Energy Statement

22-24 Prince of Wales Road
London
NW5 3LG

Application Ref: 2016/6298/P

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Prepared for:

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Appendices

1.0 The Site & Proposal

We understand that the proposal is for the change of use of ground floor from retail (Use Class A1) to provide 2 x 1-bed flats (Use Class C3); including the alteration and repositioning of front elevation; construction of new front boundary fence and gate.

1.1 Planning Policy Context

The project sits within the boundaries of the London Borough of Camden (Camden).

An application has been submitted under reference 2016/6298/P

In a draft decision notice dated 10th March 2017, Camden have included the following condition

7 Prior to construction the development hereby approved shall submit an energy statement demonstrating how a 20% reduction in carbon dioxide emissions beyond Part L 2013 Building Regulations in line with the energy hierarchy has been submitted to and approved in writing by the Local Planning Authority. Prior to occupation, evidence demonstrating that the approved measures have been implemented shall be submitted to and approved in writing by the Local Planning Authority and shall be retained and maintained thereafter.

Reason: To ensure the development contributes to minimising the effects of, and can adapt to a changing climate in accordance with policies CS13 of the London Borough of Camden Local Development Framework Core Strategy and DP22 (Promoting sustainable design and construction) of the London Borough of Camden Local Development Framework Development Policies.

This report will satisfy the above requirement by following the methodology of the energy hierarchy as set out in the London Plan;

1.1 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;

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..

Guidance is also taken from Camden Planning Guide 3 – Sustainability.

Accordingly, this report will demonstrate how the proposed development scheme will meet the requirements s set out in Condition no 7 as reproduced above.

2.0 Baseline energy results

In order to consider the project against the Energy Hierarchy, we must first establish the "baseline" energy model.

2.1 New Dwelling Created via Conversion

The new dwellings created as part of the conversion/extension of the existing retail spaces will be considered against the Building Regulations AD L1B; Accordingly, the energy requirements for space heating, water heating and ventilation for the dwellings within the existing structure have been calculated using the Standard Assessment Procedure 2012 (SAP) in line with Part L1B of the Building Regulations 2013 and the Domestic Heating Compliance Guide 2nd Edition.

The baseline building results have been calculated and are presented in Table 3 below. They have been compiled assuming basic compliance with the building regulations as set out below:-

Table 1 - AD L1B Elemental Standards

Element	AD L1B U -Value Standard
Retained Walls (where upgraded)	0.30
New Walls	0.28
Retained/New Roof - pitched	0.16
Retained/New Roof - flat	0.18
Floors	0.22
Windows	1.6
Doors	1.8
Air permeability	$15m^3/Hr/m^2$

The replacement of/new controlled services are governed by the Compliance Guides:-

Table 2 – AD L1B - Controlled services and fittings

Controlled Service	AD L1B Compliance Requirement
Mains Gas Boiler	86% Efficient
DHW	150l tank with 35mm Foam insulation
Controls	Programmer, Stat, TRVs & Interlock
Lighting	N/A

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 sets the benchmark for the worst performing, but legally permissible, development.

The baseline emission levels are set out in table 3 below:-

Table 3 – Baseline energy consumption and CO2 emissions

Unit	Baseline Emission Rate (regulated energy use) Kg/sqm	Total baseline emissions Kg
Flat 1	37.41	1967.02
Flat 2	37.55	2084.65
Total		4051.67

The baseline SAP Dwelling Emission Rate outputs for the flats converted to a minimum standard are attached at **Appendix A.**

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 minimizing associated carbon dioxide emissions.

Camden Core Strategy Policy CS13, paragraph 13.9 expects development or alterations to existing buildings to include proportionate measures to be taken to improve their environmental sustainability, where possible.

CPG3 offers further detail:-

"All buildings, whether being updated or refurbished, are expected to reduce their carbon emissions by making improvements to the existing building. Work involving a change of use or an extension to an existing property is included. As a guide, at least 10% of the project cost should be spent on the improvements."

This section sets out the measures included within the design of the dwellings, 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 subject building 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 Heating system

For the energy efficient model, the primary heating system for the dwellings will consist of a high efficiency condensing gas combination boilers to will provide domestic heating and hot water;

- High efficiency gas combination boiler – (89.1% SEDBUK efficiency)
- Built-in Flue gas heat recovery

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 controls fitted with delayed start thermostat

3.3 Fabric heat loss

Fabric

Insulation measures will be utilised to ensure the calculated u values exceed the Building Regulations minima, with specific guidance taken from the design team:-

New wall constructions to the front façade have been specified and the design team is targeting achieving a u value of 0.17 via a highly insulated brick and block construction.

The Flat Roof structures will be upgraded to meet a u value of 0.12

The newly laid ground floor will target a u value at 0.15 or better.

Glazing & Openings

New timber framed double glazing for windows and doors will have area weighted average U-Values of 1.45w/m^2 K.

New apartment doors will achieve a u value of 1.2.

Air Tightness

The project will be tested for air tightness with a target value of 5.0m^3/hr/m^2 for the new residential units.

3.4 Ventilation

The design team are proposing a low energy natural ventilation strategy in line with AD Part F – System 1 – Background Ventilation and Intermittent Extract.

3.5 Lighting

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

3.6 Energy efficiency results

The following table shows a comparison between the baseline scheme assessed under the SAP methodology Part L 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	Efficient Emission Rate (regulated energy use) Kg/sqm	Total emissions Kg
Flat 1	26.51	1393.90
Studio 2	26.27	1457.72
Total		2851.62

The results show that, the new development with the energy efficiency measures, the reduction in CO_2 emissions is **29.6% -** Clearly, the client has confirmed their commitment to meet the requirements of Condition 7 via the “fabric first” approach.

The corresponding SAP Dwelling Emission Rates 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.

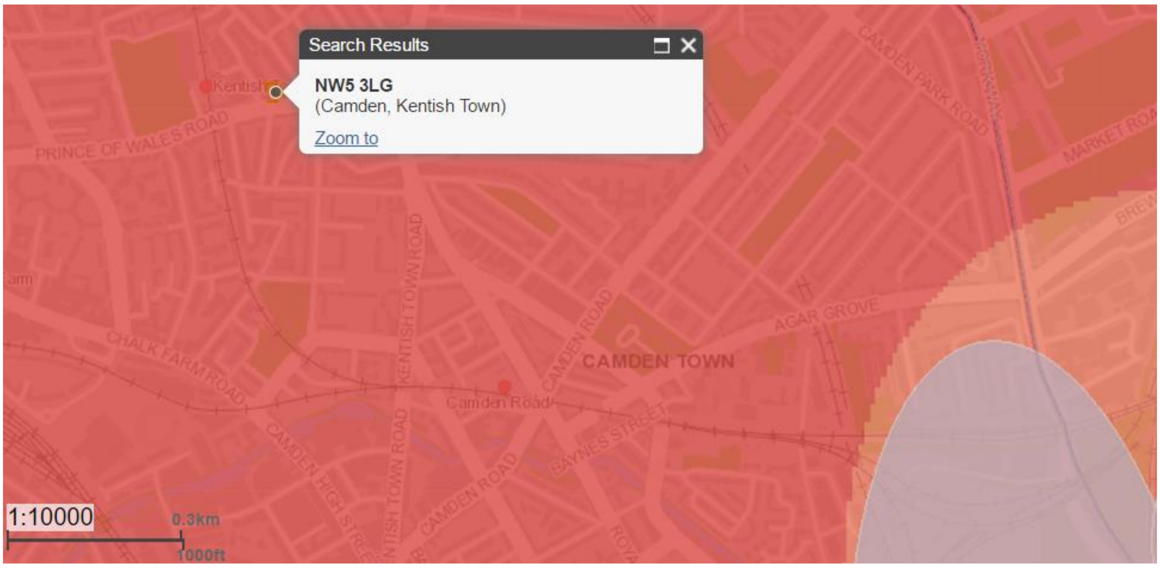
4.1 Community heating/Combined Heat and Power (CHP)

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 – District Energy Networks, or DENs.

The London Heat map has been consulted to look at the potential to connect to a DEN now, or in the future. As can be seen from the extract below, the Prince of Wales Road area is approximately 1500m remote from the any proposed DEN.

Extract from the London Heat Map – Potential Networks



Clearly, there will be limited opportunity to connect to a DEN in the medium term, however the design team do acknowledge the need for the LTHW heating systems within the new development to be capable of connecting to any such network in the future, and the proposed LTHW heating system would be compatible with such a connection.

Given that the it would appear prudent to have the infra-structure, or at least the design to enable the infra-structure for the future inclusion of district heating, and taking into account the scale of development involved - then consideration must be given for an on-site community heating/CHP solution for the subject development.

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.

The key benefit from running a CHP engine is that it produces electricity, which can displace grid supplied electricity, which has significant carbon savings. It is for this reason that CHP is designed to run for as many hours of the year as possible.

Clearly, as a small scale domestic development, with only the limited, and unpredictable 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.

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.

Despite the recent cuts to the feed in tariff rates, the combination of FiT payments, export payments and saving on electrical consumptions can still yield acceptable returns

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 have 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

The development at Watling Avenue would be able to qualify for the domestic tariff as part of the scheme.

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 by other properties approximately 2 to 3 storeys in height in most 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 and the new development itself.

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. However, this ground floor development has no access to external roof space. 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 1.8m 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 apartments and Commercial space.

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

As noted above, there is no access to external roof space to accommodate the solar PV panels; therefore the technology must be rejected as an option

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 the residential development, 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 in dense urban development areas.

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

As the development in question has no outside space in which to even install a borehole, it is therefore not possible to consider a ground source heat pump.

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 actual the 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 the potential saving based on the assumption of a demand of 1000Kwh/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	1111	0.216	240
320% efficient ASHP	288	0.519	150
100% efficient immersion (back-up)	100	0.519	52

A theoretical carbon saving of circa 16%

With the above data in mind, clearly an ASHP could offer a solution.

However, in practical terms, the above efficiencies rely on the low temperature flows from the heat pump (generally 35-40º) to under floor heating systems. The proposed project is to use radiators as heat emitters and would require higher flow and return temperatures.

In these circumstances careful consideration to building heat losses has to be made to ensure that the heat pump is not required to run at flow temperatures that are too high, with the resultant loss in efficiency, often as low as 200%-250%, thereby eradicating any theoretical carbon savings

The heat pump would also require external installation – which would in turn create a visual impact as well as a potential noise nuisance to neighbours in this location.

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 there is no renewable technology that can be practically employed at 22-24 Prince of Wales Road.

Accordingly, the development has met the requirements of Condition 7 via the fabric first approach, and the final emission statistics are reproduced below;

Table 4 – Final energy consumption and CO2 reductions

Unit	Efficient Emission Rate (regulated energy use) Kg/sqm	Total emissions Kg
Flat 1	26.51	1393.90
Flat 2	26.27	1457.72
Total		2851.62

The data at Table 4 confirms that, when considering emissions controlled under the Building Regulations AD L1B 2013, the reduction in emissions equates to over **29.6%.**

Tables 5 & 6 Demonstrates how the Prince of Wales Road project complies with the requirements of Condition 7 by following the Energy Hierarchy:-

Table 5 – Carbon Emission Reductions

	Carbon Dioxide Emissions (Kg CO_2 per annum)	
	Regulated	Unregulated
Building Regulations 2013 Part L1A Compliant Development	4,051.67	N/A
After Energy Demand Reduction	2,851.62	N/A
After renewable energy	2,851.62	N/A

Table 5 – Regulated Emissions Savings

	Regulated Carbon Dioxide Savings	
	Kg CO_2/annum	%
Savings from energy demand reduction	1,200.05	29.6
Savings from renewable energy	0.00	0.00
Total Cumulative Savings	**1,200.05**	**29.6**

Appendix A

Baseline Energy Use:-

SAP 2012 – TER outputs

Appendix B

SAP 2012 Dwelling Emission Rate Outputs

“Be Lean”