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Planning Statement
Energy Assessment
Whitfield Street

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Disclaimer:

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About the Scheme:

The scheme is a major refurbishment of a large office building, which is to be brought up to modern standards and Building Regulations compliance. The scheme is located in the Charlotte Street conservation area and is part of a block bounded by Goodge Street, Tottenham Court Road and Tottenham Street.

Planning Policy:

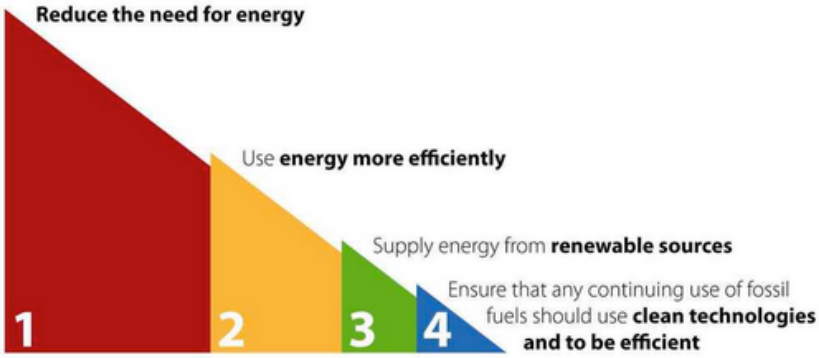
In accordance with the Sustainable Design and Construction SPG, the scheme is required to achieve a 40% carbon reduction (beyond Part L 2010) as set out in The London Plan Policy 5.2.

The 2013 Building Regulations Part L has been followed and the minimum energy efficiency targets in the following document has been followed:

- Refurbishment (Part L2B) – Consequential improvements to refurbished areas have been made to ensure that the building complies with Part L, to the extent that such improvements are technically, functionally, and economically feasible.

The Energy Hierarchy:

The proposed scheme has followed the energy hierarchy that is illustrated below:



The resulting energy savings are shown below in accordance with the GLA's Energy Hierarchy:

GLA's Energy Hierarchy – Regulated Carbon Emissions				
	Baseline:	Be Lean:	Be Clean:	Be Green:
CO_2 emissions (Tonnes CO_2/yr)	106.99	52.05	-	38.69
CO_2 emissions saving (Tonnes CO_2/yr)	-	54.94	-	13.36
% saving over the previous stage	-	51.4%	-	25.7%
Total CO_2 emissions saving (Tonnes CO_2/yr)	68.30			
63.8% Total carbon emissions savings over existing and minimum Building Regulations requirements				

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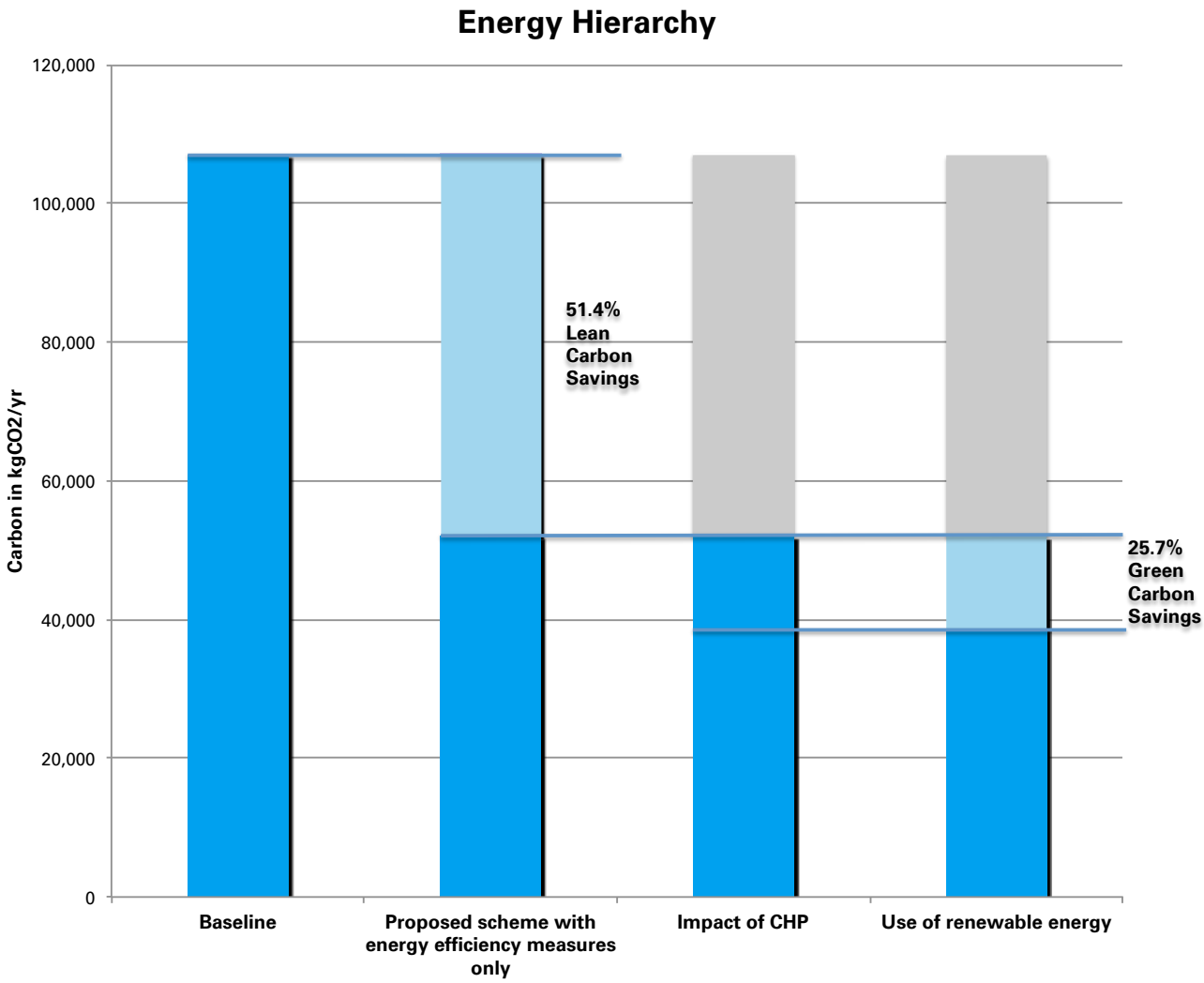
GLA's Energy Hierarchy – Regulated Carbon Emissions:

A graphical illustration of how the scheme performs in relation to the existing building in accordance with the Energy Hierarchy is shown below.

Figure



63.8% Carbon Savings Overall

Summary:

As demonstrated above, the development will reduce carbon emissions by 51.4% from the fabric energy efficiency measures described in the 'Be Lean' section, and will reduce total carbon emissions by 25.1% through the inclusion of low and zero carbon technologies.

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Shortfall in Emissions:

As set out in Policy 5.2 of the London Plan, if the development fails to meet the 40% target, the annual shortfall is determined by subtracting the overall regulated carbon dioxide savings from the target savings. The result is then multiplied by the assumed lifetime of the development's services (e.g. 30 years) to give the cumulative shortfall. The cumulative shortfall is multiplied by the carbon dioxide offset price to determine the required cash-in-lieu contribution. This is shown below.

Carbon Dioxide Emissions – Regulated (Tonnes CO_2/yr)		
	(Tonnes CO_2/yr)	Percentage
Total Cumulative Savings:	2,049	63.8%
Total Target Savings:	1,284	40%
Annual Surplus:	25.5	23.8%
Annual Shortfall:	0	-
Cumulative Shortfall (30 years):	0	-
	Carbon offset contribution required: £0	

Total Carbon Emissions:

As required by the GLA, both the regulated and unregulated emissions of the development must be quantified and demonstrated. The total emissions for the scheme are shown below.

Carbon Dioxide Emissions – Regulated and Unregulated (Tonnes CO_2/yr)			
	Regulated Emissions	Unregulated Emissions	Total Emissions
Baseline: Existing	106.99	30.04	137.03
Be Lean: After demand reduction	52.05	30.04	82.09
Be Clean: After CHP	52.05	30.04	82.09
Be Green: After Renewable energy	38.69	30.04	68.73

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Introduction
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Aim of this study:

The aim of this study is to assess feasible carbon emissions reductions and the use of low and zero carbon technologies. This report demonstrates how the site has followed the London Plan's energy hierarchy by reducing energy demand through passive design, energy-efficiency measures, generating heat using a clean and efficient system and by using on-site renewable energy systems to further reduce the overall carbon emissions of the development.

Methodology:

The methodology followed in this report follows the guidance set out by the Greater London Authority (GLA) for developing energy strategies as detailed in the document "GLA Energy Team Guidance on Planning Energy Assessments", 2013 version. In particular, the London Plan's Energy Hierarchy has been observed along with the new target of a 40% improvement on the Building Regulations 2010.

Under the GLA's guidance and the London Borough of Camden's policy document CPG3, applications for major developments should be accompanied by an energy assessment, which provides information as set out below:

- A calculation of the baseline energy requirements and CO_2 emissions, including regulated emissions (i.e. space heating, hot water, fixed electricity).
    - Baseline regulated emissions have been identified by the modelling of the current scheme. The modelling has been calculated using SBEM (Design Builder) software.

- A demonstration of how the Mayor's energy hierarchy has been followed (i.e. being 'Lean, Clean, Green') including consideration of passive design and decentralised energy options (including CHP/CCHP).
  &
- Calculation of the 'energy efficient' baseline (i.e. the reduced energy demand and CO_2 emissions after the application of energy efficient measures and decentralised energy provision) and predicted target for CO_2 reduction through renewables.
    - A description of proposed energy efficiency measures and details of these measures e.g. U-values, air permeability, percentage of energy efficient light fittings, heating efficiencies, has been provided.
    - An assessment of the potential for 'Clean' energy and community energy networks, and a feasibility assessment of low and zero carbon technologies has been included, each of the technologies have been investigated and detail provided as to why any technologies have been ruled out, (i.e. technical limitations, costs, etc.)

Please note that these findings are currently subject to a detailed analysis from a building services design engineer and qualified quantity surveyor.

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Energy Hierarchy
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London Plan Energy Hierarchy:
Taken from GLA Energy Team Guidance on Planning Energy Assessments, Version 2, 2011

The London Plan's energy hierarchy takes a 'whole energy' approach and addresses energy efficiency use, energy supply efficiency and use of renewable energy. The purpose is to demonstrate that climate change mitigation measures are integral to the scheme's design and evolution, and that they are appropriate to the context of the development.

Baseline calculations:
Section 5.0

The baseline calculations are taken from the Building Emission Rate (BER, as existing) worksheet from the SBEM modelling.

For the purpose of this report, the baseline has been defined as the energy from the current specification and with the profile of the building as existing. Energy modelling using SBEM has been undertaken with Design Builder software to define the baseline energy demands and carbon emissions of the proposed scheme. This has identified the building to have the energy profile outlined in the following pages.

Be Lean:

Demand reduction (Be Lean) measures specific to the scheme are encouraged at the earliest design stage of a development and aim to reduce the demand for energy. Measures typically include passive design: both architectural and building fabric measures, and active design: energy efficient services. It is possible to exceed Building Regulations requirements (Part L 2010) through demand reduction (Be Lean) measures alone.

Be Clean:

A 'clean' energy supply refers to the energy efficiency of heating, cooling and power systems. Planning applications should demonstrate how the heating, cooling and power systems have been selected to minimise CO_2 emissions in accordance with the order of preference in Policy 5.2, such as through high-efficiency low NO_x gas boilers.

Be Green:

Use of renewable energy in developments is encouraged at the 'Be Green' third stage. Each renewable energy technology in Policy 5.7 of the London Plan is technically feasible in London and each should be considered in the Energy Assessment. An assessment of what is achievable and compatible with the measures implemented in Be Lean and Be Clean is also required.

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Energy Profile
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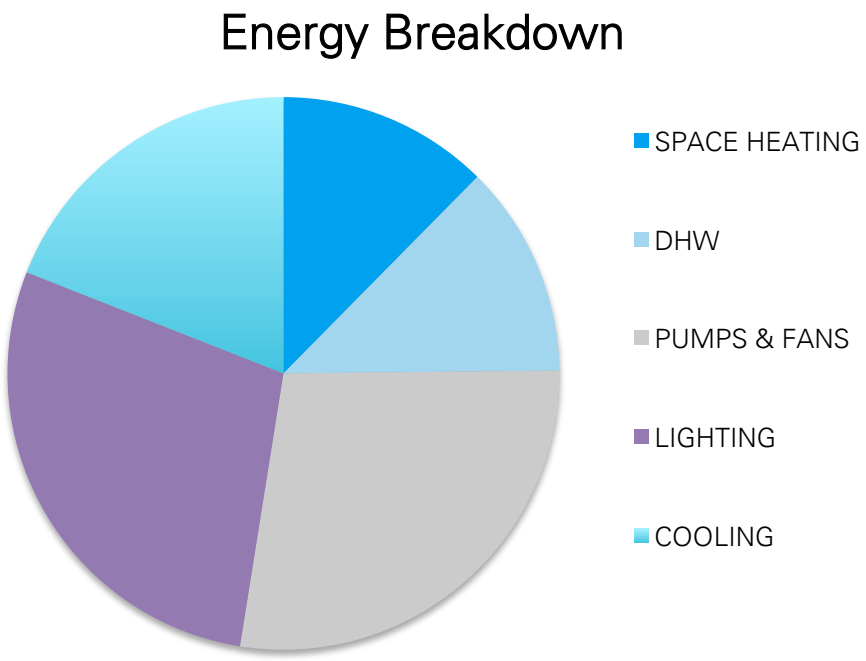
Baseline Calculation:

The graph below shows the site's baseline carbon emissions breakdown in terms of heating, hot water, cooling and lighting, fans and appliances over the course of a year.

Carbon Emissions in $kgCO_2/yr$	Heating	Cooling	Hot Water	Fans and Pumps	Lighting
	13,281	20,382	13,313	29,637	30,448



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‘Be Lean’: Energy Efficiency Measures

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Energy Efficiency Targets:

Energy efficiency measures through optimising the building fabric will be incorporated to reduce the energy demand and carbon footprint of the proposed scheme. The measures outlined below result in an annual carbon emission saving of 51.4% or 54,942 $kgCO_2/yr$ over baseline.

U-values Modelled:

Element	Building Regulations minimum U-Value (W/m^2K)	Proposed U-Value Indicative build-up (W/m^2K)
Roof (upgraded)	0.18	0.18
Roof (new)	0.16	0.16
Walls (new)	0.35	0.25
Walls to unheated spaces (new)	0.30	0.30
Windows (new)	1.80	1.20

Air-Tightness and Thermal Bridging:

A building with improved air tightness levels is to be achieved such that the proposed scheme does not exceed an air permeability level of 15 $m^3/hr/m^2$ at 50 Pascals during testing.

This will be achieved through ensuring that sensitive areas are accounted for in the design and construction phases to make certain that a sealed building is constructed and all punctures through the fabric are airtight. In particular, attention will be paid to major openings as well as minor openings such as services and downlighters at roof level.

Thermal bridges will not be calculated.

Ventilation:

Mechanical extract ventilation will be supplied to any food preparation areas and WCs, maximum specific fan powers of 0.4 will be achieved.

Office areas will have mechanical supply and extract and will have heat recovery fitted with 80% efficiency.

Heating:

Heating will be provided by high efficiency (minimum 90%) gas condensing boilers, and will have optimum stop/start and weather compensation.

Lighting:

Lighting will be provided primarily by LEDs, with a maximum lighting power density of $8W/m^2$. All lighting will be fitted with occupancy and photoelectric sensors.

Cooling:

Cooling will be provided by condensers with a minimum EER of 3.2.

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‘Be Clean’: Use of CHP

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Use of Combined Heat and Power:

The inclusion of gas combined heat and power (CHP) within the energy strategy has been considered and proposed as a viable option to reduce the carbon footprint of the building. This section demonstrates how decentralised energy generation has been considered in accordance with the Mayor’s London Plan. The following guidance hierarchy was followed:

Option One - Connection to existing CCHP/CHP networks
This option is not deemed feasible in this instance due to the lack of an existing CCHP/CHP network in the vicinity of the proposed development.

Option Two – Site-wide CCHP/CHP generation powered by renewables
CCHP/CHP generation powered through renewables such as biomass is not considered feasible in this instance due to issues relating to air quality.

Option Three - Gas CCHP/CHP accompanied by renewables
A communal heating and hot water system will not be provided in this scheme. Carbon emissions reductions will be achieved with individual systems.

Site-wide Combined Heat and Power (CHP) generation:

A communal heating and hot water system will not be provided in this scheme. Carbon emissions reductions will be achieved with individual systems.

CHP systems are best utilised where there is a consistent and high demand for heat.

The heat demand profile of this office scheme is not suitable to CHP, given the peak and base loads of the scheme. With the implemented fabric improvements from the ‘Be Lean’ scenario the energy demand is relatively low at times of limited space heating, therefore the consideration of a CHP system was not deemed feasible, as the system would be oversized, therefore less efficient and economic.

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‘Be Green’: Feasibility of Renewable Technologies

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Feasible renewable energy technologies:	A reduction in carbon emissions through the use of on-site renewable energy can be achieved through several technologies to generate either heat or power. Following the analysis of the carbon emissions related to the scheme, the objective of this section is to determine the feasible renewable energy options that provide cost-effective and practical emissions reductions. The renewable energy options for the proposed scheme are provided in the table below. Each technology is also assessed as either feasible or rejected based on its implications for the scheme in terms of their implementation, cost-effectiveness, site-related constraints, planning issues or other issues.

Technology and feasibility	Rationale
Biomass: Rejected	Biomass would be able to provide a reasonable reduction in carbon emissions. However, this technology would have a significant impact on local air quality in the Borough and development access restraints preclude the possibility of biomass pellet delivery.
Ground Source Heat Pump (GSHP): Rejected	A ground source heat pump could supply heating and hot water to the proposed scheme. However, there is no room to allow for horizontal closed loop pipes; therefore boreholes would be required at a depth of approximately 20-50m. This option is capital intensive, subject to uncertainty with regards to the ground conditions and would be unacceptable given the conservation status of the area.
Air Source Heat Pump (ASHP): Accepted	An air source heat pump could supply heating and hot water to the proposed scheme. The effectiveness of such a unit has been assessed and it has been deemed an appropriate method of reducing carbon emissions. These pumps will provide a further 25.7% reduction over the fabric energy efficiency measures.
Photovoltaic (PV): Rejected	Roof mounted PV units could be a possible solution on the southwest-facing roof. The available roof area is quite limited and as such only a small PV array could be fitted on the roof, this would reduce the array’s payback. As such the limited space would be best utilised by an air-source heat pump.
Solar Hot Water (SHW): Rejected	Roof-mounted SHW units could be located on the roof space. However, the roof space is limited and a SHW system will not be able to provide a significant carbon reduction as a stand-alone measure relative to the other options highlighted above.
Wind Turbine: Rejected	Turbulence created from surrounding listed buildings makes this an inefficient solution.

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Feasible Renewable Technologies: Air Source Heat Pump Energy Assessment Whitfield Street

Air Source Heat Pump:

Air source heat pumps use the vapour compression cycle to efficiently extract heat from one place and transfer it to another. The air source heat pumps extract heat from external air, and transfer this heat to water, which is then used for space and domestic hot water heating.

Variable refrigerant flow systems are a form of air source heat pump that consists of a number of floor, wall or ceiling mounted indoor units connected to a common outdoor unit by refrigerant pipework. The anticipated system will incorporate a heat recovery function and would therefore, increase the overall energy efficiency and reduce the space heating requirement.

Space heating and comfort cooling will be provided via the VRF system, with a Heating SCOP of 4.35 and a Cooling SEER of 3.2.

Domestic hot water will be provided by a packaged air to water heat pump, the system will have a COP of 3.2.

The outside units will generate little noise; therefore this will have a minimal impact on the noise level for the occupants of the building.

Site-specific considerations:

The outside units will be located either on the flat roof space. The fixtures and fittings of the outside units are yet to be determined.

There are no known planning requirements for the installation of the above system and the noise from the outside units would not have an impact on the surroundings.

Performance Calculations for Heat Pump		
	Heat Pump Predicted Annual Energy Saving (kWh/yr)	25,836 kWh/yr
	Annual Carbon Emissions Reductions (kgCO2/yr)	13,357 $kgCO_2/yr$
	% CO_2 Emissions Reduction	25.7%

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Conclusion
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Recommendation:

The proposed scheme will implement energy efficiency measures where feasible to achieve carbon emission reductions.

The baseline carbon emissions for the scheme are 106,993 $kgCO_2/yr$. Following implementation of measures within this report a total saving of 68,299 $kgCO_2/yr$ will be made. These measures include:

- 'Be Lean' (51.4% savings over baseline); energy efficiency measures to improve the building fabric with high performance building elements and efficient building services.
- 'Be Green' (25.7% savings over the 'Be Lean' stage); an air-source heat pump will reduce carbon emissions by providing space and water heating.

The measures within this report have followed the GLA's Energy Hierarchy and meet a 63.8% carbon emissions saving.

GLA's Energy Hierarchy – Regulated Carbon Emissions				
	Baseline:	Be Lean:	Be Clean:	Be Green:
CO_2 emissions (Tonnes CO_2/yr)	106.99	52.05	-	38.69
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