B&Q Cricklewood

Outline Energy Assessment

Final Draft Issue

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MONTREAUX

MEINHARDT

B&Q CRICKLEWOOD

OUTLINE ENERGY ASSESSMENT

FINAL DRAFT ISSUE

Quality Assurance Page

Issue	Date	Prepared By	Checked By	Approved By	Remarks
P1	28//10/2019	Mr M.Bryan	Mr M.Bryan	Mr M.Taylor	Draft Issue
P2	08/11/2019	Mr M Bryan	Mr M Bryan	Mr M Taylor	For outline planning
P3	17/07/2020	Mr R Henry	Mr M Bryan	Mr M Bryan	Final Draft issue for comment
P4	29/07/2020	Mr M Bryan	Mr M Bryan	Mr M Bryan	For Issue

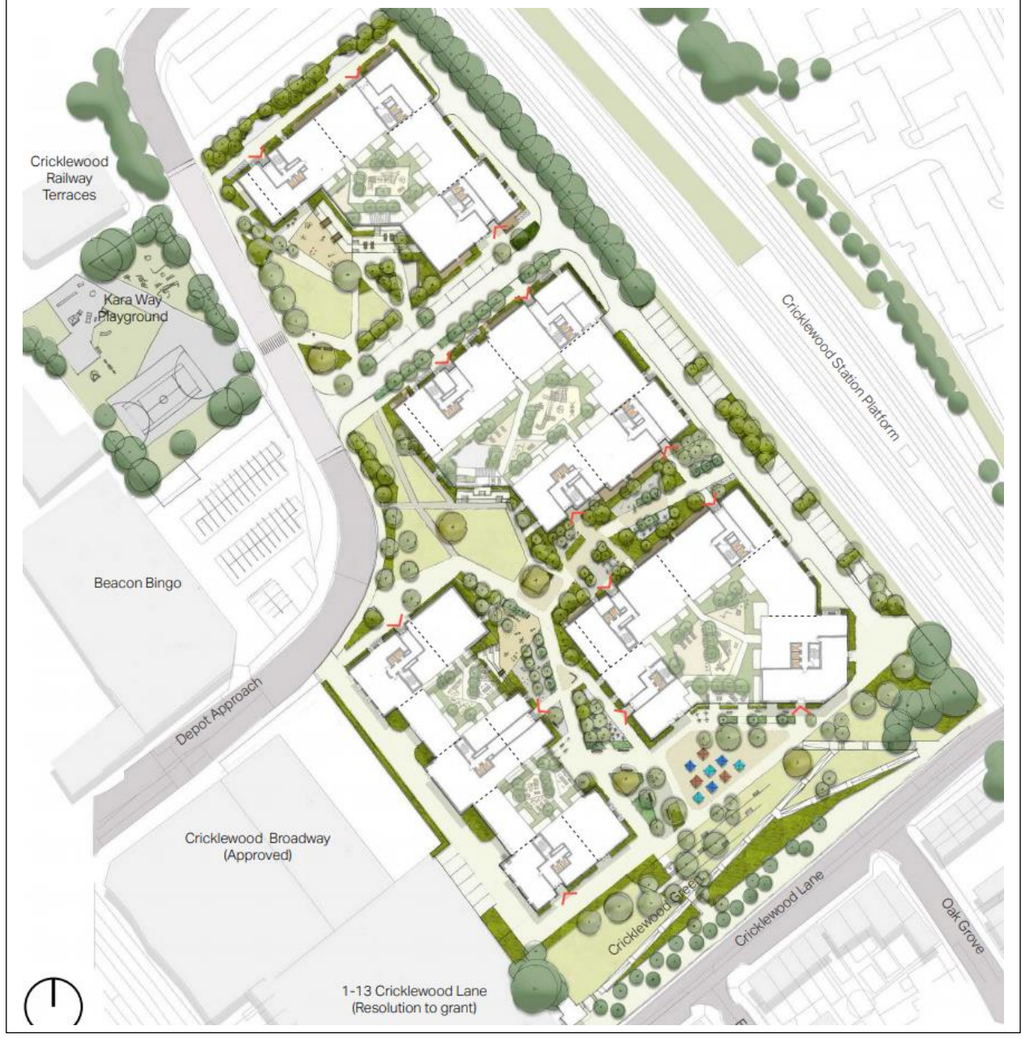


Figure 1: Illustrative Masterplan view of the proposed development

Table of Contents

EXECUTIVE SUMMARY

This report describes the outline energy and sustainability strategy for the proposed development at Cricklewood Lane on behalf of Montreaux Limited.

The Proposed Development is for outline planning application (including means of access with all other matters reserved) for the demolition of existing buildings and comprehensive redevelopment of the site for a mix of uses including residential C3 and flexible commercial and community floorspace in uses classes A3/B1/D1 and D2; car and cycle parking; and associated works.

Energy and sustainability is an integral part of the proposed development's outline design, and this report demonstrates how the scheme satisfies national, regional and local planning guidance in relation to sustainability and climate change mitigation/adaption.

Carbon Dioxide Reduction Targets

Barnet Council Local Plan Core Strategy (2012)

The Barnet Council Local Plan Core Strategy reflects policy applicable at that time (25 % CO_2 reduction) and its targets for major developments has effectively been superseded by later revisions of the London Plan.

London Plan (2016)

All new residential buildings should be 'zero carbon' and all non-residential buildings should achieve a minimum 40% improvement in regulated carbon dioxide emissions over Building Regulations Part L 2010 requirements, with 20% of the improvement provided through the use of on-site renewable energy generation wherever feasible.

Energy Assessment Guidance (October 2018)

Updated planning guidance has been published by the GLA in October 2018 on the preparation of energy assessments to clarify the requirements for compliance with the new policies of the Draft New London Plan.

This is an outline application therefore the following applies:

- Estimated site-wide regulated CO2 emissions
- Design commitments to regulated CO2 emissions for domestic and non-domestic uses.
- Design mitigation measures for overheating including the overheating checklist
- Investigations into the following;
    - Heat networks
    - Low/zero carbon technology
    - Renewable energy technologies
- Initial calculations for carbon offset payments.

Draft New London Plan (2019)

The 2016 London Plan remains part of the adopted Development Plan, but the Draft London Plan intended to publish version 2019 is a material consideration in planning decisions.

As stated above a zero-carbon target for the residential element of all major developments has been in place since October 2016. In the New London Plan the Mayor intends to introduce this target for non-residential development.

An on-site carbon reduction of at least 35% beyond the baseline of Part L 2013 is currently required, but this minimum improvement is expected to be increased over a period of time in order to achieve the zero-carbon London ambition and reflect the costs of more efficient construction methods.

Carbon Reduction Strategy

The outline energy strategy for the proposed redevelopment will follow the London Plan's energy hierarchy approach of 'Be Lean', 'Be Clean', 'Be Green'.

As this is outline stage, thermal modelling has yet to be undertaken in detail. Guidance on the quantum of CO_2 emissions reduction will be given in this outline statement and how to achieve those reductions only, including SAP calculation modelling which cannot be undertaken in detail as the apartment layouts are not drawn. Nevertheless this document commits the scheme to the associated carbon dioxide emissions reductions as in the GLA Energy Hierarchy, as shown below;

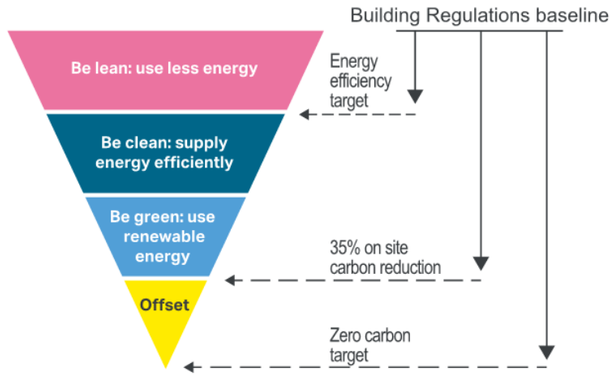


Figure 2: The energy hierarchy and associated targets

The proposed development will target an overall on-site reduction in carbon dioxide emissions in excess of the Draft New London Plan minimum requirement of 35% for both residential and non-residential. The residential aspect will then seek 'zero carbon' design standards, via passive, renewable energy and carbon offsetting measures.

Demand Reduction (Be Lean)

Energy demand will be significantly reduced beyond Part L requirements, and will target the GLA's aims in the Draft New London Plan for a minimum 10% reduction in residential carbon emissions and 15% in non-residential carbon emissions over Part L 2013 through passive design and energy efficiency measures alone.

The reduction will be achieved by a combination of measures, which shall include the following;

- Significantly improved fabric 'U' values
- Improved air tightness
- Minimising cold bridging
- Optimisation of size and g-value of the glazing to provide a balance between minimising heat gain and maximising natural daylight (to reduce lighting energy)
- Communal heating system to the building
- High efficiency ventilation systems including MVHR to residential apartments
- Minimising heat loss from heating and hot water systems
- Low energy lighting
- Controls systems to monitor and operate the plant and equipment as efficiently as possible
- Smart meters

It is expected that the residential elements of the scheme will achieve a carbon reduction of between 8 and 14% through passive design and energy efficiency measures alone, and the non-residential between 12 and 20%.

Information on the development's total energy demand (MWh/year) for each building use and the total Part L Fabric Energy Efficiency Standard (FEES) will be reported in reserve matters applications.

Heating Infrastructure (Be Clean)

The proposed development is close to an area identified for a potential community energy scheme (see below extract from the London Heat Map).

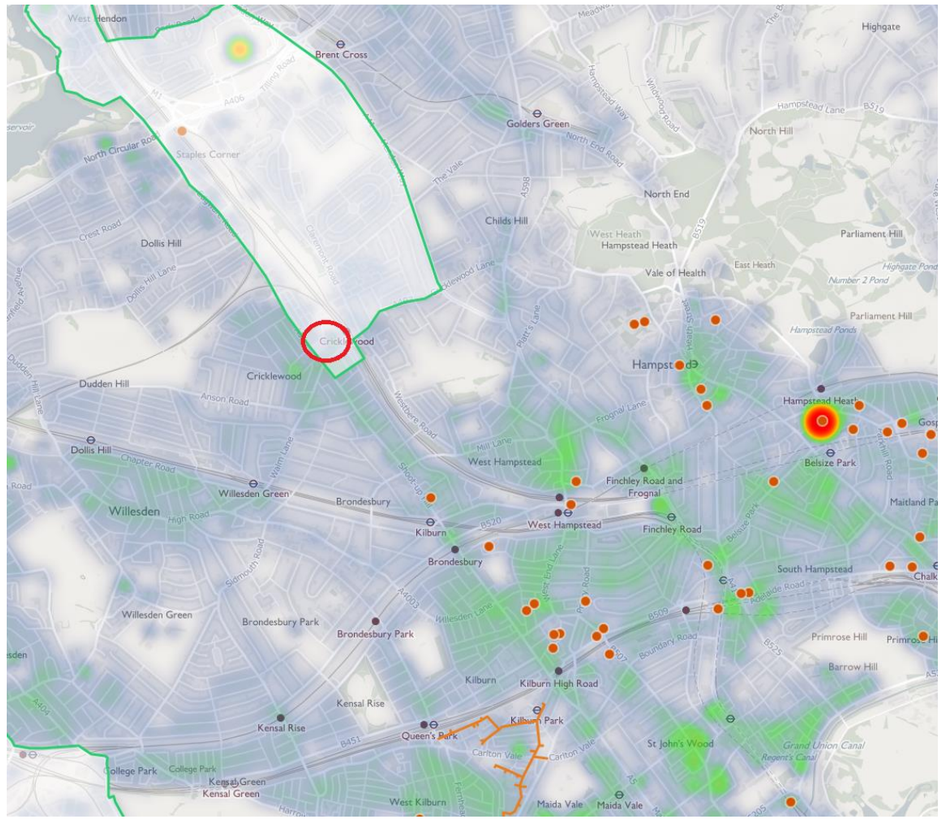


Figure 3: Extract from the London Heat Map

It is understood that there are no immediate plans to develop a heat network in the near future, so the site will be 'future proofed' to allow connection to a heat network should one be developed at a later date, as the site is in an opportunity area planning framework. Even future proofing the site, logistically the site will be hard to connect to from the heat hubs of Hampstead Heath and Brent Cross due to the main train line dissecting possible routes across.

It is proposed to provide a site-wide heat network serving all parts of the development, fed by air source heat pumps, possibly an ambient loop system, subject to detailed design. This network would operate at a lower temperature than for a boiler/CHP system to maximise the efficiency of the heat pumps, with the domestic hot water temperature raised locally in each apartment by in apartment water-water heat pumps.

The number and location of the air source heat pump plant will need to be carefully designed in Reserve Matters Applications to allow the connectivity to a future wider borough network whilst minimising distribution losses across the site.

Each of the heat pump network will have the following provisions to allow connection to a future community heat network;-

- Space within Ground Floor zone for future community energy interfacing heat exchanger, pumps, controls etc.
- Provision to allow future community energy connecting pipework to be routed through from outside
- Spare ways on local electrical distribution boards for future electrical supplies to pumps, controls etc

Renewable Energy Systems (Be Green)

As stated above, heat pumps are proposed as the main heat source and the carbon savings generated will be reported under the Be Green stage of the hierarchy.

An assessment of the feasibility of including any further on-site renewable energy will be carried out.

Solar Photovoltaics (PV) are likely to be the most appropriate technology to supplement the air source heat pumps and will offer direct contribution to the developments overall energy requirements. Provision of PV panels will be assessed and maximised against the other project requirements such as roof plant, external amenity space and surface water run-off control.

Carbon Offset

The remaining regulated carbon dioxide emissions for the residential (to 100 per cent) elements of the scheme will be off-set through a cash in lieu contribution (of £60/Tonne for a period of 30 years) to the local planning authority to be ring fenced to secure delivery of carbon dioxide savings elsewhere.

Unregulated Energy

The energy demand and associated carbon dioxide emissions from unregulated uses, i.e. those not covered by the Building Regulations assessments (e.g. cooking and appliances), will be estimated using the BRE Domestic Energy Model (BREDEM) for the residential elements and using data from CIBSE Guide F and CIBSE TM50 for non-residential.

An assessment will be carried out to determine how unregulated energy and carbon dioxide emissions can be reduced through the use of energy efficient appliances and equipment, controls, good management practice, etc.

Overheating and Cooling

As requested in the Energy Assessment Guidance, Section 1 of the domestic overheating checklist is provided below and will be used to identify potential overheating risk and passive responses early in the design process.

Section 1 - Site features affecting vulnerability to overheating		Response
Site location	Urban – within central London or in a high density conurbation	
	Peri-urban – on the suburban fringes of London	**Peri-urban**
Air quality and/or Noise sensitivity – are any of the following in the vicinity of buildings?	Busy roads / A roads	**Yes**
	Railways / Overground / DLR	**Yes**
	Airport / Flight path	**No**
	Industrial uses / waste facility	**No**
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	**Not expected**
	Are residents likely to be at home during the day (e.g. students)?	**Not expected**
Dwelling aspect	Are there any single aspect units?	**Yes**
Glazing ratio	Is the glazing ratio (glazing: internal floor area) greater than 25%?	**Yes**
	If yes, is this to allow acceptable levels of daylighting?	**Yes**
Security - Are there any security issues that could limit opening of windows for ventilation?	Single storey ground floor units	**No**
	Vulnerable areas identified by the Police Architectural Liaison Officer	**No**
	Other	

The proposed redevelopment will be assessed in accordance with the cooling hierarchy detailed in policy 5.9 of the London Plan and the latest Energy Assessment Guidance, in order to reduce overheating and minimise the use of air conditioning.

Future Reserve Matters applications, the residential assessment should include dynamic thermal modelling on a representative sample of apartments to assess the risk of overheating, in accordance with the guidance and data sets in CIBSE TM49 and TM59 guidance. The guidance for this outline application is an architectural guidance no more than 40 % of the façade shall be glazed.

Non-domestic risk assessment for overheating will be made against the three criteria outlined in CIBSE TM52/TM59.

The area weighted average (MJ/m2) and total (MJ/year) cooling demand for the actual and notional building will be provided in Reserve Matters applications. The scheme will target reducing the actual building's cooling demand so that it is lower than the notional.

Monitoring

The on-going energy strategies in Reserve Matters applications will include information on how the building's energy performance will be monitored post-construction to enable occupants to monitor and reduce their energy use.

Environmental Standards

Barnet Council policy requires that major non-residential developments are to achieve a minimum Very Good rating under the most up-to-date version of BREEAM.

BREEAM pre-assessment(s) will be carried out to assess and confirm that a minimum rating of 'Very Good' is achievable, and that all mandatory elements can be met.

Sustainability Strategy

The proposed strategy in relation to sustainable design and construction has been prepared and will address the key issues such as certification, water use, drainage, flood risk, pollution, materials, waste, ecology, transport, management, health and wellbeing, accessibility.

The strategy will also detail how the proposed redevelopment responds to the Mayor's priorities and best practice set out within the Greater London Authority (GLA) Sustainable Design and Construction Supplementary Planning Guidance (April 2014).

Carbon Dioxide calculations

As this is an outline application detailed calculations have not been undertaken, however outline calculations have been followed and achieved the below reductions;

GLA energy hierarchy	tCO2 emissions	% reduction
Baseline	1848	
Be Lean	1663	10
Be Clean	1016	45
Be Green	996	46.1
Carbon Offset (£)	1,793,647	100

Residential CO2 reductions

GLA energy hierarchy	tCO2 emissions	% reduction
Baseline	2283	
Be Lean	2033	10.9
Be Clean	1312	42.5
Be Green	1292	43.3
Carbon Offset (£)	1,793,647	

Site wide CO2 reductions

A detailed Energy Strategy and CO_2 reductions for each phase will be submitted with each Reserve Matters Application..

1 Introduction

1.1 This Application

This Energy Assessment and Sustainability Strategy report has been prepared by Meinhardt on behalf of Montreaux Ltd (“the Applicant”) to accompany an Outline Planning Application that has been submitted to Barnet Council (Local Planning Authority) for the redevelopment of Cricklewood Way, NW2 London (the “Site”).

1.2 This Energy Assessment and Sustainability Strategy

The purpose of this Outline Energy Assessment and Sustainability Strategy is to demonstrate that B&Q Cricklewood has been developed and will continue to develop in accordance with the relevant local, regional and national planning policies in terms of energy and sustainability.

1.3 Project Team

Client:	Montreaux
Architect:	EPR
Planning Consultant:	Iceni Projects
Energy and Sustainability:	Meinhardt (UK) Ltd
Building Services and Utilities:	Meinhardt (UK) Ltd
Landscape Architect：	Exterior Architecture
EIA	AECOM
Townscape:	Montagu-Evans

2 Scheme Overview

2.1 Site and Surroundings

The site is adjacent to Cricklewood rail station, which connects to Central London and surrounding areas. The site is currently used for retail provision with associated car parking. A background utilities assessment has shown that the all the major infrastructure are on the site boundaries including, gas, electric and water. Local Low Voltage electrical infrastructure runs across the site (to current store). There is a medium pressure gas main to the South East of the site but shall not impact upon potential construction matters.

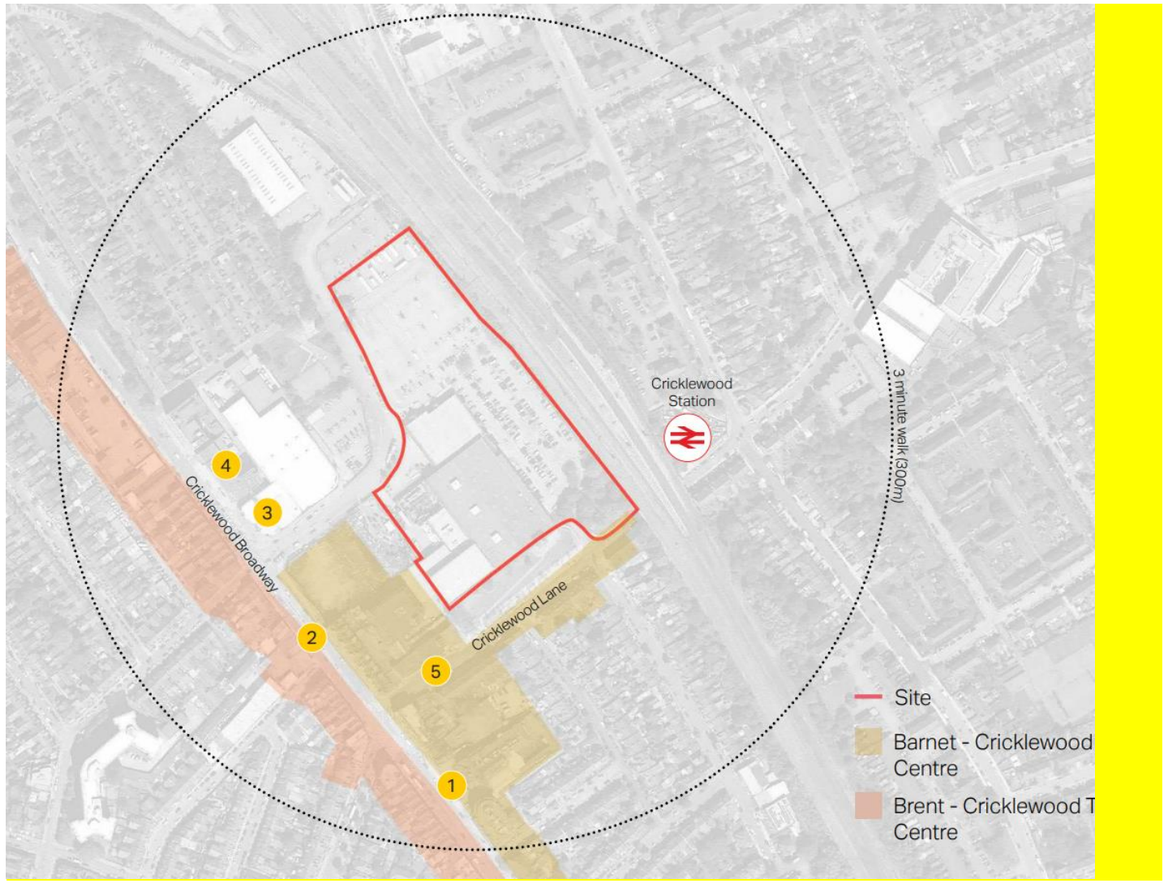


Figure 4: Aerial view of the existing site

2.2 Proposed Redevelopment

The Proposed Development is for outline planning application (including means of access with all other matters reserved) for the demolition of existing buildings and comprehensive redevelopment of the site for a mix of uses including residential C3 and flexible commercial and community floorspace in uses classes A3/B1/D1 and D2; car and cycle parking; and associated works.

3 Planning Policy

3.1 National

3.1.1 National Planning Policy Framework (2019)

The National Planning Policy Framework (NPPF) set out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.

3.1.2 Building Regulations

The Building Regulations set out the statutory standards that developments are to meet. These standards cover measures including energy efficiency, water efficiency, sound resistance and ventilation.

Part L of the Building Regulations covers energy efficiency requirements.

The current version of Part L was issued in 2013 (with minor amendments in 2016).

3.2 Regional

3.2.1 The London Plan (2016)

The London Plan is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years.

It brings together the geographic and locational aspects of the Mayor's other strategies, including those dealing with transport, economic development, housing, culture, a range of social issues, and a range of environmental issues (including climate change, air quality, noise and waste)

3.2.2 Draft New London Plan (2019)

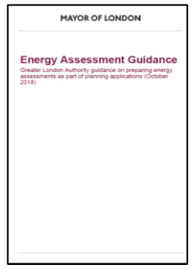
The current 2016 Plan is still the adopted Development Plan, but the Draft London Plan is a material consideration in planning decisions.

The final version is expected to be published in February/March 2020.

3.2.3 Sustainable Design and Construction SPG (2014)

The Sustainable Design and Construction SPG provides guidance on how to achieve the goals set in the London Plan, in relation to land use, site layout and building design, energy and carbon dioxide emissions, renewable energy, water efficiency, materials and waste, nature conservation and biodiversity, flooding and pollution.

3.2.4 Energy Assessment Guidance (2018)



This guidance note explains how to prepare an energy assessment to accompany strategic planning applications.

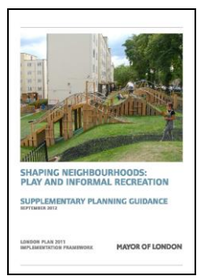
The purpose of an energy assessment is to demonstrate that the proposed climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the development's design and evolution.

3.2.5 Housing SPG (2016)

This supplementary Planning Guidance (SPG) provides guidance on the implementation of housing policies in the 2015 London Plan and the 2016 Minor Alterations to the Plan (MALP).

The guidance covers housing supply, housing quality, housing choice, viability appraisals, investment and existing housing stock, social infrastructure, and mixed use/large developments.

3.2.6 Shaping Neighbourhoods: Play and Informal Recreation SPG (2012)



The Play and Informal Recreation SPG provides more detailed guidance relating to the implementation of London Plan Policy 3.6 and a range of policies on shaping neighbourhoods (see Chapter 7 of the London Plan).

3.2.7 Shaping Neighbourhoods: Accessible London SPG (2014)

The Accessible London SPG provides advice to boroughs, developers, designers and planning applicants on implementing inclusive design principles effectively and on creating an accessible environment in London, with particular emphasis on the access requirements of disabled and older people.

3.2.8 Social Infrastructure SPG (2015)

The Social Infrastructure SPG provides guidance to support London Plan Policy 3.16 on the Protection and Enhancement of Social Infrastructure, as well as policies 3.17 Health and Social Care Facilities, 3.18 Education Facilities and 3.19 Sports Facilities.

It particularly focuses on those elements of social infrastructure that face the biggest strategic challenges - specifically health, education, sport, faith and burials.

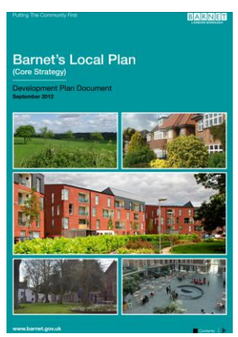
3.2.9 The Control of Dust and Emissions During Construction and Demolition SPG (2014)

This document provides more detailed guidance on the implementation of all relevant policies in the London Plan and the Mayor's Air Quality Strategy.

It sets out the methodology for assessing the air quality impacts of construction and demolition in London and identifies good practice for mitigating and managing air quality impacts, with the overarching aim of protecting public health and the environment

3.3 Local

3.3.1 Local Plan - Core Strategy (2012)



Barnet's philosophy is to ensure protection and enhancement of what is good, consolidation of building work in the pipeline and ensure the provision of supporting infrastructure. It sets out plans and controls further re-development and to manage change, throughout the borough for the benefit of residents. The policies in the Core Strategy will shape the suburb in the future, help create attractive new buildings and neighbourhoods by providing the policy framework to restrict inappropriate increases in urbanisation.

4 Establishing Energy Demand and Emissions

4.1 Carbon Reduction Targets

4.1.1 London Plan (2016)

The London Borough of Barnet Development Plan reflects the carbon reduction targets of the London Plan (2016).

All new residential buildings should be 'zero carbon' and all non-residential buildings should achieve a minimum 40% improvement in regulated carbon dioxide emissions over Building Regulations Part L 2010 requirements, with 20% of the improvement provided through the use of on-site renewable energy generation wherever feasible.

4.1.2 Draft New London Plan

The 2016 London Plan remains part of the adopted Development Plan, but the Draft London Plan intended to publish version 2019 is a material consideration in planning decisions.

As stated above a zero-carbon target for the residential element of all major developments has been in place since October 2016. In the New London Plan the Mayor intends to introduce this target for non-residential development.

An on-site carbon reduction of at least 35% beyond the baseline of Part L 2013 is currently required, but this minimum improvement is expected to be increased over a period of time in order to achieve the zero-carbon London ambition and reflect the costs of more efficient construction methods.

4.1.3 Energy Assessment Guidance (October 2018)

Updated planning guidance has been published by the GLA in October 2018 on the preparation of energy assessments to clarify the requirements for compliance with the new policies of the Draft New London Plan.

This guidance confirms that these policies should be implemented as follows;-

- The residential element of major development applications should achieve at least a 35 per cent reduction in regulated carbon dioxide emissions (beyond Part L 2013) onsite. The remaining regulated carbon dioxide emissions, to 100 per cent, are to be offset through a cash-in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.
- The non-residential elements should achieve at least a 35% reduction in regulated carbon dioxide emissions (beyond Part L 2013).
- Developments are expected to achieve carbon reductions beyond Part L from energy efficiency measures alone to reduce energy demand as far as possible. Residential development should aim to achieve 10% and non-residential development should aim to achieve 15% over part L.

4.2 Modelling

4.2.1 Residential

Building Regulations Part L1A SAP outline calculations have been undertaken, using Stroma FSAP 2012 software across the site. To note as this is an outline application detailed SAP calculations cannot be undertaken as internal layouts have not be confirmed at this stage. Outline SAP calculations have been undertaken to demonstrate Carbon Dioxide savings.

4.2.2 Non-Residential

CIBSE Guide F benchmarking data has been used for guidance on energy consumption and CO2 emissions for non-residential elements, for the following areas;

- Commercial units
- BOH office
- Residential entrance and circulation

4.2.3 Carbon Factors

Outputs are based on current Building Regulations carbon factors, however SAP 10 following GLA policy should be adopted when presenting Reserve Matters applications going forwards.

5 Passive Design and Energy Efficiency (Be Lean)

Energy demand will be significantly reduced beyond Part L requirements, and will be expected to exceed the GLA's target for a minimum 10% reduction in residential carbon emissions and 15% in non-residential carbon emissions over Part L 2013 through passive design and energy efficiency measures alone.

The demand reduction will be achieved by a combination of the measures including those detailed below;-

5.1 Building Fabric Insulation

The thermal performance of the building fabric will be significantly improved over Part L 2013 minimum requirements as below;-

Residential Fabric Element	Limiting 'U' Value (W/m^2 K)	Proposed 'U' Value (W/m^2 K)
External Walls	0.30	0.16
Floor	0.25	0.12
Roof	0.20	0.12
Glazing	2.00	1.3 (g-value 0.5)

Table 1: Proposed residential fabric 'U' values

Non-Residential Fabric Element	Limiting 'U' Value (W/m^2 K)	Proposed 'U' Value (W/m^2 K)
External Walls	0.35	0.16
Floor	0.25	0.12
Roof	0.25	0.12
Glazing	2.20	1.5 (g-value 0.3)

Table 2: Proposed non-residential fabric 'U' values

5.2 Cold Bridging

Cold bridging should be minimised to prevent the loss of heat and to prevent the development of cold spots which can lead to mould. Suitable construction details will be developed to ensure insulation continuity and to meet the air tightness targets detailed below.

5.3 Air Tightness

The target air permeability for the development has been set at 3 $m^3/(h\ m^2)$ at 50 Pa as compared to the Part L minimum requirement of 10 $m^3/(h\ m^2)$ to reduce heat loss in winter.

5.4 Natural Daylight

Natural daylight should be maximised wherever possible in the residential accommodation by arranging the living rooms and bedrooms as shallow spaces on the perimeter, by providing dual aspect glazing where possible, and by ensuring ceiling voids are as small as possible (particularly at the perimeter) to maintain the maximum floor to ceiling heights possible.

Increased floor to ceiling heights with full height glazing are generally provided to the ground floor commercial units and residential entrances.

5.5 Solar Gain

For the residential apartments the size and g-value of the glazing should be optimised using the SAP calculations and the dynamic thermal modelling for the overheating assessment, in order to provide a balance between minimising summer heat gain to prevent overheating, maximising winter heat gain to reduce heating loads, and maximising natural daylight to reduce lighting energy. This has resulted in the g-value of the residential glazing being set at 0.5.

The glazing for the non-residential areas should be optimised using the dynamic thermal modelling and SBEM calculations, which will result in the g-value of the non-residential glazing being set at 0.3.

5.6 Shading

Balconies are proposed to be provided to most of the proposed development which will provide a shading effect to the residential apartments to minimise peak solar gain.

The deep window reveals will also provide additional external shading.

5.7 Corridor Ventilation

Where natural means of ventilation cannot be utilised, mechanical ventilation will be used to ventilate the corridors to the minimum levels in winter. In reserve matters applications to demonstrate that the ventilation system does not affect overheating, thermal modelling calculations to TM59 should be undertaken.

5.8 Heating and Hot Water System Insulation

A high level of insulation (in excess of British Standards) will provided to all parts of the systems, in accordance with the recommendations of CIBSE CP1.

5.9 Heating Systems

It is proposed that the scheme be future proofed to connect to a district heating network should one be viable to do so in the future. The current design is based upon a centralised heat network which is formed on a low temperature network, led by heat pumps. Due to the height of the proposed development it will not be possible to control the flow of heat over 18 stories therefore each residential building where required will have heat pumps in ventilated ground floor areas and at roof top level.

5.10 Cooling

Active mechanical cooling is not proposed for the residential apartments, with the use of natural ventilation via openable windows to prevent overheating in summer.

5.11 Ventilation Systems

Residential apartments are provided with openable windows to allow occupants to ventilate via natural means to prevent overheating.

Ventilation to the residential apartments to provide fresh air and extract moisture/pollutants in accordance with Building Regulations Part F will be via individual Mechanical Ventilation with Heat Recovery (MVHR) units. Each unit will provide continuous supply and extract ventilation at a low air volume flow rate, and are expected to achieve a Specific Fan Power of less than 0.5 W/(l/s) and a heat recovery efficiency of greater than 90%.

Mechanical ventilation to the non-residential areas will also be provided with high efficiency heat recovery systems (thermal wheel or plate heat exchanger), and will operate at variable speed where possible to reduce fan energy.

5.12 Lighting

Energy efficient LED lighting will be used throughout the proposed redevelopment. Occupancy and daylight sensors will be used where appropriate.

5.13 Smart Controls / Metering

It is expected that residential apartments will be provided with an individual, programmable, zoned, control system, together with smart energy meters.

This will allow the display of energy use within individual units, assisting occupants to understand the way in which they consume energy and how much it costs, and encouraging them to turn off non-essential equipment or run some equipment at a lower capacity during times of peak demand.

A central Building Management System (BMS) will be provided to operate the ‘Landlord’ plant and systems in the most energy efficient manner.

5.14 Appliances

Where appliances are provided by the developer they will be of an energy efficient type, which generally generate less heat and can help minimise the build-up of heat within the buildings. Where appliances are not provided by the developer, owners/tenants will be encouraged to supply energy efficient equipment.

6 Community Energy and Heat Network (Be Clean)

6.1 Heat Network Overview

As described in the executive summary. The site is not located near to an existing heat network serving the area. However THE site has been identified as a possible heat network opportunity site, therefore a provision for a centralised heat network has duly been explored.

6.2 Secondary Building Network

The proposed development will be provided with a secondary building network which will connect all apartments, commercial and other non-domestic uses, and supply heat for space heating and domestic hot water generation. This secondary distribution within the development will be designed in accordance with CIBSE CP1 Heat Networks: Code of Practice.

A heating substation, containing heat pumps, will be provided for connection by the heat network operator, located within the allocated ground floor plant room, this area can act as a hydraulic break between the primary network and the secondary heating system that distributes heat throughout the building.

The system will operate with a variable volume and maximum temperature to satisfy the requirements of the tertiary system, which delivers the heat demand to the occupied spaces.

A high level of insulation (in excess of British Standards) will be provided to all parts of the systems, in accordance with the recommendations of CIBSE CP1.

7 Renewable Energy (Be Green)

An outline appraisal of potential on-site renewable energy systems has been undertaken for B&Q Crickelwood, Barnet with the following technologies considered:

- Biomass boilers
- Photovoltaics (PVs)
- Solar thermal
- Ground source heat pumps
- Air source heat pumps
- Wind Turbines

Each of these systems are presented in Appendix A.7, with the summary of the assessment below.

7.1 Biomass Boilers

Biomass boilers could provide a proportion of the space heating and hot water load, but would compete with a potential district heat network for the base heat load.

Biomass boilers are better operating as the lead heat source (and not as top up to the solar thermal) as they are not suited to operating with variable load.

Biomass boilers would also adversely impact on local air quality due to their emissions, and vehicular delivery of fuel would be required resulting in increased traffic movements.

Biomass boilers are therefore not proposed for the development.

7.2 Photovoltaics (PVs)

An active area of approximately 300 m^2 of photovoltaic panels with an efficiency of 16.5% would generate 42.8 kWp, spread across the site providing a saving of around 2 % regulated carbon dioxide emissions.

PVs would be a complimentary technology to the proposed heat network.

Photovoltaics are therefore proposed for the development.

The drawings in Appendix A.1 show the proposed location and arrangement of the panels.

7.3 Solar Thermal

A solar thermal system could provide a proportion of the hot water load, but would compete with the district heat network and or heat pumps for the base heat load.

Solar thermal is therefore not proposed for the development.

7.4 Ground Source Heat Pumps

A ground source heat pump system would compete with the district heat network for the base heat load, and would provide low grade heat which is not best suited to the redevelopment's main heat demand – domestic hot water.

The overall cooling load is low, resulting in a poor balance between heating and cooling demand, which would adversely impact on the potential yield from any ground source system.

Ground source heat pumps are therefore not proposed for the redevelopment.

7.5 Air Source Heat Pumps

If a potential district heating system is not deemed feasible for this scheme for this outline application, space planning has been planned for the utilisation of centralised air source heat pumps (ASHP) technology. Low temperature heat network (LTHW) pipework will distribute around the site, thus having the infrastructure available to connect to a district heating network should one be available.

Air source heat pumps are therefore proposed for the development.

7.6 Wind Turbines

Wind turbines would be a complimentary technology to the proposed district heat network, however, they would have significant architectural and townscape implications, together with potential noise.

Wind turbines are therefore not proposed for the redevelopment.

8 Unregulated Energy

This section outlines how non-regulated energy and carbon dioxide emissions will be reduced through the use of energy efficient appliances and equipment, controls, good management practice, etc.

8.1 Baseline

The energy demand and associated carbon dioxide emissions from unregulated uses, i.e. those not covered by the Building Regulations assessments (e.g. cooking and appliances), have been estimated using the BRE Domestic Energy Model (BREDEM) for the residential elements and using data from CIBSE Guide F and CIBSE TM50 for non-residential.

8.2 Demand Reduction (Be Lean)

An assessment has been carried out to determine how unregulated energy and carbon dioxide emissions can be reduced through the use of energy efficient appliances and equipment, controls, good management practice, etc.

8.2.1 Residential Cooking

The baseline energy demand and associated carbon dioxide emissions from BREDEM are assumed to be based on the use of appliances with a good standard of energy efficiency commonly available in the commercial market, such as 'A' rated electric ovens and 'D' rated cooker hood extract units.

More efficient appliances are easily available, and provision of 'A+' rated oven and a 'C' rated cooker hood extract units will be encouraged.

8.2.2 Residential Appliances/Equipment

The baseline energy demand and associated carbon dioxide emissions from BREDEM are assumed to be based on the use of appliances with a good standard of energy efficiency commonly available in the commercial market, such as 'A+' rated fridge/freezers, 'A++' rated washing machines, 'A+' rated dishwashers and 'A' rated televisions.

More efficient appliances are easily available, and purchasers/tenants will be encouraged to reduce energy demand by providing an 'A++' rated fridge/freezer, an 'A+++' rated washing machine, an 'A++' rated dishwasher and an 'A+' rated television.

Further reductions in unregulated energy can be achieved by owners/tenants of residential properties as detailed below. The potential savings are difficult to quantify as they are operational items. A reduction has not been included in this assessment, but owners/tenants will be encouraged to operate appliances as suggested.

Washing Machine and Dryer

Wash full loads rather than just a few items.

Use a temperature setting of 40°C or even 30°C where possible.

Reduce dryer use by using an outdoor line in summer and a drying rack in winter.

Use tumble dryer balls to reduce drying time.

Dishwasher

Fill the dishwasher before using.

Use the economy setting if available.

Kettle

Only boil the amount you need each time.

Oven

Limit the number of times the oven door is opened while cooking.

Hob

Use the smallest pot possible each time.

Use a lid.

Use stacked steamers.

General Appliances

Do not leave appliances on standby.

8.2.3 Commercial Cooking

The baseline energy demand and associated carbon dioxide emissions from CIBSE (typical practice) are assumed to be based on the use of appliances/equipment with a good standard of energy efficiency commonly available in the market.

Tenants will be encouraged to reduce energy demand and associated carbon dioxide emissions to achieve the CIBSE good practice benchmarks.

It is expected that the energy demand reduction will be achieved by a combination of measures including those detailed below.

- Both gas and electricity to be made available so that the most appropriate, energy efficient equipment can be selected by each tenant.
- Sub-metering of gas and electricity to each commercial kitchen to allow energy use to be monitored.
- Time controls installed on equipment to ensure it is only used during kitchen operation periods.

8.2.4 Non-residential Equipment/Small Power

Tenants will be encouraged to reduce energy demand and associated carbon dioxide emissions to achieve the CIBSE good practice benchmarks.

The table below details the breakdown of unregulated equipment/small power energy demand and associated CO_2 emissions following demand reduction.

It is expected that the energy demand reduction will be achieved by a combination of measures including those detailed below.

Commercial Space

- Energy efficient lamps to be used in electric insect killers
- Optimisation of refrigeration storage temperatures.
- Specification of refrigeration equipment to include (where possible) automatic defrost, self-closing doors, fan assistance (with auto shut-off and energy efficient fans), high performance insulation, and door open alarms.
- Energy efficient glass and dishwashers to be used.
- Energy efficient desktop PCs, laptops, screens etc to be used.
- Energy efficient sound systems to be used.

- Encourage staff to switch off equipment when not in use.

Residential Amenity

- Energy efficient TVs, white goods and other equipment to be used.
- Encourage residents to switch off equipment when not in use.

Residential Entrance/Office

- Energy efficient TVs, white goods and other equipment to be used.
- Energy efficient desktop PCs, laptops, screens etc to be used.
- Encourage staff to switch off equipment when not in use.

Residential Entrance

- Energy efficient TVs, white goods and other equipment to be used.
- Energy efficient desktop PCs, laptops, screens etc to be used.
- Encourage staff to switch off equipment when not in use.

Residents Gym (if provided)

- Energy efficient TVs and other equipment to be used.
- Encourage staff to switch off equipment when not in use.

9 Overheating and Cooling

The proposed development within Reserve Matters stages will be assessed in accordance with the cooling hierarchy detailed in policy 5.9 of the London Plan, in order to reduce overheating and minimise the use of air conditioning.

In Reserve Matters applications sample apartments include a range of apartment sizes and orientations will need to be modelled once internal layouts are agreed. In general the glazing to solid ratio through the façade must not be greater than 40 % in order to achieve a TM59 overheating criteria pass. This may be even less on West facing dwellings, due to low evening sun impact.

9.1 Overheating Risk Assessment Methodology

9.1.1 Domestic

The Chartered Institution of Building Services Engineers (CIBSE) has produced guidance on assessing and mitigating overheating risk in new developments. TM 59 Design Methodology for the Assessment of Overheating Risk in Homes should be used for residential developments.

For compliance with CIBSE TM 59, the modelled apartments must pass both of the following two criteria:

a) For living rooms, kitchens and bedrooms: the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).

b) For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26°C will be recorded as a fail).

Criteria 2 and 3 of CIBSE TM52 may fail to be met, but both (a) and (b) above must be passed for all relevant rooms.

9.1.2 Non-Domestic

The non-domestic overheating risk assessment has been made against the three criteria outlined in CIBSE TM52. A room or building that fails any two of the three criteria is classed as overheating.

- The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).
- The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.
- The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

9.1.3 Weather Data

The weather file used for ongoing assessments is as per TM59: DSY1 (Design Summer Year) for the site location, for the 2020s, high emissions, 50% percentile scenario.

The London Heathrow weather data set has been used which is the most representative for the site location.

It is expected that the CIBSE compliance criteria are met for the DSY1 weather scenario.

Additional testing has been undertaken for the residential apartments using the 2020 versions of the following more extreme design weather years;-

- DSY2 – 2003: a year with a very intense single warm spell.
- DSY3 – 1976: a year with a prolonged period of sustained warmth.

9.2 Cooling Hierarchy

The assessment of the proposed development has considered the below against the cooling hierarchy;

9.2.1 Minimise internal heat generation through energy efficient design

Internal heat generation will be minimised by a combination of measures including the following;-

- Minimising cold bridging
- Minimising heat loss from heating and hot water systems
- No separate primary domestic hot water pipework distribution
- No boilers or DHW storage in apartments
- Low energy lighting
- Energy efficient appliances

9.2.2 Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls

The heat entering the building will be reduced by a combination of measures including the following;-

- Significantly improved fabric ‘U’ values
- Improved air tightness
- Optimisation of glazing g-value
- Optimisation of glazing area
- External shading (including via inset balconies and deep reveals)
- Internal blinds

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

Floor to floor heights have been maximised in the proposed development.

Residential corridors can be naturally ventilated to prevent overheating in summer.

As demonstrated by the dynamic modelling assessment, overheating cannot be prevented in the other non-residential (commercial and amenity) areas through the use of natural ventilation.

9.2.4 Mechanical ventilation

Ventilation to the residential apartments to provide fresh air and extract moisture/pollutants in accordance with Building Regulations Part F will be via individual Mechanical Ventilation with Heat Recovery (MVHR) units.

The communal corridors shall have a dual purpose mechanical extract system that can operate to assist the natural ventilation when necessary in maintaining air movement in corridors and prevent stagnant air and odour build up in winter.

For the other non-residential areas, mechanical ventilation with high efficiency heat recovery will provide fresh air and extract moisture/pollutants in accordance with Building Regulations Part F.

9.2.5 Active Cooling Systems

It could be appropriate to use provide active cooling to the following potential areas to prevent overheating;-

- Commercial units (A1/A2/A3/B1/D1/D2)
- Residents' gym (if provided)
- Residents' lounge
- Residential entrance

The commercial units will be completed as 'Shell and Core' and are subject to tenant design, but it expected that VRV or multi-split cooling systems will be provided for cooling. These systems use highly efficient air source heat pumps and are expected to achieve a seasonal cooling efficiency of at least 5.8.

Tenant plant space and riser and a sufficient electrical supply will be made available for future tenants to make use of.

10 Sustainability Strategy

10.1 Sustainability Certification

10.1.1 BREEAM

London Borough of Barnet require a BREEAM assessment to be carried out for the commercial element of all major developments. The however the planning policy doesn't state what the minimum rating to be achieved is, however in line with modern design practice the scheme should demonstrate a minimum rating of Very Good, with a target of achieving Excellent where feasible.

A BREEAM pre-assessment will be carried out for the commercial units at ground floor to assess and confirm that a minimum rating of 'Very Good' is achievable, and that all mandatory elements can be met. This pre-assessment is provided in Appendix A.2.

10.2 Water Efficiency

Water is becoming an increasingly scarce resource, with new development generating a growing demand. To meet increased demand new water sources and associated infrastructure need to be in place.

London and the South-East is one of the UK's water stressed areas where demand is rapidly outgrowing supply. Freshwater consumption of the proposed redevelopment will be reduced through water efficiency.

In accordance with the optional requirement of Building Regulation Part G, in the domestic apartments the proposed redevelopment will aim to reduce average internal potable water consumption to 105 litres per person per day plus 5 litres per person per day for external use, which equates to approximately two thirds of the UK average.

This will be achieved through the provision of efficient water fittings throughout the redevelopment, including aerated shower heads and taps (also helping to reduce hot water demand), dual flush toilets, and low water consumption appliances where provided, as outlined below:

Fitting	Flow Rate
WC	6 / 3 litre dual flush
Bath	160 litres capacity to overflow
WHB Taps	4 litres/minute aerating tap
Shower (1-Bed)	10 litres/minute
Shower (2-Bed/2-Bath)	8.4 litres/minute (Proportionate flow rate)
Kitchen Taps	6 litre/minute
Washing Machine	6.2 litres/kg
Dishwasher	0.64 litres/place setting

Table 3: Proposed water fittings

Commercial buildings will incorporate water efficient fittings in line with BREEAM standards to reduce their water consumption.

Domestic water supplies will be separately metered using smart meters to allow residents and the local water authority to easily monitor water consumption.

Irrigation water use will be limited by designed landscaped areas to be as drought resistant as possible. Drought resistance will come from good stock choice, the correct planting practices and good initial aftercare during establishment.

10.3 Noise and Vibration

Unattended sound measurements should be undertaken for sound levels representative of the existing environment for assessment in accordance with BS 8233:2014 and the WHO Guidelines for Community Noise.

Measured ambient LAeq,T noise levels should achieve the BS 8233 criterion noise levels for residential and office spaces with windows closed, assuming a façade reduction of 33 dB.

Night-time maximum LAmax,F noise levels exceed the WHO guideline noise level by 9.7 dB, a composite façade reduction of at least 42.7 dB is therefore required to achieve the guidelines noise level for the onset of sleep disturbance.

The required façade reduction is attainable with appropriate design choices. Detailed façade calculations can be undertaken following finalization of the façade design, should they be required. Additionally, internal measurements can be undertaken upon completion in order to ensure compliance with BS 8233 and the WHO.

10.4 Air Quality

An air quality assessment has been carried out to assess the impact of the construction phase and determine the likely exposure of future occupants of the Proposed Development.

An assessment of the potential impacts during the construction phase has been carried out in accordance with the latest Institute of Air Quality Management Guidance. This has demonstrated that for the Proposed Development, releases of dust and particulate matter are likely to be generated from on-site activities. However, through good site practice and the implementation of suitable mitigation measures, the impact of dust and particulate matter releases may be effectively mitigated and the resultant impacts are considered to be negligible.

ADMS Roads dispersion modelling has been carried out to assess the suitability of the Site for its proposed end use with regards to local air quality. The results indicate that predicted concentrations of relevant pollutants (NO2, PM10 and PM2.5) concentrations will be below the relevant objectives across the Site. Future occupants of the Site would therefore not be exposed to pollutant concentrations above the relevant objective levels.

The Proposed Development is considered to be air quality neutral with regards to both building and transportation emissions.

Appendix A.1 – Renewables Assessment

A.1.1 Biomass Boilers

Description

As with all biomass heat provision, wood chips or wood pellets are responsible for CO_2 emissions at the point of combustion. When burnt, levels of emissions are almost double that of natural gas. However, as wood has captured CO_2 during its growth process, the overall CO_2 balance of wood chips or wood pellets is equivalent to that of a very low carbon fuel.

Types

Wood chips are a medium-sized solid material made by cutting, or chipping, larger pieces of wood. Pellets are ma de from clean wood waste or clean forest-sources such as saw mills, joinery factories and well-managed woodland thinning. They are designed specifically to compete with fossil fuels on convenience and performance.

Pellets offer a number of advantages for small scale installations, including:

- Quality: they are drier and homogeneous in size and shape;
- Storage: they are denser and require less storage;
- Operation and Maintenance: they are easier to ignite, more compatible with automated feed mechanisms and lower in ash content.

Key Features

Unlike natural gas, wood fuel is delivered and has to be stored. Recent advances in boiler designs and controls mean that most modern boilers are highly automated. The key human interventions can be limited to loading the store periodically, de-ashing every six months and cleaning the flue.

Storage needs to be considered and provided carefully as it is a critical component of automated biomass boiler systems, which tend to be based on either vacuum suction- or screw-auger-based systems. Wood pellets can be delivered in reduced quantities (e.g.10 kg bags) but are generally supplied in much larger volumes (e.g. 1 ton). Low intervention systems require large fuel stores.

It is recommended to select high quality equipment present on the exempted heating appliance list (mandatory in some ‘smoke control’ zones) and potentially to fit a catalytic converter to reduce local emissions and improve efficiency.

Efficiency

The efficiency of the boiler is an important consideration but the carbon content of the fuel is equally important.

Although wood pellets can generally be distributed economically within a radius of 80 to 250 miles, it is important to ensure that an efficient supply is accessible and that the carbon content of the fuel is verified beforehand.

Cost Benchmarks

Prices of an automatically fed pellet boiler vary depending on the size. The price of a 200 kW boiler (including feeding mechanism) is estimated to be approximately £120,000.

Financial Incentives

Biomass systems are eligible for the Renewable Heat Incentive (RHIs), with a tariff of between 0.76 p/kWh and 5.24 p/kWh from 1 July 2018 for commercial systems, and 6.74 p/kWh for domestic.

Maintenance

Medium / High

The boiler fuel feed mechanism will require attention

Typical Lifetime

15-20 years

Embodied Carbon

Low to medium

Key Advantages

Very low carbon fuel

A.1.2 Photovoltaics

Description

Photovoltaic cells, also known as solar PVs, generate electricity from sunlight. An inverter turns the Direct Current (DC) generated into Alternative Current (AC) which can be used in the building, with any surplus sent to the grid.

PV modules are made of a number of photovoltaic cells, a semiconductor device usually made of silicon wafers.

They can generate some electricity even when they are not in direct sunlight as the light is diffused by the cloud cover.

PV modules are wired together to create arrays of several kWp.

Types

Monocrystalline - Slices of a single grown crystal of pure silicon

Polycrystalline - Slices of multiple crystals of pure silicon

Thin film - Amorphous silicon, CdTe or CIS/CIGS

Hybrid - Crystalline and amorphous silicon

Key Features

PVs are generally mounted on the roof in an unshaded location, oriented towards the best possible view of the sun's path.

They can be fixed with bolts or clips on prefabricated rails or mounting brackets (both of which are fixed through the roof and roofing material) or on angled metal frames weighed down with concrete ballasts.

Efficiency

The amount of electricity generated by a PV module depends typically on the type of PV cells, on the orientation/incline of the module, on the location and on the inverter's efficiency. Therefore PV modules are generally described by quoting their peak output in kilowatts peak (kWp).

Generally, in terms of efficiency, the following can be assumed:

Monocrystalline	14 to 20%
Polycrystalline	13 to 15%
Thin film	8 to 12%
Hybrid	> 14%

10.4.1 Cost Benchmarks

Prices of PVs are coming down fast, but are typically between £200 and £400 / sqm depending on the product.

10.4.2 Maintenance

Very low – occasional cleaning

Typical Lifetime

25 years for the panels - 10 years for the inverter

Embodied Carbon

Medium

Key Advantages

Requires no fuel to operate

Has no moving parts

Can provide an income through FiTs.

A.1.3 Solar Thermal

Description

Heating water with solar energy is the most common use of solar thermal technology. The main elements of a solar water heating system are a solar collector, a pump, a hot water tank and a controller. In the UK, a solar water heating system can generally cover up to 50% of the annual hot water needs.

Types

Flat-plate collectors consist of a black absorber (usually copper or metal) with a glazed layer in front and insulation around the edges and at the back.

Evacuated tubes are collectors that have had the air evacuated out of them to prevent heat-loss through convection. The tubes generally contain sealed copper pipes.

The thermal fluid used in both cases is the same: a non-toxic glycol alcohol-based antifreeze. It circulates in the absorber in the case of flat plate collectors and in the copper pipes in evacuated tubes.

Key Features

A temperature sensor placed near the outlet pipe of the collector relays temperature information to the controller unit, which activates/de-activates a pump depending on the difference between the measured temperature leaving the collector and the temperature in the hot water tank.

The hot water tank should have a volume of approximately 60-80 litres per sqm of solar collector.

Efficiency

The amount of hot water generated by a solar thermal collector depends typically on the type of collector, on the orientation/incline of the module, on the location and on the size of the hot water tank.

Evacuated tubes are generally the most efficient, particularly on cold sunny days.

Generally, in terms of efficiency, the following can be assumed:

Flat plate	40%
Evacuated tubes	40 to 50%

Cost Benchmarks

Prices of a typical solar thermal installation are approximately £500 to £700/sqm excl. VAT. Evacuated tubes are more expensive but more efficient than flat-plate collectors.

Financial Incentives

Solar thermal systems are eligible for the Renewable Heat Incentive (RHIs), with a tariff of 10.75 p/kWh from 22 May 2018 for commercial systems less than 200kW, and 20.66 p/kWh for domestic.

Maintenance

Very low – annual inspection

Typical Lifetime

20-25 years (except pumps)

Embodied Carbon

Low

Key Advantages

Can be used to complement other technologies efficiently (e.g. heat pumps)

Can be building-integrated

Essentially ‘free’ heat

A.1.3 Heat Pumps

Description

The purpose of heat pumps is to absorb dispersed low-grade heat, upgrade it to a higher quality and deliver it to the spaces that need heating. Low-grade heat is considered by many as both renewable and essentially free. It is present in the ground, the air or a body of water (e.g. aquifer). Electricity is required to run the system.

Types

Ground source (horizontal)

Ground source (vertical)

Ground source (aquafer)

Air source

Key Features

The three key components of a heat pump system are:

- the heat sink (e.g. ground loop, aquifer, outside air, exhaust air);
- the heat pump system and associated hot water storage;
- the distribution system.

The heat sink can be based on a horizontal or vertical, open-loop or closed-loop design and its installation (e.g. depth) will vary depending on the heat exchange and the ground conditions. In the case of air source heat pumps, it is the outside air which serves as the heat sink.

The heat pump contains a refrigerant which boils and condenses at different temperatures and pressures, absorbing and releasing heat in the process.

Underfloor heating and low surface temperature radiators are ideally suited to heat pump systems: they provide the most efficient delivery of the kind of consistent lower temperature heat produced by the heat pump.

Efficiency

Heat pump efficiencies are often described in terms of the coefficient of performance (COP), which describes how many units of energy are delivered for every unit used. Typical seasonal efficiencies are given below and compared to a standard direct electric heater.

Ground source heat pump	250 to 600%
Air source heat pump	200 to 350%
Standard electric heater	100%

Cost Benchmarks

Prices of heat pumps depend significantly on the type but generally a vertical ground source heat pump system would cost approximately £1,400 / kW.

Financial Incentives

Heat pumps are eligible for the Renewable Heat Incentive (RHIs), with a tariff of 9.36 p/kWh from 22 May 2018 for Tier 1 ground source commercial systems, and 20.46 p/kWh for domestic.

The tariff for air source systems is 2.69 p/kWh from 22 May 2018 for commercial and 10.49 p/kWh for domestic.

Maintenance

Medium/High – Pumps and refrigerant circuit critical

Typical Lifetime

15 years

Embodied Carbon

Medium

Key Advantages

Heat pumps can be reversible and can provide cooling.

A.1.4 Wind Turbines

Description

Wind power can be used to generate electricity, either in parallel with mains supplies, gear or for stand-alone applications with battery back-up.

Types

Horizontal axis

Vertical axis

Key Features

In order to generate worthwhile quantities of electricity, average wind speeds of more than 5–6 m/s are typically required.

The best locations for wind turbines are away from obstructions which affect air flow, including any features of buildings which may have an effect on airflow. Wind speed increases with height, and so turbines often require masts or towers to take advantage of higher wind speeds and to avoid turbulence caused by the building structure. Ideal geographical locations include near hill tops and the coast.

Wind characteristics are specific to each location, and initial evaluations of the feasibility of wind power at any particular site will require details of historic meteorological data. A more detailed local assessment will normally be required to establish the effects of local topology, obstructions, etc.

Efficiency

The theoretical maximum power efficiency of any design of wind turbine is 0.59 (i.e. no more than 59% of the energy carried by the wind can be extracted by a wind turbine).

Once the inefficiencies of a complete wind turbine system (e.g. generator, bearings, power transmission etc.) are included, around 10-30% of the power of the wind is actually converted into usable electricity.

The power output of wind turbines depends on two key factors: the swept area of the rotor and the wind speed.

Horizontal axis wind turbines generally have higher power efficiencies than vertical axis, however wind direction is not as important for a vertical axis type.

Cost Benchmarks

Prices of wind turbines depend significantly on the type but generally a 6kW pole mounted system would cost approximately £30,000.

Maintenance

Low

Typical Lifetime

20 years (except inverter)

Embodied Carbon

Low

Key Advantages

Essentially ‘free’ electricity

Can provide an income through FiTs.

Appendix A.2 - BREEAM Pre-assessment

Barnet's Policy doesn't set a minimum requirement. However the aim for the Non – domestic areas will be to achieve an Excellent rating, therefore a percentage score of over 70 % as shown below.

Issue	Credits	Credits Targeted [E]	Credits Targeted [OS]
Man 01: Project Brief and Design	Credit 1: Stakeholder Consultation (Project Delivery)	1	1
Man 01: Project Brief and Design	Credit 2: Stakeholder Consultation (Third Party)	1	1
Man 02: Life Cycle cost and service life planning	Credit 1: Elemental Life Cycle Cost	2	2
Man 02: Life Cycle cost and service life planning	Credit 2: Component Level LCC option apprasial	1	1
Man 02: Life Cycle cost and service life planning	Credit 3: Capital Cost Reporting	1	1
Man 03: Responsible Construction Practices	Credit 0: Pre-Requiste	(M)	(M)
Man 03: Responsible Construction Practices	Credit 1: Environmental Management	1	1
Man 03: Responsible Construction Practices	Credit 2: Sustainability Champion	1	1
Man 03: Responsible Construction Practices	Credit 3: Considerate Construction	2	2
Man 03: Responsible Construction Practices	Credit 4: Monitoring of Construction Site Impacts (Energy & Water)	1	1
Man 03: Responsible Construction Practices	Credit 4: Monitoring of Construction Site Impacts (Transport)	1	1
Man 04: Commissioning and Handover	Credit 0: Pre-Requiste	(M)	(M)
Man 04: Commissioning and Handover	Credit 1: Commissioning and Testing Schedule and Responsibilities	1	1
Man 04: Commissioning and Handover	Credit 2: Commissioning Building Services	1	1
Man 04: Commissioning and Handover	Credit 4: Handover	1	1
Man 05: Aftercare	Credit 1: Aftercare Support	1	1
Man 05: Aftercare	Credit 2: Commissioning - implementation	1	1
Man 05: Aftercare	Credit 3: Post-occupancy evaluation (POE)	1	1
Hea 01: Visual Comfort	Credit 1: Control of glare from sunlight	1	1
Hea 01: Visual Comfort	Credit 2: Daylighting	1	1
Hea 01: Visual Comfort	Credit 3: View Out	1	1
Hea 01: Visual Comfort	Credit 4: Internal and External Lighting Levels, Zoning and Control	1	1
Hea 02: Indoor Air Quality	Credit 0: Indoor Air Quality (Pre-Requiste)	(M)	(M)
Hea 02: Indoor Air Quality	Credit 2: Emissions from Building Products	2	2
Hea 02: Indoor Air Quality	Credit 3: Post-construction indoor air quality measurement	1	1
Hea 04: Thermal Comfort	Credit 1: Thermal Modelling	1	1
Hea 04: Thermal Comfort	Credit 2: Design for future thermal comfort	1	1
Hea 04: Thermal Comfort	Credit 3: Thermal zoning and controls	1	1
Hea 05: Acoustic Performance	Credit 1: Acoustic Performance	4	4
Hea 06: Safety and Security	Credit 2: Security of site and building	1	1
Hea 07: Safe and Healthy Surroundings	Credit 1: Safe Access	1	1
Hea 07: Safe and Healthy Surroundings	Credit 2 Outside space	1	1
Ene 01: Reduction of Energy Use and Carbon Emissions	Credit 1: Energy Performance	4	6
Ene 01: Reduction of Energy Use and Carbon Emissions	Credit 2: Prediction of operational energy consumption	4	4
Ene 02: Energy Monitoring	Credit 1: Sub-Metering of Major Energy Consuming Systems	1	1
Ene 02: Energy Monitoring	Credit 2: Sub-Metering of high energy load and tenancy areas	1	1
Ene 03: External Lighting	Credit 1: External Lighting	1	1
Ene 04: Low Carbon Design	Credit 1: Passive Design - Passive Design Analysis	1	1
Ene 04: Low Carbon Design	Credit 3: Low and zero carbon feasibility study	1	1
Ene 05: Energy Efficient Cold Storage	Credit 1: Refrigeration energy consumption	1	1
Ene 05: Energy Efficient Cold Storage	Credit 2: Indirect greenhouse gas emissions	1	1
Ene 06: Energy Efficient Transportation Systems	Credit 1: Energy consumption	1	1
Ene 06: Energy Efficient Transportation Systems	Credit 2: Lifts	1	1
Ene 08: Energy Efficient Equipment	Credit 1: Energy efficient equipment	2	2
Tra 01: Transport assessment and travel plan	Credit 1: Transport assessment and Travel plan	2	2
Tra 02: Sustainable Transport Measures	Credit 0: Pre-Requiste	(M)	(M)
Tra 02: Sustainable Transport Measures	Credit 1: Transport options implementation	8	8
Wat 01: Water Consumption	Credit 1: Water Consumption	2	3
Wat 02: Water Monitoring	Credit 0: Pre-Requisite	(M)	(M)
Wat 02: Water Monitoring	Credit 1: Water Monitoring	1	1
Wat 03: Leak Detection	Credit 1: Leak Detection System	1	1
Wat 03: Leak Detection	Credit 2: Flow Control Devices	0	1
Wat 04: Water Efficient Equipment	Credit 1: Water Efficient Equipment	1	1
Mat 01: Environmental impacts from construction products - Building life cycle assessment (LCA)	Credit 1: Superstructure	2	2
Mat 01: Environmental impacts from construction products - Building life cycle assessment (LCA)	Credit 2 Substructure and hard landscaping options appraisal during Concept Design (all building types)	1	1
Mat 02: Environmental impacts from construction products - Environmental Product Declarations (EPD)	Credit 1: Specification of products with a recognised environmental product declaration (EPD)	1	1
Mat 03: Responsible Sourcing of Materials	Credit 0: Pre-Requisite	(M)	(M)
Mat 03: Responsible Sourcing of Materials	Credit 1: Sustainable Procurement Plan	1	1
Mat 03: Responsible Sourcing of Materials	Credit 2: Responsible Sourcing of Materials	2	2
Mat 05: Designing for Durability and Resilience	Credit 1: Protecting Vulnerable Parts of the Building from Damage & Protecting Exposed Parts of the Building from Material Degradation	1	1
Mat 06: Material Efficiency	Credit 1: Material Efficiency	0	1
Wst 01: Construction Waste Management	Credit 1: Pre-demolition audit	1	1
Wst 01: Construction Waste Management	Credit 2: Construction resource efficiency	2	2
Wst 01: Construction Waste Management	Credit 3: Diversion of resources from landfill	1	1
Wst 03: Operational Waste	Credit 1: Operational Waste	1	1

Appendix A.3 – Overheating Checklist

Section 1 - Site features affecting vulnerability to overheating		Response
Site location	Urban – within central London or in a high density conurbation	
	Peri-urban – on the suburban fringes of London	**Peri-urban**
Air quality and/or Noise sensitivity – are any of the following in the vicinity of buildings?	Busy roads / A roads	**No**
	Railways / Overground / DLR	**No**
	Airport / Flight path	**No**
	Industrial uses / waste facility	**No**
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	**Not expected**
	Are residents likely to be at home during the day (e.g. students)?	**Not expected**
Dwelling aspect	Are there any single aspect units?	**No**
Glazing ratio	Is the glazing ratio (glazing: internal floor area) greater than 25%?	**Yes**
	If yes, is this to allow acceptable levels of daylighting?	**Yes**
Security - Are there any security issues that could limit opening of windows for ventilation?	Single storey ground floor units	**No**
	Vulnerable areas identified by the Police Architectural Liaison Officer	**No**
	Other	

Section 2 - Design features implemented to mitigate overheating risk		Response
Landscaping	Will deciduous trees be provided for summer shading (to windows and pedestrian routes)?	**Yes (in public realm and on roof podium)**
	Will green roofs be provided?	**No**
	Will other green or blue infrastructure be provided around buildings for evaporative cooling?	**Blue roof**
Materials	Have high albedo (light colour) materials been specified?	**Some areas**
Dwelling aspect	% of total units that are single aspect	**NA**
	% single aspect with N / NE / NW orientation	
	% single aspect with E orientation	
	% single aspect with S / SE / SW orientation	
	% single aspect with W orientation	
Glazing ratio - What is the glazing ratio (glazing; internal floor area) on each facade?	N / NE / NW	
	E	
	S / SE / SW	
	W	
Daylighting	What is the average daylight factor range?	**0.8 to 4.8**
Window opening	Are windows openable?	**Yes**
Window opening	What is the average percentage of openable area for the windows?	**60%**
Window opening - What is the extent of the opening?	Fully openable	**Openable window sections and balconies doors can be fully opened.**
	Limited (e.g. for security, safety, wind loading reasons)	**No**
Security	Where there are security issues (e.g. ground floor flats) has an alternative night time natural ventilation method been provided (e.g. ventilation grates)?	**No ground floor flats.**
Shading	Is there any external shading?	**Yes (from balconies and adjacent buildings).**
	Is there any internal shading?	**Potentially Blinds**
Glazing specification	Is there any solar control glazing?	**0.5 g-value**
Ventilation - What is the ventilation strategy?	Natural – background	**No**
	Natural – purge	**Yes**
	Mechanical – background (e.g. MVHR)	**Yes (MVHR)**
	Mechanical – purge	**No**
	What is the average design air change rate	**2 ACH**
Heating system	Is communal heating present?	**Yes**
	What is the flow/return temperature?	**25/15**
	Have horizontal pipe runs been minimised?	**Yes around 7.5 meters max**
	Do the specifications include insulation levels in line with the London Heat Network Manual	**Yes**

Meinhardt (UK) Ltd
10 Aldersgate Street
London
EC1A 4HJ
T: +44 (0) 20 7831 7969

www.meinhardt.co.uk