155 Regent's Park Road

Energy & Sustainability Statement

Uchaux Ltd

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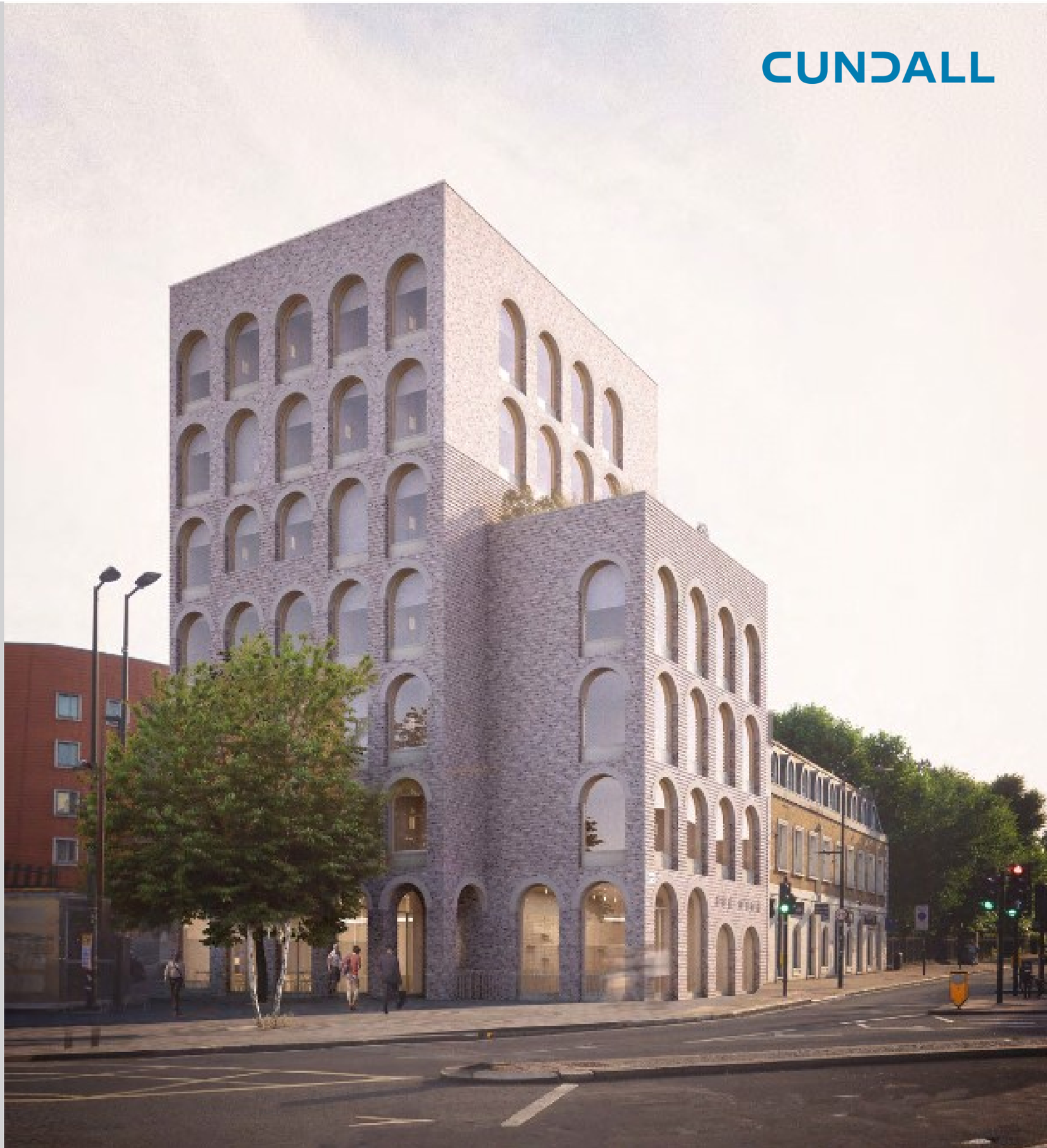

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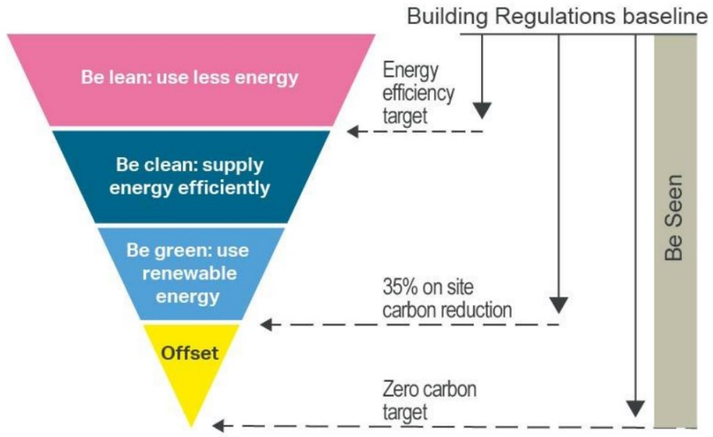
Executive Summary

155 Regent's Park Road development aims to be at the forefront of sustainability. Its strong carbon and sustainability goals will help create a development which supports London's ambitious climate transition.

This Energy and Sustainability Statement sets out the development's response to the Camden Council's and the Greater London Authority's (GLA) energy and sustainability planning policies. Specific consideration is given to the Publication London Plan (December 2020) Policy SI 2: Minimising Greenhouse Gas Emissions that requires that all 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 'Energy Hierarchy' as set forth by the GLA, illustrated below.



Source: Greater London Authority

Energy Strategy

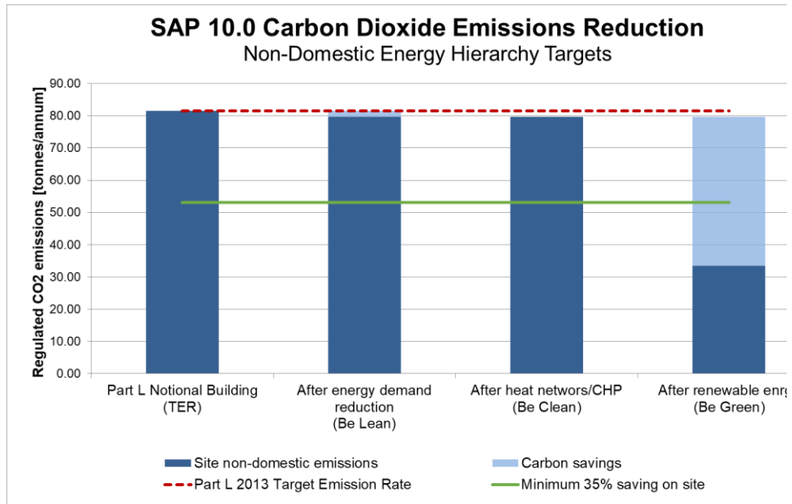
The energy strategy has been developed by following the energy hierarchy; Be Lean, Be Clean and Be Green.

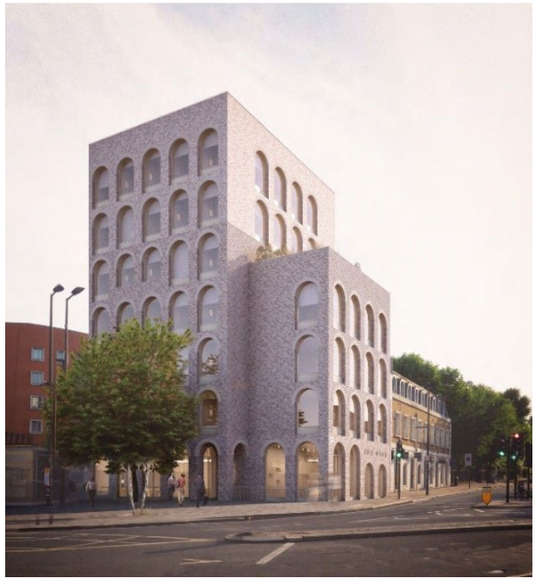
- 'Be Lean' - **Energy demand** will be reduced by achieving a well-insulated envelope which is both airtight and thermal bridge free. High performance glazing provides a positive energy balance whilst mechanical ventilation with heat recovery maintain good air quality with minimal heat loss.

  Energy efficient building systems such as LED lighting and low-power fans and pumps will further drive down regulated energy use. Robust quality control, commissioning and handover procedures on site will further drive down energy use.
- 'Be Clean' - Combined heat & power was considered however this has been discounted due to poor base load and desire to avoid on-site combustion of fossil fuels. Connection to the district heating scheme was also considered however the distance from the existing network means connection would be infeasible.
- 'Be Green' - The remaining energy demand will be met through l**ow and zero carbon** energy sources. The development's heating, cooling and hot water needs will be provided through efficient air-source heat pumps.

In accordance with the GLA Energy Assessment Guidance (April 2020), for the carbon emissions and reductions calculations SAP 10 emission factors have been used to present the results.

Through the above measures, the development achieves the required carbon emissions reduction, which surpasses those outlined in the GLA's guidance.





Carbon emissions reduction through energy efficiency measures: **2.3%**

Carbon emissions reduction through low & zero carbon technologies: **56.7%**

Total carbon emissions reduction over the Building Regulations Part L 2013 TER: **59.0%**

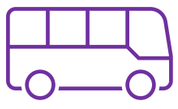
Health & Wellbeing

With people spending up to 90% of their lives indoors, the impact that buildings have on the health & wellbeing of occupants is of growing importance. The development aims to provide an environment that has a positive impact on its occupants.

- **Good daylight** will be achieved in occupied spaces through the balanced and considered use of glazing. High performance glazing will reduce energy loss and prevent excessive heat gain.
- High noise levels on site preclude the use of openable windows, therefore, the development will be mechanically cooled to maintain **thermal comfort.**
- Central Air Handling Units (AHU) will maintain a consistent supply of filtered fresh air to maintain good **indoor air quality**. Low VOC materials and finishes will minimise internal sources of pollutants.

Transport

As the second largest emitter of CO_2 in the UK, the transport of people is a priority area in achieving the UK's net zero carbon ambition. Supporting alternatives to fossil fuel and private modes of transport is key.



- The promotion of **walking and cycling** with strong connection links from the site to the surrounding area. This is further supported with the provision of cycle storage facilities for occupant use.
- Good **public transport** links in the immediate vicinity with further national links in the nearby city centre.

Water

Climate change continues to place increasing pressure on the UKs water supply, with an increase in the frequency and severity of droughts. Furthermore, the energy and carbon emissions associated with the treatment of fresh water places water conservation at the forefront.

- **Water efficient** fixtures and fittings will be specified to reduce water consumption below the levels required for national building regulations.
- **Metering and sub-metering** of consumption will enable ongoing, targeted reductions in water use.
- **Leak detection and shut-off** will prevent both major and minor leaks within the buildings as well as in external areas.
- The need for **irrigation** will be minimised through appropriate landscaping which are adapted to the UK's conditions.
- The incorporation of a **blue roof**.

Materials

As well as carbon emissions, materials can have much wider social and environmental impacts which need to be considered.

- All **timber** used in the project will be from a responsible or sustainable source, using certified FSC or PEFC sources.
- To ensure **responsible and sustainable procurement**, materials will be specified in line with a documented sustainable procurement plan.
- Materials that are **durable and resilient** will be specified to maximise their life-span and avoid the need for disposal and replacement.

Waste

Buildings and building sites produce a significant amount of waste per year.

- The use of a **Resource Management Plan** will set targets for resource efficiency and procedures for waste management.
- Appropriate and accessible **waste facilities** will be provided to encourage occupants to recycle waste effectively.

Land Use & Ecology

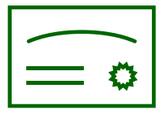
As well as a climate crisis, the UK faces a biodiversity crisis with a rapid decline in biodiversity in recent years. The built environment can respond to this through sustainable land use, habitat protection and creation as well as improvement of long-term biodiversity for the site and surrounding land.

- Using the 4th floor terrace and roof area to integrate **biodiversity** and create a microclimate for planting, green walls and rainwater gardens.
- Diversity of planting to create valuable habitat throughout the seasons

Pollution

- The site will feature no **on-site combustion** for heating and hot water which would be detrimental to local air quality.
- **External lighting** will be designed to minimise the impact of light pollution. Light fittings will be specified with a reduced light spill and controlled using photocells and timeclocks to limit unnecessary operation.
- Limits to noise emitting plant to prevent impacts on its surroundings.
- Responsible construction practices to minimise resource use and the impact of noise, dust and pollution.

Environmental Compliance



Camden Council Policy CC2: Adapting to climate change states that all major non-domestic developments of 500 m^2 of floorspace or above must achieve at least 'Excellent' in BREEAM assessments.

The development has been registered and assessed against BREEAM New Construction (NC) 2014. The scheme considers the broad environmental concerns of climate change, pollution, impact on occupants and the wider community. The preliminary BREEAM assessment indicates that the development is currently likely to achieve 'Excellent'.

Contents

1.0

Introduction

1.0 Introduction

155 Regent's Park Road development aims to set a benchmark for carbon and sustainability in central London. This Energy and Sustainability Statement sets out the development's response to the energy and climate change requirements of the Greater London Authority (GLA) and the Camden Council.

Specific consideration is given to the Publication London Plan (December 2020) Policy SI 2: Minimising Greenhouse Gas Emissions requires that all 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 energy hierarchy.

The objectives of this statement are to:

- Outline the development's approach to reducing the site's contribution to the causes of climate change by minimising the site's needs for energy and the emissions of CO_2, and by providing some of the requirement by renewable/sustainable means.
- Demonstrate that the proposed development will meet the highest standards of sustainable design and construction throughout all of the stages of the project, including demolition, construction and long-term management in line with the principles of BREEAM to achieve 'Excellent'.

1.1 Existing Site

The existing site comprises a four-storey building on the corner of Regents Park Road and Haverstock Hill. The building fronts Haverstock Hill and is set back from the main road by an area of public realm. The site comprises a mix of uses including retail at ground floor with office accommodation at first and second floor and a single residential unit on the top floor.

The Site is within a Neighbourhood Centre. The site is immediately adjacent to Chalk Farm Station and is located next to the Roundhouse Arts venue. The site is not located within the Conservation Area but is in close proximity to the Primrose Hill, Eton and Regents Canal Conservation Area.

1.2 Proposed Development

The proposal includes redevelopment of the existing site to provide a part ground plus 6-storey building comprising a hotel (C1 Class Use) with associated works. The proposed first to third floor plan is shown in the next figure.

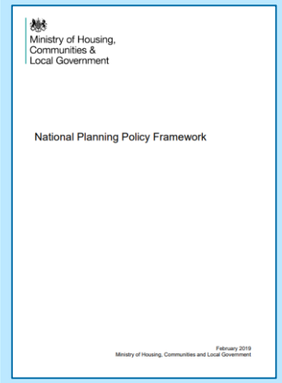
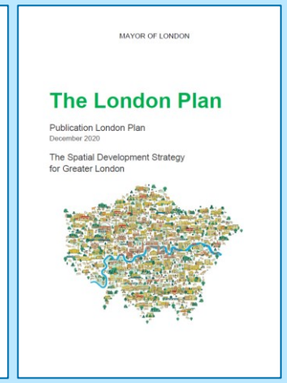
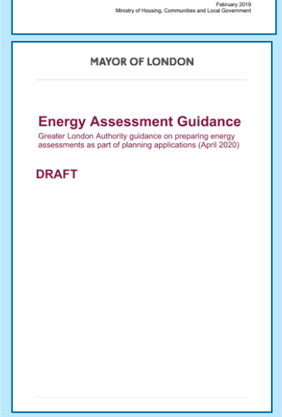
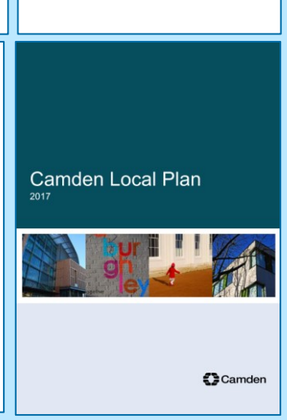
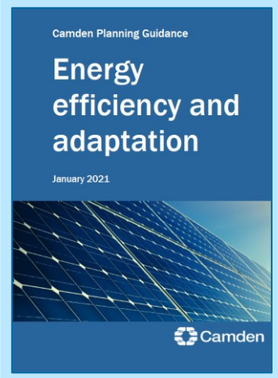
2.0

Policy

2.0 Policy

In support of the planning submission this energy and sustainability statement has been produced to demonstrate how the 155 Regent's Park Road development proposal addresses the policies and standards presented in the following table.

For more details about the planning policies see **Appendix A**.

	Guidance	Policy Reference	Minimum Requirements	
Energy Strategy	National ▪ National Planning Policy Framework – February 2019 ▪ Building Regulations Part L2A 2013 Regional ▪ Greater London Authority (GLA) London Plan 2016 ▪ GLA's Energy Assessments Guidance October 2018 ▪ Draft GLA's Energy Assessments Guidance April 2020 ▪ Publication London Plan December 2020 Local ▪ Camden's Local Plan (2017) ▪ Camden Planning Guidance (CPG) Energy efficiency and adaptation (January 2021)	Publication London Plan (Dec 2020) ▪ Policy SI 2 Minimising greenhouse gas emissions ▪ Policy SI 3 Energy infrastructure + Supporting guidance documentation Camden Local Plan (2017) Policies CC1 and CC2	Non-domestic development ▪ Net-zero carbon development ▪ Minimum on-site 35% reduction in carbon emissions beyond Part L of 2013 Building Regulations ▪ Minimum 15% reduction through energy efficiency measures (Be Lean) ▪ Maximise reduction in CO2 from onsite renewables (Be Green) ▪ Monitor, verify and report on energy performance (Be Seen) ▪ Calculate and minimise carbon emissions from any other part of the development including plant and equipment that are not covered by Building Regulations e.g. unregulated emissions ▪ Use the updated SAP 10 emissions factors while continuing to use the current Building Regulation methodology	     
Overheating Assessment	▪ Draft GLA's Energy Assessments Guidance April 2020 ▪ Publication London Plan December 2020	Publication London Plan (Dec 2020) ▪ Policy SI 4 Managing heat risk	Undertake dynamic overheating modelling in line with the guidance and data sets in CIBSE TM52 and TM49 respectively	
Sustainability Strategy	Publication London Plan (Dec 2020) & Camden Local Plan (2017) ▪ Air quality ▪ Sustainable drainage ▪ Sustainable water ▪ Noise ▪ Ecology/ landscaping (Urban Greening) ▪ Sustainable transport	Publication London Plan (Dec 2020) ▪ Policy SI 1 Improving air quality ▪ Policy SI 12 Flood risk management ▪ Policy SI 13 Sustainable drainage ▪ Policy SI 15 Water Infrastructure ▪ Policy D14 Noise ▪ Policy G5 Urban greening ▪ Policy G6 Biodiversity and access to nature ▪ Policy T4 Assessing and mitigating transport impacts ▪ Policy T5 Cycling Camden Local Plan (2017) Policies CC3, CC4, CC5 and T1	Policy SI 15 Water Infrastructure: Achieve at least the BREEAM 'Excellent' Standard for the WAT 01 water category or equivalent	
Compliance Tools	▪ Camden Local Plan (2017) ▪ Camden Planning Guidance (CPG) Energy efficiency and adaptation (January 2021)	Camden Local Plan (2017) ▪ Policy CC2 Adapting to climate change	BREEAM 'Excellent' required for non-domestic development	

3.0

Energy Strategy

3.0 Energy Strategy

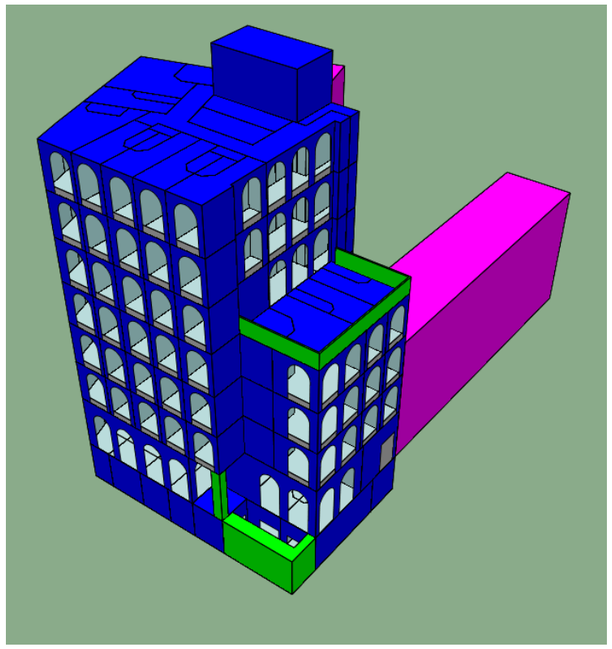
This section outlines the development's approach to achieve the Camden Council's planning requirements and the GLA's London Plan requirements.

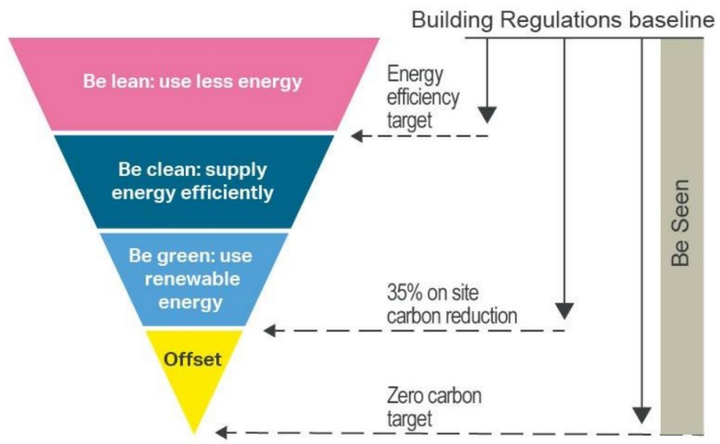
To calculate carbon emissions and reductions, the design was assessed under 'Part L 2013: Conservation of Fuel and Power' of the UK Building Regulations, using the National Calculation Methodology (NCM). A detailed energy model was created using Government approved software Integrated Environmental Solutions: Virtual Environment (IES: VE) 2019, in line with CIBSE AM11. The model was revised for each of the steps of the Energy Hierarchy to establish expected performance and satisfaction of the policy requirements. As per the GLA Energy Assessment Guidance (April 2020) document, calculations incorporate SAP 10 emission factors, as opposed to the outdated National level emission factors.

Fuel type	Fuel Carbon Factor ($kgCO_2/kWh$)	
	SAP 2012	SAP 10.0
Natural Gas	0.216	0.210
Grid Electricity	0.519	0.233

The energy strategy has been developed by following the energy hierarchy:

- **Energy Demand Reduction – Be Lean**: The energy demand of the development is minimised through prioritisation of passive design.
- **Heat Networks/ Combined Heat Power (CHP) – Be Clean:** The use of a decentralised heating network utilising a combined heat and power to reduce emissions.
- **Low & Zero Carbon Technologies – Be Green:** On site renewable energy generation should be prioritised and where this is not possible, off-site renewable energy should be procured.

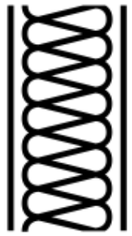




Source: Greater London Authority

3.1 Demand Reduction – Be Lean

Envelope



The development will first and foremost seek to reduce its energy demand in line with five basic principles:

1. Continuous thermal insulation
2. Airtightness
3. Thermal bridge free
4. High-performance windows
5. Mechanical ventilation with heat recovery

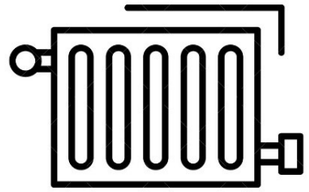
These principles focus on achieving a continuous, well insulated envelope which is both airtight and thermal-bridge free. High performance glazing provides a positive energy balance whilst improving thermal comfort. Mechanical ventilation with heat recovery ensures a continual supply of fresh air with minimal heat loss.

The thermal envelope will go significantly beyond the building regulation standards, with preliminary target values as shown in the table below:

Element U-Values (W/m^2K)	Part L2A Minimum	Design Values
Floor	0.25	0.12
Roof	0.25	0.12
External Wall	0.35	0.15
Windows	2.20	1.40

An improved air leakage rate of $3.0m^3/(hr.m^2)$ is being targeted for the proposed development, in comparison with the Building Regulation minimum standards of $10m^3/(hr.m^2)$ at 50Pa. Good air tightness could be achieved by prefabrication of several key building components under factory conditions, robust detailing of junctions and good building practices on site.

Systems



All equipment and plant will exceed the minimum requirements of the Building Services Compliance Guides. This document provides guidance on the means of complying with the requirements of Approved Document Part L2A of the Building Regulations for conventional space heating/ cooling systems, hot water systems and ventilation systems.

Central Air Handling Units (AHU) are to be employed to provide fresh air with a heat recovery efficiency of at least 75%.

All fans and pumps will be specified with variable-speed drives, which will reduce their energy consumption by more than two-thirds compared with equivalent constant speed alternatives, by only supplying the required flow rate to meet the demand.

The heating and cooling systems shall be appropriately zoned, with local fast responding controls.

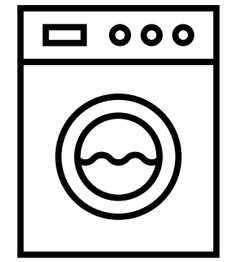
Natural light is maximised throughout, where practicable, with appropriate glazing design. This allows electric lighting energy consumption to be reduced during daylight hours, reducing running costs and CO_2 emissions.

Installing efficient low energy light fittings internally and externally can significantly reduce a building's overall lighting load hence lowering its annual CO_2 emissions. The development will reduce the energy consumption by the specification of low energy, high efficacy, LEDs to all areas.

Appropriate lighting controls such as manual on and off with an automatic extinction signal shall be specified for the hotel rooms. Occupancy controls will further reduce the lighting energy use where appropriate.

A summary of the fixed building services inputs used for the 'Be Lean' scenario can be found in **Appendix B**.

Unregulated Energy



Unregulated energy is those uses that fall outside the typical scope of building regulations. This can include energy used through cooking, computers, external lighting and other 'plug loads' which are typically under the control of the occupant.

Addressing these loads, which often form a significant portion of a building's overall energy consumption, is key to reducing energy consumption to levels required for Net Zero Carbon.

This will be achieved through the specification of energy efficient white goods, lifts as well as other appliances.

Be Lean Results

In accordance with the Camden Council and the Mayor's Energy Hierarchy, an energy assessment has been carried out for the entire development with the aforementioned passive design and energy efficiency measures.

The table below presents the 'Be Lean' Part L2A 2013 carbon emissions after the energy demand reduction.

In accordance with the GLA's Energy Assessments Guidance April 2020, the 'Be Lean' scenario utilises a centralised gas-fired boiler system to deliver the space heating and Domestic Hot Water (DHW) requirements and an electric chiller to provide cooling.

The development's hot water demand is significantly higher proportion of the overall heating demand due to the hotel use. Based on the National Calculation Methodology (NMC) modelling guide, the notional building uses the same system type and fuel for hot water generation as the actual building. For this reason, it is not possible to get an improvement between the notional and actual building carbon emissions, therefore, it is not possible to meet the 15% GLA requirement through passive design measures.

Part L2A 2013 End-uses Breakdown ($kgCO_2/m^2$)		
End-use	TER	BER
Heating	6.2	5.2
DHW	23.3	23.8
Cooling	2.6	2.4
Auxiliary	6.4	7.3
Lighting	3.4	2.3
Renewables	0.0	0.0
Total	41.9	40.9
Improvement over TER		**2.3%**
Part L Status (BER<TER)		**Pass**

The 'Be Lean' BRUKL document's front page and technical data sheet can be found in **Appendix C**.

Energy Demand

The development's energy demand has been calculated and presented in the following table. The estimated annual regulated energy demand is expected to be 371.1MWh/year.

Total Energy Demand							
Building Use	Energy demand following energy efficiency measures (MWh/year)						
	Space Heating	Hot Water	Lighting	Cooling	Auxiliary	Unregulated electricity	Unregulated gas
Non-domestic	47.8	220.4	19.6	20.7	62.5	121.4	-

3.2 Cooling and Overheating

The proposed development has been designed to minimise its use of energy intensive cooling systems through passive and energy efficient measures.

GLA Cooling Hierarchy

To reduce the need for cooling and reduce the risk of overheating, the following measures have been taken in accordance with Policy 5.9 of the GLA's Cooling Hierarchy.

Minimising internal heat generation

Plug-loads and occupant densities associated with hotel activities cannot be altered beyond the client's brief. Therefore, the only area that can be targeted is the lighting. Low energy, high efficacy, Light Emitting Diode (LED) lighting will be used through-out the development to minimize internal heat gains.

Reducing the amount of heat entering the building

The development facades have undergone design review to control the amount of solar gain entering internal spaces. The façade elements have been specified with a low solar transmission (g-value) of 35%.

All spaces comply with Criterion 3: Limiting the Effects of Heat Gains in summer of the Building Regulations Part L2A.

Passive ventilation

The acoustic consultant advised against opening hotel room windows for cooling and ventilation due to noise issues. For this reason, natural ventilation and passive cooling techniques are not appropriate for the development.

Mechanical ventilation and active cooling systems

To deliver the high-performance internal environment required by the client, a mechanical ventilation and cooling strategy has been recommended. All fresh air will be delivered by AHUs in the hotel rooms and common areas. Cooling will be provided by air source heat pumps in the hotel rooms, reception and basement staff area. Efficiency values of these systems will exceed the requirements of the 'Non-Domestic Building Services Compliance Guide'.

Active Cooling

The Part L assessment also provides a quantification of the energy demand likely to be expected of the cooling system. This is compared to the notional building benchmark demand to demonstrate compliance. The table below shows that the cooling demand is only 155MJ/m^2, compared to 177 MJ/m^2 for the Notional building. Therefore, the proposed design meets the cooling reduction requirements of Policy 5.9 of the London Plan.

	Area weighted average non-domestic cooling demand (MJ/m^2)	Total area weighted non-domestic cooling demand (MJ/year)
Actual Building	155	301,704
Notional Building	177	344,437

3.3 Heating Infrastructure – Be Clean

Combined Heat & Power

Combined Heat and Power (CHP), also known as cogeneration, is an energy system capable of producing both useful heat and electricity simultaneously in a single process. It allows for optimum use of the energy available from the fuel used.

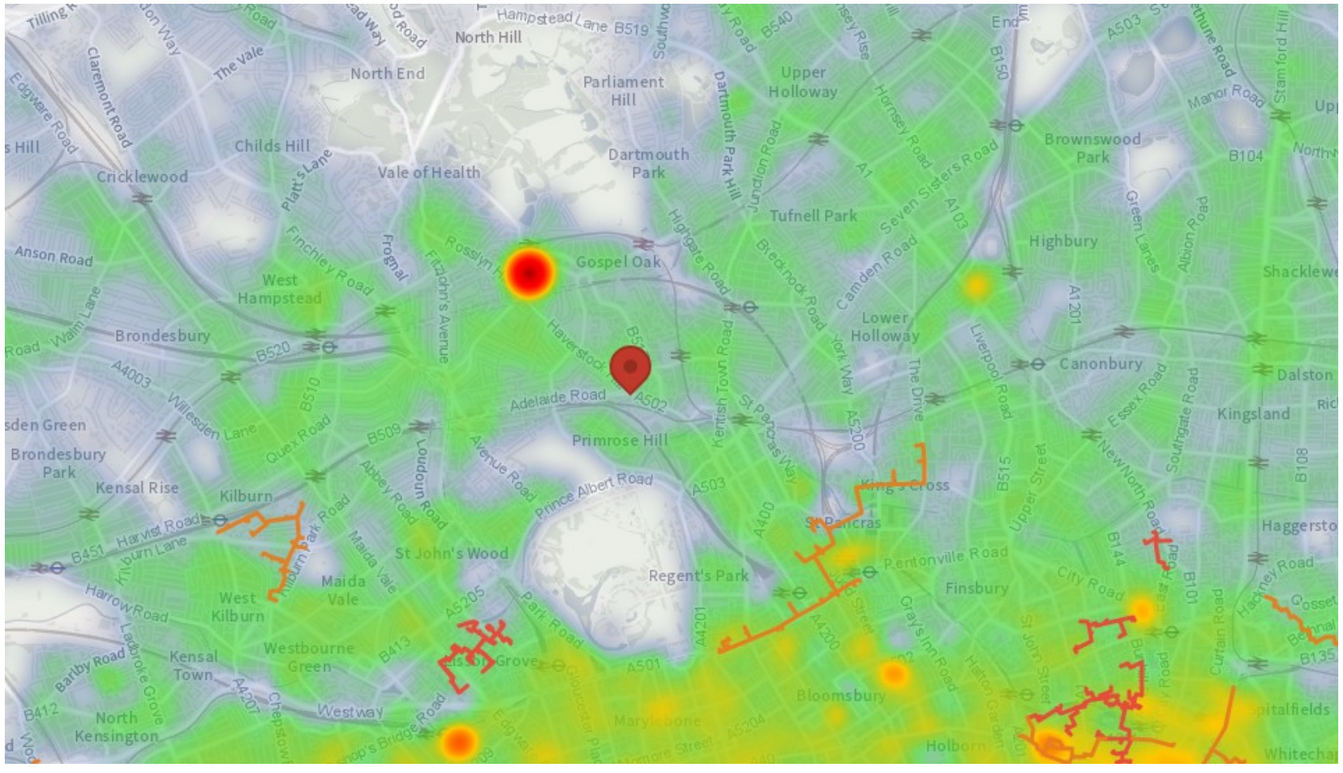
However, it is widely recognised that CHP is now more CO_2 intensive than electricity because of the rapid decarbonisation of the electricity grid. Therefore, CHP is not considered to be an appropriate technology for this development. Furthermore, flue gases from the gas-fired CHP can lead to a reduction in local air quality.

District Heating

A district heating or cooling scheme comprises of a network of insulated pipes used to deliver heat or cooling, normally in the form of hot or chilled water from the point of production to an end user.

The feasibility of connecting to an existing district network has been investigated for the site in accordance with Policy 5.6 of the London Plan. An analysis of the London Heat Map (www.londonheatmap.org) indicates that there are no existing or proposed district heating networks within 500m of the site, therefore connection to an existing network is not feasible. It illustrates the heat density of the area surrounding 155 Regent's Park Road. Red; red networks are installed, orange networks are proposed routes

To facilitate future connection, space will be earmarked at the basement level to host a plate heat exchanger, pump and calorifier should a district energy network be commissioned at a later date.



3.4 Low & Zero Carbon Technologies – Be Green

Air Source Heat Pumps

Air source heat pumps exchange heat between the outside air and a building to provide space heating in winter and cooling in the summer months. The efficiency of these systems is inherently linked to the ambient air temperatures.

Heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pump systems can supply as much as 4kW of heat output for just 1kW of electrical energy input.

To enable the development to be net zero carbon, heat pumps will be used throughout for the provision of heating, cooling and hot water:

Domestic hot water will be provided via centralised air source heat pumps. These will utilise high temperature refrigerant, such as CO_2, which operate efficiently at the high temperatures that DHW generation demands.

Heating and cooling will be provided by an air-to-air or air-to-water heat pump. Heat recovery enables waste heat to be fed into the domestic hot water cylinder.

These heat pump systems will enable significant emissions savings over a conventional gas boiler heating system, particularly when factoring in the decarbonisation of the electrical grid.

A summary of the fixed building services inputs used for the 'Be Green' scenario can be found in **Appendix B**.

Other Technologies

Other technologies were considered, however are not considered appropriate for the development. These include:

- **Wind Turbines:** The output from wind turbines is highly sensitive to wind speed. Hence it is essential that turbines should be sited away from obstructions, with a clear exposure, or fetch, for the prevailing wind. The urban nature of the site means these are not considered appropriate for this development.
- **Biomass:** Biomass in the form of logs, wood chips and wood pellets are classified as a renewable source of energy since the carbon dioxide emitted when the biomass is burned has been taken out of the atmosphere by the growing plants. Even allowing for emissions of carbon dioxide in planting, harvesting, processing, and transporting the fuel they will typically reduce net CO_2 emissions by over 90%. However, biomass boilers and their associated NOx emissions would impact local air quality and therefore are not considered feasible for this development.
- **Photovoltaics (PV)**: Photovoltaic solar cells convert solar energy directly into electricity. The advantage of photovoltaic cells is once they are installed they require minimal maintenance over their operational life and have no primary fuel requirements.

  The proposed roof area is allocated as plant area, therefore, there is no space to accommodate PVs.
- **Solar Thermal:** Solar thermal collectors utilise solar radiation to heat water for use in buildings. Solar collectors are typically designed to meet a development's base heat load, associated with its domestic hot water requirements. However, the complexities involving the integration of pipework as well as the limited available roof space means that solar thermal collectors are not considered feasible for the development.

Be Green Results

In accordance with Policy 5.7 of the London Plan, investigations into providing a proportion of the site's energy requirements through renewables was undertaken.

The analysis indicates that the proposed development is performing significantly better than the minimum requirements of Part L of the Building Regulations and achieves an improvement of 59% over the Building Regulations Part L 2013 Target Emission Rate as highlighted below. This exceeds the 35% requirement of the GLA guidance.

Part L2A 2013 End-uses Breakdown ($kgCO2/m^2$)

End-use	TER	BER
Heating	6.2	1.3
DHW	23.3	8.1
Cooling	2.6	2.3
Auxiliary	6.4	3.4
Lighting	3.4	2.1
Renewables	0.0	0.0
Total	41.9	17.2
Improvement over TER		**59.0%**
Part L Status (BER<TER)		Pass

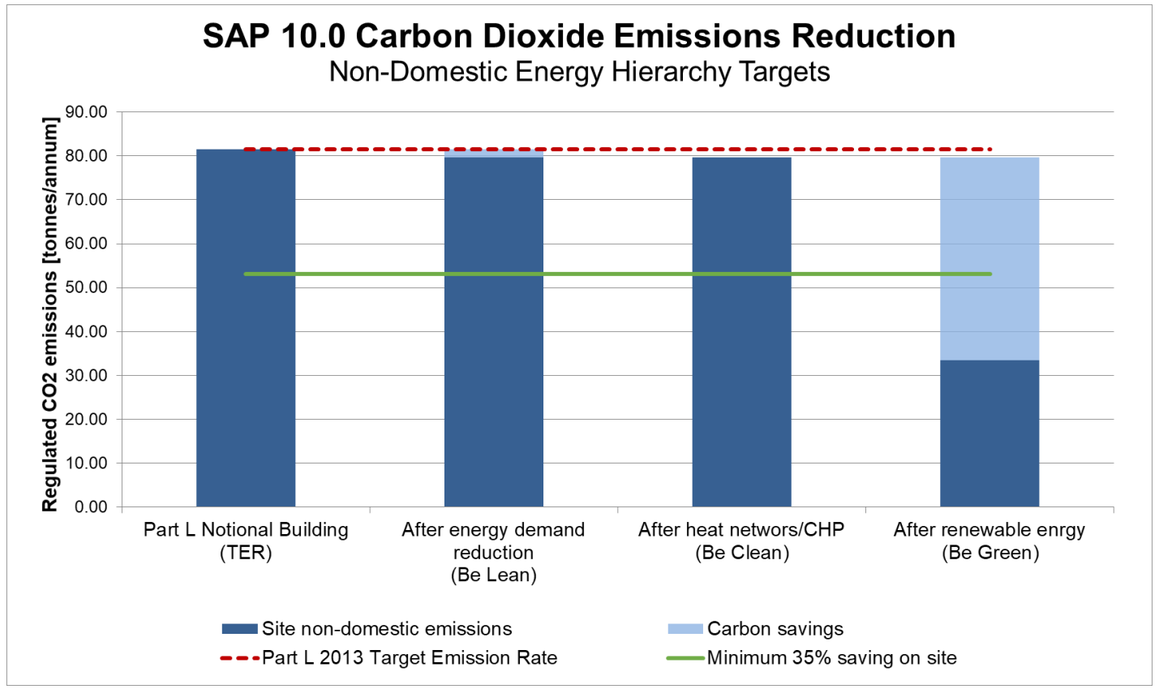
The 'Be Green' BRUKL document's front page and technical data sheet can be found in **Appendix C**.

3.5 Proposed Energy Strategy

The analysis indicates that the proposed development is performing significantly better than the minimum requirements of Part L of the Building Regulations and achieves an improvement of 59% over the Building Regulations Part L 2013 Target Emission Rate as highlighted below.

A summary of the energy and sustainability policies and the developments performance against the targets is shown in the next page.

	Carbon Dioxide Emissions for Non-Domestic Buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development	81.58	28.28
After energy demand reduction	79.71	28.28
After heat network / CHP	79.71	28.28
After renewable energy	33.42	28.28
	Regulated Non-Domestic Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	**(%)**
Savings from energy demand reduction	1.87	2.3%
Savings from heat network / CHP	0.00	0.0%
Savings from renewable energy	46.29	56.7%
Cumulative on-site savings	**48.15**	**59.0%**



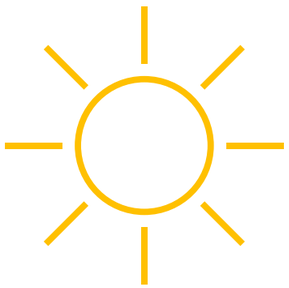
	Guidance	Minimum Requirements	Summary of Performance
Energy Strategy	<u>National</u> ▪ National Planning Policy Framework – February 2019 ▪ Building Regulations Part L2A 2013 <u>Regional</u> ▪ Greater London Authority (GLA) London Plan 2016 ▪ GLA's Energy Assessments Guidance October 2018 ▪ Draft GLA's Energy Assessments Guidance April 2020 ▪ Publication London Plan December 2020 <u>Local</u> ▪ Camden's Local Plan (2017) ▪ Camden Planning Guidance (CPG) Energy efficiency and adaptation January 2021	<u>Non-domestic development</u> ▪ Net-zero carbon development ▪ Minimum on-site 35% reduction in carbon emissions beyond Part L of 2013 Building Regulations ▪ Minimum 15% reduction through energy efficiency measures (Be Lean) ▪ Maximise reduction in CO2 from onsite renewables (Be Green) ▪ Monitor, verify and report on energy performance (Be Seen) ▪ Calculate and minimise carbon emissions from any other part of the development including plant and equipment that are not covered by Building Regulations e.g. unregulated emissions ▪ Use the updated SAP 10 emissions factors while continuing to use the current Building Regulation methodology	The results indicate that the proposed development is achieving a 59% improvement over the Building Regulations Part L 2013 Target Emission Rate, using the new SAP 10 emissions factors. This exceeds the 35% requirement of the GLA guidance. A 2.3% carbon emissions reduction is achieved through energy efficiency measures ('Be Lean'), using the new SAP 10 emissions factors. In accordance with the GLA's Energy Assessments Guidance October 2018, the 'Be Lean' scenario utilises a centralised gas-fired boiler system to deliver the space heating and domestic hot water requirements. The development's hot water demand is significantly higher proportion of the overall heating demand due to the hotel use. Based on NMC modelling guide, the notional building uses the same system type and fuel for hot water generation as the actual building. For this reason, it is not possible to get an improvement between the notional and actual building carbon emissions, therefore, it is not possible to meet the 15% GLA requirement through passive design measures. The analysis found that the use of Air Source Heat Pumps for heating and cooling to the hotel rooms could reduce CO_2 emissions by 56.7% for the development over a conventional HVAC configuration, using the new SAP 10 emissions factors. Therefore, the development complies with the 20% reduction in CO2 from onsite renewables. The SAP 10 results and BRUKL output files are provided for the various result stages.
Overheating Assessment	▪ Draft GLA's Energy Assessments Guidance April 2020 ▪ Publication London Plan December 2020	Undertake dynamic overheating modelling in line with the guidance and data sets in CIBSE TM52 and TM49 respectively	High noise levels on site preclude the use of openable windows for cooling and ventilation. Therefore, the development will be mechanically cooled and ventilated throughout. There is no requirement for an overheating assessment.
Sustainability Strategy	<u>Publication London Plan December 2020 & Camden Local Plan (2017)</u> ▪ Air quality ▪ Sustainable drainage ▪ Sustainable water ▪ Noise ▪ Ecology/ landscaping (Urban Greening) ▪ Sustainable transport	Policy SI 15 Water Infrastructure: Achieve at least the BREEAM 'Excellent' Standard for the WAT 01 water category or equivalent	The development achieves 1 credit under WAT 01 of BREEAM NC 2014 for the specified component types and performance levels. Therefore, it achieves the minimum required for 'Excellent'.
Compliance Tools	▪ Camden Local Plan (2017) ▪ Camden Planning Guidance (CPG) Energy efficiency and adaptation (January 2021)	BREEAM 'Excellent' required for non-domestic development	The development has been registered and assessed against BREEAM New Construction (NC) 2014. The development achieves 5 credits under the Ene 01 of BREEAM NC 2014, therefore, it achieves that minimum required for 'Excellent'. The preliminary BREEAM assessment indicates that the development is currently likely to achieve 'Excellent'.

4.0

Health & Wellbeing

4.0 Health & Wellbeing

4.1 Daylight



Good daylight is an important factor in moderating people's circadian rhythm, which enhances productivity and regulates the sleep cycle. It is also a key factor in reducing energy consumption from artificial lighting.

Achieving a perfect balance between thermal comfort, internal daylight and energy consumption is a main driver when establishing the location and size of windows and the glazing properties.

The elevations have been established using a balanced approach to glazing to ensure that all windows within elevations are providing maximum daylighting resulting in bright and airy space, but at the same time, no excessive heat enters the hotel rooms during hot summer days.

Shallow room depths enable occupants to have access to a view out, which is important in allowing the eyes to refocus after periods of deep focus.

Glare control measures such as blinds will allow occupants to regulate their own internal daylight conditions in line with their preferences.

4.2 Thermal Comfort

As climate change leads to rising summer temperatures, maintaining acceptable temperatures in occupied spaces is fundamental to creating productive, healthy & safe places for people to live and work. Maintaining good thermal comfort has been central to the project's shading, ventilation & cooling strategy.

Heat has been limited from entering the building through careful consideration of glazing. This must be balanced with a need for good daylight and solar heat in winter, so the use of shading and solar control glass has been considered.

Circulation of high-temperature water in the corridors has been minimised, as well as the specification of LED lighting and energy efficient equipment reducing the internal heat generation.

High noise levels on site preclude the use of openable windows, therefore, the development will be mechanically cooled and ventilated throughout.

4.3 Air Quality

Poor external air quality originates from the high number of vehicles, as well as plant and machinery such as boilers used to heat buildings, and the density of roads and building, which prevents effective dispersal of pollutants.

To protect occupants from the high levels of air pollution experienced at certain areas of the site, a background ventilation strategy that does not rely on openable windows will be adopted. Centralised Air Handling Units (AHU) with heat recovery will maintain a reliable and consistent supply of fresh air to occupants whilst avoiding excessive heat loss in winter. Where necessary, appropriate filtration will be installed to clean the incoming air into the hotel rooms and ensure good standards of air quality.

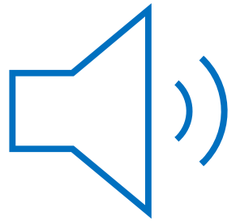
The development proposal will not include the installation of any combustion plant for the purposes of generating heat or hot water. This will be entirely electric, therefore will not create any adverse affect on the local air quality for residents and neighbouring properties.

To maintain good internal air quality, internal finishes will be specified which have low or no emissions of VOCs and other harmful pollutants complying with European best practice levels as a minimum.

An air quality assessment has been carried out to support the development's planning application. The assessment demonstrates that the development is unlikely to cause new exceedances of air quality standards, therefore, complies with the Publication London Plan (Dec 2020) Policy SI 1.

For more details refer to the Air Quality Assessment report issued by Cundall in February 2021.

4.4 Acoustics



Acoustic comfort is important for occupant productivity, relaxation and rest. High noise levels which hinder this can have a range of adverse effects on people's mental and physical health.

The acoustic consultant advised that internal noise levels may be as high as 45+ dBA during both daytime and night-time periods and would exceed the internal noise level criteria for the hotel.

Therefore, opening of the windows for natural ventilation is not feasible and the development will be mechanically cooled and ventilated throughout.

For more details refer to the Environmental Noise Report Rev C issued by Cundall in February 2021.

5.0

Transport

5.0 Transport

5.1 Walking & Cycling

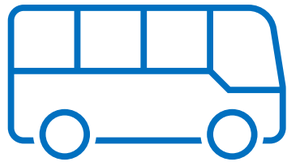
The transport of people between buildings is the second largest source of CO_2 emissions in the UK after energy use in buildings and remains the main source of many local pollutants. Energy use and emissions from transport are growing at 4% per year, while the effects of climate change are becoming more severe.

As part of the development, secure cycle spaces will be provided for occupants use to reduce reliance on car-based travel. The development will offer 1 blue badge bay and 4 short-stay cycle spaces.

The site benefits from good walking and cycling links from the site to the surrounding areas, including:

- The area provides multiple options for safe cycling such as trails, dedicated lanes and bicycle-friendly roads.
- The closest Santander cycle hiring station is located 8min walk from the site.
- Access to the Regent's canal provides for journeys to the east and west London.

5.2 Public Transport



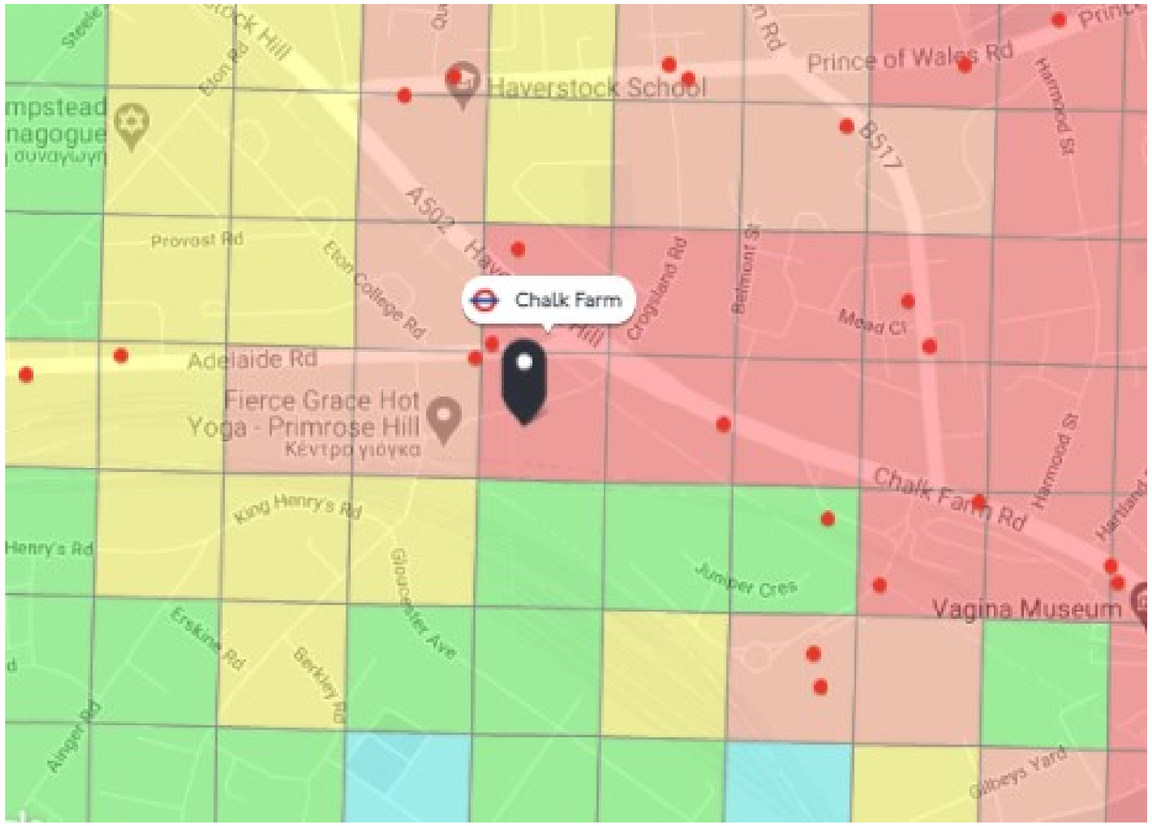
The sites location is highly accessible and benefits from access to a comprehensive range of public transport services.

Reflecting the variety of transport options, the London Public Transport Accessibility Level (PTAL) for the site is 6a, indicating excellent transport links.

The closest bus stops are located either side of the Haverstock Hill Road, approximately 3min walk to the north of the site and serve 168, 393, and N5 routes which offer a high frequency service into the city centre. Other stops are located on Adelaide Road serving the 28 and N31 routes.

The Chalk Farm underground station is 1min walk for the development. The Kentish Town overground station, Camden Town underground station and Camden Road overground station are located within 15min walking distance from the site.

Further details on the development's approach to sustainable transport can be found in the Transport Assessment and Travel Plan.



6.0

Water

6.0 Water

6.1 Water Efficiency

Water consumption in the UK has risen by 70% over the last 30 years. Trying to meet the increasing demand by locating new sources of water supply is both expensive and damaging to the environment. Therefore, the design team have focused on reducing the demand for water and managing the existing resources.

The aim is to minimise internal and external potable water use within the development. Good water management can contribute to reducing the overall level of water consumption maintaining a vital resource and having environmental as well as cost benefits in the lifecycle of the building.

Water consumption in the development will be limited to no more than 105 litres per person per day.

The following water saving measures are being considered throughout:

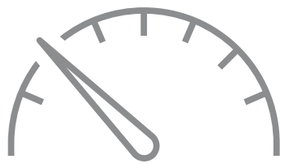
- ***Dual Flush Cisterns on WC's*** - It is proposed that these are used throughout the development in order to minimise water consumption.
- ***Flow Restrictors to Taps*** - Flow restrictors reduce the volume of water discharging from the tap. Spray taps have a similar effect and are recommended to reduce both hot and cold-water consumption.
- ***Low Flow Showers -*** The average shower uses 15 litres of water a minute, however by restricting the output of any showers in the development to lower rate, a significant water saving can be achieved. Flow rates can be reduced to 6 litres/ minute without compromising on water pressure and hence will be considered as the design develops.

As per the Publication London Plan (Dec 2020) Policy SI 15 Water Infrastructure, development proposals must achieve at least the BREEAM 'Excellent' Standard for the WAT 01 water category or equivalent.

The development achieves 1 credit under WAT 01 required for BREEAM 'Excellent' for the following component types and performance levels:

- WC: Category 2
- Wash hand basin taps: Category 3
- Showers: Category 1

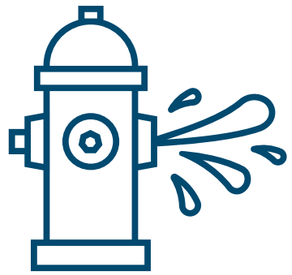
6.2 Water Monitoring



In 2017, approximately 5.3 billion cubic meters of water were abstracted for public water supply, making up over half of all water abstracted in the UK. To reduce this figure, accurate information on usage is required for management of a building's consumption.

Water meters will be specified on the main supply and sub-metering in line with the BREEAM requirements.

6.3 Leak Prevention and Detection

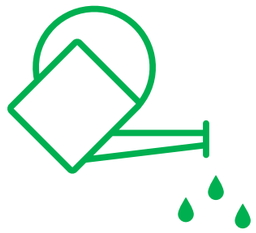


To minimise the risks of major water leaks occurring, a water leak detection will be installed. The flow-rate of the incoming water meter will be monitored by a leak detection system, which will highlight when there is a significant rise in water consumption, indicating a major leak within the building.

The leak detection system can be standalone or can be integrated within the Building Management System (BMS). It will feature programmable thresholds to suit the specific consumption of the building and an audible alarm if those thresholds are exceeded. It will also be designed to avoid false alarms by normal operation of large water consuming plant.

As well as a major leak detection system, minor leaks will be prevented through automatic flow control devices within each WV/facility. These will feature solenoid valves within the cold-water supply to each area, linked to the occupancy sensors within the space. This will minimise water leaks and wastage from sanitary fittings.

6.4 Irrigation



External irrigation can also contribute towards significant water consumption if not appropriately managed. External planting on the 4th floor terrace and roof area, will utilise plants which are adapted to the local climate and can rely on precipitation alone for the majority of the year.

The incorporation of a **blue roof** can offer temporary storage of rainfall to mitigate runoff impacts and storage for reuse such as irrigation.

6.5 Sustainable Urban Drainage

A surface water drainage assessment has been carried out for the development to examine opportunities to reduce the overall level of flood risk through the appropriate application of sustainable drainage systems. The assessment demonstrates that there is scope for various SuDS features that can restrain run-off, in accordance with Policy CC3 of the Camden Local Plan, to mitigate the risk of future surface water flooding, taking into account potential climate changes.

Further details on the development's can be found in the Surface Water Drainage Assessment & Outline SuDS Strategy issued by LBHGEO in January 2021.

7.0

Materials

7.0 Materials

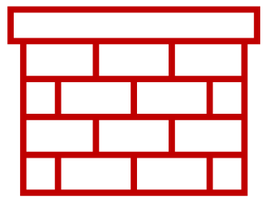
7.1 Responsible Sourcing & Procurement

All timber used for basic or finishing building elements in the scheme will be sourced from responsibly managed and sustainable forests or plantations. Such timber products are the only truly renewable construction material in common use and the responsible management of forests for timber helps to lock in CO_2. By maximising the use of timber for structural or finishing purposes the embodied carbon impact of the development can be reduced.

The development recognises the importance of using locally sourced materials, which it will aim to consider throughout the design. Preference will be given to locally sourced materials wherever practical. Materials will be sourced from reasonable sources where possible, including ISO 14001 and BES 6001.

Much of the responsibility for materials procurement falls to the contractor, therefore they will aim to procure all materials in accordance with a documented sustainable procurement plan. This sets out a clear framework for the responsible sourcing of materials to guide those involved in the specification and procurement of materials throughout a project. It is intended to identify risks & opportunities against a broad range of social, economic & environmental issues, and provide a strategic assessment of sustainably sourced materials available locally or nationally. This will also contain a policy to procure materials locally where possible. This is to reduce the environment impacts and CO_2 emissions associated with transportation to the site.

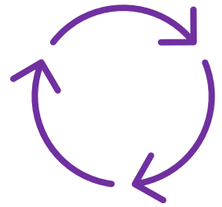
7.2 Durability and Resilience



In order to ensure the longevity of the materials used in the building construction and avoid the need for replacement, durability & protection measures will be specified where appropriate. This will prevent damage to vulnerable parts of the building, such as high pedestrian traffic areas, external vehicular collision and areas with internal vehicle/storey movement.

The building elements will also be designed to incorporate appropriate measures to limit material degradation due to environmental factors. This includes degradation due to factors such as temperature variation, water/moisture damage, pollutants etc.

7.3 Material Efficiency



Material use will be reduced or optimised through design, specification and construction techniques. Targets will be set and monitored throughout the construction process to achieve the objective. This is to reduce the environmental impact through optimising the use of materials during all stages of the project.

7.4 Healthy Materials

Volatile organic compounds (VOCs) are emitted as gases (commonly referred to as off-gassing) from certain solids or liquids. VOCs include a variety of chemicals, some of which are known to have short-term and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.

VOCs are emitted by a wide array of products numbering in the thousands. Examples include paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials, furnishings, adhesives, Urea-formaldehyde foam insulation (UFFI), pressed wood products (hardwood plywood wall panelling, particleboard, fibreboard) and furniture made with these pressed wood products.

'No' or 'low' VOC paints are available from most standard mainstream paint manufacturers. The 'eco-friendly' paints are made from organic plant sources and powdered milk-based products.

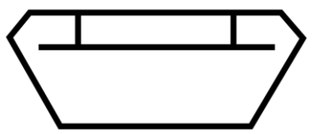
The design team will select internal finishes and fittings with low or no emissions of VOCs and comply with European best practice levels as a minimum.

8.0

Waste

8.0 Waste

8.1 Construction Waste Management



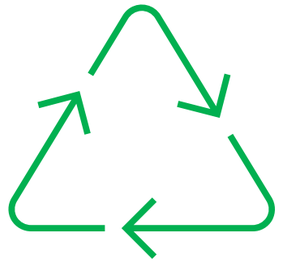
During the construction phase, a large amount of waste material will be generated through construction, demolition and land clearing procedures. In building construction, the primary waste products in descending percentages are wood, asphalt/concrete/masonry, drywall, roofing, metals, and paper products.

Prior to commencement on site a Resource Management Plan (RMP) that complies with the requirements of current legislation and BREEAM will be prepared. This plan will identify the local waste haulers and recyclers, determine the local salvage material market, identify and clearly label site spaces for various waste material storage and require a reporting system that will quantify the results and set targets. As a minimum, the RMP will contain:

1. The target benchmark for resource efficiency i.e. m^3 of waste per $100m^2$ or tonnes of waste per $100m^2$.
2. Procedures and commitments to minimise non-hazardous waste in line with the target benchmark.
3. Procedures to minimise hazardous waste.
4. A waste-minimisation target and details of waste minimisation actions to be undertaken.
5. Procedures to estimate, monitor, measures and report on hazardous and non-hazardous site waste and demolition waste, where relevant, arising from work carried out by the principal contractor and all subcontractors. Waste data obtained from licensed external waste contractors needs to be reliable and verifiable, i.e. using data from EA/SEPA/EA Wales/NIEA waste return forms or from a PAS402 compliant company.
6. Monthly reporting of all construction waste data throughout the project checked against what would be expected based on the stage of the project, invoices, etc., to validate completeness of waste reporting data.
7. Procedures to sort, reuse and recycle construction waste into defined waste groups, either on site or through a licensed external contractor.
8. Procedures to review and update the plan.
9. The name or job title of the individual responsible for implementing the above.

The development's target is to achieve more than 90% of construction waste be diverted away from landfill.

8.2 Operational Waste



The detailed design phases will identify the potential waste streams that the development will produce. As a minimum, plans will be formulated to handle the separation, collection, and storage of common recyclable materials such as paper, glass, plastics, and metal. The collection points will be easily accessible to all users.

The main aim will be to recycle as much waste as possible, this will be achieved by making sure that waste recycling facilities are strategically placed in convenient locations.

Dedicated storage space for recyclable materials generated by the site during occupation, will include the following:

- Be clearly labelled to assist with segregation, storage and collection of the recyclable waste streams.
- Be placed within accessible reach to building occupants or facilities operators for the deposit of materials and collections by waste management contractors
- Of a capacity appropriate to the building type, size, number of units (if relevant) and predicted volumes of waste that will arise from daily or weekly operational activities and occupancy rates.

9.0

Land Use & Ecology

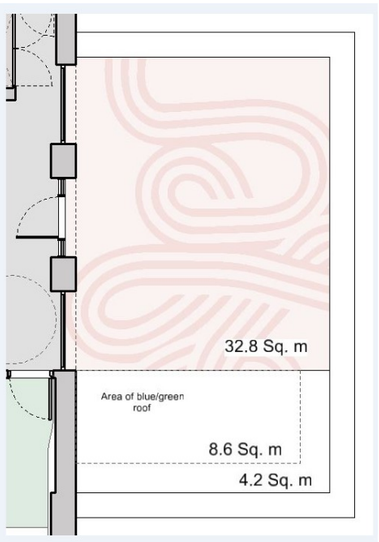
9.0 Land Use & Ecology

Biodiversity of wildlife, plants and their habitats is a vital component of healthy, well-functioning ecosystems, which in turn sustain all life on the planet.

In response to the ecological emergency developments should aim to increase local ecology and diversity.

The development's proposed front square and terraced area will be used as amenity area offering the occupants vital outdoor space. The 4th floor terrace and roof will offer potential for a garden and green roof that will create a microclimate and enhance biodiversity of the site. This achieves an urban greening factor of 0.2.

For more details refer to the Design & Access Statement issued by Piercy&Company.

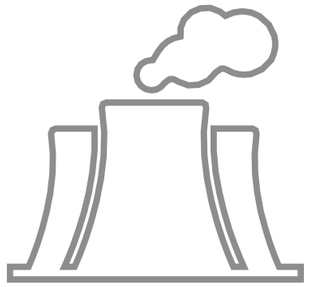


10.0

Pollution

10.0 Pollution

10.1 Local Air Pollution



Global concern for environmental pollution has risen in recent years, as concentrations of harmful pollutants in the atmosphere are increasing. Buildings have the potential to create major pollution both from their construction and operation, largely through pollution to the air (dust emissions, NOx emissions, ozone depletion and global warming) but also through pollution to watercourses and ground water. The proposed development will aim to minimise the above impacts, both at the design state and onsite.

The development will feature no on-site combustion for the provision of heating and hot water. All services will be electrically driven. As well as supporting the development's net zero carbon aspirations, this has the added benefit of negating its impact on local air quality.

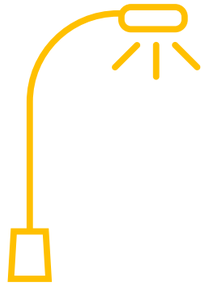
Further details of the development's response to air quality can be found in the Air Quality Assessment.

10.2 Sustainable Urban Drainage

A flood risk assessment (FRA) and Drainage Strategy has been prepared for this development in support of the planning application. The FRA is used to establish the risk of flooding to the development and from the proposed development to the vicinity.

Further details on the site's flood risk and sustainable drainage strategy can be found in the Surface Water Drainage Assessment & Outline SuDS Strategy issued by LBHGEO in January 2021.

10.3 Light Pollution

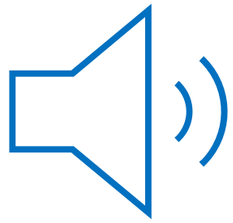


External lighting encompasses vehicle and pedestrian access lighting, security lighting, facility illumination and general feature lighting. The lighting will be designed on a site wide basis to meet the mandatory requirements and aesthetic considerations. The strategy is to provide a balance between adequate external lighting for safe and secure operation of the site without unnecessary illumination or power consumption.

The intention is to be a good neighbour and not to introduce nuisance glare or light pollution of the night sky from misdirected or unnecessary lighting. Feature lighting, where required, will be focussed to the task/subject. Where necessary, luminaires will be further screened in cases where there may be an issue of proximity and light spill to the adjacent neighbouring residential areas, although the intention is to avoid this situation wherever possible from the outset. The external lighting design will take into consideration the relevant guidance from the British Standards and other recommended documents including the following Standards and Design Guides:

- CIBSE Lighting Design Guides
- BS5489 Code of Practice for the Design of Road Lighting
- BS EN 13201-1&2 Road Lighting
- Institute of Lighting Engineers Guidance for Reduction of Obtrusive Light

10.4 Noise Pollution



New developments can have an adverse impact on their local surroundings by creating nuisance noise that did not exist before. It is therefore important to understand and limit these noise to avoid disturbances.

Any new items of building services plant will need to be selected, mounted and attenuated such that the local authority noise criteria are achieved. It is proposed that noise from any new items of building services plant associated with the development be designed to meet the BS4142:2014 requirements.

For more details refer to the Environmental Noise Report Rev C issued by Cundall in February 2021.

11.0

Environmental Certification

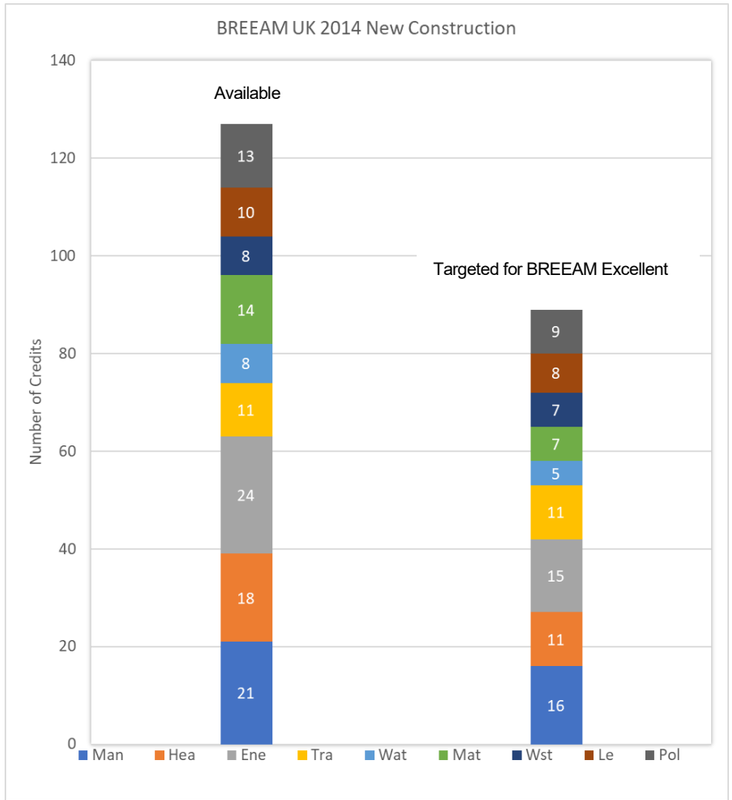
11.0 Environmental Certification

As part of the Proposed Development a review into appropriate environmental certification options has been undertaken.

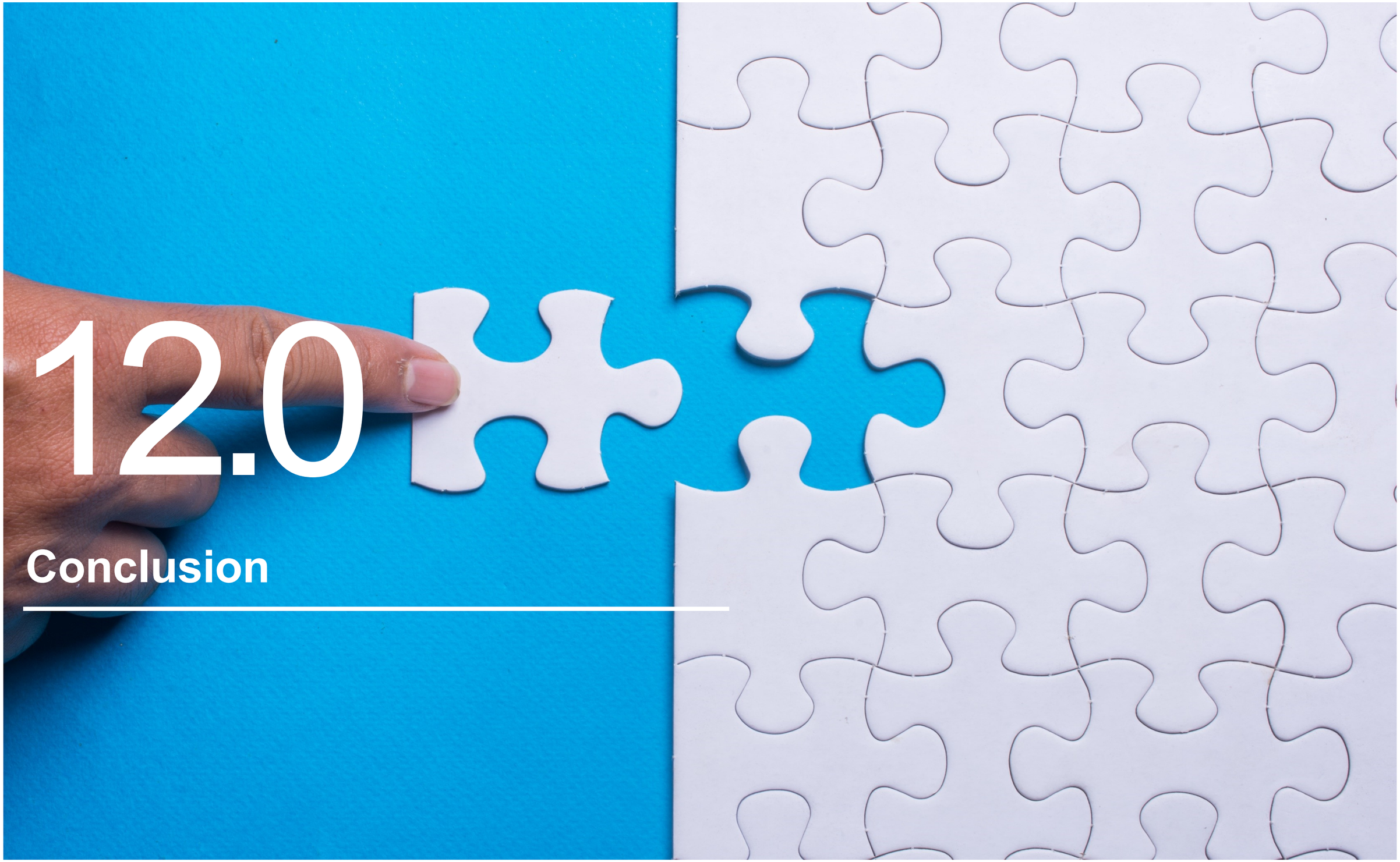
Camden Council Policy CC2: Adapting to climate change states that all major non-domestic developments of 500 m^2 of floorspace or above must achieve at least 'Excellent' in BREEAM assessments.

As such a pre-liminary review into the feasibility of achieving BREEAM UK 2014 New Construction (NC) has been undertaken for the development.

The below graph presents how the development may be able to align to the BREEAM 'Excellent' aspiration. However, this is subject to further design considerations that will be explored as the design develops.



BREEAM Category	Commentary
Management	The design team are undertaking consultation with the relevant end users and project delivery team. Further to this a BREEAM AP has been involved in the development of a project specific sustainability strategy. Responsible construction practices will be implemented, where monitoring and management of on-site operations will limit the local environmental impact and disturbance to neighbours. Commissioning will be planned and managed for all building services in line with best practice guidelines. This will include seasonal commissioning. An extensive handover process will occur to the building management team and operational users.
Health & Wellbeing	Glare has been designed out in the relevant places through the incorporation of blinds, coupled with the internal and external lighting systems being designed to avoid flickers and provide appropriate illuminance for the tasks in the relevant spaces. The building ventilation strategy is being designed to effectively managing the indoor air quality and meet the needs of the buildings' occupants. Thermal and acoustic comfort is being considered as part of the development, alongside a focus upon the necessary security needs of the site.
Energy	Significant improvements are being made to all buildings' operational energy usage, which will in turn to reduce the carbon emissions. An extensive energy metering system will be installed to enable energy consumption to be assigned to the various end uses. A feasibility review has been undertaken to establish the most appropriate on-site low or zero carbon energy sources. This has resulted in a heat pump-based heating, cooling and hot water solution being utilised for the development. The internal transport demand is being reviewed and the optimum number and size of lifts has been incorporated.
Transport	The public transport accessibility for the site is high as well as the proximity of and accessibility to local amenities. An operational travel plan will be developed that will be specific to the development's requirements.
Water	Potable water demand will be reduced through the provision of efficient sanitary fittings. Mains water supply will have suitable water meters as well as a water leak detection system to minimising the water consumption. The flow controls devices will be fitted to the relevant building areas to limit water consumption when not in use.
Materials	The life cycle environmental impact has been reduced due to the high levels of reuse of materials. Insulation that will be used in the development will look to have a low embodied environmental impact relative to its thermal properties. The development is designed to be durable and resilience to the everyday operations of the development.
Waste	Waste will be reduced through all stages of the building development, through reuse and recycling where possible. The amount of waste generated during the on-site construction will be limited and where waste is generated it will be diverted from landfill as far as possible. Operational waste facilities will be provided to manage and segregate the various operational waste streams.
Land Use & Ecology	Steps are being taken to enhance sit ecology. This is driven by the local authority's requirements and will include a management plan to encourage improvement in the site's long-term biodiversity.
Pollution	NOx emissions have been significantly reduced as combustion at the site has been limited. A flood risk assessment and surface water management strategy will increase the development resilience to flooding and effectively manage surface water. Measures have been incorporated to reduce the likelihood of disturbance arising as a result of noise from fixed installation of the development



12.0

Conclusion

12.0 Conclusions

155 Regent's Park Road development's energy and sustainability approach is aligned with the Camden Council's planning requirements and the GLA's London Plan requirements.

In accordance with the GLA Energy Assessment Guidance (October 2018), for these calculations the SAP 10 emission factors have been used to present the results. The energy strategy has been developed by following the energy hierarchy; Be Lean, Be Clean and Be Green.

- 'Be Lean' - **Energy demand** will be reduced by achieving a well-insulated envelope which is both airtight and thermal bridge free. High performance glazing provides a positive energy balance whilst mechanical ventilation with heat recovery maintain good air quality with minimal heat loss. **Energy efficient** building systems such as LED lighting and low-power fans and pumps will further drive down regulated energy use. Robust quality control, commissioning and handover procedures on site will further drive down energy use.
- 'Be Clean' - Combined heat & power was considered however this has been discounted due to poor base load and desire to avoid on-site combustion of fossil fuels. Connection to the district heating scheme was also considered however the distance from the existing network means connection would be infeasible.
- 'Be Green' - The remaining energy demand will be met through l**ow and zero carbon** energy sources. The development's heating, cooling and hot water needs will be provided through efficient air-source heat pumps.

Through the above measures, the development achieves the required carbon emissions reduction, which surpasses those outlined in the GLA's guidance.

In line with London Plan's and Camden Council's policies, other sustainability measures include:

- **Good daylight** will be achieved in occupied spaces through the balanced and considered use of glazing. External shading will be used where required to prevent excessive heat gain, whilst high performance glazing will reduce energy loss.
- High noise levels on site preclude the use of openable windows, therefore, the development will be mechanically cooled to maintain **thermal comfort**.
- Mechanical ventilation with heat recovery will be used to maintain a consistent supply of filtered fresh air to maintain good **indoor air quality**. Low VOC materials and finishes will minimise internal sources of pollutants.
- The promotion of **walking and cycling** with strong connection links from the site to the surrounding area. This is further supported with the provision of cycle storage facilities for occupant use.
- Good **public transport** links in the immediate vicinity with further national links in the nearby city centre.
- **Water efficient** fixtures and fittings will be specified to reduce water consumption below the levels required for national building regulations.
- **Metering and sub-metering** of consumption will enable ongoing, targeted reductions in water use.
- **Leak detection and shut-off** will prevent both major and minor leaks within the buildings as well as in external areas.
- The need for **irrigation** will be minimised through appropriate landscaping which are adapted to the UK's conditions.
- All **timber** used in the project will be from a responsible or sustainable source, using certified FSC or PEFC sources.
- To ensure **responsible and sustainable procurement**, materials will be specified in line with a documented sustainable procurement plan. This will the include the use of certification schemes such as ISO14001 and BES 6001.
- Materials that are **durable and resilient** will be specified to maximise their life-span and avoid the need for disposal and replacement.
- The use of a **Resource Management Plan** will set targets for resource efficiency and procedures for waste management.
- Appropriate and accessible **waste facilities** will be provided to encourage occupants to recycle waste effectively.
- Using the 4th floor terrace and roof area to integrate biodiversity and create a microclimate for planting, green walls and rainwater gardens.
- **Diversity of planting** to create valuable habitat throughout the seasons.
- The incorporation of a **blue roof** can offer temporary storage of rainfall to mitigate runoff impacts and storage for reuse such as irrigation.
- The site will feature no **on-site combustion** for heating and hot water which would be detrimental to local air quality.
- **External lighting** will be designed to minimise the impact of light pollution. Light fittings will be specified with a reduced light spill and controlled using photocells and timeclocks to limit unnecessary operation.
- Limits to noise emitting plant to prevent impacts on its surroundings.
- Responsible construction practices to minimise resource use and the impact of noise, dust and pollution.

13.0

Appendices

Appendix A – Policy

A review into the anticipated statutory compliance requirements in relation to sustainability has been undertaken. A summary of the finds, applicable policies and likely necessary actions has been provided below. Full planning guidance and validation requirements should be sought from the project's planning consultant.

National Planning Policy Framework

The revised National Planning Policy Framework (NPPF) was published in February 2019 and sets out the government's planning policies for England and states a clear presumption in favour of sustainable development. The revised Framework replaces the previous NPPF published in July 2018.

The NPPF supports the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourages the reuse of existing resources, including conversion of existing buildings, and encourages the use of renewable resources.

The NPPF, Section 14 outlines its energy and climate change policies. New developments should be planned for in ways that:

- avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaption measures, including through the planning of green infrastructure; and
- can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

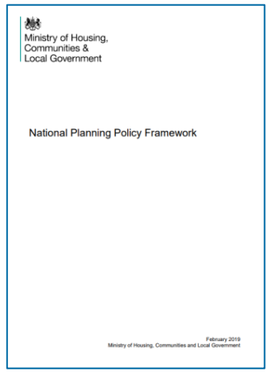
To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
- identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

In determining planning applications, local planning authorities should expect new development to:

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

The key focus of the NPPF is to support local and regional planning authorities.



Regional Policy

The Greater London Authority (GLA) London Plan 2016 and the GLA's Guidance on Preparing Energy Assessments October 2018 document are the benchmark for London planning regulation. Together they provide a useful tool to undertake energy and sustainability assessments.

The GLA Energy Assessment Guidance (October 2018) looks to standardise how energy assessments for developments within London are presented and reported. As part of the this process the guidance from January 2019 referable developments are encouraged to use the updated SAP 10 emissions factors while continuing to use the current Building Regulation methodology.

In December 2020, the Mayor released a new London Plan, the 'Publication London Plan'. It is currently under the final stages of the development process and it is likely to be formally adopted in February 2021. In relation to energy and sustainability the Plan looks to further push the requirements on referable developments. The policies considered in the preparation of the statement are mainly under Chapter 9: Sustainable Infrastructure and Chapter 10: Transport.

Policy SI 2: Minimising Greenhouse Gas Emissions requires that all 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 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

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.

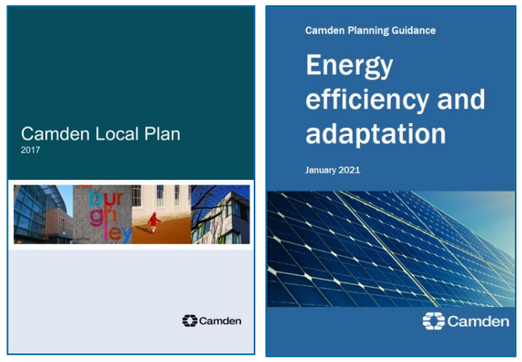
A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Non-residential development should achieve 15 per cent through energy efficiency measures.

Local Policy – Camden

The Camden's Local Plan (2017) and the Camden's Planning Guidance (CPG) on energy efficiency and adaptation (March 2019) are the main documents to support the planning decisions for developments within the London Borough of Camden.

The Camden's Local Plan, adopted in 2017, sets out the Council's planning policies and replaces the Core Strategy and Development Policies planning documents (adopted in 2010). The Council has also prepared the Camden Planning Guidance (CPG) Energy efficiency and adaptation (January 2021) to support the policies in the Camden Local Plan 2017.

The Local Plan includes the following policies regarding sustainable development:



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. Developments are required to:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;
c. ensure that the location of development and mix of land uses minimise he need to travel by car and help to support decentralised energy networks;
d. support and encourage sensitive energy efficiency improvements to existing buildings;
e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
f. expect all developments to optimise resource efficiency.

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:

a. the protection of existing green spaces and promoting new appropriate green infrastructure;
b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;
c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
d. 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. The Council will promote and measure sustainable design and construction by:

e. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;
f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;
g. 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
h. 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.

Policy CC3: Water and flooding – The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible. Developments are required to:

a. incorporate water efficiency measures;
b. avoid harm to the water environment and improve water quality;
c. consider the impact of development in areas at risk of flooding (including drainage);
d. incorporate flood resilient measures in areas prone to flooding;
e. utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and
f. not locate vulnerable development in flood-prone areas.

Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable.

Policy CC4: Air quality – The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough. The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan. Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.
Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.

Policy CC5: Waste – The Council will seek to make Camden a low waste borough. Developments are required to:

a. aim to reduce the amount of waste produced in the borough and increase recycling and the reuse of materials to meet the London Plan targets of 50% of household waste recycled/composted by 2020 and aspiring to achieve 60% by 2031;
b. deal with North London's waste by working with our partner boroughs in North London to produce a Waste Plan, which will ensure that sufficient land is allocated to manage the amount of waste apportioned to the area in the London Plan;
c. safeguard Camden's existing waste site at Regis Road unless a suitable compensatory waste site is provided that replaces the maximum throughput achievable at the existing site; and
d. make sure that developments include facilities for the storage and collection of waste and recycling.

Policy T1: Prioritising walking, cycling and public transport – The Council will promote sustainable transport by prioritising walking, cycling and public transport in the borough.
In order to promote walking in the borough and improve the pedestrian environment, the council will seek to ensure that developments:

a. improve the pedestrian environment by supporting high quality public realm improvement works;
b. make improvements to the pedestrian environment including the provision of high quality safe road crossings where needed, seating, signage and landscaping;
c. are easy and safe to walk through ('permeable');
d. are adequately lit;
e. provide high quality footpaths and pavements that are wide enough for the number of people expected to use them. Features should also be included to assist vulnerable road users where appropriate; and
f. contribute towards bridges and water crossings where appropriate.

In order to promote cycling in the borough and ensure a safe and accessible
environment for cyclists, the Council will seek to ensure that development:

g. provides for and makes contributions towards connected, high quality, convenient and safe cycle routes, in line or exceeding London Cycle Design Standards, including the implementation of the Central London Grid, Quietways Network, Cycle Super Highways and;
h. provides for accessible, secure cycle parking facilities exceeding minimum standards outlined within the London Plan (Table 6.3) and design requirements outlined within our supplementary planning document Camden Planning Guidance on transport. Higher levels of provision may also be required in areas well served by cycle route infrastructure, taking into account the size and location of the development;
i. makes provision for high quality facilities that promote cycle usage including changing rooms, showers, dryers and lockers;
j. is easy and safe to cycle through ('permeable'); and
k. contribute towards bridges and water crossings suitable for cycle use where appropriate.

Appendix B – Services Input

The tables below provide a summary of the fixed building services inputs used for the 'Be Lean' and 'Be Green' scenarios of the development.

System Detail	Be Lean	Be Green
Ventilation:		
Ventilation type	Central AHU	Central AHU
AHU SFP central (W/l/s)	1.6	1.6
Heat recovery type	Plate Heat Exchanger	Plate Heat Exchanger
Heat recovery efficiency type	75.0%	75.0%
Demand Control Ventilation	No	No
Ventilation FCU SFP terminal (W/l/s)	0.25	-
AHU leakage classification	Class L2	Class L2
Ductwork leakage classification	Class A	Class A
Space Heating:		
Space heating type 1 – Hotel rooms and bathrooms	Boilers	ASHP
Space heating emitters type 1	FCUS throughout	VRF
Space heating fuel type 1	Natural gas	Electric
Space heating seasonal efficiency type 1 (%) (SCOP)	94.0	4.0
Space heating type 2 – Toilets, stores	Boilers	Electric
Space heating emitters type 2	LTHW Radiators	Electric Radiators
Space heating fuel type 2	Natural gas	Electricity
Space heating seasonal efficiency type 2 (%)	94.0	100
Space Cooling:		
Space cooling type	Chiller	ASHP
Space cooling emitters	FCUs	VRF
Space cooling fuel	Electricity	Electric
Space cooling seasonal efficiency (SEER)	4.5	5.0
Space cooling nominal efficiency (EER)	4.5	5.0
Domestic Hot Water (DHW):		
DHW heating type	Boilers	ASHP
DHW heating fuel type	Natural gas	Electricity
DHW heating seasonal efficiency (%)	94.0	3.0
DHW heating storage volume (L)	2000.0	2000.0
DHW heating storage losses (kWh/(lday))	0.0026	0.0026
DHW secondary circulation type	Yes	Yes
Lighting:		
Luminaire efficacies (Lm/cW) – all areas	90	90
Luminaire display efficacies (Lm/cW) - reception	30	30
Lighting controls – Hotel rooms and bathrooms	Man on / man off + Automatic extinction signal	Man on / man off + Automatic extinction signal
Lighting controls - circulation, toilets	Auto on / auto off	Auto on / auto off
Time Switch (photoelectric / occupancy)	No / No	No / No
Parasitic power (photoelectric / occupancy)	0.1 / 0.1	0.1 / 0.1
Other:		
Pump speed	Variable Speed - Differential pressure sensors across pump	-
HVAC systems metering	Yes	Yes
HVAC systems out of range warning	Yes	Yes
Lighting systems metering	Yes	Yes
Lighting systems out of range warning	Yes	Yes
Power factor correction	>0.95	>0.95

Appendix C – Be Lean and Be Green BRUKL Documents

The BRUKL outputs and the supporting GLA spreadsheet can be provided in a zip file separately. The GLA spreadsheet confirms the results in both SAP 2012 & SAP 10 emission factors.

Be Lean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

155 Regents Park Road Hotel_Be Lean As designed

Date: Fri Feb 05 14:02:29 2021

Administrative information

Building Details

Address: 155 Regents Park Road, London,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Maria Papantoni

Telephone number: 020 7438 1600

Address: One Carter Lane, London, EC4V 5ER

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	58
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	58
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	56.5
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{b\text{-}Limit}$	$U_{b\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	0100000B:Surf[1]
Floor	0.25	0.12	0.12	01000037:Surf[0]
Roof	0.25	0.12	0.12	B1000017:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	0100000B:Surf[0]
Personnel doors	2.2	1.4	1.4	04000005:Surf[3]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	1.4	1.4	00000001:Surf[3]

$U_{b\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{b\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	3

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Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1946.6	1946.6
External area [m²]	2353.1	2353.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	827.03	1314.44
Average U-value [W/m²K]	0.35	0.56
Alpha value* [%]	10.12	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
100	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	24.58	29.4
Cooling	10.65	11.4
Auxiliary	32.11	28.34
Lighting	10.08	15.04
Hot water	113.24	110.91
Equipment*	62.35	62.35
TOTAL**	190.67	195.09

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	213.74	246.72
Primary energy* [kWh/m²]	326.34	335.16
Total emissions [kg/m²]	56.5	58

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

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Be Green

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

155 Regents Park Road Hotel_Be Green — As designed

Date: Fri Feb 05 10:01:38 2021

Administrative information

Building Details

Address: 155 Regents Park Road, London,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Maria Papantoni

Telephone number: 020 7438 1600

Address: One Carter Lane, London, EC4V 5ER

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	40.4
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	40.4
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	38.2
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{k\text{-}Limit}$	$U_{k\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	0100000B:Surf[1]
Floor	0.25	0.12	0.12	01000037:Surf[0]
Roof	0.25	0.12	0.12	B1000017:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	0100000B:Surf[0]
Personnel doors	2.2	1.4	1.4	04000005:Surf[3]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	1.4	1.4	00000001:Surf[3]

$U_{k\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{k\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1946.6	1946.6
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Average conductance [W/K]	827.03	1314.44
Average U-value [W/m^2K]	0.35	0.56
Alpha value* [%]	10.12	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
100	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	5.83	10.45
Cooling	10.13	11.4
Auxiliary	14.85	5.79
Lighting	9.29	15.04
Hot water	35.48	37.38
Equipment*	62.35	62.35
TOTAL**	75.57	80.06

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	213.43	246.72
Primary energy* [kWh/m^2]	226.2	238.1
Total emissions [kg/m^2]	38.2	40.4

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

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