost setting, together with openable windows to meet the purge ventilation requirements of Part F.

The MVHR units in residential units will recycle heat from the dwellings as fresh air is brought in and will include a summer bypass function. The MVHR systems will provide continuous background ventilation, and create an improved acoustic environment compared to natural ventilation.

5.4.1.4 Internal Lighting

To minimise energy consumption from lighting, the number of light fittings will be minimised whilst specifying 100% low energy LED lighting with manual controls.

5.4.1.5 Wastewater Heat Recovery

Wastewater heat recovery systems have not been integrated into the design at stage 2. The benefit of such a system would not be easily realised in the Part L calculations due to limitations in the modelling methodology. The systems will be actively explored by the design team throughout detailed design stages. However

5.4.2 'Lean' predicted energy demand

Table 5-8 Lean energy demand

Scenario	Lean energy demand (kWh/m ² /year)					
	Space heating	Hot water	Cooling	Auxiliary	Lighting	Unregulated Electricity
Scenario A: DEN	17.31	25.26	2.81	11.19	8.56	26.95
Scenario B: ASHP	5.61	8.24	2.01	10.82	8.56	26.95

5.4.3 'Lean' Carbon emissions

Table 5-9 Predicted Lean carbon emissions using Part L 2021 carbon factors

Scenario	Baseline Regulated Carbon Emissions		Lean Regulated Carbon Emissions		
	kg CO ₂ /m ² /year	Tonnes CO ₂ /year	kg CO ₂ /m ² /year	Tonnes CO ₂ /year	% improvement over Baseline
Scenario A: DEN	3.35	30.53	3.20*	29.14	4.6%
Scenario B: ASHP	5.06	46.11	4.82	43.93	2.2%

*3.65 without notional PV reduction

5.5 Heating infrastructure – 'Clean'

5.5.1 Addressing the London Plan heating hierarchy

The Greater London Authority promote that once the demand for energy has been minimised, all planning applications must demonstrate how their energy systems will exploit local energy sources (such as secondary heat) and supply energy efficiently and cleanly to reduce carbon emissions, by following the heating hierarchy in London Plan Policy SI 3.

5.5.2 Connecting to Planned Heating or Cooling Networks

Correspondence with Energetik, indicates there are significant works in progress in relation to a new Meridian Water Energy Centre and construction of main distribution networks, as seen in Figure 5-2. The energy centre, located at the 'Ecopark' North East of the HRW development, is understood to generate Heat from Waste and will be operational in 2026. The carbon factor for this energy generation is 0.014 at source, and 0.015 at development connection.

Prior to its completion, the DEN distribution will utilise its heat from alternative sources, which will subsequently become energy sources to manage with peak lopping of high demand periods to the network.

The main distribution (Purple) is indicated as per the Energetik network development proposals, with a further development proposal (Orange) to enable HRW utilisation of the heat network.

It has been indicated the Energetik DEN will be installed at Fore Street (the point where the orange meets purple) and that it is likely the DEN would be available for day one connection to HRW, subject to construction programme development. The HRW development is located approximately 400 meters from the 'to be installed' DEN service within Fore Street, meaning only a short extension of main distribution pipe work will be required.

Initial conversations with Energetik have confirmed the Ecopark energy centre, currently under construction, will be capable of providing the HRW development with a connection to satisfy the required peak heat demand. This means that additional on-site energy production would not be required and therefore present additional benefits to space savings of usable building area.

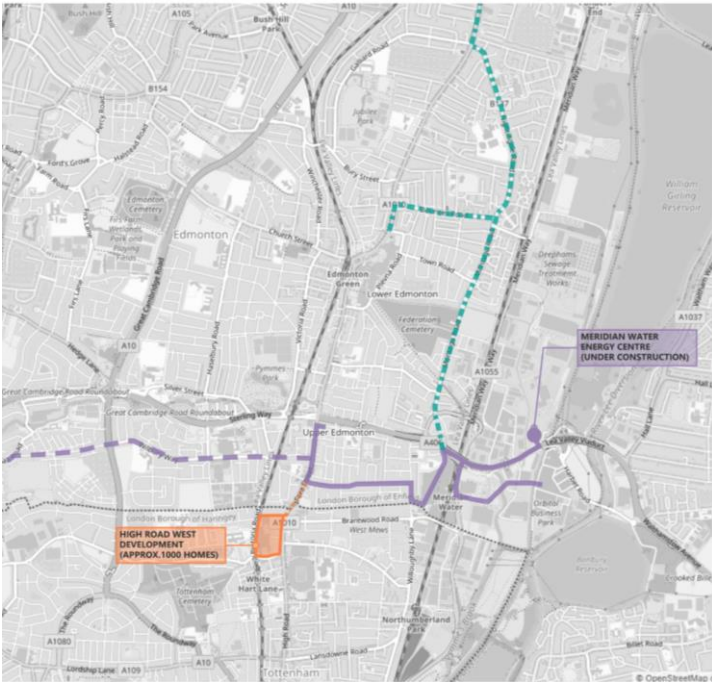


Figure 5-2 Local district heat network plans

5.5.3 Heating strategy

The heating and DHW shall be provided via individual Heat Interface Units (HIU) located in each cluster on each floor. To mitigate pipework losses within communal corridors, a minimum insulation thickness of 40mm has been proposed regardless of pipe size.

Table 5-10 Predicted 'Clean' carbon emissions using Part L 2021 carbon factors

Scenario	Baseline Regulated Carbon Emissions		'Clean' Regulated Carbon Emissions		
	kgCO ₂ /m ² /year	Tonnes CO ₂ /year	kg CO ₂ /m ² /year	Tonnes CO ₂ /year	% improvement over Baseline
Scenario A: DEN	3.35	30.53	3.20*	29.14	4.6%
Scenario B: ASHP	5.06	46.11	4.82	43.93	2.2%

*3.65 without notional PV reduction

5.6 Renewable Energy – 'Green'

This section outlines the strategic approach applied to renewable energy to achieve the necessary carbon reduction requirement across the Proposed Development. It outlines the technologies to be implemented and their effectiveness across the site, as well as their impact on site wide carbon emissions.

5.6.1 Proposed PV

For the purpose of this analysis, a PV panel has been selected to determine the potential peak solar yield (kWp) from the usable roof area.

The panel selected is a generic unit with a conservative efficiency of 20.0%. The dimensions of the panel are 1046mm x 1690mm meaning a 1.77m² PV area per panel.

The areas in Table 5-11 have been identified with the following definitions:

Roof area – total available roof area suitable for PV to be installed

Active PV area – roof area designated for PV installation minus;

- 40% spacing factor between panels for shading, access and maintenance

Panel Quantity – amount of 1.77m² panels that could be installed to roof area

Peak kW(p) – calculated potential peak solar yield

Table 5-11 Potential PV areas

Plot	Roof Area	Active PV Area	Panel Quantity
Printworks	486.5m ²	291.9m ²	165

5.6.2 Green Carbon Emissions

Emissions shown include the savings from connection to a District Energy Network using energy from waste under Scenario A and high efficiency reversible heat pump systems under Scenario B.

Table 5-12 'Green' Carbon Emissions and Savings using Part L 2021 carbon factors

Scenario	Baseline Regulated Carbon Emissions		Green Regulated Carbon Emissions (i.e. after Lean, Clean and Green measures)		
	kg CO ₂ /m ² /yr	Tonnes CO ₂ /yr	kg CO ₂ /m ² /yr	Tonnes CO ₂ /yr	% improvement over Baseline
Scenario A: DEN	3.35	30.53	3.02	27.52	9.9%
Scenario B: ASHP	5.06	46.11	4.20	38.28	17.0%

5.7 Proposed metering strategy – 'Seen'

Energy metering will be provided to meet the requirements of the Building Regulations 2021, CIBSE TM39, Metering Instruments Directive (MID) Class 2 Accuracy and the "Be Seen" strategy for the GLA. Smart energy meters/ energy display devices will be installed which have the ability to be read remotely.

5.8 Energy Hierarchy conclusions

Analysis for the Lean, Clean, and Green steps outlined by the new London Plan, 2021 have been collated in the format required for the planning submission as outlined in the GLA's Energy Assessment Guidance Greater London Authority guidance on preparing energy assessments as part of planning applications (June 2022). The charts below summarise the carbon emissions at each stage of the energy hierarchy as set out in the GLA guidance for both Scenario A: DEN and Scenario B: ASHP.

As can be seen from the results, the Proposed Development is unable to achieve the GLA requirements for a 15% reduction on Part L through energy efficiency and a 35% reduction on Part L through onsite measures. This reflects the cover note to the GLA Energy Assessment Guidance which acknowledges that achieving both of these targets may not be possible for non-domestic buildings working towards Part L 2021. The guidance specifically highlights the presence of low carbon heating for the non-domestic notional building meaning that carbon savings are more difficult to achieve for the heating system.

In addition, the residential nature of student accommodation means that the Proposed Development is limited in the onsite carbon reductions that can be achieved in comparison to the non-domestic notional building. For example, the relatively high hot water demand compared to other non-domestic use-types limits the savings that can be made from water heating. Active cooling is also required to meet night-time thermal comfort requirements for the student bedrooms while also complying with the acoustic requirements set out by Part O of Building Regulations.

5.8.1 Scenario A: DEN

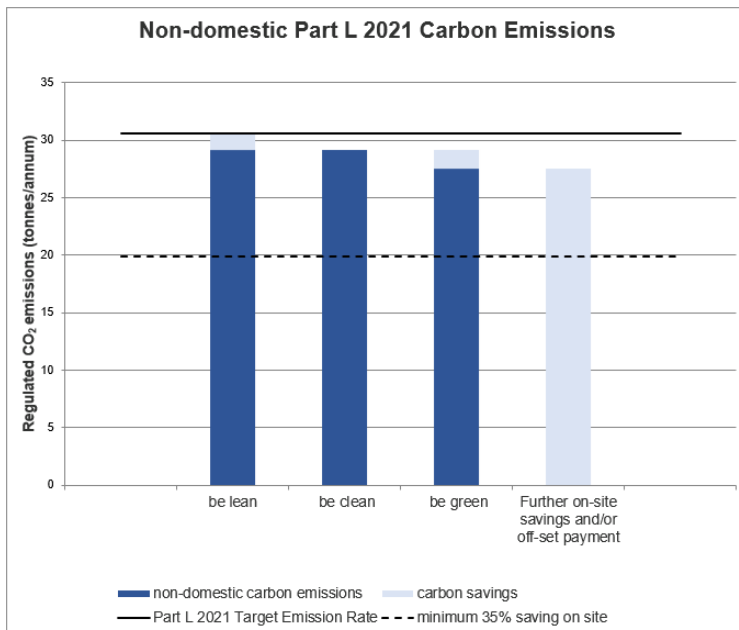


Figure 5-3 Scenario A: DEN- Carbon Savings throughout the energy hierarchy

Table 5-13 Scenario A: Predicted Carbon Dioxide Emissions saving after each stage of the Energy Hierarchy for the non-residential

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	1.4	5%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	1.6	5%
Total Cumulative Savings	3.0	10%
Annual savings from off-set payment	27.5	-
(Tonnes CO₂)		
Cumulative savings for off-set payment	826	-
Cash in-lieu contribution (£)	78,441	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development

5.8.2 Scenario B: ASHP

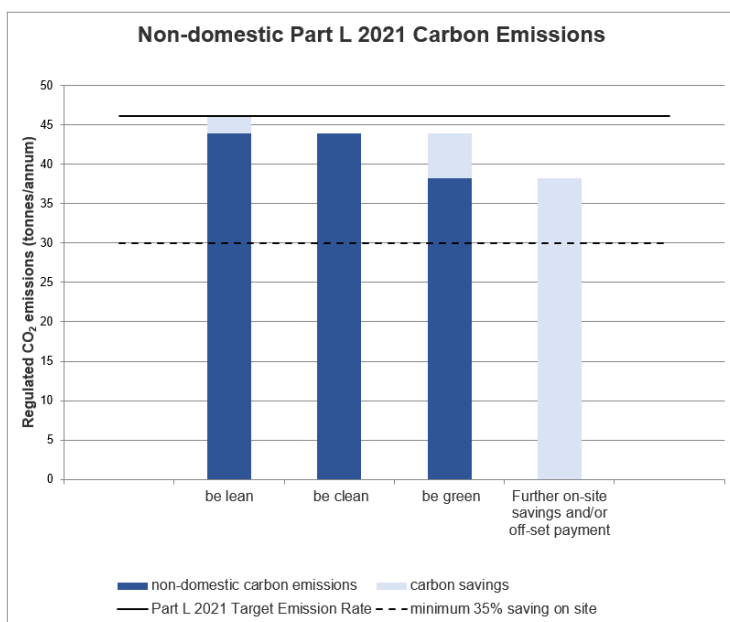


Figure 5-4 Scenario B: ASHP- Carbon Savings throughout the energy hierarchy

Table 5-14 Scenario B: Predicted Carbon Dioxide Emissions saving after each stage of the Energy Hierarchy for the non-residential

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	2.2	5%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	5.7	12%
Total Cumulative Savings	7.8	17%
Annual savings from off-set payment	38.3	-
(Tonnes CO₂)		
Cumulative savings for off-set payment	1,148	-
Cash in-lieu contribution (£)	109,090	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development

6 Overheating and Cooling Analysis

6.1 Overview

In the context of global temperatures rising due to climate change, and predictions of further increase in the upcoming years, managing overheating is essential. Heat waves are set to become more frequent and more severe. There were 2,000 heat related fatalities in the UK due to the 2003 heatwave and summers of this severity are predicted to occur every other year by 2050. The new developments being built currently are highly likely to be in use in 2050 and beyond.

This section of the report summarises the outcomes of the overheating analysis undertaken to date in line with CIBSE TM52 and TM59. These have been considered alongside assessments of acoustic risk on the proposed design in line with Part O guidance and methodologies.

Together, these assessments indicate that a cooling strategy compliant with thermal and acoustic requirements would need a combination of natural and active ventilation for the student accommodation. Heat gains will therefore be minimised as far as possible through passive measures which will be supplemented by active comfort cooling. The below cooling hierarchy Figure 6 1 outlines the design approach to managing high external temperatures and maintaining comfortable internal temperatures.

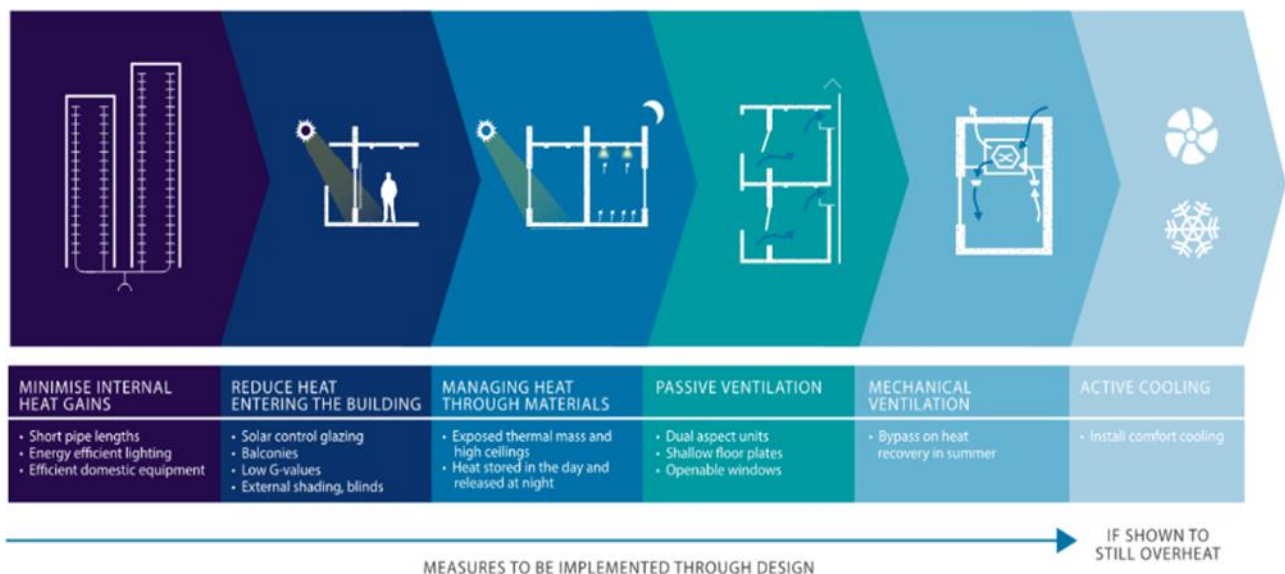


Figure 6-1 Cooling hierarchy

Table 6-1: Cooling Hierarchy: Design measures implemented

Cooling hierarchy step	Design measures
Reduce the amount of heat entering the building	Energy efficient lighting, Rationalised glazing ratios, Low solar transmittance glazing, efficient domestic equipment
Minimise internal heat generation	Passive Design Principles have been prioritised across the scheme, including optimised U-values, γ -values and g-values.
Manage heat with thermal mass	The building's thermal mass used to store heat in the day and release at night, heat storage in the day and release at night.

Cooling hierarchy step	Design measures
Passive ventilation	Openable windows are incorporated to allow for natural purge ventilation Due to acoustic constraints under Part O, natural ventilation is not sufficient to meet the thermal comfort of occupants according in line TM52.
Mechanical ventilation	Mechanical ventilation with heat recovery (MVHR) is proposed for the student rooms including a summer by-pass mode to allow for free cooling of the space using external air. MVHR systems will be designed and sized to meet whole unit background ventilation requirements ensuring that window opening is only required for purge scenarios.
Active cooling	Acoustic constraints during day and night time mean that natural ventilation strategies do not provide comfortable temperatures for the student rooms in line with TM52. Air conditioning is therefore proposed as a necessary strategy for ensuring the thermal comfort of occupants.

6.1.1 Site Location and Weather

The proposed project is part of a redevelopment scheme, consisting of a plot West of High Road in Tottenham, London. The plot referenced is the Printworks.

Thermal analysis for the site is based on the CIBSE weather files for Central London. These are the nearest Building Regulations approved weather files to the project site and is felt to be the most representative of the local conditions., Figure 6-2, Figure 6-3 and Figure 6-4 show annual plots of dry bulb temperature, relative humidity and solar radiation based upon the London Test Reference Year (TRY) 2005 Weather File, which represents a statistically average year.

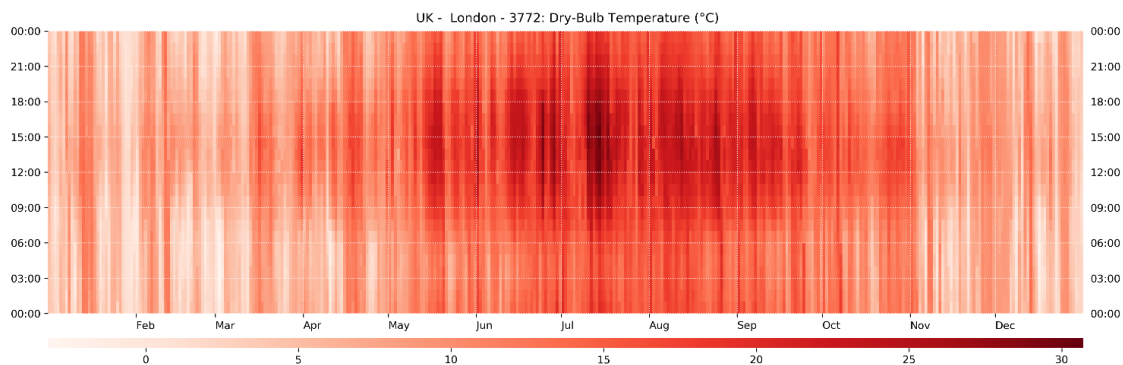


Figure 6-2 Dry Bulb Temperature

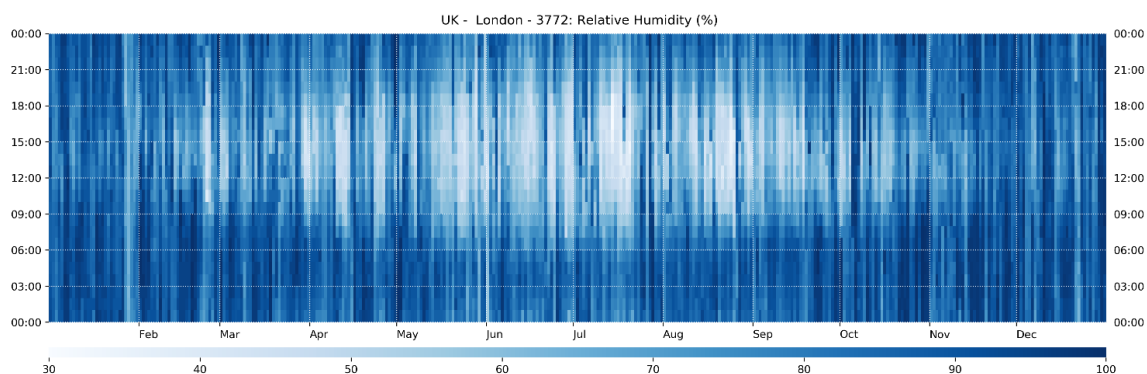


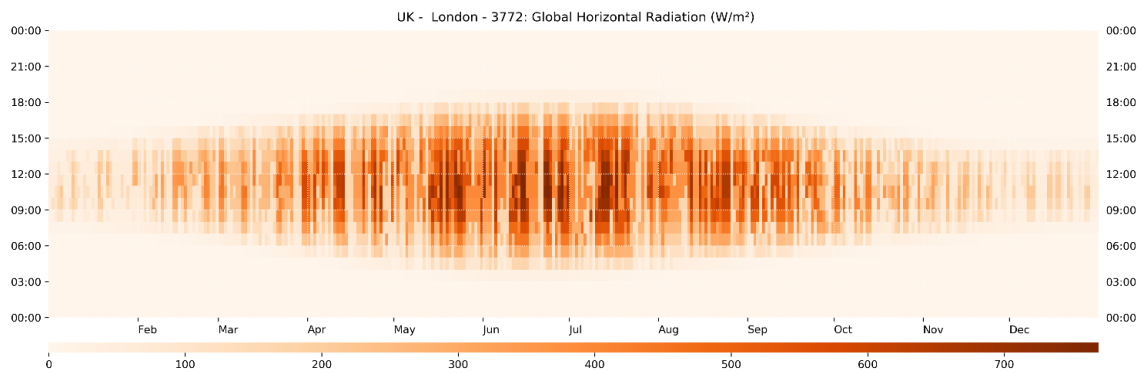
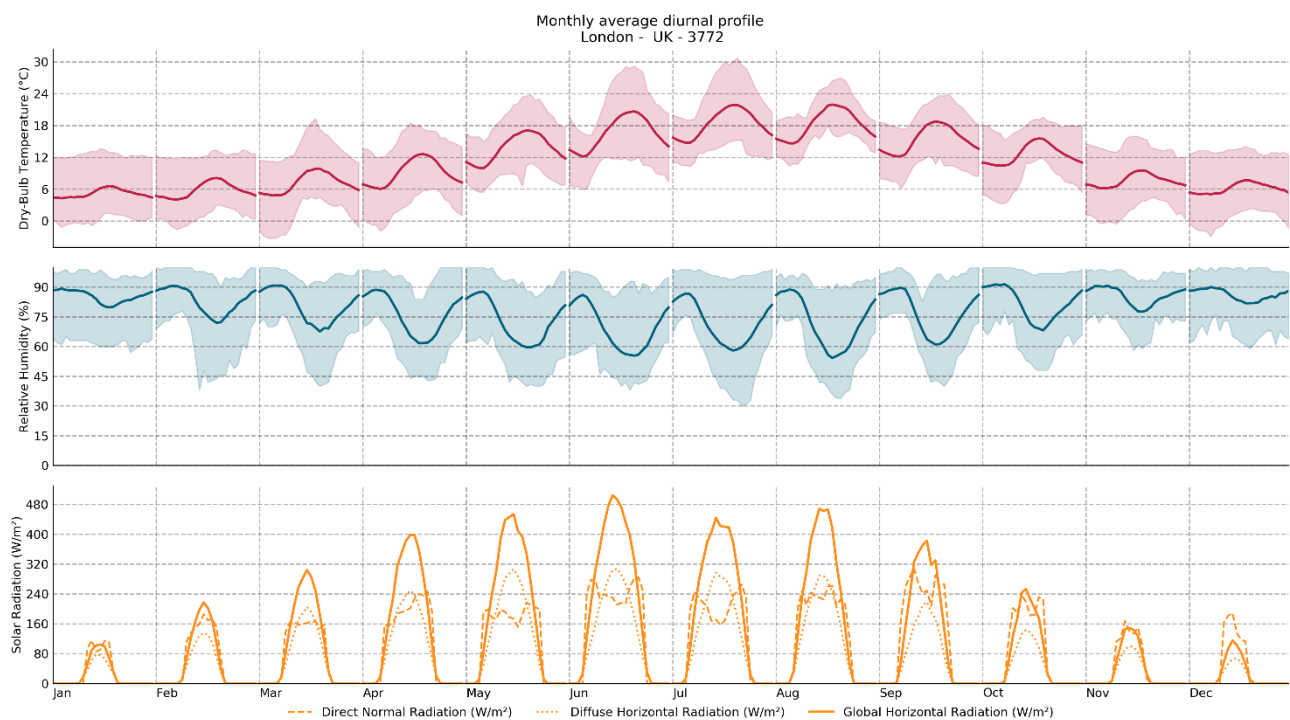
Figure 6-3 Relative Humidity**Figure 6-4 Solar Radiation**

Figure 6-5 shows the average, minimum and maximum diurnal profiles for dry bulb temperature and relative humidity for each month of the year, along with the average solar radiation profile. The region is mild and humid.

**Figure 6-5 Monthly Diurnal Average Profiles**

Wind data has been obtained from the Met Office for London. The data collected was hourly average wind speeds for the 10-year period from 1 January 1991 to 31 December 2000. The wind has been translated from the London Heathrow to the development site.

Figure 6-6 shows the annual directional velocity distribution for the proposed site. The wind in London comes predominantly from the west, with the strongest winds also coming from this direction. Moderate occurrences of southerly and south-westerly winds are also observed.

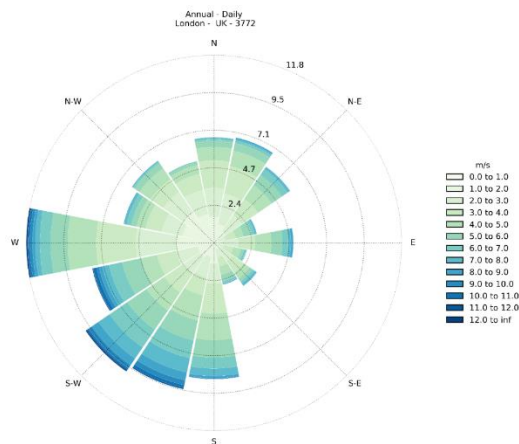


Figure 6-6 Annual Wind Rose

6.2 Overheating assessment

6.2.1 CIBSE TM52 criteria – Tests against human adaptability and fail criteria

In line with current industry best practice for the assessment of overheating, the CIBSE TM52 methodology has been pursued for this study. The methodology includes an adaptability range over the comfortable limit. This limit varies by region and climate and is generated based on the weather files used. The CIBSE TM52 methodology has three criteria for assessing risk across the summer months. Two of these criteria must be passed for each space within a dwelling for it be considered a pass.

Criterion 1 - The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1°C or more during the occupied hours of a typical non-heating season (1st May to 30th September).

Criterion 2 - The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.

Criterion 3 - The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

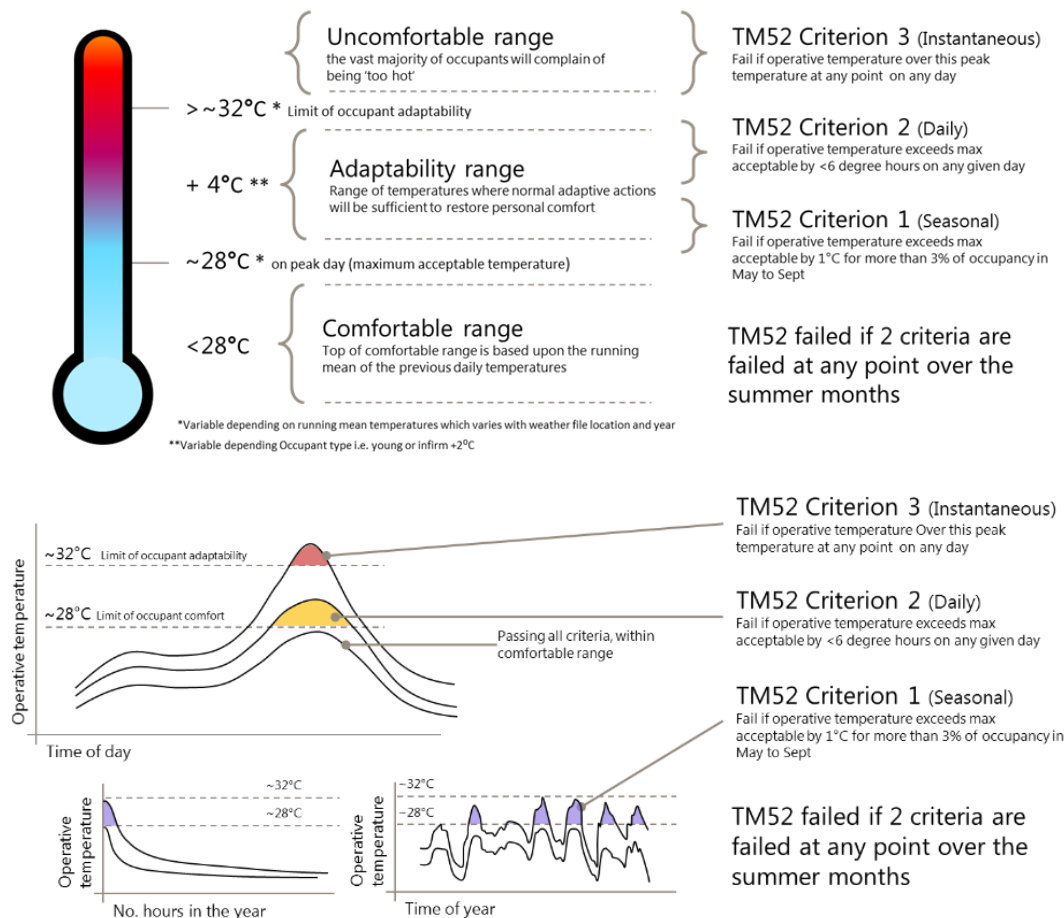


Figure 6-7 TM52 assessment summary

The figure highlights that it is acceptable for a room to generate temperatures within the adaptability range consisting of +4°C over the comfortable range, however limits the amount of time on a seasonal and daily basis that this can occur. Exceeding this Adaptability range at any point will result in a fail and uncomfortable temperatures being reached. The adaptive comfort criteria assume that building occupants adapt to weather conditions, wearing lighter, looser clothing during summer for example and this approach accounts for this.

6.2.2 CIBSE TM59 criteria - Bedroom overheating criteria

Whilst TM52 is an effective assessment for overheating, its scope is limited for student residential projects. TM59 is an overheating assessment designed specifically for residential buildings including thermal comfort in bedrooms during the night, allowing for a 24-hour realistic assessment. Furthermore, TM59 details standardised thermal templates (occupancy, equipment, lighting, etc.) for occupied zones and guidance on how to model openings, ventilation, and heat losses from equipment.

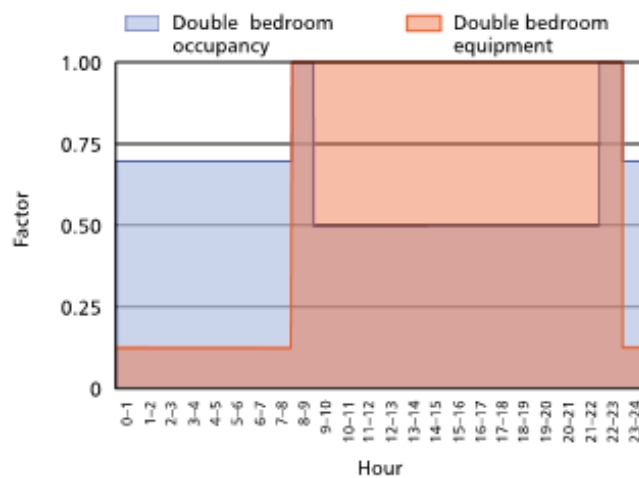


Figure 6-8 TM59 occupancy and equipment profiles by space (living room and double bedroom)

Dynamic thermal modelling has been undertaken using the methodology and overheating criteria as laid out in CIBSE TM59. For bedrooms, TM59(b) specifically targets night-time operative temperatures at 26°C, beyond which can severely impact an occupant's quality of sleep. TM59(b) recommends that no more than 32 hours at night throughout a year exceed this limit, and thus 33 hours or more is recorded as a fail for that bedroom. Dynamic weather data London_LWC_DSY1_2020High50.epw has been used for this assessment which includes a peak outdoor temperature of 33.6°C.

6.2.3 Modelling assumptions

The standard bedrooms for the scheme have been assessed at this early stage and have been modelled using the 'Double Bedroom' standardised template, due to the bedrooms including double beds and thus two occupants could potentially be present in any bedroom at any time. Internal gains are based on the standardised template as given in CIBSE TM59 for double bedrooms. This includes two occupants continuously present, with a lighting gain allowance of 2 W/m² and an equipment allowance of 80 Watts per bedroom.

The following design details have been utilised for the modelling:

- External Wall U Value – 0.14 W/m².K
- Roof U Value – 0.11 W/m².K
- Ground Floor Value – 0.11 W/m².K
- Glazing U Value (including frame) – 1.0 W/m².K
- Glazing g value – 0.3
- Infiltration allowance – 0.1 AC/H

Internal gains are based on the standardised template as given in CIBSE TM59 for double bedrooms. This includes two occupants continuously present, with a lighting gain allowance of 2 W/m² and an equipment allowance of 80 Watts per bedroom. Each bedroom is modelled with 15 l/s of continuous mechanically driven air introduced at outdoor condition.

6.2.4 Windows Openable Day and Night Scenario (no louvres)

The following scenarios have been modelled to establish what would be required to comply with TM59, assuming that windows can be opened at any time of the day and night.

- 100mm clear restriction
- Opening to 30 degrees
- Opening to 50 degrees
- Opening to 70 degrees
- Opening to 90 degrees

The equivalent free areas in each case have been estimated and take into account obstructions from the window reveal depths.

Additional testing has been carried out to understand if this measure would result in TM59 compliance in the case where windows cannot be opened at night for acoustic reasons. Openings are controlled in line with the requirements of Part O – Section 2.6.

Window Opening	% Bedrooms Passing TM59(a) (TM52 C1)	% Bedrooms Passing TM59(b) Night Criteria	Maximum Operative Temperature (deg C)
100mm restriction	73.8%	0.0%	33.62
30 degree opening	100.0%	22.3%	32.59
50 degree opening	100.0%	94.5%	32.42
70 degree opening	100.0%	100.0%	32.46
90 degree opening	100.0%	100.0%	32.46

It should be noted that compliance with TM59(a) is typically easier for bedrooms than other rooms without night occupancy. This is because TM59(a) assesses the percentage of all occupied hours that exceed a daytime temperature limit, which means most of the night-time hours comply trivially and thus the overall % of non-compliance is kept low. Therefore TM59(b) is the more important criteria for bedrooms, since it specifically targets night-time operative temperatures at 26°C, beyond which can severely impact an occupant's quality of sleep. TM59(b) recommends that no more than 32 hours at night throughout a year exceed this limit, and thus 33 hours or more is recorded as a fail for that bedroom.

As can be seen on the above table, at a 100mm restriction, the airflow is very poor, to the point where no rooms pass TM59(b) for night-time and some even fail against TM59(a). Our sample testing suggests that a window opening of at least 50 degrees available day and night (centre pivot) is required to get close to full compliance with TM59(a) and TM59(b) for the standard bedrooms.

6.2.5 Windows Openable During the Day and Closed at Night (louvres added)

In the case where bedroom windows cannot be opened at night, an acoustic louvre could be used to provide night-time ventilation, but at a restricted air rate compared to an opening window. An early stage estimate for the louvre free area is 30%.

The results above demonstrate that compliance with TM59(b) is not possible with closed or restricted windows at night, which is likely to be the case, given the acoustic requirements of Part O. Adding an acoustic louvre to the bedrooms in the model to provide additional natural ventilation during the day and night while keeping the windows closed during the night resulted in some of the worst-case bedrooms still failing TM59(b) by approximately a 35% exceedance.

The proposed louvres are already significant in size and adding additional louvres would be challenging from a design perspective and would likely result in a lower fabric efficiency and higher air leakage for the building, pushing up heating requirements in the winter.

6.3 Acoustic modelling

Measurements of the existing sound environment around the proposed development were taken in 2017 and 2019, with additional spot measurements taken in 2021. It is expected that these levels are indicative of the current sound environment, as they were taken before COVID lockdowns and before there were work-from-home/hybrid working plans put into place by industries. Therefore, it is expected that vehicle and rail traffic levels were at a peak. Further, for there to be a noticeable increase in background and ambient noise levels a 3 dB increase would be needed, which correlates to a doubling of traffic flow. Based on this, it is expected that the measurements are still valid.

The analysis that was undertaken in 2021 for the planning application of the Printworks included a section on overheating guidance, which was based on the *Acoustics, Ventilation and Overheating Guide* (AVO Guide, January 2020). This guidance can be reduced to the following daytime and night-time categories (green = low risk, amber = medium risk, red = high risk):

Daytime	Night-time
• $\leq L_{Aeq,07:00-23:00}$ 52 dB • $L_{Aeq,07:00-23:00}$ 53 – 61 dB • $\geq L_{Aeq,07:00-23:00}$ 62 dB	• $\leq L_{Aeq,23:00-07:00}$ 47 dB • $L_{Aeq,23:00-07:00}$ 48 – 56 dB • $\geq L_{Aeq,23:00-07:00}$ 57 dB

These risk categories indicate the likelihood of adverse effects due to noise through open window ventilation. As seen for a night-time level, the low risk category is $L_{Aeq,8hours} \leq 47$ dB. In the previous analysis the lowest expected ambient level at the façade of the development, based on 3D modelling in CadnaA, is $L_{Aeq,8hours} \leq 45$ dB at night-time. The lowest expected max level at the façade of the development, based on 3D modelling in CadnaA, is $L_{AF,max} \leq 59$ dB.

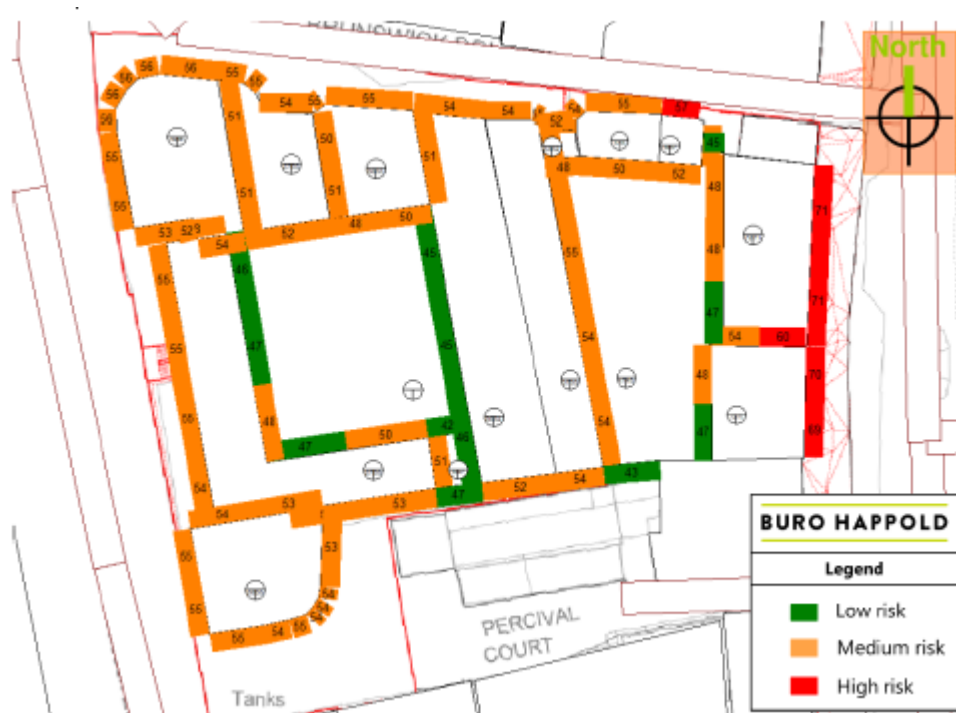


Figure 6-9: Night-time level 1 risk assessment

Under the new *Overheating: Approved Document O* building regulations, the Internal Ambient Noise Level (IANL) for a bedroom at night-time is $L_{Aeq,8hours} \leq 40$ dB. The expected sound reduction of an open window (in London) is 4 dB. This performance has been taken from the joint publication from the Associate of Noise Consultants (ANC) and the Institute of Acoustics (IOA) *Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O* and is based on the window openings necessary to satisfy the simplified method of AD-O for developments in dense cities such as London. Therefore, the façade level would have to be $L_{Aeq,8hours} \leq 44$ dB to allow for open windows as a natural ventilation solution for the development. Further for max levels, the façade level would have to be $L_{AF,max} \leq 59$ dB.

Based on the new building regulations it is expected that the majority of the development would not meet the Approved Document O noise break-in criteria with open windows as the natural ventilation strategy. The acoustic restrictions imposed by the recently implemented Part O mean that the scheme cannot assume that windows can be opened at night in the student bedrooms for much of the building.

6.4 Cooling strategy

6.4.1 Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure

Passive design principles have been prioritised where possible aiming to reduce the energy demands, maintain thermally comfort conditions and provide enough daylighting within the spaces. A balance is critical between maintaining optimum daylight, reduced solar gains and energy requirements. In addition, the applicant is committed to achieve ambitious U-values (increased insulation) beyond Part L 2021 notional building standard aiming to reduce the heat losses from the thermal envelope.

The design team minimised the overall window to wall ratio, with the current design submitted to planning having an optimised ratio of around 31.5% overall to limit the unwanted solar gains and high cooling demands. In addition, the bedroom windows will be recessed back with minimum reveal widths of 200mm, increasing to 300mm at the lintel. This provides shading and acts as overhangs and vertical fins, therefore preventing increased solar radiation entering the spaces.

The g-values of the glazing have been reduced as far as possible without compromising vertical light transmittance. Engagement with product suppliers has highlighted the potential to specify a low g-value of 0.3 while maintaining vertical light transmittance (VLT) of 0.6. The current standard for glazing products is for a g-value of 0.3 to be associated with a lower VLT of just 0.55.

The Part L Criterion 3 assessment indicates that, even without reliance on internal blinds, none of the relevant occupied areas exceed the solar gain limit. Indeed, all but two of the bedrooms undershoot the solar gain limit by more -50%, demonstrating a façade and glazing that is highly effective in minimising solar heating. The use of internal blinds is however still recommended for the development to address glare in the bedrooms.

Following the optimisation of the glazing, parametric modelling was utilised during the early design stages to quickly assess potential impacts of additional shading elements beyond the window reveals. The illustrative example in Table 6-2: Indicative solar gains with additional external shading below shows the impact of applying 500mm of solid additional shading area to both vertical and horizontal planes. This is equivalent to any shading arrangement with the same combined total area such as 2x 250mm shades or fins. The results indicate that the additional shading can reduce overall solar gains to the East, West and South façades during peak time by around 11-13%.

Table 6-2: Indicative solar gains with additional external shading

	Window ratio	Solar gain W/m2					
		East/West façade		South façade		North façade	
		Peak	Annual	Peak	Annual	Peak	Annual
Proposed design window with no additional shading	31.5%	46.6	35.7	47.1	41.7	12.5	21.8
Proposed design with extended shading 500mm	31.5%	41.8	25.6	41.2	27.1	9.5	16.0

These results demonstrate that solar gains would be reduced by the addition of further external shading but the savings would be relatively minor, particularly given the very low solar gain risk highlighted by Criterion 3 analysis. It is unlikely that cooling energy demand would be reduced by more than the 13% reduction in peak time solar gains.

These savings also need to be considered alongside the potential implications of integrating additional solar shading into the current façade. Most significant of these would be the increase in cold bridging from the addition of further structural elements protruding from the façade and the reduction in annual solar gains, both of which would directly increase the heating requirements of the building.

The Part L assessment indicates that energy required for heating the development will be roughly double the energy required for cooling. Assuming a 13% reduction in cooling energy demand from additional shading, just a 7% increase in heating energy demand would offset all these energy savings. This indicates there is a low likelihood of achieving a net decrease in energy demand through the integration of additional shading.

On top of this, there would be a significant increase in embodied carbon due to the additional shading elements. Given the rapidly decarbonisation of the electricity grid, it would not be possible to offset these additional emissions throughout the building lifecycle using even if a marginal saving in energy consumption could be achieved.

It was therefore concluded that the integration of additional solar shading into the façade is appropriate for the design. While a small decrease in solar gains may be realised, this is unlikely to result in net savings of energy and would increase the whole life carbon of the development.

6.4.2 Minimise internal heat generation through energy efficient design

All heating pipework services of the proposed development will be provided with adequate insulation to limit the internal heat gains during the production of domestic hot water. Insulation on pipework will meet the requirements of CIBSE code of practice for heat networks CP 1 2020.

In addition, the internal heat gains assigned for occupancy, equipment and lighting have been assessed using realistic and conservative values for student accommodation, given the non-standard use of the bedrooms. However efficient LED lighting will be used throughout the development to further reduce the internal heat gains.

6.4.3 Manage the heat within the building through exposed internal thermal mass and high ceilings

There is no exposed thermal mass internally due to the fitout requirements for student accommodation. However, high thermal mass is mostly beneficial if combined with a night-purge ventilation to enable the heat trapped within the bedrooms released and reduce daytime peak temperatures. The strategy of the proposed development cannot rely on night-time ventilation due to high acoustic noise levels therefore this approach is not recommended.

6.4.4 Provide passive ventilation

Openable windows are incorporated into the design to allow for passive cooling and purge ventilation. Initial overheating assessments of the bedrooms indicate that of the rooms can meet the criteria for TM52 and TM59 (night-time) with the provision of sufficient free area (see Section 6.2)46.

However, it has not been possible to follow a cooling strategy solely based upon natural ventilation due to the acoustic constraints of the site. Part O of Building Regulation outlines that in locations where external noise is an issue, the overheating mitigation strategy should take into account windows being closed during sleeping hours (11pm to

7am). The regulation sets maximum limits for bedrooms' internal noise levels that cannot be exceeded. Acoustic assessments of the site highlight that most the facades have either a high or medium acoustic risk – see Figure 6-9: Night-time level 1 risk assessment under section 6.3 Acoustic Modelling – which will preclude the opening of bedroom windows at night time. Without the ability to open windows the bedrooms throughout the night, it is not possible to achieve the night-time TM59 criteria for overheating.

Acoustic louvres were considered as an alternative option for night-time cooling, but it is not possible to achieve the required free area using this approach without compromising the glazing area and natural light in the bedrooms. The inclusion of extensive acoustic louvres would also have a significant negative impact on air tightness and heat loss from the bedrooms.

The site is also in an area of high vehicle circulation and it is thus anticipated to be a polluted environment. Whilst some residents might not be equally affected by noise than others, air quality is of significant importance and should be considered when opening windows for natural/passive ventilation means.

Regardless the constraints, the design of the proposed development incorporates openable windows for provision of fresh air as well as providing increased ventilation measures during daytime. However, it will not be possible to rely only on natural ventilation for night-time cooling due to the constraints of Part O. As such, we have to also incorporate additional mitigations measures via mechanical ventilation to reduce the overheating risk and maintain sufficient air quality internally.

6.4.5 Provide mechanical ventilation

Given the acoustic constraints listed above, mechanical ventilation with heat recovery (MVHR) is proposed for the student rooms including a summer by-pass mode to allow for free cooling of the space using external air. MVHR systems will be designed to meet 15 l/s/person, exceeding minimum fresh air requirements to ensure that window opening is only required for purge scenarios. This approach also allow for a more controlled and highly efficient way to deliver required minimum ventilation requirements in winter, certainly when compared to natural ventilation only.

MVHR systems allow for a controlled and highly efficient way to deliver ventilation requirements in winter, particularly when compared to a natural ventilation strategy. Up to 95% of internal heat can be recovered in winter months and re-distributed via the supply air, significantly reducing space heating demand.

Demand side control will be incorporated into the design of the MVHR systems. PIR sensors will be integrated with the controls of the MVHR units to vary the speed dependent on occupancy levels.

We have also investigated using mechanical ventilation via the normal MVHR units as a method of overheating mitigation, however, the units are not sufficiently large to provide of volume of sufficient air to prevent overheating.

6.4.6 Provide active cooling systems

Only after following the initial passive steps of the cooling hierarchy and demonstrating that these are insufficient was it concluded that providing cooling by mechanical means is the only viable option for meeting thermal comfort criteria, considering the noise constraints of the development. By concluding to this decision, the design team has proposed a strategy for the development which minimises the reliance on active cooling systems thanks to a mixed strategy combining natural ventilation and mechanical cooling.

The preference is for natural ventilation through openable windows. This is supplemented by MVHR to provide additional ventilation when required. Active cooling will then be used as a last resort when these strategies are insufficient for maintaining comfortable temperatures. The cooling system will therefore be centrally controlled and will utilise high temperature set points to limit use, while interrupter controls will also prevent the system from activating when the windows are open.

High efficiency modular air-cooled chillers shall provide the chilled water for air conditioning via 4-pipe fan coil units to the spaces which require it. Thermal storage will be incorporated to act as a buffer during periods of peak demand and prevent short cycling of the chillers during low load conditions. Variable speed pumps will control the cooling flow rate based on demand and will be selected to ensure they are able to operate at minimum flow conditions.

For the subsequent design stages, the project team will aim to maintain all the passive measures and the excellent fabric standards. Moreover, the mechanical ventilation and active cooling systems will be designed in detail using a dynamic thermal model, ensuring the design is both optimised and that the capacity is sufficient for a mitigated overheating risk in line with Part O/CIBSE TM59 criteria.

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