/INTEGRATION
40 BOWLING GREEN LANE
LONDON EC1R 0NE
+44 (0) 20 7415 7206
INTEGRATIONUK.COM

DATE
20 JUNE 2016

SUSTAINABILITY & ENERGY STATEMENT

115-119 GOLDHURST TERRACE, LONDON NW6 3EY

page blank

/NTEGRATION
40 BOWLING GREEN LANE
LONDON EC1R 0NE
+44 (0) 20 7415 7206
INTEGRATIONUK.COM

DOCUMENT STATUS

PROJECT
115-119 Goldhurst Terrace
London
NW6 3EY

PROJECT NO.
243

CLIENT
Hive1 Ltd
3 Belsize Place
London
NW3 5AL

IN CONJUNCTION WITH
KSR Architects

REVISION	STATUS	CHECKED	DATE
-	Draft Issue for Comment	Dan Brooks	10.06.16
1	Comments incorporated	Dan Brooks	16.06.16
2	Issued for Planning Application	Dan Brooks	20.06.16

page blank

CONTENTS

EXECUTIVE SUMMARY

This Sustainability & Energy Statement has been prepared by Integration Consultancy Limited in support of the planning application for the re-development of the site at 115-119 Goldhurst Terrace, in the London Borough of Camden.

National, Regional and Local Policy, in particular the London Plan 2015 (including 2015-2016 MALPs). and the London Borough of Camden Strategic Policies, outline the sustainability and energy issues which should be addressed in the planning application for the proposed development. The key issues to be incorporated into the design are:

- The development must demonstrate a 35% improvement in carbon dioxide emissions over the Target Emission Rate outlined in the national Building Regulations 2013;
- The energy strategy shall achieve a 20% reduction of carbon dioxide emissions over the TER through on-site renewable energy generation where feasible;
- Water efficiency measures shall be incorporated to limit the daily water consumption to 110 litres per person

To achieve the carbon dioxide emissions reduction targets it is proposed to:

- Use building fabric with good thermal performance and air permeability, exceeding the requirements of the Building Regulations Part L1A (2013);
- Utilise low energy building services systems, i.e. lighting, mechanical ventilation with heat recovery, high efficiency condensing boilers for heating systems;
- Provide a network of photovoltaic cells located at roof level and orientated to maximise power generation throughout the year.

The proposed solar PV network will have the potential to connect to a future decentralised energy network, enabling both the import and export of power to and from the development.

An energy assessment has been undertaken to demonstrate that by incorporating the above into the design of proposed development a reduction in carbon dioxide emissions in excess of the targeted 35% will be achieved for both residential units.

The proposed photovoltaic panels will be orientated to maximise power generation throughout the year without any over shading from surrounding buildings. The extent of the proposed PV installation will provide a minimum of 20% reduction in CO_2 emissions over the TER through on-site renewable energy generation.

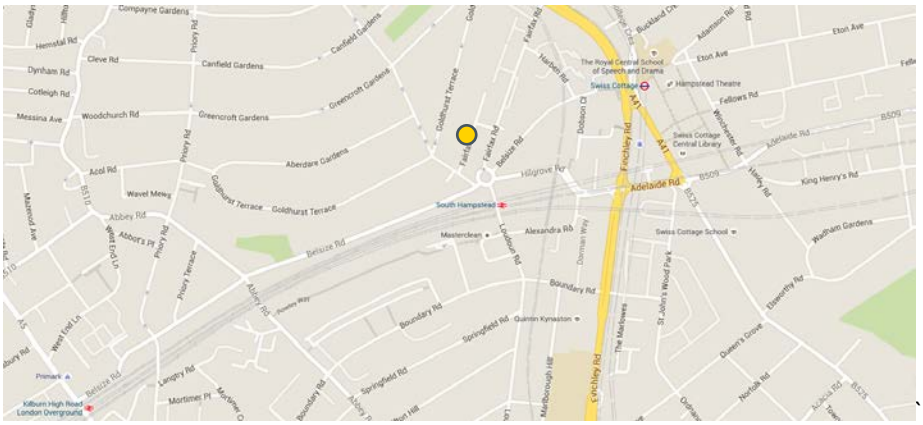
1 INTRODUCTION

This Sustainability & Energy Statement has been prepared by Integration Consultancy Limited in support of the planning application for the redevelopment of the site at 115-119 Goldhurst Terrace, in the London Borough of Camden.. The report is one of several documents that accompany the planning application and should be read in conjunction with these.

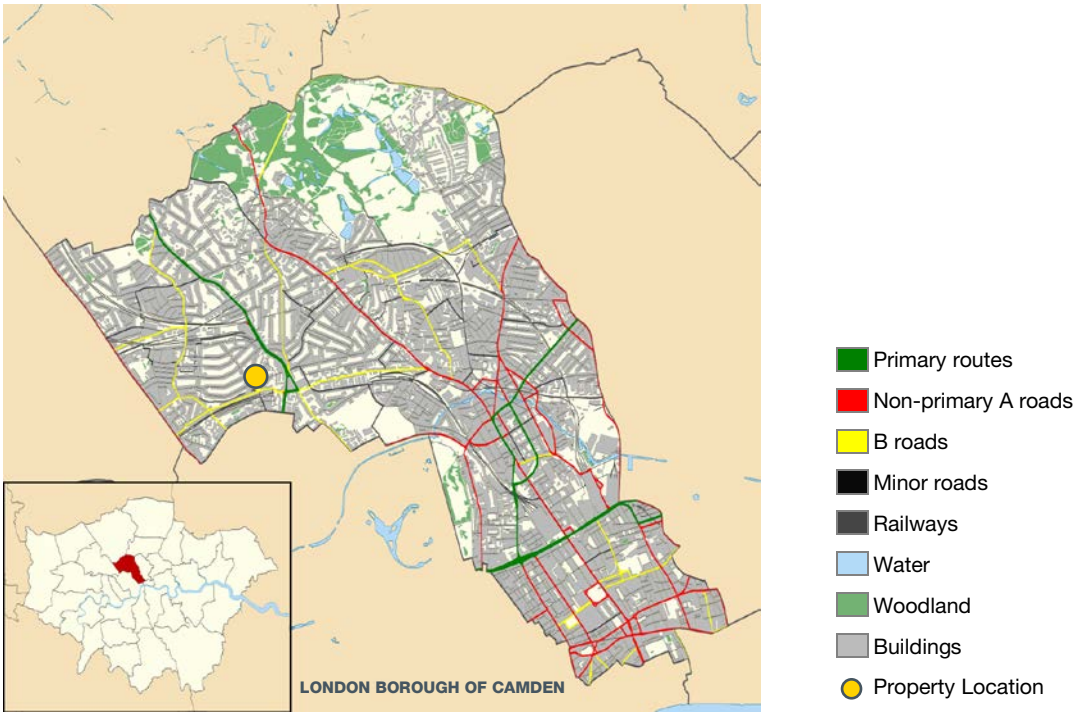
The purpose of this report is to set out how sustainability is integrated into the design and construction of the proposals, to demonstrate the design approach and the measures adopted to meet the sustainability targets set out in the London Borough of Camden Strategic and Development Policies and the London Plan.

1.1 THE DEVELOPMENT SITE

The site is currently occupied by an existing residential building comprising six flats. The proposed new development includes the creation of ten new apartments and communal/landlords space with total combined area of 1,118m^2. The new development will be occupying a similar built envelope as the previous building.



Detail of Local Area (© Google)



Location of the Proposed Property within the London Borough of Camden

2 PLANNING POLICY CONTEXT

2.1 THE LONDON PLAN – CHAPTER 5: LONDON'S RESPONSE TO CLIMATE CHANGE

Regional policy in London is controlled by The Greater London Authority, and is set out in The London Plan, adopted March 2015 (including the Minor Alterations to the London Plan published March 2016). The Plan sets out policy and guidance in the London context and identifies a number of main objectives related to improving London as a workplace and living place.

The concept of sustainable development runs through the London Plan and all its policies with reference to topics including Places, People, Economy, Response to climate change, Transport, and Living places and spaces. Chapter 5 of the London Plan sets out a range of policies in relation to climate change, including climate change mitigation and adaptation, waste, aggregates, contaminated land and hazardous substances.

Key policies within the London Plan which are applicable to the proposed development and addressed in this report are:

POLICY 5.2 -MINIMISING CARBON DIOXIDE EMISSIONS

Planning Decisions

A Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

1 Be lean: use less energy

2 Be clean: supply energy efficiently

3 Be green: use renewable energy

B The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

Residential Buildings:

Year	**Improvement on 2010 Building Regulations**
2010 – 2013	25 per cent
2013 – 2016	40 per cent *
2016 – 2031	Zero carbon

* equivalent to a minimum improvement of 35% beyond the 2013 edition of Part L.

Other key policies within the London Plan which are applicable to the proposed development and addressed in this report are:

- 5.3 - Sustainable Design & Construction
- 5.6 - Decentralised Energy In Development Proposals
- 5.7 - Renewable Energy
- 5.8 – Innovative Energy Technologies
- 5.9 - Overheating & Cooling
- 5.15 - Water Use & Supplies

2.2 LONDON BOROUGH OF CAMDEN RELEVANT POLICIES

The sustainability and energy strategy for the development will be developed in accordance with London Borough of Camden's Local Development Framework, specifically the following policies:

- Core Strategy Policy CS13: Tackling climate change through promoting higher environmental standards
- Development Policy DP22: Promoting Sustainable Design and Construction
- Development Policy DP23: Water
- Camden Planning Guidance CPG3 (2015): Sustainability

2.3 CORE STRATEGY POLICY CS13: TACKLING CLIMATE CHANGE THROUGH PROMOTING HIGHER ENVIRONMENTAL STANDARDS

Camden's Core Strategy sets out the key elements of the Council's planning vision and strategy for the borough and is the central part of the Local Development Framework.

Core Strategy Policy CS13 sets out the Council's commitment to reducing Camden's carbon dioxide emissions in line with the national target of 80% by 2050. Applicable policy for the new development at 115-119 Goldhurst Terrace is:

Reducing the effects of and adapting to climate change

The Council will require all development to take measures to minimise the effects of, and adapt to, climate change and encourage all development to meet the highest feasible environmental standards that are financially viable during construction and occupation by:

b) promoting the efficient use of land and buildings;

c) minimising carbon emissions from the redevelopment, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:

1. Ensuring developments use less energy,

3. Generating renewable energy on-site; and

d) ensuring buildings and spaces are designed to cope with, and minimise the effects of, climate change.

The redevelopment of the existing building and development of the existing land is considered an efficient use of land and buildings. The proposed property will minimise carbon emissions through enhancements to the thermal performance of the building fabric, passive design measures, the use of energy efficient active building services systems and the incorporation of renewable energy technologies.

2.4 DEVELOPMENT POLICY DP22: PROMOTING SUSTAINABLE DESIGN & CONSTRUCTION

The London Borough of Camden Local Development Framework - Development Management Policies 2010-2025, sets out a long term planning vision and strategic objectives for future development in the area.

Development Policy DP22 sets out the Council's approach to improving energy conservation, efficiency and sustainability.

Applicable policy for the proposed development is:

> The Council will require development to incorporate sustainable design and construction measures. Schemes must:
>
> a) demonstrate how sustainable development principles have been incorporated into the design and proposed implementation; and
>
> b) incorporate green or brown roofs and green walls wherever suitable.
>
> The Council will require development to be resilient to climate change by ensuring schemes include appropriate climate change adaptation measures, such as:
>
> f) summer shading and planting;
>
> g) limiting run-off;
>
> h) reducing water consumption;
>
> i) reducing air pollution; and
>
> j) not locating vulnerable uses in basements in flood-prone areas.

The proposed development will have a floor area greater than 500m^2 therefore a sustainability assessment will be undertaken using SAP (Standard Assessment Procedure) as the assessment tool.

Appropriate climate change adaptation measures will be incorporated into the proposals, including rainwater collection and recycling and clean, renewable energy systems.

The proposed Lower Ground Floor is not in a flood prone area.

2.5 DEVELOPMENT POLICY DP23: WATER

Development Policy DP23 sets out the Council's approach to the efficient use and disposal of water and the minimisation of surface water run-off.

Applicable policy for the proposed property is:

> The Council will require developments to reduce their water consumption, the pressure on the combined sewer network and the risk of flooding by:
>
> a) incorporating water efficient features and equipment and capturing, retaining and re-using surface water and grey water on-site;
>
> b) limiting the amount and rate of run-off and waste water entering the combined storm water and sewer network through the methods outlined in part a) and other sustainable urban drainage methods to reduce the risk of flooding;
>
> c) reducing the pressure placed on the combined storm water and sewer network from foulwater and surface water run-off and ensuring developments in the

areas identified by the North London Strategic Flood Risk Assessment and shown on Map 2 as being at risk of surface water flooding are designed to cope with the potential flooding;

Rainwater collection tanks will be including in the design to collect run-off from all roofs and hard standing areas. The water will be re-used wherever possible including for garden irrigation, WC flushing systems and swimming pool make –up supply. A greywater recycling system will be provided to collect waste water from basins, baths and shower for re-use for WC flushing.

It is proposed that these measures will significantly reduce the rate of run-off into the sewer network compared to that of the existing property.

2.6 CAMDEN PLANNING GUIDANCE CPG3: SUSTAINABILITY (2015)

Camden Planning guidance CPG3 is a Supplementary Planning Document including additional "material considerations" in planning decisions. The document provides information on ways to achieve carbon reductions and more sustainable developments. It also highlights the Council's requirements and guidelines which support the relevant Local Development Framework (LDF) policies.

The majority of the guidance within this document is relevant to the proposals for 115-119 Goldhurst Terrace, however the key issues and requirements are:

2 The Energy Hierarchy

All developments are to be design to reduce carbon dioxide emissions

Energy strategies are to be designed following the steps set out by the energy hierarchy

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

Developments of 5 or more dwellings and/or 500sq m (gross internal) floorspace or more are required to submit an energy statement which demonstrates how carbon dioxide emissions will be reduced in line with the energy hierarchy.

3 Energy Efficiency: New Buildings

All new developments are to be designed to minimise carbon dioxide emissions. This is to be achieved through high levels of insulation and air tightness.

Energy efficient design requires an integrated approach to solar gain, access to daylight, insulation, thermal materials, ventilation, heating and control systems. Natural systems design should make the most of sunlight, daylight and preventing overheating.

A full model of the building should be carried out to ensure the building design optimises solar gain and daylight without resulting in overheating for developments comprising 5 dwellings or more or 500sq m or more of any floorspace

Consider maximising the use of natural systems within buildings before any mechanical services are considered

Any development proposing electric heating (including heat pumps) will need to demonstrate the carbon efficiency of the proposed heating system. Specifications of

the electric heating system and calculations will need to be provided to demonstrate that the proposed electric heating system would result in lower carbon dioxide emissions than an efficient gas fuelled heating system.

Where traditional mechanical cooling e.g. air conditioning units are proposed applicants must demonstrate that energy efficient ventilation and cooling methods have been considered first, and that they have been assessed for their carbon efficiency.

5 Decentralised Energy Networks and Combined Heat & Power

Where feasible and viable your development will be required to connect to a decentralised energy network or include CHP.

6 Renewable Energy

All developments are to target at least a 20% reduction in carbon dioxide emissions through the installation of on-site renewable energy technologies. Special consideration will be given to heritage buildings and features to ensure that their historic and architectural features are preserved.

7 Water Efficiency

Developments over 10 units or 1000 m^2 should include grey water recycling.

The Council expects all developments to be designed to be water efficient by minimising water use and maximising the re-use of water. This includes new and existing buildings.

10 Brown Roofs, Green Roofs and Green Walls

The Council will expect all developments to incorporate brown roofs, green roofs and green walls unless it is demonstrated this is not possible or appropriate. This includes new and existing buildings.

An energy statement will be produced to demonstrate how carbon dioxide emissions will be reduced in line with the energy hierarchy.

The key design elements included within the proposals in response to the requirements of CPG3 are:

- Enhancements to the thermal performance of the building fabric
- Passive design measures,
- The use of energy efficient active building services systems
- The incorporation of renewable energy technologies
- Rainwater and greywater collection and recycling systems
- Green roof(s) will be incorporated into the design

2.7 SUMMARY OF KEY POLICY REQUIREMENTS

1. 35% improvement in CO_2 emissions over the Target Emission Rate (TER) outlined in the national Building Regulations 2013.
2. The property should be designed to be water efficient by minimising water use and maximising the re-use of water, i.e. grey water and rainwater collection and re-distribution systems should be incorporated
3. Major development should be designed to link to and extend existing heat and energy networks in the vicinity. Where it is not possible to link to an existing heat and energy network, major development will be required to provide site-wide decentralised energy generation.

   Smaller developments will be encouraged to be enabled to connect into heat and energy networks.
4. 20% reduction of CO_2 emissions through on-site renewable energy generation where feasible.

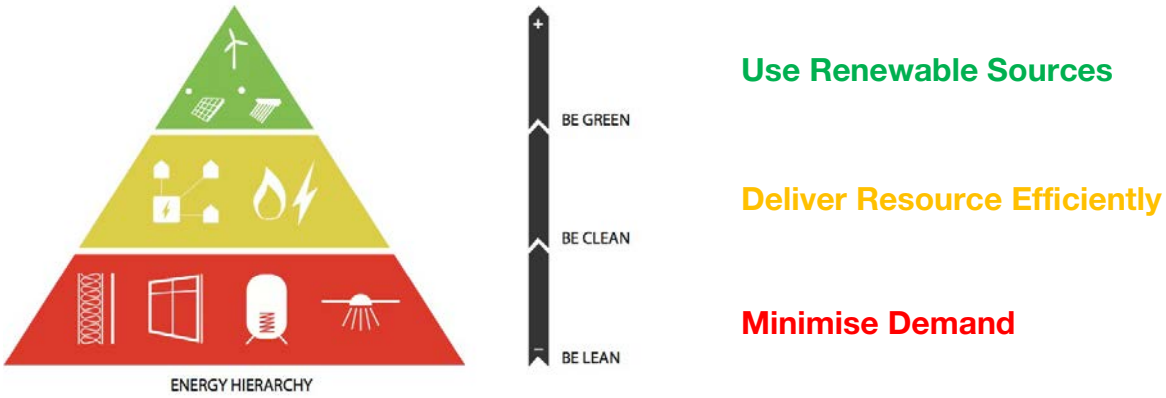
3 DESIGN APPROACH TO SUSTAINABILITY

The Energy Strategy for 115-119 Goldhurst Terrace will have the potential to generate significant carbon savings over the lifetime of the development. The objective is to develop an energy infrastructure that supplies low carbon energy, utilises renewable sources, reduces energy bills for the occupants, provides a high quality internal environment, is adaptable and able to accommodate future upgrades.

Sustainability will be integral to the design, construction, operation and performance of the proposed development, the design principles will encompass a wide range of criteria, i.e. energy, water use, selection of construction materials, waste generation and management, pollution, Health & Well-Being of the occupants, and the ecological impact of the building both during construction and operational use.

3.1 THE ENERGY HIERARCHY

The energy hierarchy referred to in the London Plan suggests a three-step approach to decision making and prioritizing strategies for the reduction of resource consumption and carbon emissions from energy. This approach is applicable to other resources such as water, waste and construction materials.



ENERGY HIERARCHY

The purpose of this approach is to reduce the resource consumption and consequent carbon emissions of development without compromising the occupant comfort and quality of the development. This will be achieved by developing design strategies that respond to the opportunities and challenges of the climate, site and the local external environment as well as implementing efficient energy infrastructure that also integrates on-site renewable sources.

3.2 MINIMISING DEMAND

The incorporation of appropriate passive measures in the building design is essential if the building services systems are to be efficient and economic. Passive design measures are integral to the building form and fabric and therefore have the greatest influence on carbon emissions throughout the life cycle of a building.

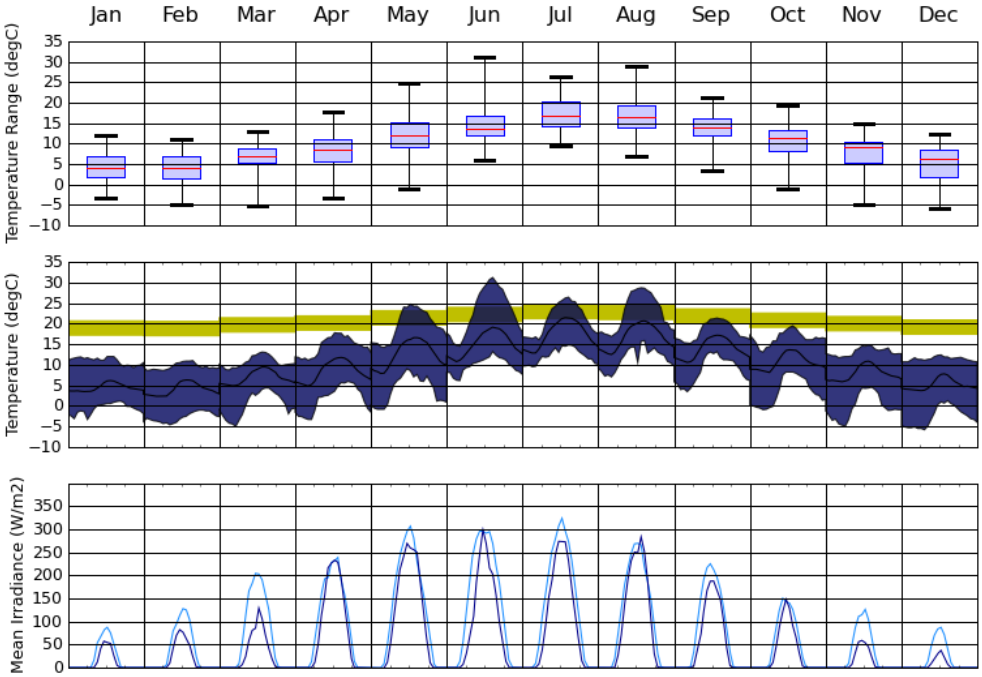
The development of passive design strategies starts by identifying site-specific challenges and opportunities, considering the microclimate, location and surroundings and applying them to the building form, façade and orientation.

The existing property will be demolished and replaced with a new building resulting in a significant reduction in the energy demand of the site (per m^2 of habitable floor area) by constructing the new development to current Building Regulations standards.

Climate Analysis

The London climate is heating dominated, hence the key passive measure to be implemented are high levels of insulation and air-tightness. Temperatures in the summer can occasionally rise above comfortable levels; this will intensify as a consequence of the climate change and further urbanisation.

Diurnal temperature variations are high, with average daily swing of 8-10°C even during peak summer, this creates potential for passive cooling using night-time purging of heat via openable windows. Other passive measures to reduce the risk of overheating include solar shading, daytime natural ventilation and providing local vegetation to mitigate the heat island effect.



Average climate data for Central London

Building Fabric Performance & Insulation

Thermal insulation must be able to deliver significant carbon emissions reductions throughout the life of the development. High levels of insulation will significantly reduce energy consumption and ensure optimum occupant comfort all year round by retaining heat in the winter and reducing heat gain in the summer.

This is particularly relevant for glazed surfaces that may suffer from overheating in summer or overcooling and condensation formation in winter. A minimum U-value of 1.2 W/m^{2}K for all glazed elements is recommended to avoid radiant temperature asymmetry in winter.

The thermal performance of all new exposed elements will exceed the minimum requirements for Building Regulations compliance.

Air Tightness & Infiltration

The target air-permeability rate is 4 m^3/m^2/h, however it is possible to achieve as low as 3 m^3/m^2/h though appropriate selection of materials and seals and design of airtight details.

The key to achieving high levels of airtightness is the quality of construction. Selection of Accredited or Improved Robust Details improves air-tightness of the building envelope in practice.

Thermal Bridging

By implementing Accredited or Enhanced Construction Details overall thermal bridging heat loss factor can be reduced to as low as 0.04, for the purposes of the Energy Calculations a value of 0.06 is assumed.

Natural Ventilation & Thermal Mass

Daytime natural ventilation is essential to purge excess heat during the summer months and enables rapid dilution of pollutants. When used in combination with exposed thermal mass, natural ventilation will reduce high internal daily temperature variations which will minimise the overheating risk in the summer. Therefore occupant comfort can be maintained without sole reliance on the mechanical cooling or ventilation systems.

Solar Exposure and Daylight

Maximising exposure to solar energy and daylight is essential to reduce reliance on artificial lighting reducing winter daytime heating requirements and to contribute to the general wellbeing of occupants.

The site has average access to solar energy and natural daylight as the surrounding buildings are either higher or of a similar height as the proposed development. The surrounding buildings could overshadow portions of the roofs which could limit PV panel's ability for maximum energy production.

The façades of the building are well oriented to receive good level of natural daylight all year round and will benefit from low angle solar energy in winter. All rooms are able to achieve 1% ADF as set out in the BRE Guidelines. The Lower Ground Floor would utilise lightwells and highly efficient reflective materials within the lightwell to reflect more daylight into the rooms.

Active Building Services Systems

All building services systems will be in accordance with, and where possible exceed the energy efficiency requirements of the Domestic Building Service Compliance Guide.

The heating, air conditioning and ventilation systems will be controlled via a central building management system, providing weather compensation, optimised start and time clock and temperature control to each individual room.

All apartments will be mechanically ventilated via local supply and extract air handling plant (MVHR) incorporating heat recovery. This will negate any requirement for trickle vents in the façade and contribute to achieving low air permeability rates. Systems will be designed and low energy fans selected to ensure a low specific fan power (SFP) and electrical consumption.

Low energy fixed lighting, generally comprising LED fittings, will be installed throughout the development.

3.3 DELIVERING RESOURCES EFFICIENTLY

Policy 5.9 of the London Plan 2015 requires developments to connect to a decentralised energy network and use the heat unless it can demonstrate it is not technically feasible or financially viable.

The property is located in the South Hampstead area of the London Borough of Camden, therefore connection to an existing district heating network is unlikely to be viable at the time of construction.

3.4 RENEWABLE & LOW ENERGY TECHNOLOGY SYSTEMS

In accordance with Policy 5.7 of the London Plan 2015, a viability assessment for the most applicable renewable energy and low carbon technologies that could be installed to meet the target 20% CO_2 emissions reduction has been developed in the following section. Capital and operational costs, local availability of renewable energy resource, local pollution, environmental impact, commercial availability, maintenance, control and operational issues, and carbon emissions are considered.

4 ENERGY STRATEGY

The energy strategy for the residential areas of the proposed development has been established using the following process:

- Qualitative assessment of the viable options for conventional, renewable & low energy technologies, considering CO_2 reduction potential, suitability and practicalities of incorporating into the scheme and financial viability to determine the most applicable system.
- Determine the baseline Target Emissions Rate for evaluation of the proposed option in terms of achieving the CO_2 emission reduction targets.
- Calculate the Dwelling Emissions Rate (TER) for the residential units for the preferred options to enable quantitative assessment of CO_2 reductions.
- Quantitative assessment of CO_2 emissions reductions from the proposed renewable energy systems.

4.1 RENEWABLE & LOW ENERGY TECHNOLOGY SYSTEMS ASSESSMENT

Technology		Assessment / Viability
Wind Power	Wind turbine installed on the roof of the development.	Due to the urban location, and the impacts in terms of visual appearance, noise and shadow flicker, wind turbines are not considered a viable technology for the development. CONCLUSION: **VISUALLY AND TECHNICALLY INAPPROPRIATE**
Ground Source Heat Pumps	Open or closed loop GSHP system requiring extraction of ground water and / or deep boreholes.	Significant investment required, limits to how many can be installed in an area and the capacity achievable within a confined site, could be used to supply cooling in summer. No external visual or noise impact. CONCLUSION: **NOT CONSIDERED TECHNICALLY OR FINANCIALLY VIABLE**
Air Source Heat Pumps	Electric powered external plant serving each residential unit providing heating and cooling	Simple and economic system utilises grid electricity - resultant CO_2 reductions lesser other options available, siting of external units will have a visual / planning impact if individual systems per apartment. Greater benefits achieved if part of a central communal heating system. CONCLUSION: **CONSIDERED AS FEASIBLE OPTION BUT ISSUES WITH NOISE LEVELS & EXTERNAL PLANT SPACE REQUIREMENTS**
Solar Thermal Collectors	Roof mounted solar thermal panels providing heating energy to a centralised domestic hot water system	Roofs have good potential for solar thermal energy collection. Solar hot water collectors have a high efficiency and would provide a significant proportion of domestic hot water demand of the development. However PV systems have a greater carbon reduction potential and are more cost effective over the lifetime of the building for the same roof area coverage. CONCLUSION: **NOT CONSIDERED TECHNICALLY VIABLE**
Solar Photovoltaic Panels	Roof mounted Photovoltaic panels (PV) provide electricity directly to the development, exporting any surplus production to the grid.	Roofs have good potential for solar power generation. PV electricity is clean and zero-carbon and will offset carbon intensive grid power. Unlike solar thermal systems, all electricity produced by PVs can be utilised with negligible losses regardless of the installation size/capacity. CONCLUSION: **CONSIDERED A FEASIBLE OPTION**
Solar PV-Thermal Panes	Emerging hybrid system, combination of the Solar Thermal Panels for heat supply and PV panels for electrical power supply.	Hybrid solar thermal + PV systems enhance efficiency by cooling exposed PV cells. Water is circulated on the rear of the panel and the heat is supplied to the building. There are few UK suppliers of PVT systems and installation will require significant investment. CONCLUSION: **NOT CONSIDERED FINANCIALLY VIABLE**

Technology		Assessment / Viability
Biomass Heating	Biomass fired community heating system.	Biomass heating is proven technology and is likely to provide a significant CO_2 reduction. The size of fuel storage, delivery management and local increase in pollution, notably particulates (PM10), SO_2 and NO_X emissions should be considered, The entire borough of Camden is an Air Quality Management Area (AQMA) which states that small biomass boilers are not suitable in AQMA's unless they have no adverse effects on local air quality compared to conventional gas fired boilers. CONCLUSION: **NOT CONSIDERED TECHNICALLY VIABLE**
Combined Heat & Power	Mains gas fired electricity generation plant to supply electrical power and waste heat recovered and used to community heating and domestic hot water.	CHP is proven technology and well suited to community heating systems in conjunction with other heat sources. Electricity is generated more efficiently than grid power as waste heat is fully utilised and transmission losses are minimised. CONCLUSION: **NOT CONSIDERED TECHNICALLY OR FINANCIALLY VIABLE FOR A MINOR DEVELOPMENT**

The table above summarises the viability assessment for the most applicable renewable energy and low carbon technologies. Capital and operational costs, local availability of renewable energy resource, local pollution, environmental impact, commercial availability, maintenance, control and operational issues, and carbon emissions are considered.

When determining the most suitable system, the priority is to maximise the utilisation of on-site renewable energy, minimise the use of carbon intensive and high polluting fossil fuels and avoid energy conversion and transmission losses. Availability of un-obstructed solar energy is considerable on the roofs of the proposed development, therefore systems such, solar photovoltaic technologies should be considered.

Centralised low-carbon energy systems such as community heating systems with gas fired combined heat and power systems have the potential to generate a significant reduction in carbon emissions with overall system efficiencies reaching typically 80%. This is due to the avoidance of massive transmission loses associated with grid electricity and the recovery of 'waste' heat from the electrical generation process. Due to the small size of the development this system is not considered a viable solution.

4.2 ENERGY ASSESSMENT METHODOLOGY

The proposed energy strategy and compliance with the required CO_2 emissions reductions targets are demonstrated using SAP 2012 software. A Target Emissions Rate (TER) is calculated for each residential unit and an average TER across the whole development is used for comparison/evaluation.

The SAP calculations have been repeated to evaluate the CO_2 reduction potential of improvements to the building fabric and the following systems:

- Building Regulations 2013 compliant scheme (base case) achieved by with local gas fired boilers.
- 35% Improvement on Building Regulations 2013 achieved by enhanced building fabric performance, photovoltaic panels and heating via efficient condensing gas boilers.

4.3 BUILDING FABRIC PERFORMANCE

The following building fabric properties have been used in the SAP calculations

Element	Building Regulations 2013 Compliant (base case)		Enhanced Building Fabric – Target 35% Improvement	
	U Value (W/m²K)	G Value	U Value (W/m²K)	G Value
External Walls	0.20	-	0.15	-
Floor	0.13	-	0.13	-
Roof	0.13	-	0.13	-
Windows	1.40	0.63	1.20	0.7
External Doors	1.40	-	1.20	-
Air Tightness	5.0 $m^3/m^2/h$		3.0 $m^3/m^2/h$	
Thermal Bridging	accredited details		accredited details	

4.4 BUILDING SERVICES SYSTEM DATA

The following building services systems have been used in the SAP calculations

Element	Building Regulations 2013 Compliant (base case)	Target 35% Improvement
Space Heating	local gas condensing combination boiler 89% efficient. Underfloor heating in insulated floor	local gas condensing combination boiler 92% efficient. Underfloor heating in insulated floor
Heating Controls	Time and temperature zone control, weather compensation modulating boiler with interlock	Time and temperature zone control, weather compensation modulating boiler with interlock
Hot Water Storage	via boiler	via boiler
Ventilation	local MVHR – 89% efficient	local MVHR – 89% efficient
Lighting	100% low energy	100% low energy
Lighting Control	PIR and daylight sensors to lighting in external areas	PIR and daylight sensors to lighting in external areas
Solar Photovoltaics	none provided	9.24 kW_P total installed capacity

4.5 ENERGY DEMAND & CO_2 EMISSIONS

The energy demand and carbon emissions calculations for Regulated Energy have been prepared using SAP 2012 software. The calculations are based on the proposed building fabric performance and building services systems detailed in this report.

Non-Regulated Energy demand and associated CO_2 emissions associated with small power and any other process or plant equipment not covered under Building Regulations Part L have been estimated based on a benchmarking exercise, following the methodologies outlined in the BRE Domestic Energy Model (BREDEM).

Energy Demand

Energy Use	Primary Energy Demand (kWh/year)		Primary Energy Demand Rate (kWh/m²/year)	
	Part L 2013 Compliant Building	Proposed Building	Part L 2013 Compliant Building	Proposed Building
Space Heating	28,106	15,935	28.03	15.89
Domestic Hot Water	31,991	31,191	31.90	31.10
Regulated Electricity	28,445	7,843	28.36	7.82
Non-regulated Electricity	23,648	23,648	23.58	23.58
Total	**112,190**	**78,617**	**111.87**	**78.39**

The predicted total annual regulated energy demand of the proposed development following the introduction of energy efficiency measures, passive design and renewable and low energy technologies is 54,969 kWh compared to a Building Regulations Part L1A (2013) compliant building demand of 88,542 kWh. This represents a significant improvement in energy efficiency, equating to a reduction of 33.48 kWh per sq.m or 37.9%.

The following table details the potential subsequent reduction in CO_2 emissions as a result of the improvements to the energy demand.

CO_2 Emissions

Energy Use	Emissions (Kg CO_2/year) [1]		Emissions Rate (Kg CO_2/m²/year) [1]	
	Part L 2013 Compliant Building	Proposed Building	Part L 2013 Compliant Building	Proposed Building
Space Heating	4,876	2,821	4.86	2.81
Domestic Hot Water	5,664	5,522	5.65	5.51
Regulated Electricity	4,809	1,326	4.79	1.32
Non-regulated Electricity	12.274	12,274	12.24	12.24
Total	**27,622**	**21,943**	**27.54**	**21.88**

[1] Carbon Emissions conversion factors have been taken from SAP 2012:

- Grid Electricity – 0.519 kgCO_2 / kWh
- Natural Gas – 0.216 kgCO_2 / kWh

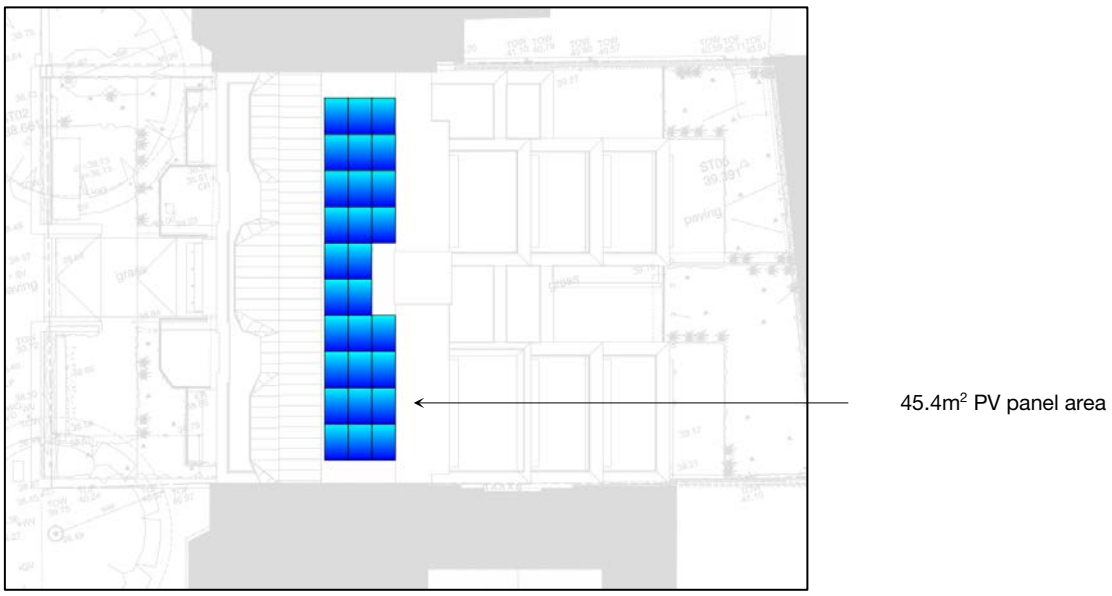
The predicted total regulated energy annual CO_2 emissions of the proposed development following the introduction of energy efficiency measures, passive design and renewable and low energy technologies is 9,669 Kg CO_2 compared to the Building Regulations Part L1A (2013) compliant building of 15,348 Kg. This represents a significant improvement in carbon emissions, equating to a reduction of 5.66 Kg per sq.m or 37.0%.

4.6 ON-SITE RENEWABLE ENERGY GENERATION

It is proposed that photovoltaic panels are located on the 3nd Floor pitched roof facing South East. Although this arrangement will not enable the optimal orientation of photovoltaic panels, it will allow an unobstructed solar availability to be achieved.

The available gross roof area is 56.5 m^2. It is recommended that the panels are surface mounted on the roof (roof tilt 12° on East side, orientation 76° East). This will enable the available roof area to be maximised and minimize overshadowing of the PV panels. It has been considered also an allowance of space for access and maintenance of 1 meter form the edge of the roof.

The diagram below indicates the proposed location of the PV panels.



Roof Plan

	Generated Energy (kWh /year)	**Equivalent CO_2 Emissions (Kg CO_2/year)**	**Proportion (CO_2) of Total Demand**
Total Demanded Energy	78,617	21,943	100%
Generated Solar Photovoltaic Energy	20,602	3,483	26.2%
Total from Renewables	**20,602**	**3,483**	**26.2%**

5 SUSTAINABILITY APPRAISAL

The following appraisal addresses the sustainable features of the proposed redevelopment of 115-119 Goldhurst Terrace, following policy guidelines.

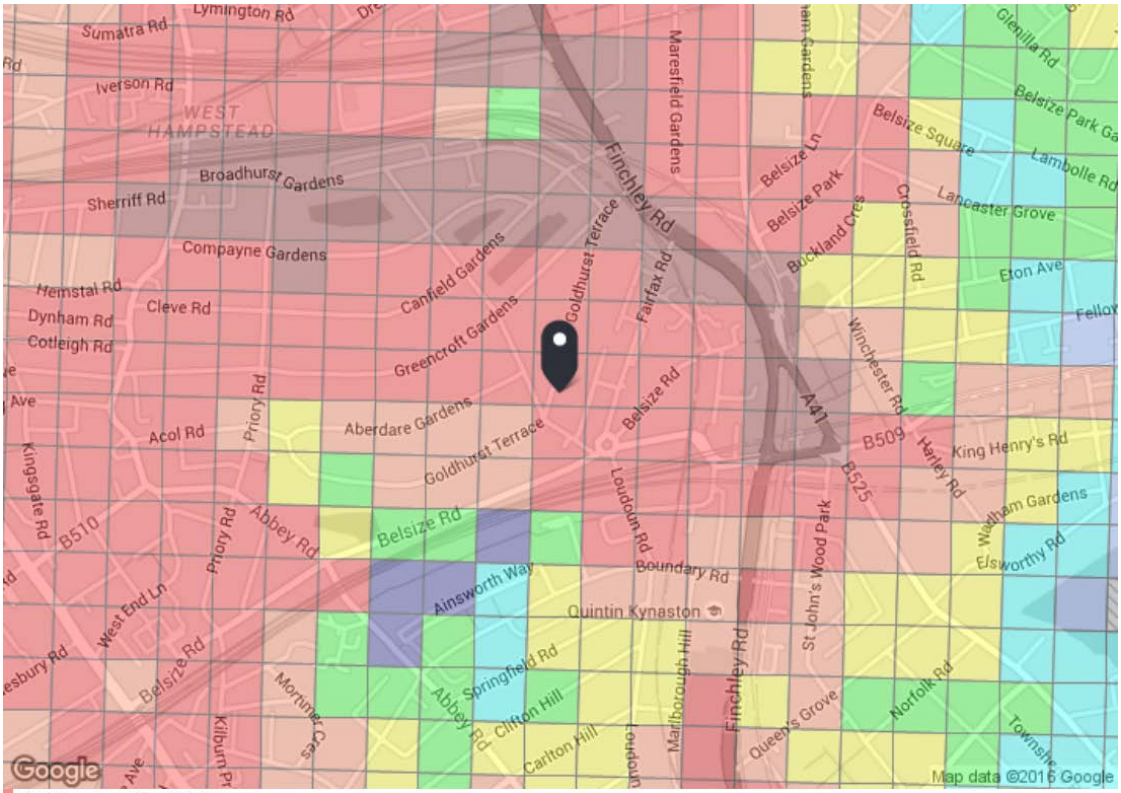
5.1 LAND & BUILDING USE

The site at 115-119 Goldhurst Terrace, is located in South Hampstead, within the London Borough of Camden. The site is within the South Hampstead Conservation area and does not contain any Listed Buildings.

The site is currently occupied by an existing vacant multi-unit residential building and hard landscaping, and is considered of low architectural merit. The proposed building largely occupies the footprint of the previously proposed building.

5.2 SITE LOCATION & PUBLIC TRANSPORT ACCESSIBILITY

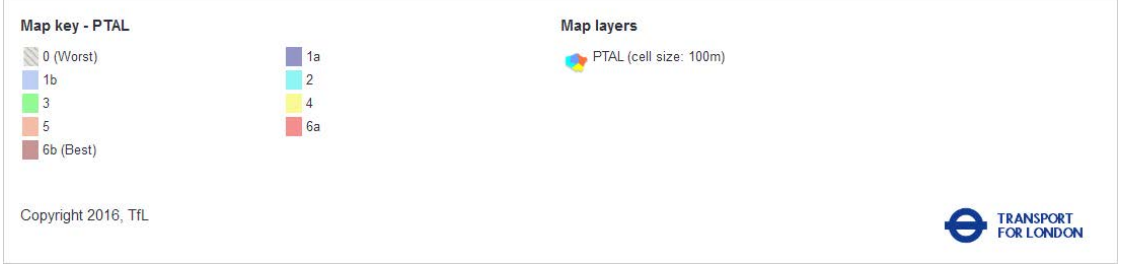
The site is located in the urbanised area of South Hampstead, within the London Borough of Camden, which has a range of frequent transport links. The nearest tube station is Finchley Road which is within 500m and the nearest Overground rail station, South Hampstead is within 270m of the site. There are numerous local bus routes with bus stops between 290 and 470 m from the site.



PTAL output for 2021 (Forecast)

6a

Easting: 526248, Northing: 184212



The Transport for London Web PTAL report for the site states that the Accessibility Index is 34.44, which translates as a PTAL Rating of 6a. This is the second highest rating and demonstrates the site is extremely well placed for public transport.

Each apartment will include provision for cycle storage facilities which will be provided to encourage cycling rather than car usage. The cycle storage will be located within the building at Lower Ground Floor Level, providing a secure facility.

5.3 ENERGY CONSERVATION & EFFICIENCY

The energy efficient design of the development is discussed in detail in section 4

5.4 WATER CONSERVATION & RECYCLING

The water management strategy will adopt the same *Lean-Clean-Renewable* hierarchy that is applied in development of the energy strategy. To reduce potable water demand and use the resource efficiently, a combination of the following strategies will be adopted:

- Rainwater harvesting and reuse for garden irrigation and façade cleaning.
- Specification of water efficient appliances, including washing machines and dishwashers, all white goods provided will have maximum water efficiency ratings.
- Dual and low flush toilets; flow restrictors on piped water supplies to sinks and basins.
- A pulsed water meter will be installed to each dwelling.

These will reduce potable water demand, when compared to a typical UK dwelling, from 155 litres / person per day to 110 litres / person per day.

5.5 MATERIALS

It is proposed that high quality materials be used throughout the proposed development. The materials selected for the development will therefore:

- Be selected to suit the hierarchy within the BRE Green Guide to Specification, maximising the use of A & A+ materials where ever possible;
- Be sourced from the demolition materials where possible. Where possible, the recovered demolition materials will be reused on-site.
- Be sourced responsibly from certified and accredited suppliers and manufacturers, e.g. Chain of Custody certification, FSC, EWMAS, BES6001 etc.;
- Be manufactured off site where possible;
- Comprise low VOC content products;
- Be locally sourced where possible, with a sourcing hierarchy starting within London, then South East England, England, and then the UK.

5.6 WASTE

The construction of a building involves the production of a variety of waste streams. These can arise at each stage of the development life cycle including demolition of the existing buildings, excavations, construction and the building operation. By careful planning, appropriate design and management of these waste streams the waste volumes can be substantially reduced or in some cases even removed completely.

The waste strategy will be developed with the intention of reducing waste disposal to landfill sites. This includes a waste hierarchy which is consistent with the basic sustainability principles of reduce, reuse and recycle. This hierarchy follows the steps below.

- Waste prevention
- Re-use

- Recycle
- Disposal

The property design will be developed with full consideration given to selection of materials and promotion of construction techniques that can reduce waste. The use of standard material sizes, and proprietary products can reduce waste generation, as can the specification of materials such as plasterboard which have an inherent recyclable option for off cuts.

The contractor will be required to implement a Site Waste Management Plan for the management of construction materials, to demonstrate how they will be recycled or re-used and confirm how waste discharge to landfill will be kept to a minimum.

Communal internal storage areas will be provided for each residential unit within communal storage areas for recyclable and non-recyclable waste.

The London Borough of Camden is well serviced with regard to refuse collection, with both municipal waste and recycling regularly collected. Waste management and storage provision will be designed to make full benefit of these waste collection facilities.

5.7 HEALTH & WELLBEING

All living rooms, dining areas studies and areas designated as a home office will be designed to achieve a minimum average daylight factor of at least 1.5 %. All kitchens will be designed to achieve a minimum average daylight factor of at least 2.0 %.

The residential units will be designed to ensure all airborne sound insulation values are at least 5dB higher and impact sound insulation values are at least 5dB lower than the Building Regulation Part E 2003.

The design of the proposed development will incorporate the principles of Lifetime Homes to ensure all residential units are accessible and easily adaptable to meet the changing needs of future occupants.

5.8 MANAGEMENT OF CONSTRUCTION

The Contractor should be required to meet best practice under a nationally or locally recognised certification scheme such as the Considerate Constructors Scheme. This will include the management, control and monitoring of the following arising from site activities:

- water consumption
- water (ground and surface) pollution
- air (dust) pollution
- the use of reclaimed, re-used and responsibly sourced site timber
- waste generation, mitigation measures and maximising waste diversion from landfill

5.9 ECOLOGY

The site is largely made up of residential buildings and associated hard standing with back garden areas. The gardens are accessed from the living accommodation and have been planned as outdoor rooms, making the most use of the available space. The site is considered to be of low ecological value with no specially protected habitats present.

The net internal floor area to net internal ground floor area is in excess of 2,5:1, therefore it can be considered that proposed development provides efficient use of the building footprint by ensuring that land and material use is optimised across the development.

6 SUMMARY

Minimise Demand

Passive design measures will be incorporated into the design of the proposed development to reduce energy consumption whilst enhancing occupant comfort and wellbeing. Key sustainable design features include maximising exposure to solar energy and daylight through considered façade design, minimising overheating and glare via passive shading, providing facilities for effective, controlled natural ventilation.

The thermal performance of the building fabric will be enhanced through the use of appropriate construction materials and details providing low U-values, minimising cold bridging, enhanced air tightness and reduced air infiltration.

Deliver Resource Efficiently

The residential units will include efficient building services systems including mechanical ventilation systems incorporating heat recovery, low energy lighting and time, temperature and weather compensated heating controls.

Use Renewable Sources

A network of photovoltaic panels will be provided to generate a supply of clean, zero-carbon electricity to the development. The PV panels will be located on the roof and tilted to maximise power generation throughout the year without any over shading from surrounding buildings.

Decentralised Energy in Development Proposals

The proposed solar PV network will have the potential to connect to any future decentralised energy network, enabling both t

he import and export of power to and from the development.

Due to the size and location of the proposed development and availability of local district heating networks it is not deemed feasible to connect to any heat network at this stage.

Achieving CO_2 Emissions Reduction Targets

Improvements to the building fabric and the proposed active building services systems can achieve an average reduction of CO_2 emissions over the TER of 35%.

The proposed photovoltaic panels will be tilted to maximise power generation throughout the year with minimal over shading from surrounding buildings. The extent of the proposed photovoltaic cell panel installation will provide a 20% reduction in CO_2 emissions over the energy use of the entire development.

This strategy represents the maximum energy and CO_2 emissions reductions that could be achieved for this development and therefore it confirms that the development complies with the minimum requirements set by London Plan and the London Borough of Camden's sustainability targets.

The figures within this report are based on preliminary analysis only and further detailed studies will be required as part of the next design stage before any further development of the proposed systems.