Energy & Sustainability Statement

99 Camden Mews
London
NW1 9BU

16th October 2017

Prepared for:

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Contents

Appendices

1.0 The Site & Proposal

The proposed development is located at 99 Camden Mews, London, NW1 9BU, within the Camden Square conservation area.

The proposed development comprises the demolition of an existing building on site and construction of a 3 bedroom house arranged over 2 floors and part 3rd floor.

Overall the proposed dwelling will provide 3 bedrooms and space for cycle and bin storage.

1.1 Planning Context

The project sits within the London Borough of Camden (Camden) and specific planning guidance has been taken into account via a per-application consultation; the relevant policies are: -

- London Plan Policy
- Camden Local Plan adopted June 2017 – Policies CC1, CC3, CC4 & CC5
- Camden's CPG 3 Sustainability
- Energy Efficiency - planning guidance for conservation areas (Sept 2014)

Specific advice was offered in response to the pre-application submission:

"Sustainability

Camden Council requires all development to minimise the effects of climate change and encourages all developments to meet the highest feasible environmental standards during construction and occupation. Policies CC1 (climate change mitigation), CC3 (Water and flooding), CC4 (air quality), CC5 (waste) and CPG6 *(3?)* (sustainability) provide detailed guidance and sets out how all developments are expected to reduce their carbon dioxide emissions by following the steps in the energy hierarchy (be lean, be clean, be green) to reduce energy consumption.

All new residential development will also be required to demonstrate a 19% CO2 reduction below Part L 2013 Building Regulations (in addition to any requirements for renewable energy). This can be demonstrated through an energy statement or sustainability statement. All proposals for substantial demolition and reconstruction should be fully justified in terms of the optimisation of resources and energy use, in comparison with the existing building. Where the demolition of a building cannot be avoided, we will expect developments to divert 85% of waste from landfill and comply with the Institute for Civil Engineer's Demolition Protocol and either reuse materials on-site or salvage appropriate materials to enable their reuse off-site. We will also require developments to consider the specification of materials and construction processes with low embodied carbon content (Policy CC1, para 8.17). We will expect all developments, whether for refurbishment or redevelopment, to optimise resource efficiency by:

- reducing waste;
- reducing energy and water use during construction;
- minimising materials required;
- using materials with low embodied carbon content; and
- enabling low energy and water demands once the building is in use"

1.2 The London Plan

On 10 March 2015, the Mayor published (i.e. adopted) the Further Alterations to the London Plan (FALP). From this date, the FALP are operative as formal alterations to the London Plan (the Mayor's spatial development strategy) and form part of the development plan for Greater London; further updates to The London Plan – not relevant to this report – were adopted in 2016

Chapter 5 deals with London's Response to Climate Change and covers areas such as climate change - minimising energy; (see Policy 5.2 below), sustainable use of water, aggregates and other resources, reducing air and water pollution, managing flood risk and sustainable urban drainage systems, conserving and enhancing the natural environment and promoting sustainable waste behaviour.

Of particular significance is Policy 5.2 Minimising Carbon Dioxide Emissions, which requires:-

Development proposals should make the fullest contribution to minimising carbon dioxide emission 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

As part of this assessment, it must consider unregulated energy use not covered under the Building Regulations at each stage of the Energy Hierarchy i.e. cooking and appliances and use of equipment.

In March 2016, the Mayor's office published "Energy Planning - Greater London Authority guidance on preparing energy assessments"

This document formally introduces the principle of zero carbon hoes from 1st October 2016 and confirmed that "the London Plan policy seeking 'zero carbon' homes remains in place and was not changed by the recent Minor Alterations to the London Plan."

'Zero carbon homes are defined as homes forming part of major development applications where the residential element of the application achieves at least a 35 per cent reduction in regulated carbon dioxide emissions (beyond Part L 2013) on-site. The remaining regulated carbon dioxide emissions, to 100 per cent, are to be off-set through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.

Accordingly, this report is guided by and reports against the above noted required standards, however, it should be noted that the project at 99 Camden Mews would not be considered major development.

2.0 Baseline Energy Results

In order to consider the project against the London Plan Energy Hierarchy, this report will first establish the “Baseline” energy consumption.

2.1 New Build Dwellings

The baseline emission levels – the Target Emission Rate (TER) as required for Building regulations compliance - is obtained by applying the design to a reference ‘notional’ building the characteristics of which are set by regulations – SAP2012; The new Part L Building Regulations 2013 came into force on April 2014 and introduced a completely new notional dwelling as detailed below:-

Table 4 Summary of concurrent notional dwelling specification

Element or System	Values
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion of 25% of total floor area [1]
External Walls (including opaque elements of curtain walls) [6]	0.18 W/m²K
Party Walls	0.0 W/m²K
Floor	0.13 W/m²K
Roof	0.13 W/m²K
Windows, roof windows, glazed rooflights and glazed doors	1.4 W/m²K [2] (Whole window U-value)
	g-value = 0.63 [3]
Opaque doors	1.0 W/m²K
Semi glazed doors	1.2 W/m²K
Air tightness	5.0 m³/hr/m²
Linear thermal transmittance	Standardised psi values – See SAP Appendix R, except use of y=0.05 W/m²K if the default value of y=0.15 W/m²K is used in the actual dwelling
Ventilation type	Natural (with extract fans) [4]
Air conditioning	None

Element or System	Values
Heating System	Mains gas If combi boiler in actual dwelling, combi boiler; otherwise regular boiler Radiators
	Room sealed
	Fan flue
	SEDBUK 2009 89.5% efficient
Controls	Time and temperature zone control [5] Weather compensation
	Modulating boiler with interlock
Hot water storage system	Heated by boiler (regular or combi as above) If cylinder specified in actual dwelling, volume of cylinder in actual dwelling. If combi boiler, no cylinder. Otherwise 150 litres. Located in heated space. Thermostat controlled Separate time control for space and water heating
Primary Pipework	Fully Insulated
Hot water cylinder loss factor (if specified)	Declared loss factor equal or better than 0.85 x (0.2 + 0.051 V2/3) kWh/day
Secondary Space Heating	None
Low Energy Lighting	100% Low Energy Lighting
Thermal Mass Parameter	Medium (TMP=250)

SAP first creates the notional reference building, based upon the same shape and form as the proposed dwelling and applies the above the characteristics as defined in SAP2012.

Once all of the baseline emission rates have been calculated in line with the above Government approved methodologies, they are considered as stage 'zero' of the energy hierarchy as described earlier and Target Emission Rate sets the benchmark for the worst performing, but legally permissible, development.

The baseline un-regulated energy uses for cooking & appliances in the dwelling have been calculated using the SAP Section 16 methodology; the same calculation used for Code for Sustainable Homes (CfSH) Ene 7.

Appliances = E_A = 207.8 X (TFA X N)$^{0.4714}$

Cooking = (119 + 24N)/TFA

N= no of occupant SAP table 1B

TFA – Total Floor Areas

The unregulated energy use per sqm is summarised in Table 1 below

Table 1 – Unregulated Energy Use

Unit	Unregulated Energy Use Kg/sqm
99 Camden Mews	14.73

The un-regulated emission rates are added to the baseline regulated emission rates (as calculated above) in order to set the total baseline emission rates before then applying the energy hierarchy in line with The London Plan and Camden Local Plans policies: -

Table 2 – Baseline energy consumption and CO2 emissions

Unit	Baseline Emission Rate (regulated energy use) Kg/sqm	Unregulated Energy Use Kg/sqm	Total baseline emissions Kg/sqm	Total baseline emissions Kg
99 Camden Mews	16.7	14.73	31.43	4692.70
Total				4692.70

The baseline SAP TER outputs are attached at **Appendix A** confirming the above tabulated data.

3.0 Design for energy efficiency

The first step in the Mayor's 'Energy Hierarchy' as laid out in Section 5 of The London Plan requests that buildings be designed to use improved energy efficiency measures – Be Lean. This will reduce demand for heating, cooling, and lighting, and therefore reduce operational costs while also minimising associated carbon dioxide emissions.

This section sets out the measures included within the design of the proposed dwelling to reduce the demand for energy, both gas and electricity (not including energy from renewable sources). The table at the end of this section details the amount of energy used and CO_2 produced by the proposed development after the energy efficiency measures have been included.

To achieve reductions in energy, demand the following measures have been included within the design and specification of the building:

3.1 Orientation & Passive Design

Core Strategy Policy 13 requires "ensuring buildings and spaces are designed to cope with, and minimise the effects of, climate change."

The project is based upon a site with fixed southeast – northeast orientation due to its mid-terrace location.

The fenestration design is specific to meeting the design requirements of the building's contribution to the conservation area, so options for external shading are limited.

Accordingly, passive solar gain control is achieved via the use of a solar control glazing with a g-value at less than 0.45.

Advantage is taken of the north westerly aspect – not seen from the road, with larger areas of glazing incorporated to enhance internal daylight levels and reduce reliance on artificial lighting

The dwelling has a design which enables cross ventilation, enabling a purge ventilation rate at circa 3 air changes per hour - maximising passive cooling.

3.2 Heating system

The primary heating system for the dwelling will consist of a high efficiency condensing gas boilers - this will in turn provide domestic heating and hot water via a highly insulated low loss cylinder for DHW storage

- High efficiency gas boiler – (89.3% SEDBUK efficiency)
- Built-in flue gas heat recovery, improving combustion efficiency by up to 3%

To increase the efficiency in the use of the heating system, the following controls will be used in a 'boiler interlock' system to eliminate needless firing of the boiler.

- Time and temperature zone control
- Boiler fitted with weather/load compensator

3.3 Fabric heat loss

Insulation measures will be utilised to ensure the calculated u values exceed the Building Regulations minima, with specific guidance taken from the design team, with the applicant seeking to go beyond the recommendation contained within Camden's CPG 3:

New wall constructions will aim to achieve a u value of 0.18.

The lightweight roof structures will meet a u-value of 0.12

The ground floor will be an insulated ground slab floor structure achieving u = 0.14.
Glazing

New glazing for windows, roof lights and doors have area weighted average U-Values of $1.2w/m^2$ K or better

3.4 Lighting and appliances

A 100% of internal light fittings will be dedicated low-energy/compact fluorescent fittings, with extensive use of LED lighting.

It is anticipated that under the principles of BREEAM and best practice sustainability, all of the electrical appliances will be provided as part of the finished dwelling; fridge/freezers A+ rated, Dishwasher and washing machines A rated and tumble dryer with a B rating.

In addition, again in line with BREEAM principles, any external lighting will be of the low energy type with consideration given to the design and location to reduce light pollution.

3.5 Energy efficiency results

The following table shows a comparison between the baseline scheme assessed under the SAP methodology based upon AD Part L1A minima and the scheme following the introduction of energy efficiency measures (not including energy from renewable sources).

Table 3 – Energy consumption and CO2 reductions

Unit	"Be lean" Emission Rate (regulated energy use) Kg/sqm	Unregulated Energy Use Kg/sqm	Total "Be lean" emissions Kg/sqm	Total emissions Kg
99 Camden Mews	16.16	14.73	30.89	4612.08
Total				4612.08

The results show that, the new dwelling with the energy efficiency measures has achieved emissions reductions of 1.72% over the baseline model and clearly, the applicant has confirmed their commitment to go beyond the requirements of the minimum standards of the Building Regulations through the fabric first approach.

The SAP 2013 Dwelling Emission Rate outputs are attached at **Appendix B.**

4.0 Supplying Energy Efficiently

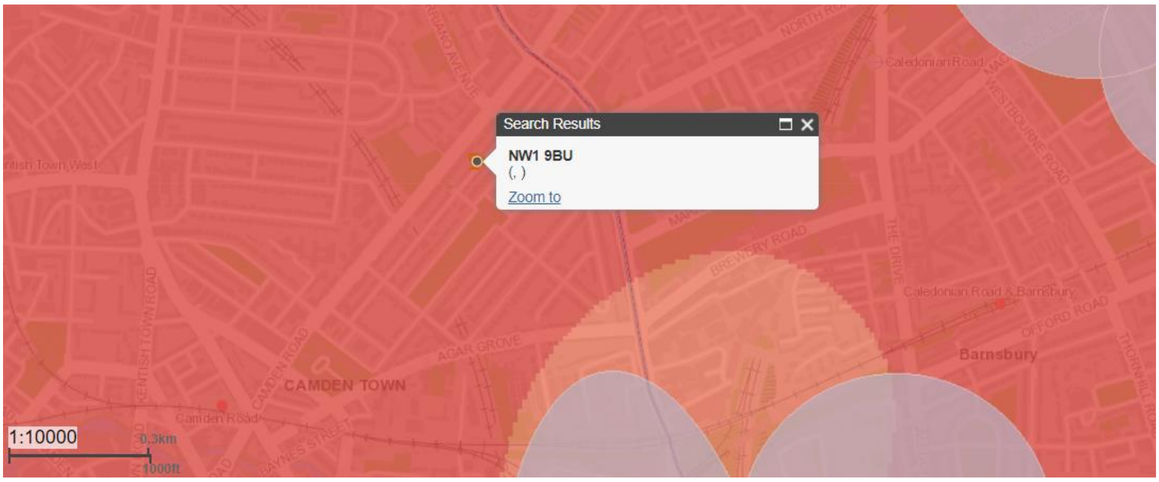
The second stage in the Mayor's 'Energy Hierarchy' is to ensure efficient and low carbon energy supply – Be Clean. In particular, this concerns provision of decentralised energy where practical and appropriate.

4.1 Community Heating/Combined Heat and Power (CHP)

Combined heat and power systems are essentially biomass or fossil fuel fired electricity generators that use the heat by-product to provide space and water heating. The electricity generated can be used directly within the host buildings or sold to electricity suppliers on the national grid. These systems can be employed on a large scale for community schemes or at the micro scale for individual dwellings.

Alternatively, larger scale systems operated as a standalone entity can be used to provide heat and power to the local neighbourhood – a District Energy Network (DEN).

The London Heat map has been consulted to look at the potential for the project to connect to a DEN now, or in the future. However, as can be seen from the extract below, the development site at Camden Mews is some 600m distant from any opportunity areas of decentralised energy potential.



With this in mind, the distance that the heat network flow and return would need to be brought to site, as well as the small scale of the proposed development, the design team has agreed that a district heating system would not be appropriately employed in this scheme.

So, in line with best practice - we consider on-site provision:-

4.2 On-site CHP/District Heating

The heat production facility for a district heating scheme is generally considered to include heat only boilers (HOB) and/or the production of both electricity and heat i.e. CHP.

CHP is, as a rule of thumb, is only operated as a base load as, depending on the technology, it may be difficult and/or inefficient to operate according to daily variations in demand.

In a well-designed district heating network heat from CHP will provide between 60% and 80% of the annual heat (heating and hot water) requirement with heat-only boiler plants providing the peak load and back-up. To maximise efficiency of the engine it needs to run for at least 17 hours a day; therefore, the heat load needs to be present for this period.

Clearly, as a limited scale domestic development, with only the limited combined DHW demand to support a CHP installation, the economy of scale, in terms of year-round demand simply isn't present and as such the potential use of on-site CHP can be dismissed.

5.0 Renewable Energy Options

The final element of the Mayor's 'Energy Hierarchy' requires development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible – Be Green.

Renewable energy can be defined as energy taken from naturally occurring or renewable sources, such as sunlight, wind, waves/tides, geothermal etc. Harnessing these energy sources can involve a direct use of natural energy, such as solar water heating panels, or it can be a more indirect process, such as the use of Biofuels produced from plants, which have harnessed and embodied the suns energy through photosynthesis.

The Energy Efficiency measures outlined under 3.0 above have the most significant impact on the heating and hot water energy requirements for the dwelling, and the associated reduction in gas consumption.

Camden Core Strategy also requires that all developments achieve a reduction in on-site carbon dioxide emissions through renewable technologies, unless demonstrated that such provision is not feasible.

It should be noted that each Kwh of gas energy saved reduces emissions by 0.216kgCO_2/kwh, whereas, grid based electrical energy has a emissions factor of 0.519kgCO_2/kwh and accordingly, emphasis will be placed upon "off-setting" grid based electricity in order to achieve the optimum use of renewable technologies.

This section then sets out the feasibility of implementing different energy technologies in consideration of: -

- Potential for Carbon savings
- Capital costs
- Running costs
- Payback period as a result of energy saved/Government incentives
- Maturity/availability of technology
- Reliability of the technology and need for back up or alternative systems.

5.1 Government incentives

5.1.1 Feed in Tariff

Feed in Tariffs (FiTs) replaced ROCs for renewable energy generators rated at less than 5MW in April 2010. FiTs are payments made for every kilowatt-hour kWh of renewable electricity generated and the level of the payment is laid down by the government, and varies for different renewable energy sources and at different scales. Unlike the flat rates paid for ROCs, FiTs are designed to compensate for less efficient/more expensive sources of renewable energy – and for the first time – make the investment in low and zero carbon technologies viable for both domestic generators and larger companies alike.

Recent reviews of Feed in Tariff rates will lead to lower returns on such technologies in 2016, but the expectation is that system capital costs and enhanced efficiencies will compensate for this over the medium term.

5.1.2 Renewable Heat Incentive

The Renewable Heat Incentive (RHI) was formally launched by the UK Government on 10th March 2011. The RHI will pay a tariff payment to renewable technologies that provide heat energy from a renewable source, with the payment relating to the KWh of heat energy provided e.g. if a property has a heat load of 20,000 KWh per annum, and it is 100% provided from a renewable source, then the tariff is paid against the 20,000KWh.

The Government decided on a two stage delivery - the first stage being for non-domestic schemes, which commenced in July 2011, with domestic scheme having come on stream in April 2014.

5.2 Wind turbines

Wind turbines come in two main types'- horizontal axis and vertical axis. The more traditional horizontally axis systems rotate around the central pivot to face into the wind, whilst vertical axis systems work with wind from all directions.

The potential application of wind energy technologies at a particular site is dependent upon a variety of factors. But mainly these are: -

- Wind speed
- Wind turbulence
- Visual impact
- Noise impact
- Impact upon ecology

The availability and consistency of wind in urban environments is largely dependent upon the proximity, scale and orientation of surrounding obstructions. The site is surrounded with other properties of 3-4 storeys in height adjacent and in all directions.

To overcome these obstructions and to receive practical amounts of non-turbulent wind, the blades of a wind turbine would need to be placed significantly above the roof level of the surrounding buildings.

It is clear that a wind turbine of this size would be considered unacceptable in this location and is therefore dismissed as an option.

5.3 Solar Energy

5.3.1 Solar water heating

Solar water heating panels come in two main types; flat plate collectors and evacuated tubes. Flat plate collectors feed water, or other types of fluid used specifically to carry heat, through a roof mounted collector and into a hot water storage tank. Evacuated tube collectors are slightly more advanced as they employ sealed vacuum tubes, which capture and harness the heat more effectively.

Solar energy can be delivered in 2 formats as noted above, each system requiring an appropriate area in which to install panels.

The new development at Camden Mews has some available roof space with a clear southerly aspect, so solar panels could be an option.

However, given the limited roof space available, and the strategy to off-set the electrical use, solar PV may be a stronger candidate (see below) and would offer a greater return in terms of carbon savings

Solar thermal systems also require a constant demand on hot water, and a large solar tank in which to store the pre-heated water as well as a management strategy to ensure energy savings and environmental benefits are maximised – the space required not being a commodity available for the development at 99 Camden Mews

Accordingly, this technology is dismissed as being inappropriate for the development.

5.3.2 Photovoltaics (PV)

Solar panel electricity systems, also known as solar photovoltaics (PV), capture the sun's energy using photovoltaic cells. These cells will be accumulated on a PV panel, usually about 2.0m x 1.0m. These panels are then wall, roof or floor mounted and are connected directly to the electricity grid via the properties meter. In this way, the electrical generation can be fully exported and is not related to the consumption of the dwelling.

PV panels also offer a much more attractive return from the Feed in Tariff often achieving 6-8% returns or better.

As noted above, the available roof spaces located on the main roof areas would be appropriate for solar PV panels.

Accordingly, the design team are proposing an installation of 3 x 330w panels at 1.05m x 2.00m at roof top level.

5.4 Biomass heating

Biomass is a term given to fuel derived directly from biological sources for example rapeseed oil, wood chip/pellets or gas from anaerobic digestion. It can only be considered as a renewable energy source if the carbon dioxide emitted from burning the fuel is later recaptured in reproducing the fuel source (i.e. trees that are grown to become wood fuel, capture carbon as they grow).

Biomass heating systems require space to site a boiler and fuel hopper along with a supply of fuel. There also needs to be a local source of biomass fuel that can be delivered on a regular basis.

It is not considered appropriate to specify biomass boilers within this dwelling, as they do not have space to accommodate a relatively large biomass boiler and a supply of fuel.

A boiler of this type would replace the need for a conventional gas boiler and therefore offset all the gas energy typically used for space and water heating, however, biomass releases high levels of NO_x emissions and would therefore have to be considered carefully against the high standard of air quality requirements set out in the London Plan.

5.5 Ground source heat pump

All heat pump technologies utilise electricity as the primary fuel source – in this case displacing gas, as such, the overall reduction in emissions when using this technology can be less effective when opposed to a technology that is actually displacing electricity.

Ground source heating or cooling requires a source of consistent ground temperature, which could be a vertical borehole or a spread of pipework loops and a 'heat pump'. The system uses a loop of fluid to collect the more constant temperature in the ground and transport it to a heat pump. In a cooling system this principle works in reverse and the heat is distributed into the ground.

The heat pump then generates increased temperatures by 'condensing' the heat taken from the ground, producing hot water temperatures in the region of 45^{o}C. This water can then be used as pre-heated water for a conventional boiler or to provide space heating with an under floor heating system.

The use of a ground source heating/cooling system will therefore require:

- Vertical borehole or ground loop
- Use of under floor heating
- Space for heat pump unit

Clearly, there is insufficient land area to install low level collector loops, leaving deep bore GSHP as the only potential option.

Normally the boreholes would need to be 6 to 8 metres apart and a 100 metre deep borehole will only provide about 5kW of heat. The borehole should also be formed around 3m away from the perimeter of the building and most specialists don't recommend using the structural boreholes.

Clearly, in the case of the proposed development at Camden Mews, there is no scope for the locating of the ground collector devices and as such, ground source heating cannot be considered.

5.6 Air source heat pump

Air source heating or cooling also employs the principle of a heat pump. This time either, upgrading the ambient external air temperature to provide higher temperatures for water and space heating, or taking warmth from within the building and dissipating it to the outdoor air.

It must be remembered that heat pumps utilise grid based electricity and the associated emissions, so that the actual reduction in emissions can be limited. Assuming a seasonal system efficiency of 320% (Coefficient of Performance of 3.2) and that the air source heat pump will replace 90% of the space heating/hot water demand, then the system would reduce the overall CO_2 emissions by approximately 10-20%. The table below demonstrates, on the assumption of a demand of 10000Kwh/year for heating and hot water:-

Table 4 – Comparative Heat Pump performance

Type of Array	Energy Consumption (Kwh/yr.)	Emission factor ($kgCO_2$/Kwh)	Total CO_2 emissions (kg/annum)
90% efficient gas boiler	11111	0.216	2400
320% efficient ASHP	2813	0.519	1460
100% efficient immersion (back-up)	1000	0.519	519

A theoretical carbon saving of 17.5%

With the above data in mind, clearly an ASHP could be an option, however, heat pump would require external installation, giving rise to: -

- A potential visual impact to neighbouring properties overlooking the installation location.
- The requirement for a noise impact assessment, and the potential for a noise nuisance to be present in this dense suburban location.
- Negative impact on the conservation area.

Given such impacts, it is considered that air source heat pumps would not be appropriate at this location.

5.7 Final Emissions Calculation

The results of the assessment of suitable technologies relative to the nature, locations and type of development suggest that the installation of a 0.99Kwp PV array would be the most appropriate solution.

Accordingly, the data set out in Table 5 below demonstrate the data contained within the final design SAP DER outputs, which are attached at **Appendix C**: -

Table 5 – Energy consumption and CO2 reductions

Unit	"Be lean" Emission Rate (regulated energy use) Kg/sqm	Unregulated Energy Use Kg/sqm	Total "Be lean" emissions Kg/sqm	Total emissions Kg
99 Camden Mews	13.33	14.73	28.06	4189.56
Total				4189.56

The data at Table 5 confirms that overall emissions – including unregulated energy use - have been reduced by **10.91%** over and above the baseline model.

Excluding the un-regulated use, i.e. considering emissions controlled under the Building Regulations AD Part L, then the reduction equates to **20.18% (TARGET 19%)** and given the proposals put in place above, it is clear that the applicant has sought to meet the requirements of London Borough of Camden's Policies through a careful design strategy involving best practice passive design and energy efficient services.

6.0 Sustainable Development

"Due to the small scale nature of the development, LDF Policy DP22's requirement for a formal Eco Homes assessment does not apply - indeed, in March 2015, HM Government withdrew the Code for sustainable Homes and any other technical housing standard; a fact acknowledged within Camden's draft Local Plan (2015)."

However, the applicant is committed to adopting many of the principles of Eco Homes and the Code for Sustainable Homes in line with the pre-application advice:-

Materials

- Newly construction elements will be considered against the BRE Green Guide to ensure that, where practical, the most environmentally friendly construction techniques are deployed.
- Construction materials will be sourced from suppliers capable of demonstrating a culture of responsible sourcing via environmental management certification, such as BES6001
- Insulation materials will be selected that demonstrate the use of blowing agents with a low global warming potential, specifically, a rating of 5 or less. Additionally, all insulants used will demonstrate responsible sourcing of material and key processes.
- The principle contractor with be required to produce a site waste management plan and sustainable procure plan, in line with BREEAM requirements – this will include a pre-demolition audit to identify demolition materials to reuse on-site or salvage appropriate materials to enable their reuse or recycling off-site, with a requirement to divert 85% of waste from landfill and comply with the Institute for Civil Engineer's Demolition Protocol.
- The procurement plan will follow the waste hierarchy Reduce; Reuse & Recycle.
- A Site Waste Management Plan (SWMP) will be developed prior to commencement of development stage to inform the adoption of good practice waste minimisation in design. This will set targets to minimise the generation of non-hazardous construction waste using the sustainable procurement plan to avoid over-ordering and to use just-in-time delivery policies.
- The developer will also maximise the use of recycled and secondary aggregates.
- Waste and recycling – appropriate internal and external storage space will be provided to ensure that residents can sort, store and dispose of waste and recyclable materials in line with Camden's collection policies.

Pollution

- The contractor will submit a construction management plan, this will include the requirement to monitor the use of energy and water use during the construction phase and incorporate best site practices to reduce the potential for air (dust) and ground water pollution.
- The completed dwelling will use low NOx emission gas boilers, with a minimum NOx rating of 5 and emissions at less than 40mg/Kwh
- The main contractor will be required to register the site with the Considerate Constructors Scheme and achieve a best practice score of 25 or more.
- To void the issue of noise pollution, the development will comply with Building Regulations Part E, providing a good level of sound insulation between the proposed development and surrounding buildings. All new windows will be double glazed to minimise the transmission of noise between the building and adjacent properties.

Energy

- The new dwelling will incorporate the energy efficient measures as set out within the main body of this report.
- Control of energy consumption will be further enhanced by the installation of smart energy metering, enabling occupants to accurately assess their energy usage and thereby, manage it.

Water

- The development will minimise water use as far as practicable by incorporating appropriate water efficiency and water recycling measures; the applicants will ensure that the dwelling meets the required level of 105 litres maximum daily allowable usage per person in accordance with Level 4 of the Code for Sustainable Homes. A sample Part G internal water use calculation is attached at **Appendix D**
- Elements of green roof planting are to be incorporated into the design proposals to aid in the attenuation of surface water run-off, as well as enhancing site ecology.

7.0 Conclusions

This report has detailed the baseline energy requirements for the proposed development, the reduction in energy demand as a result of energy efficiency measures and the potential to achieve further CO_2 reductions using renewable energy technologies.

The baseline results have shown that if the development was built to a standard to meet only the minimum requirements of current building regulations, the total amount of CO_2 emissions would be **4.693Kg/year**.

Following the introduction of passive energy efficiency measures into the development, as detailed in section 3, the total amount of CO_2 emissions would be reduced to **4.612Kg/year**, a reduction of **1.72%.**

There is also a requirement to reduce CO_2 emissions across the development using renewable or low-carbon energy sources, where practical and feasible. Therefore, the report has considered the feasibility of the following technologies:

- Wind turbines
- Solar hot water
- Photovoltaic systems
- Biomass heating
- CHP (Combined heat and power)
- Ground & Air source heating

The results of the assessment of suitable technologies relative to the nature, location and type of development suggest that a small PV array is the most appropriate renewable technology.

The SAP models (reproduced at **Appendix C**) for the development which have also been detailed above in Table 5, which show a final gross emission level of **4,190/year** representing a total reduction in emission over the baseline model, considering unregulated energy, of **10.91%.**

Tables 6 & 7 Demonstrate how the project at Camden Mews aligns with the London Plan requirements and current GLA guidance on the preparation of energy statements.

Table 6 – Carbon Emission Reductions – Domestic Buildings

	Carbon Dioxide Emissions (Tonnes CO2 per annum)	
	Regulated	Unregulated
Building Regulations 2013 Part L1A Compliant Development	2.49	2.2
After Energy Demand Reduction	2.41	2.2
After renewable energy	1.99	2.2

Table 7 – Regulated Emissions Savings – Domestic Buildings

	Regulated Carbon Dioxide Savings	
	(Tonnes CO2 per annum)	%
Savings from energy demand reduction	0.08	3.23
Savings from renewable energy	0.42	17.51
Total Cumulative Savings	**0.50**	**20.18**
Annual Savings from off-set payment	**1.99**	
Cumulative savings for off-set payment	**59.7**	

Appendix A

Baseline Energy Use:-

SAP 2012 Target Emission Rate Outputs

Appendix B

SAP 2012 Dwelling Emission Rate Outputs

"Be Lean"

Appendix C

SAP 2012 Dwelling Emission Rate Outputs

"Be Green"

Appendix D

Part G Water Use calculations