MURPHY'S YARD

AN APPLICATION BY FOLGATE ESTATES LIMITED

ENERGY STRATEGY

JUNE 2021

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Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	20/05/2021	Draft issue for comment	J .Drane	L. Holden	M. Wilkinson
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Contents.

Executive Summary.

The following provides a summary of the energy strategy for the Murphy's Yard development (i.e. the Proposed Development), in support of the Outline application (all matters reserved).

Development description.

Land to the south of Gordon House Road bounded by railway lines to the east, west and south, known as Murphy's Yard.

Outline planning permission with all matters reserved for the demolition of existing buildings and structures and redevelopment to be carried out in phases (with each phase being an independent act of development) comprising the following mix of uses: residential (Use Class C3), residential institution (Use Class C2), industrial (Use Class B2 and/or B8), commercial floorspace (Class E), flexible commercial and Sui Generis floorspace (Use Class E and/or Sui Generis Use), Community (F1 and/or F2), Sui Generis, and cycle and vehicle parking, refuse and recycling storage, plant, highway and access improvements, amenity space, landscape and public realm improvements, and all associated works.

Drivers.

A policy review has been undertaken and is outlined in Appendix A. As a summary, planning policy applicable to the Proposed Development include:

National drivers; Approved Document Part L of the Building Regulations

Part L of the Building Regulations is the mechanism by which government is driving reductions in the regulated CO_2 emissions from new buildings. The assessment of the Proposed Development against policy targets has been carried out using Building Regulations Part L 2013 methodology.

Regional drivers; Greater London Authority (GLA) policy

This Energy Strategy follows the Mayor's energy hierarchy: 'Be Lean, Be Clean, Be Green, Be Seen' as detailed in the Publication Greater London Authority (GLA) London Plan. Calculations demonstrating the energy requirements and associated CO_2 emissions for the development have been carried out using Building Regulations approved software.

SAP10 carbon factors have been utilised in line with GLA Energy Assessment Guidance issued in April 2020.

Local drivers – London Borough of Camden (LBC)

Strategic policies in the Local Plan include "Policy CC1 Climate Change Mitigation", which requires all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met. Promoting zero carbon development and requiring all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy.

Energy Strategy Summary.

Passive design and energy efficiency measures will provide the cornerstone to the energy demand and CO_2 emission reduction achieved for the Proposed Development.

The base-line scenario, which each step of the energy hierarchy will be compared against, is established by the Part L Target Emission Rate for a gas boiler scenario, as per GLA guidance.

In line with current GLA guidance, carbon emission reductions have been evaluated using the carbon factors set out in the SAP10 guidance.

Be Lean

The Proposed Development is anticipated to achieve a 10% reduction in CO_2 emissions beyond the 'Gas boiler baseline', for the domestic element and 15% reduction in CO_2 emissions beyond the 'Gas boiler baseline', for the non-domestic element prior to the consideration of any Low or Zero Carbon (LZC) technologies, i.e. via passive design and energy efficiency measures alone.

Be Clean

The feasibility of connecting to any existing district heating networks has been reviewed, but no opportunities have been identified in the vicinity of the Site. Future-proofing measures will be implemented to enable connection to any future low carbon district heating network. Therefore, no additional carbon reductions are anticipated at the Be Clean stage.

Be Green

A feasibility assessment of integrating low and zero carbon energy systems has been undertaken. It has been found that Air Source Heat Pumps (ASHPs) would be the most suitable option.

It is proposed that ASHP technology would be utilised to provide space heating, cooling and a proportion of the domestic hot water demand. the remaining DHW demand will be met via electric instantaneous units. In addition, suitable roof space has been identified to accommodate photovoltaic (PV) panels.

Be Seen

The applicant is committed to monitoring and reporting sustainability performance and data every year in a transparent way. Once planning approval has been granted the applicant will provide the estimates of each of the performance indicators listed in Table 2 of the 'Be Seen Energy Monitoring Guidance'. These will be reported to the GLA using the 'be seen' spreadsheet, within four weeks of planning approval, as the GLA require.

Overview.

The energy strategy proposals will demonstrate that the required minimum onsite carbon reduction overall and at the Be Lean stage will be achieved. With the incorporation of the ASHP and PV Array, the minimum 35% on-site reduction will be achieved for both the domestic and non-domestic elements. It is anticipated that the Proposed Development will require offsetting via a cash in lieu payment to LBC to meet the 100% carbon reduction target for both the domestic and non-domestic elements, set by the London Plan.

Whole Life Carbon.

Whole life carbon has been a key driving design consideration from project inception. Minimising whole life carbon has influenced both the architectural and structural design, as well as the building services as part of the overall energy strategy.

An initial whole life carbon assessment has been undertaken on the outline scheme, estimating the cumulative savings for the Proposed Development, including both embodied carbon emissions and operational carbon emissions, taking into account projected grid decarbonisation and a 60-year building lifespan.

The assessment establishes a baseline case using gas boilers to meet thermal loads within the building, and with full demolition of the existing building and full new construction based on a traditional concrete / steel structural solution.

It can be seen that utilising Air Source Heat Pumps to meet thermal loads and PV provision is expected to lead to whole-life carbon emission savings.

Please refer to the separate Whole Life Carbon report (Hoare Lea) for full details.

1. Introduction.

Hoare Lea has been commissioned by Folgate Estates to undertake an Energy Strategy report to support the planning application for an Outline Application of the mixed-use development at Murphy's Yard (the 'Application Site').

1.1 Proposed Development.

Outline planning permission with all matters reserved for the demolition of existing buildings and structures and redevelopment to be carried out in phases (with each phase being an independent act of development) comprising the following mix of uses: residential (Use Class C3), residential institution (Use Class C2), industrial (Use Class B2 and/or B8), commercial floorspace (Class E), flexible commercial and Sui Generis floorspace (Use Class E and/or Sui Generis Use), Community (F1 and/or F2), Sui Generis, and cycle and vehicle parking, refuse and recycling storage, plant, highway and access improvements, amenity space, landscape and public realm improvements, and all associated works.

1.2 Application Site Description and Location.

The Application Site is the land to the south of Gordon House Road bounded by railway lines to the east, west and south, known as Murphy's Yard. The Site is located within the London Borough of Camden.

The Application Site currently proposes the following maximum floor areas by land use.

Table 1: Area schedule for the Application Site.

Space Type	Maximum Floor Area (sqm GEA)
Domestic	85,200 (including ancillary areas)
Non-domestic:	95,000
Total:	180,200

1.3 Approach to energy.

This Energy Strategy sets out the proposed approach regarding reducing carbon dioxide (CO_2) emissions and optimising energy efficiency within the development. This strategy summarises the pertinent regulatory and planning policies applicable to the Proposed Development, and sets targets commensurate with these policies, which the Proposed Development will seek to achieve. The Energy Strategy has been developed using a 'fabric first' approach through the 'Be Lean', 'Be Clean', 'Be Green', 'Be Seen' energy hierarchy.

Figure 1: Energy hierarchy.

Following the adoption of the New London Plan in March 2021, after 'Be Green' an additional stage of the energy hierarchy has been introduced: Be Seen - monitor, verify and report on energy performance in-use. The 'Be Seen' stage endorses the disclosure of the development's energy use with annual energy consumption being displayed on a public online platform accompanied by the predicted energy performance at the design stage.

This approach will demonstrate how developments are performing in-use and will underpin progress in reducing carbon emissions, operational running costs and will encourage the industry's route to achieving zero carbon buildings.

1.4 Definitions and limitations.

Definitions:
The following definitions should be understood throughout this statement:

- Energy demand: The ‘room-side’ amount of energy which must be input to a space to achieve comfortable conditions. In the context of space heating, this is the amount of heat which is emitted by a radiator, or other heat delivery mechanism.
- Energy requirement: The ‘system-side’ requirement for energy (fuel). In the context of a space heating system using a gas boiler, this is the amount of energy combusted (e.g. gas) to generate useful heat (i.e. the energy demand).
- Regulated CO_2 emissions: The CO_2 emissions emitted as a result of the combustion of fuel, or ‘consumption’ of electricity from the grid, associated with regulated sources (those controlled by Part L of the Building Regulations).

Limitations:
The appraisals within this statement are based on Part L calculation methodology and should not be understood as a predictive assessment of likely future energy requirements or otherwise. Occupants may operate their systems differently, and / or the weather may be different from the assumptions made by Part L approved calculation methods, leading to differing energy requirements.

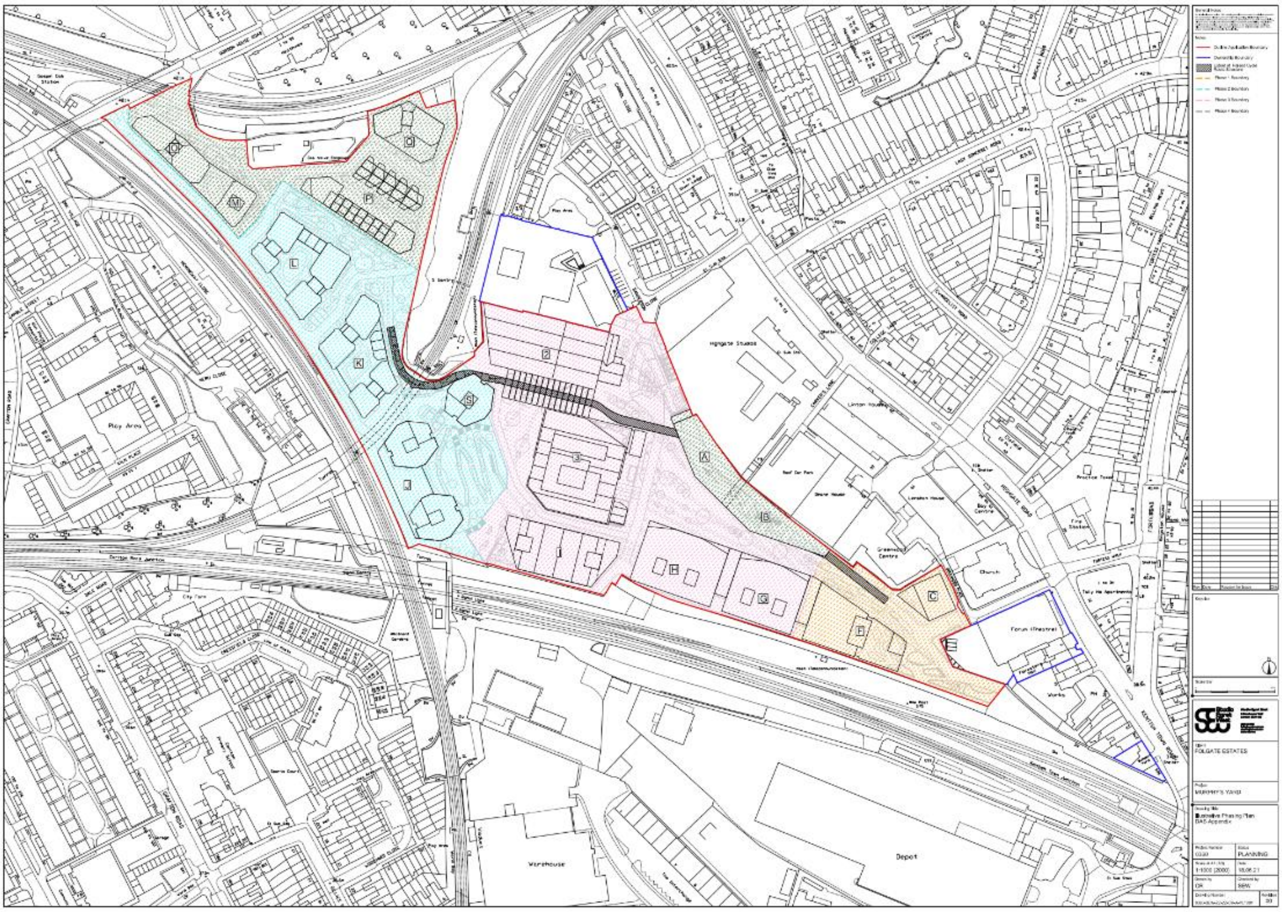


Figure 2: Illustrative view of the Proposed Development (Credit: SEW Architects).

2. Drivers.

A policy review has been undertaken and is detailed in Appendix A. As a summary, planning policy appliable to the Proposed Development are outlined within this section.

2.1 Greater London Authority (GLA).

2.1.1 London Plan (adopted March 2021)

The New London Plan was published in December 2017 for public consultation which ended March 2018. The New London Plan was adopted in March 2021. This will provide a longer-term view of London's development to inform decision making. However, some of the more detailed elements of the Plan, such as housing targets are set only for the first ten years of the Plan. This reflects the dynamic nature of London's land market and means that there will need to be a review of the housing targets, before 2029. Other elements of the Plan will need to be updated over time through Supplementary Planning Guidance as part of the 'plan, monitor, manage' approach.

Table 2: Summary of key policies related to energy and carbon – London Plan 2021.

Policy reference	Overview – London Plan
Policy SI2	Minimising Greenhouse Gas Emissions – The energy strategy should be developed to follow the following energy hierarchy: – Be Lean – Be Clean – Be Green – Be Seen – Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. (i.e. Be Lean stage). – Overall reduction of 100% with minimum on-site reduction of at least 35% beyond building regulations. – Where 100% reduction cannot be demonstrated on site, shortfall should be provided as agreed with the local borough either through cash in lieu contribution to the borough's carbon offset fund, or off-site provided that an alternative proposal is identified, and delivery is certain. – Major development proposals should calculate and minimise unregulated carbon emissions. – Whole life cycle carbon emissions to be reported.
Policy SI4	Managing Heat Risk – Developments 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

2.2 The London Borough of Camden (LBC).

The LBC Local Development Framework was adopted in July 2017.

A summary of the key adopted and draft policies relating to energy and carbon are summarised in Table 3 below.

Table 3: Summary of key policies related to energy and carbon – LBC

Policy reference	Overview – Camden Local Plan
Policy CC1	Climate Change Mitigation

Policy reference	Overview – Camden Local Plan
	– promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy; and – require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met.

2.3 Grid decarbonisation.

The carbon factor of the National Grid – the amount of carbon dioxide released per kilowatt hour of electricity generated and distributed – is recognised in current Building Regulations as being 0.519 $kgCO_2/kWh$. However, the national mix of electricity generation methods is progressing towards greener solutions with renewable sources accounting for 37% of the electricity generated in the UK in Q4 2020; up from 24.4% in 2016 (Ofgem).

As a consequence, the Building Regulations Part L 2013 value of the National Grid carbon factor has been shown to be substantially higher than how the grid is performing in reality. This severely impacts the calculated emissions produced by all heat raising plant which either use electricity directly or generate it to offset other emissions. Figure 4 shows how the mix of generation techniques serving the National Grid, as well as the associated carbon factor, has varied over the past seven years – encouragingly, the carbon intensity of the grid has reduced to almost a third of its value between 2012 and 2020 – to 0.169 $kgCO_2/kWh$ (BEIS). The carbon emissions associated with electricity consumption are therefore much lower than reported in Building Regulations. This means that, under the Part L 2013 methodology the CO_2 emissions associated with electrically driven plant are being overestimated by over 200%.

Future projections

The Future Energy Scenarios (FES) document, produced by the National Grid, discusses how the UK's energy landscape is changing. The FES 2019 makes projections of how the mix of generation in the grid is likely to change between now and 2050 – the year by which the Climate Change Act 2008 set the target of reducing the UK's CO_2 emissions by 80% from 1990 levels. This target has now been revised to be Net Zero in light of the Committee on Climate Change's recent report and the declaration of a Climate Emergency.

The latest version, FES 2020, discusses these projections in four scenarios and Figure 4 combines these future trajectories with the actual carbon intensity of the National Grid over the past 12 years. The reported emissions associated with electricity generation have fallen steeply since 2012 and in three cases, the FES 2020 scenarios see carbon factors trending towards zero by the early 2030s. This is on the basis that FES 2020 have deemed it necessary to offset other industries such as freight, shipping and aviation, which will be unable to reduce their carbon emissions to zero. Offsetting the emissions of other industries will involve Carbon Capture and Storage (CCS) technologies on a significant scale in order for the UK as a nation to meet net zero carbon by 2050. It is important to note that CCS technology is not currently commercially demonstrated at a large scale, but the FES 2020 studies are useful as future forecasts.

Part L 2020.

The government has released an update to Approved Document L – Part L 2020 which is likely to stimulate a step change in the approach to constructing and servicing new homes, commensurate to the evolving energy landscape in the UK and our ambitions for national decarbonisation. Part L 2020 is not likely to be released fully until late 2021.

The update to Part L is a stepping-stone to the introduction of the proposed Future Homes Standard, to be introduced in 2025, which aims to ready the UK's new build homes for a transition to zero carbon in 2050.

The main impacts are;

- Based on the above Options, a 31% reduction over Part L 2013 is what should be targeted as a minimum to pass Part L 2020 – although further investigations will be required once the government releases the approved Building Regulation software;
- Unless you have commenced construction on a building/ dwelling, the new version of Part L will apply, irrespective of when the Building Notice was submitted. This new approach could mean that sites under the same planning consent and Building Notice are to be constructed to different Approved Documents (Building Control will be able to provide further guidance on what denotes the start of construction); and
- All new dwellings will require an air test (as opposed to the current methodology which allows for testing of dwelling types)

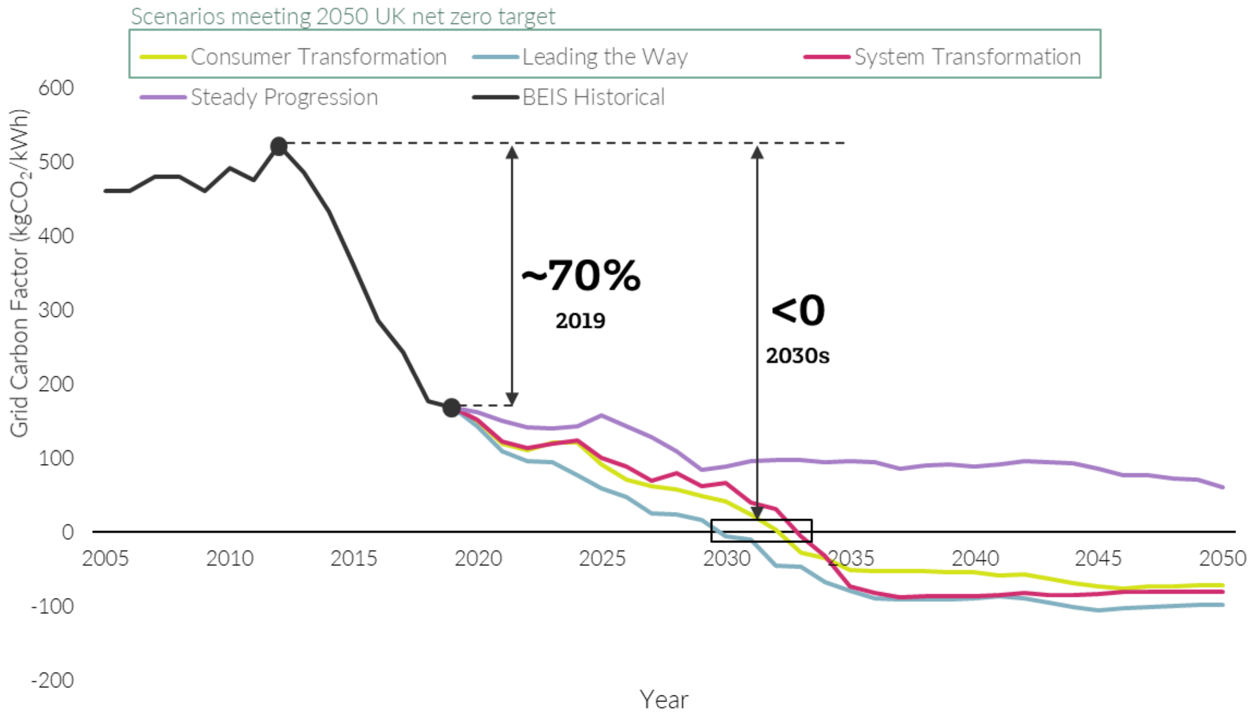


Figure 4: Historic and future projected carbon factor for the National Grid. Sources: *BEIS Green Book* (historic carbon factors); *National Grid Future Energy Scenarios (FES) 2020* (future projected carbon factors).

3. Cooling and Overheating.

3.1 Cooling hierarchy.

The London Plan Policy SI 4 (Managing Heat Risk) requests that developments should reduce potential overheating risk and reliance on air conditioning systems. A 'cooling hierarchy' is provided and the Proposed Development has sought to follow this hierarchy.

The following cooling hierarchy has been followed to limit the effects of heat gains in summer:

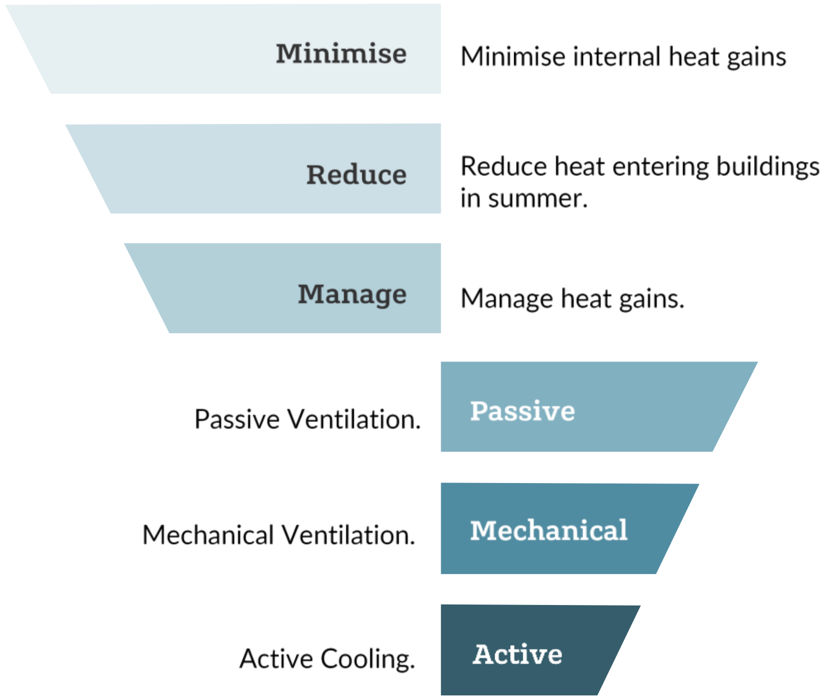


Figure 3: Cooling hierarchy.

3.2 Mitigation strategy.

The following mitigation methods will be implemented within the Proposed Development, further information can be found in the Domestic Overheating Checklist in Appendix B:

Minimising internal heat generation through energy efficient design

The following mitigation methods will be implemented to minimise the internal heat generation through energy efficient design at the Proposed Development:

- Energy efficient lighting (i.e. LED) with low heat output;
- Insulation to heating and hot water pipework and minimisation of dead legs to avoid standing heat loss; and
- Energy efficient equipment with low heat output to reduce unnecessary heat gain.

Reducing the amount of heat entering the building in summer

The following mitigation methods will be implemented to reduce the amount of heat entering the building in summer within the Proposed Development:

- Facades have been developed with suitable glazing-to-solid ratios, with particular focus on south facing orientations; and
- Carefully selecting a glazing shading coefficient to reduce the amount of solar radiation passing through the glazing in summer but also to maximise beneficial solar gains during the winter heating season.

Manage heat gains
Opportunities to expose thermal mass to help to further regulate internal temperatures will be explored where possible.

Passive ventilation
Although windows are designed to be openable, the acoustic engineer from Sandy Brown has provided the following information, suggesting that the windows of Block C should be assumed to be closed due to acoustic constraints on site.

On Block C we are predicting an external facade noise level from transportation sources (trains/road) of LAeq,16h 58-62 dB (daytime) and LAeq,8h 52-55 dB (night-time). Noise levels in excess of 55dB (daytime) and 50dB (night-time) will typically result in adversely high internal noise levels when open windows are used to control overheating. It would also not be possible to achieve the Camden Policy on entertainment noise intrusion with opening windows.

There will also be a small amount of natural ventilation through building fabric infiltration.

Mechanical ventilation
Mechanical ventilation is an important element of building services, to maintain good indoor air quality throughout the day by providing fresh air and extracting vitiated air. Providing fresh air minimises the risk of stale and stagnant air and limits the risk of condensation and mould growth as well as benefitting the occupants physical and mental wellbeing. Heat recovery mechanisms will be provided to save heating energy.

Mechanical ventilation plant will be located away from pollution sources, typically at roof level. It is anticipated that the design flow rates specified will aid the regulation of internal temperatures in summer months.

Apartments will have an MVHR unit which will supply air to the habitable spaces. Extract air will be taken from the bathrooms and the kitchen and the supplied air will be distributed into the living room/kitchen and bedrooms.

Active cooling
Although comfort cooling does not form part of the current strategy to the residential units, passive cooling will be provided through the MVHR Units – in the form of a tempered air supply.

It has been assumed that future tenants to commercial units will be installing localised comfort cooling to habitable spaces.

3.3 Part L heat gain check.

It is anticipated that the Proposed Development will achieve compliance with the Building Regulations Part L 2013 Criterion 3 and limit the effects of heat gains in summer months and reduce the demand on active cooling systems.

3.4 Cooling demand.

The anticipated cooling demand for the actual building will be less than that of the notional building.

4. Be Lean.

Passive design and energy efficiency measures form the basis for the reduction in overall energy demand and carbon emissions for the Proposed Development. This energy strategy aims to reduce the energy demand initially by optimising the envelope and building services within the development.

Figure 4: Be Lean.

4.1 Passive Design and Energy Efficient Features.

Passive Design measures are those which reduce the demand for energy within buildings, without consuming energy in the process.

These are the most robust and effective measures for reducing CO_2 emissions as the performance of the solutions, such as façade insulation, is unlikely to deteriorate significantly with time, or be subject to change by future property owners. In this sense, it is possible to have confidence that the benefits these measures bring will continue at a similar level for the duration of their installation.

Table 4: Passive design measures

	Fabric performance A 'fabric first' approach will be taken in order to reduce the energy demand and CO_2 emissions from the Proposed Development. The overriding objective for the façade design of the building will be to achieve the optimum balance between providing natural daylighting benefits to reduce the use of artificial lighting, the provision of passive solar heating to limit the need for space heating in winter and limiting summertime solar gains to reduce space cooling demands. Thermal insulation The Proposed Development will seek to utilise efficient thermal envelopes. Heat losses and gains will be controlled by the optimisation of the fabric of the building, i.e. ensuring appropriate levels of glazing to control winter heat loss and summer heat gain. Reducing the thermal transmittance of the building envelope where appropriate will help to reduce both heating and cooling requirement and result in lower energy requirements. Glazing energy & light transmittance Elevations will be developed with a suitable approach to fenestration and glazed areas, and glazing specification (light transmission and solar control) to ensure an appropriate balance between the benefits of passive solar heating in winter months whilst limiting the likelihood of high internal temperatures in summer, as applicable to the building type.

Mechanical ventilation
It is anticipated that high-efficiency mechanical ventilation with heat recovery will be adopted for all occupied building areas.

Mechanical ventilation is an important addition to the building services to maintain good indoor air quality by providing fresh air and extracting vitiated air. Providing fresh air minimises the risk of stale and stagnant air and limits the risk of condensation and mould. Coupled to a heat exchanger, the warmth in extracted air can be recovered and delivered to the supply air. In this mode, the ventilation system reduces space heating and cooling demand.

To reduce the electrical energy associated with fan usage, plant and systems will be optimised to achieve low specific fan powers.

Domestic hot water (DHW) system
To limit the demand for hot water, all spaces will include the use of water-efficient fixtures and fittings including WCs with low flush volume, flow reducers in the taps of wash hand basins and aerated shower heads in changing rooms, to limit overall water consumption.

Water consumption requirements in environmental assessment methods such as BREEAM will be considered further during detailed design stages.

Natural daylight and lighting strategy
In the context of office and retail usages, artificial lighting tends to provide a significant contribution to regulated CO_2 emissions. As such, the implementation of energy efficient lighting design is paramount to reducing overall emissions for these spaces. Therefore, it is anticipated that the Proposed Development will be supplied with high efficiency lighting installations representing best practise. Full lighting control systems including daylight linkage and presence detection will also be incorporated.

As well as the reduced energy requirement that will be achieved by implementing these strategies, the contribution to internal heat gains and associated cooling requirements will be reduced. This will further reduce the total energy requirements and CO_2 emissions of the building.

4.2 Be Lean - Performance parameters.

The anticipated passive design and energy efficiency features proposed are detailed below. The parameters below outline the inputs into the calculations at this stage in the design process.

Building fabric

Table 4: Targeted performance parameters – Building Fabric.

Parameter	Office	Industrial	Retail	Residential
Roof U-value (W/m^{2}K)	0.10	0.10	0.10	0.10
Exposed floor U-value (W/m^{2}K)	0.10	0.10	0.10	0.10
External Wall U-value (W/m^{2}K)	0.15	0.15	0.15	0.14
Glazing g-value	0.30	0.30	0.30	0.35
Air permeability	5.00	5.00	5.00	3.00

Parameter	Office	Industrial	Retail	Residential
(m^3/m^2.hr @50Pa)				

Building services

In accordance with the Energy Assessment Guidance from the GLA (April 2020), at the Be Lean stage of the energy strategy, thermal demand will be met via a gas boiler with the same performance that is used to model the Part L notional building. For the Proposed Development, thermal demand will be met via electric led plant which is considered in the Be Green stage of the hierarchy.

Table 5: Targeted performance parameters – Building Services.

	Office	Industrial	Retail	Residential
Space heating	Office plate, reception, circulation – Fan coil units – Gas boiler – COP: 91% – Distribution: Air Stairwells, WC, changing rooms – Heating only – Fan coil units – Gas boiler – COP: 91% – Distribution: Air All other areas unheated	Industrial units and workshops – Fan coil units – Gas boiler – COP: 91% – Distribution: Air	Sales area, circulation – Fan coil units – Gas boiler – COP: 91% – Distribution: Air Stairwells, WC – Heating only – Fan coil units – Gas boiler – COP: 91% – Distribution: Air All other areas unheated	All Dwellings – Communal Gas Boilers – COP 89.5%
Domestic hot water	Showers, WC – Communal store – Gas boiler – COP: 91% – Storage volume: TBC – Distribution losses: TBC Taps, kitchenette, etc. – Instantaneous hot water – Gas boiler – COP: 91% – Storage volume: TBC – Distribution losses: TBC	Industrial units and workshops – Instantaneous hot water – Gas boiler – COP: 91% – Storage volume: TBC – Distribution losses: TBC	WC, Taps, kitchenette, etc. – Instantaneous hot water – Gas boiler – COP: 91% – Storage volume: TBC – Distribution losses: TBC	All Dwellings – Hot water cylinder fed from communal air source heat pump – COP: 2.04 – Storage volume: 250 L

	Office	Industrial	Retail	Residential
Ventilation	Office plate, reception, circulation, changing rooms, WCs – Air handling units (AHU) – Terminal unit SFP: 1.90 – Local unit SFP: 0.29 – Heat recovery efficiency: 75%	Industrial units and workshops – Air handling units (AHU) – Terminal unit SFP: 1.90 – Local unit SFP: 0.29 – Heat recovery efficiency: 75%	Sales area, circulation – Air handling units (AHU) – Terminal unit SFP: 1.90 – Local unit SFP: 0.29 – Heat recovery efficiency: 75%	All Dwellings – MVHR unit – HR efficiency 94% – SFP: 0.62
Cooling	Office plate, reception, circulation – Fan coil units – Air source heat pump – COP: 3.00 – Distribution: Air – SEER: 3.50	Industrial units and workshops – Fan coil units – Air source heat pump – COP: 3.00 – Distribution: Air – SEER: 3.50	Sales area, circulation – Fan coil units – Air source heat pump – COP: 3.00 – Distribution: Air – SEER: 3.50	All Dwellings – None
Lighting	Lighting efficacy – General lighting – 100 lm/W_c – Display lighting – 65 lm/W_c Controls: – Offices plate – PIR & daylighting sensors – Reception – manual control with daylighting sensors – Circulation, WC, changing rooms, stores – PIR – Plant – manual on, auto off.	Lighting efficacy – General lighting – 100 lm/W_c – Display lighting – 65 lm/W_c Controls: – PIR & daylighting sensors – Circulation, WC, changing rooms, stores – PIR Plant – manual on, auto off.	Lighting efficacy – General lighting – 95 lm/W_c – Display lighting – 65 lm/W_c Controls: – Sales area – PIR & daylighting sensors – Circulation, WC, changing rooms, stores – PIR Plant – manual on, auto off.	All Dwellings – All low energy lighting

4.3 Be Lean Results.

Non-Domestic

Overall, the Proposed Development would be anticipated to achieve a 15% reduction in annual regulated CO_2 emissions beyond the gas boiler baseline via passive design and energy efficiency measures (i.e. before any benefit from low or zero carbon technologies), utilising SAP10 carbon factors, against Approved Document Part L2A.

Domestic

Overall, the Proposed Development would be anticipated to achieve a 10% reduction in annual regulated CO_2 emissions beyond the gas boiler baseline via passive design and energy efficiency measures (i.e. before any benefit from low or zero carbon technologies), utilising SAP10 carbon factors, against Approved Document Part L1A.

5. Be Clean.

This stage of the energy hierarchy includes consideration of connection to available district heat networks, or the use of on-site heat networks and decentralised energy production such as Combined Heat and Power (CHP) in order to provide energy and reducing consumption from the national grid and gas networks, through the generation of electricity, heating and cooling on-site.

Figure 5: Be Clean.

5.1 District/decentralised heat network.

The majority of central London is identified as a Heat Network Priority Area, i.e. areas where heat density is sufficient for heat networks to provide a competitive solution for supplying heat to buildings and consumers. The Proposed Development is located within an area of moderate to low heat density, as identified by the London Heat Map (https://maps.london.gov.uk/heatmap/).

The nearest existing heat network is the Church Street heat network ~3.5km to the South East of the Site.

Similarly, the nearest potential heat network is the Euston Road network, located ~2.5km to the South East of the Site. There are no existing or proposed networks within a kilometre of the Proposed Development's location. As such, connection to a network is not a viable opportunity at this stage for the project.

Whilst no existing or future network connection opportunities have been identified, potential incoming routes of networks, and how these could connect to the Proposed Development have been considered.

From the Site boundary, incoming district energy network distribution pipework could pass into heat exchanger plant rooms, facilitating connection to the building heating system. Therefore, it is deemed that opportunity exists for future connection to any low carbon district heating network should they become available (subject to detailed technical, practical and economic feasibility evaluation).

Until a future connection to any low carbon district heating network is made possible, an air source heat pump led site-wide heat network is proposed for the development. The feasibility of this will be discussed in Section 6.

5.2 Combined heat and power (CHP).

Changes to the carbon factor of grid electricity have meant that previously favoured systems such as Combined Heat and Power (CHP) are becoming much less carbon efficient. In fact, CHP systems are now expected to lead to greater carbon emissions than conventional gas-fired boilers due to their lower efficiency.

Due to the decarbonisation of the electricity grid, schemes using CHP engines for the delivery of heating energy at the Proposed Development leads to net increase carbon emissions (over the gas boiler baseline). Were a CHP to be utilised for the Proposed Development, a regulated CO$_2$ emission increase of ~10% over the Be Lean stage would be demonstrated.

Furthermore, CHP engines are an on-site source of particulate pollutants which will adversely affect local air quality. In light of grid decarbonisation and increased focus on air quality, CHP is therefore not proposed.

Figure 6: Extract from the London Heat Map.

5.3 Be Clean summary.

No connection opportunities to existing district heating networks in the vicinity of the Site have been identified.

Opportunities for future connection to any low carbon district heating network (subject to detailed technical, practical and economic feasibility evaluation) have been considered in the design through measures such as basement plant space provision for any future plate heat exchanger required to service the building. CHP is not proposed due to poor carbon reduction and adverse air quality impacts.

Therefore, no further carbon reductions are envisaged for the Be Clean stage of the energy hierarchy.

6. Be Green.

This section explores the feasibility of Low and Zero Carbon (LZC) technologies to allow for the production of renewable energy onsite in order to deliver further reduction in carbon emissions.

Figure 7: Be Green.

6.1 Low and zero carbon (LZC) technology assessment.

Renewable or zero carbon technologies harness energy from the environment and convert this to a useful form. Many renewable technologies are available, however, not all of these are commercially viable or suitable for urban locations.

Table 7 LZC Technology Appraisal

	Ground source heat pumps Ground Source systems work to extract heat or cooling energy from the ground. They are generally slightly more efficient than air source systems, as the ground temperature is more stable over the course of the year relative to air temperature. There are four common varieties of ground source systems: – Vertical, open loop, direct cooling (i.e. without heat pump) – Vertical, open loop, with heat pump – Horizontal, closed loop, with heat pump – Vertical, closed loop, with heat pump Suitability to Proposed Development: Regardless of the type of ground source heat loop used, all would require extensive below ground works to bury and install the system on site. For this Site to meet 60% of the heating and 100% of the cooling demand, approximately 1,800 boreholes will be required. Therefore, this technology has not been included within the strategy.
	Water source heat pumps Water source heat pumps use bodies of water, such as rivers, lakes or oceans to provide heating or cooling energy to a building. Suitability to Proposed Development: The Proposed Development is located in central Camden with the closest body of water being Rushmere Pond, approximately 1km North West of the Site. Therefore, this technology has not been included within the strategy.
	Sewer Source heat pumps Sewer source heat pumps (SSHP) is a relatively new technology which transfers heat from sewer waste via a heat exchanger and heat pump arrangement. Suitability to Proposed Development:

	Limited output from the system which will not cover the full building load, so supplementary heat sources will be required. A main sewer would be required to maximise efficiency. Therefore, this technology has not been included within the strategy.
	Air Source Heat Pumps Air source heat pumps (ASHP) use thermodynamic principles to convert heat from the air into useable heat within the building. Unlike some other sources of renewable energy, heat pumps do require energy (typically electricity or gas) to pump and compress refrigerant through the system. However, under the Renewable Energy Directive 2009/28/EC they are classified as renewable technologies provided that the final energy output significantly exceeds the primary energy input required to drive the heat pump. ASHP need to be located externally with access to the ambient air, typically at roof level. Suitability to Proposed Development: Due to grid decarbonisation and the proposed SAP10 Carbon Factors, it is expected that ASHP technology will offer significant carbon emission reductions over the gas boiler baseline scenario. ASHP plant can be located at roof level and integrated into space heating and hot water systems (albeit with some degree of ancillary top-up heating to raise water temperatures). Implementing heat-pump technology brings the additional benefit of a shift towards combustion-free development, with the associated benefit to local air quality. This approach is expected to result in significant regulated CO_2 emission reductions beyond the Building Regulations Part L (2013) 'baseline' on a site-wide basis. Air Source Heat Pumps are therefore proposed for the development as the primary heat generating technology.
	Photovoltaics Photovoltaic panels harness energy from sunlight and convert this into useful energy in the form of electricity. A PV system requires viable roof space in order for the system array to be installed and function effectively. Suitability to Proposed Development: Solar irradiance analysis on the Site has shown a good opportunity for the deployment of solar Photovoltaic technologies for onsite electricity generation. The provision and location of PV panels has been reviewed in detail, with consideration of the following aspects: - Overshading - Amenity areas - Area required for access - Area required for plant (ASHP) Suitable -areas will be identified across the roof of the Proposed Development for PV installation. A review of available PV products will be undertaken at the time in order to maximise the possible output from the PV area to improve reduce the onsite carbon emissions as much as possible. PV panels are therefore proposed for the development as an electricity generator.

	Solar thermal Solar Thermal Panels are similar to PV Panels in that they harness energy from solar. This technology however converts solar into thermal energy that can offset the demand on hot water generation systems. Suitability to Proposed Development: As noted above, a suitable roof area has been identified for solar based technologies. However, given the proposed building use and limited associated hot water demand, solar PVs would be prioritised since the electrical output from PV panels will be more suitable for implementation with the heat-pump led energy strategy and building energy usage. Therefore, solar thermal is not proposed for the development.
	Wind turbine For efficient operation and to yield high energy output, wind turbines require a consistent flow of air. Suitability to Proposed Development: The Proposed Development is located within a dense urban environment. Therefore, the wind flow profile is erratic and consequently is not conducive to high annual yields. Moreover, mounting wind turbines on the roof of the buildings could result in unacceptable vibration and resonance being felt within occupied spaces. The turbines are also likely to generate noise which may be a nuisance to neighbouring buildings. This scenario is likely to result in the turbines being switched off. Therefore, given the complexities of installing this technology, the use of wind turbines is not proposed at the Proposed Development.
	Biomass Biomass boilers burn wood fuel or other bio-fuel sources to generate heat. These boilers can operate at high efficiencies, comparable to condensing gas boilers. However, they require a large fuel store to maintain continuous operation during the winter months. As such, area taken for such plant is high. Furthermore, fuel deliveries in city-centre locations can prove difficult and security of fuel supply is an important consideration. Suitability to Proposed Development: The reasons listed above alongside high maintenance implications and air quality implications mean that biomass boilers are not considered a suitable technology for the scheme.

6.2 Be Green summary.

Table 7 above discusses the potential impact each technology considered would have on the Proposed Development's regulated CO_2 emissions. From a carbon perspective, the favoured technologies would be a form of heat pump (water, ground, air) and solar technologies (PV or thermal). Given the justifications provided within this section, the site location and intended building use, ASHP and PV have been incorporated into the Energy Strategy.

The adoption of these technologies is likely to contribute to an additional reduction of 20-25% at the Be Green stage.

6.3 Be Green Results.

Non-Domestic

Overall, with the inclusion of the energy efficiency measures, ASHP and PV Array, the Proposed Development is anticipated to achieve a minimum of 35% reduction in annual regulated CO_2 emissions beyond the gas boiler baseline utilising SAP10 carbon factors against Approved Document Part L2A for the Proposed Development.

Domestic
Overall, with the inclusion of the energy efficiency measures, ASHP and PV Array, the Proposed Development is anticipated to achieve over and above the minimum of 35% reduction in annual regulated CO_2 emissions beyond the gas boiler baseline utilising SAP10 carbon factors against Approved Document Part L2A for the Proposed Development.

7. Be Seen.

The final section of the strategy considers additional measures that will be adopted during operation to ensure the risk of performance gap is reduced and high energy performance as designed is maintained throughout the Proposed Development's lifetime.

Figure 9: Be Seen.

7.1 Metering and Monitoring.

Effective energy metering will be enabled by the provision of suitable infrastructure within the buildings services systems. This will enable energy usage of the heat-pump systems to be monitored, and the system performance optimised. Electrical and thermal meters will be provided on the main central heat pumps, providing data on plant energy consumption throughout the year.

Each tenant area and each area of high energy load will be sub-metered in order to monitor energy consumption in greater granularity and facilitate billing and reporting. Energy intensity and carbon emissions will be monitored and reported annually.

7.2 Reporting Mechanism.

The Applicant is committed to monitoring and reporting sustainability performance and data every year in a transparent way. The Proposed Development will fall under the Applicant's energy and carbon monitoring and reporting regime, which includes both landlord and tenant usage and encourages engagement with tenants to optimise operational performance. The reported data will be published in the yearly Corporate Responsibility Summary.

8. Conclusion.

This strategy has shown that the Proposed Development will result in a highly efficient, low-carbon scheme.

New, high efficiency servicing equipment and efficient façades will minimise the energy usage of the building. Using the Mayor's energy hierarchy, the strategy has been developed to ensure that the Proposed Development is efficient and economical.

This strategy has been prepared to demonstrate that, at the planning stage, the Applicant and design team have given due consideration to the principles of energy and sustainability, and how these could be implemented for the Proposed Development.

The carbon emissions from regulated energy uses at the Proposed Development have been compared with the GLA London Plan emissions targets.

8.1 The energy strategy.

The strategy has been developed using the 'Be Lean, Clean, Green and Seen' energy hierarchy which utilises a fabric first approach to maximise reduction in energy through passive design measures.

8.2 Results summary.

The Proposed Development could achieve over and above a 35% reduction in CO_2 emissions beyond the 'gas boiler baseline'. The required minimum onsite carbon reduction at the Be Lean stage (i.e. 15% reduction) has also been demonstrated. However, the Proposed Development will require offsetting via a single cash in lieu payment to London Borough of Camden to meet the 100% carbon reduction target set by the London Plan.

Table 6: Energy strategy summary.

Be lean	**Target of 15% (non-domestic) and 10% (domestic) regulated carbon emission reduction against Part L gas boiler baseline.** High energy efficient building fabric and building services will be utilised to reduce carbon emissions and energy demand through good practice passive design measures.
Be clean	**No further carbon emission reduction** Incorporation of a connection to an offsite district heating network and a CHP system has been deemed to be unsuitable as it would offer no benefit to the Proposed Development, therefore a heat network and CHP technology has been discounted. An air source heat pump led site-wide heat network is proposed for the development.
Be green	**Target of 20-25% sitewide regulated carbon emission reduction against Part L baseline via ASHP and rooftop PV** Utilisation of high efficiency air source heat pumps for the building is anticipated to significantly reduce energy consumption and carbon emissions for the Proposed Development in addition to the renewable energy generation from an on-site PV array.
Be Seen	**Monitor, verify and report** The Proposed Development will incorporate effective building monitoring systems to allow energy performance review during operation. This data will be used to report on annual emissions of the Proposed Development throughout its lifetime.

Appendix A – Policy Context.

The policies considered when preparing this strategy are contained in the London Plan (GLA, 2021) and London Borough of Camden local policies.

The Proposed Development constitutes a 'major development' (>10 dwellings and/or >1,000m^2 of non-residential floor space) and is therefore subject to the policies of the GLA, contained within the London Plan.

National policy.

Approved Document Part L
Part L of the Building Regulations is the mechanism by which government is driving reductions in the regulated CO2 emissions from new buildings.

Current Requirements: Part L 2013

Part L has five key criteria which must be satisfied as follows:

- Criterion 1 - Achieving the Target Emission Rate (TER)
- Criterion 2 - Limits on design flexibility
- Criterion 3 - Limiting the effects of solar gains in summer
- Criterion 4 - Building performance consistent with the Building Emission Rate (BER)
- Criterion 5 - Provision for energy efficient operation of the building

Criterion 1 requires that the building as designed is not predicted to generate CO_2 emissions in excess of that set by the Target Emission Rate (TER) calculated in accordance with the approved Standard Assessment Procedure (SAP) 2012.

Criterion 2 places upper limits on the efficiency of controlled fittings and services for example, an upper limit to an external wall U-value of 0.35W/m^2.K (non-domestic buildings).

A Fabric Energy Efficiency Standard (FEES) has been introduced for new buildings although no definitive targets have been set in this regard. Part L 2013 requires the following Fabric Energy Efficiency performance targets to be met:

- Target Fabric Energy Efficiency (TFEE). The TFEE is calculated for the building, based upon an elemental recipe of efficiency parameters, applied to the geometry of the building in question. This would generate a notional value which would then be relaxed by 15% to generate the TFEE

Criterion 3 requires that zones in non-residential buildings are not subject to excessive solar gains. This is demonstrated using the Simplified Building Energy Model (SBEM) or Dynamic Simulation Method (DSM) for non-residential buildings.

Local policy.

London Plan (March 2021).

Policy SI 2 – 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:
  - Be Lean: use less energy and manage demand during operation
  - Be Clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
  - Be Green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
  - Be Seen: monitor, verify and report on energy performance.
- Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.
- A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:
  - through a cash in lieu contribution to the borough's carbon offset fund, or
  - off-site provided that an alternative proposal is identified, and delivery is certain.
- Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.
- Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.
- Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life Cycle Carbon Assessment and demonstrate actions taken to reduce life cycle carbon emissions.

Policy SI 3 – Energy infrastructure

- Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.
- Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify:
  - major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
  - heat loads from existing buildings that can be connected to future phases of a heat network
  - major heat supply plant including opportunities to utilise heat from energy from waste plants
  - secondary heat sources, including both environmental and waste heat
  - opportunities for low and ambient temperature heat networks
  - possible land for energy centres and/or energy storage
  - possible heating and cooling network routes
  - opportunities for futureproofing utility infrastructure networks to minimise the impact from road works
  - infrastructure and land requirements for electricity and gas supplies
  - implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector

  - opportunities to maximise renewable electricity generation and incorporate demand-side response measures.
- Development Plans should:
  - identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure
  - identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.
- Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:
  - the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:
    - connect to local existing or planned heat networks
    - use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
    - 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, meet the development's electricity demand and provide demand response to the local electricity network)
    - use ultra-low NOx gas boilers
  - CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality
  - where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.
- Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.

Policy SI 4 – 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 following cooling hierarchy:
  - reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
  - minimise internal heat generation through energy efficient design
  - manage the heat within the building through exposed internal thermal mass and high ceilings
  - provide passive ventilation
  - provide mechanical ventilation
  - provide active cooling systems.

London Borough of Camden – Local Plan

Policy CC1 Climate Change Mitigation.

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

- Promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
- Require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;

- Ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
- Support and encourage sensitive energy efficiency improvements to existing buildings;
- Require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
- Expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

- Working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
- Protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

Policy CC2 Adapting to Climate Change.

The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

- The protection of existing green spaces and promoting new appropriate green infrastructure;
- Not increasing, and wherever possible reducing, surface water run-off through increasing permeable surfaces and use of Sustainable Drainage Systems
- Incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
- Measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures

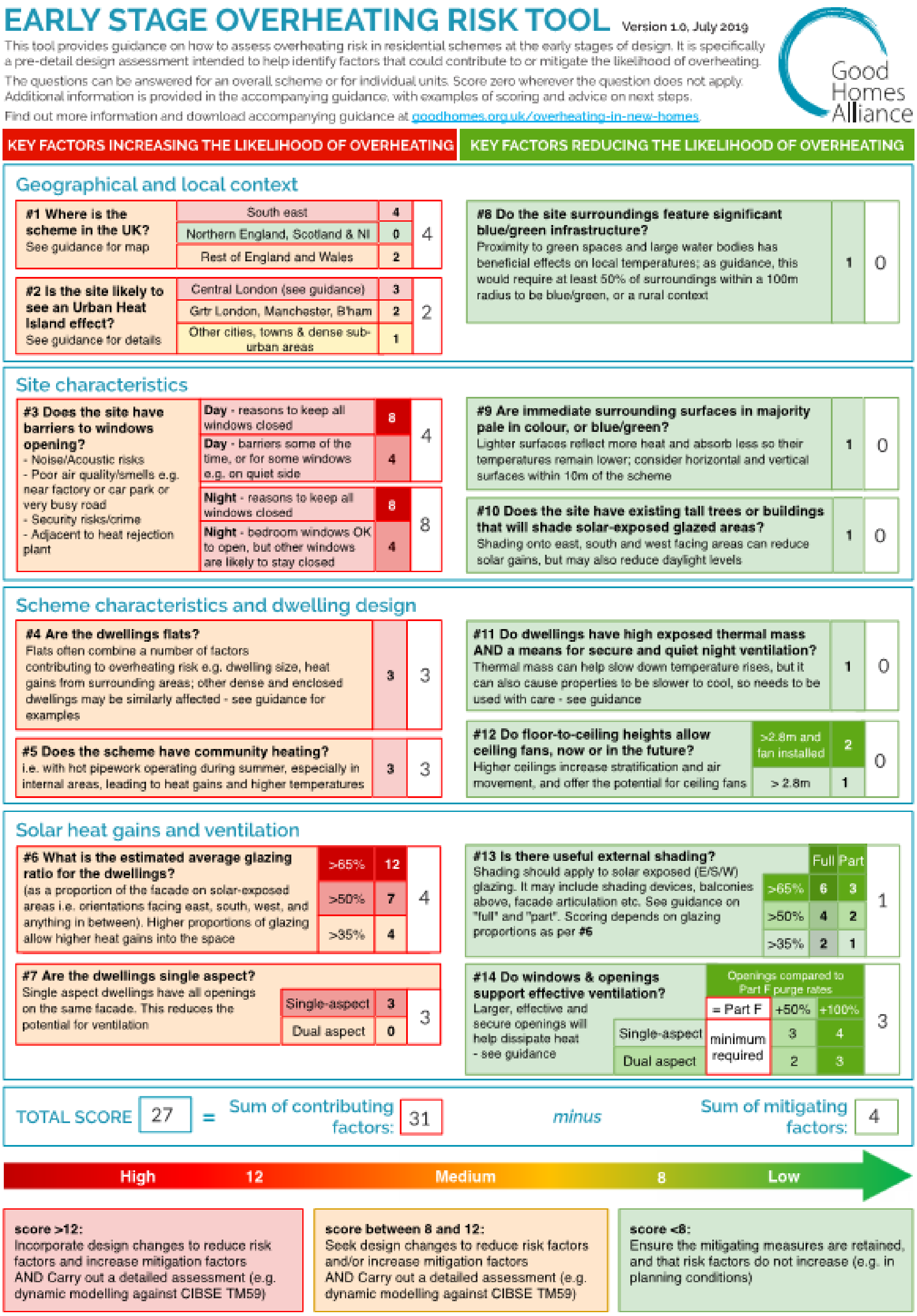
The Council will promote and measure sustainable design and construction by:

- Ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;
- Encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;
- Encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and
- Expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.

London Borough of Camden – Energy Efficiency and Adaptation (Camden Planning Guidance (CPG)) (January 2021)

This guidance provides information on key energy and resource issues within the borough and supports Local Plan Policies CC1 Climate change mitigation and CC2 Adapting to climate change.

Appendix B – Overheating Checklist.



EARLY STAGE OVERHEATING RISK TOOL

Version 1.0, July 2019

This tool provides guidance on how to assess overheating risk in residential schemes at the early stages of design. It is specifically a pre-detail design assessment intended to help identify factors that could contribute to or mitigate the likelihood of overheating.

The questions can be answered for an overall scheme or for individual units. Score zero wherever the question does not apply. Additional information is provided in the accompanying guidance, with examples of scoring and advice on next steps.

Find out more information and download accompanying guidance at goodhomes.org.uk/overheating-in-new-homes.

Good Homes Alliance

KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING | **KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING**

Geographical and local context

#1 Where is the scheme in the UK? See guidance for map	South east	4	4
	Northern England, Scotland & NI	0	
	Rest of England and Wales	2	
#2 Is the site likely to see an Urban Heat Island effect? See guidance for details	Central London (see guidance)	3	2
	Grtr London, Manchester, B'ham	2	
	Other cities, towns & dense sub-urban areas	1	

#8 Do the site surroundings feature significant blue/green infrastructure? Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context	1	0

Site characteristics

#3 Does the site have barriers to windows opening? - Noise/Acoustic risks - Poor air quality/smells e.g. near factory or car park or very busy road - Security risks/crime - Adjacent to heat rejection plant	**Day** - reasons to keep all windows closed	8	4
	Day - barriers some of the time, or for some windows e.g. on quiet side	4	
	Night - reasons to keep all windows closed	8	8
	Night - bedroom windows OK to open, but other windows are likely to stay closed	4	

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme	1	0
#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas? Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels	1	0

Scheme characteristics and dwelling design

#4 Are the dwellings flats? Flats often combine a number of factors contributing to overheating risk e.g. dwelling size, heat gains from surrounding areas; other dense and enclosed dwellings may be similarly affected - see guidance for examples	3	3
#5 Does the scheme have community heating? i.e. with hot pipework operating during summer, especially in internal areas, leading to heat gains and higher temperatures	3	3

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance		1	0
#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future? Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans	>2.8m and fan installed	2	0
	> 2.8m	1	

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings? (as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space	>65%	12	4
	>50%	7	
	>35%	4	
#7 Are the dwellings single aspect? Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation	Single-aspect	3	3
	Dual aspect	0	

#13 Is there useful external shading? Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per **#6**		Full	Part	1
	>65%	6	3	
	>50%	4	2	
	>35%	2	1	

#14 Do windows & openings support effective ventilation? Larger, effective and secure openings will help dissipate heat - see guidance		Openings compared to Part F purge rates			3
		= Part F	+50%	+100%	
	Single-aspect	minimum required	3	4	
	Dual aspect		2	3	

TOTAL SCORE	27	=	Sum of contributing factors:	31	*minus*	Sum of mitigating factors:	4

High 12 Medium 8 Low

score >12: Incorporate design changes to reduce risk factors and increase mitigation factors AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)	**score between 8 and 12:** Seek design changes to reduce risk factors and/or increase mitigation factors AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)	**score <8:** Ensure the mitigating measures are retained, and that risk factors do not increase (e.g. in planning conditions)

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