51-52 Tottenham Court Road

Energy & Sustainability Statement

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C6092

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Executive Summary

This Sustainability and Energy Statement outlines the environmental performance of the 51-52 Tottenham Court Road scheme in the London Borough of Camden. The development aspires to maximise sustainable design and energy efficiency features wherever practicable and feasible.

This report reviews the applicable policies and requirements in terms of Energy & Sustainability for the development. Camden London Borough Council (CLBC) policies and the development response to these policies are described in the following sections. BREEAM (UK Non-Domestic Refurbishment & Fit-Out) pre-assessment and detailed energy calculations have been completed for the scheme including SAP 2012 Calculation results (domestic element of the scheme) and SBEM calculations (non-domestic element of the scheme) for Part L 2013 of Building Regulations.

The following sustainability appraisal targets will be met for the development:

- The retail unit and offices will achieve a BREEAM 'Very Good' rating

The following key energy efficient measures are incorporated in the proposed design in both refurbishment and new parts to enhance the building's energy performance and reduce its annual carbon emission:

- Enhanced passive design with low U-values that exceed Part L standards and where possible, detailing that conforms to Accredited Construction Details will be specified to reduce heat losses and eliminate thermal bridging.
- Double glazed, draught proofed units of high performance will be installed to increase the air tightness of the structure.
- Fixed internal and external lighting will be of low energy light fittings.
- For the retail and office units, the building envelope will exceed the requirements of Part L 2013.

The following Low/Zero Carbon (LZC) technologies will be incorporated for the residential scheme:

- PV system with 4.16 kWp total installed peak power in the form of 13 PV panels of 0.32 kWp each to be installed on the roof of the building.

The following Low/Zero Carbon (LZC) technologies will be incorporated for the refurbished and new offices and the tenant will be required to use the system for the shell retail scheme:

- Highly efficient Air Source Heat Pumps (ASHP) are used to provide heating and cooling.

As a result of the recommended energy strategy, proposed building's energy performance is significantly improved over Part L1B 2013 standards. The scheme achieves a calculated reduction in CO_2 emissions of 35.6% over Part L 2013 Target Emission Rate for the residential elements, beyond the 35% target set within the London Plan. This is shown in the chart below.

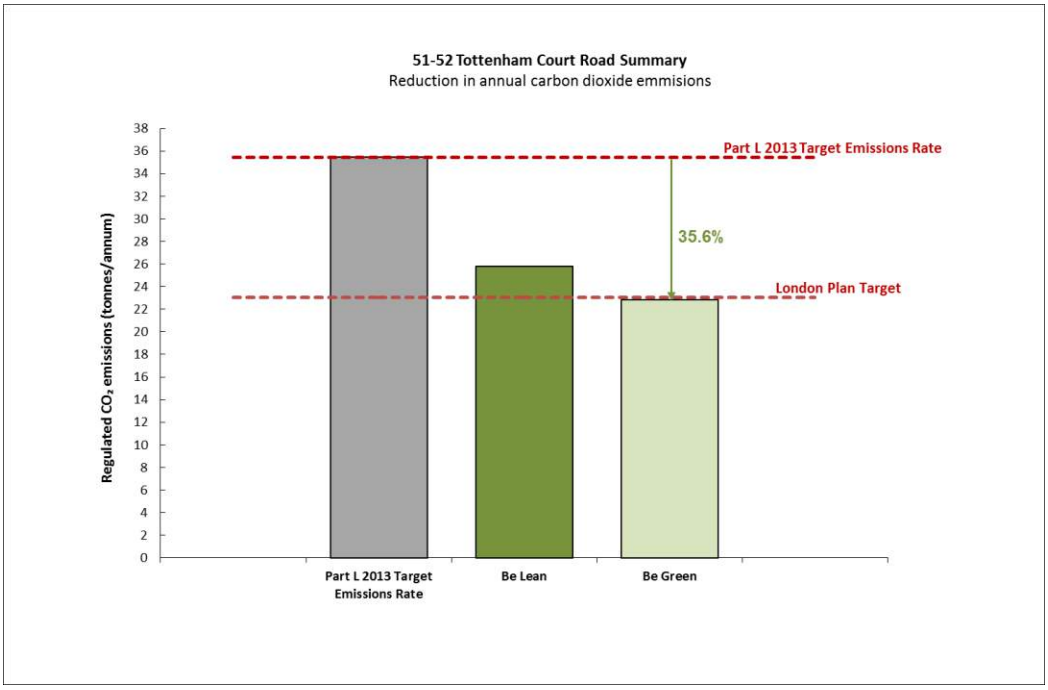

Figure 1: Annual Carbon Dioxide Emissions after the application of the Energy Hierarchy

Table 1 demonstrates the reduction in the regulated carbon emission of the residential element of the development as a result of implementing the above-mentioned strategies. The total non-regulated carbon dioxide emission of the development according to SAP 2012 and SBEM is around 23.98 tonnes per year. It is estimated that proposed strategies of using A-rated appliances and user friendly metering in all units may reduce the unregulated carbon emission by 10% or more.

Carbon Dioxide emissions (Tonnes CO_2 per annum)			
	Regulated	Unregulated	Total
Building Regulations 2013 Part L Compliant Development	35.44	23.98	59.42
After energy demand reduction	25.78	21.58	47.36
After renewable/low energy integration	22.84	21.58	44.42

Table 1: Carbon Dioxide emissions reduction for the residential development

Table 2 demonstrates the calculated CO2 savings, which will be realised from each proposed technology. As demonstrated below, an overall 35.6 % reduction in regulated carbon emissions would be achieved for the scheme after applying the proposed strategies.

	Regulated Carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reductions	9.66	27.3
Savings from renewable/low energy integration	2.94	11.4
Total Cumulative Savings	12.60	35.6
Total Target Savings	12.40	35
Annual Surplus	0.20	0.6

Table 2: Carbon Dioxide savings from each stage of Energy Hierarchy

The GLA guidance on preparing Energy Statements requires that both predicted 'regulated' and 'unregulated' carbon emissions are reported for a scheme. Regulated emissions are those from fixed building services, i.e. heating, ventilation and lighting; unregulated emissions are those relating to energy used by the building occupants, e.g. from cooking or electrical appliances.

Estimating reductions in unregulated carbon dioxide emissions is challenging, as reductions will generally be based on the operational regime of the site and users behaviour. The unpredictable nature of unregulated carbon emissions is the reason why only regulated emissions are included by Part L of the Building Regulations and the relevant local council policies.

1 Introduction

Over recent years, global public opinion has been increasingly concerned with the state of the environment and the impact of climate change. Buildings are responsible for a significant proportion of the world's energy consumption. In the United Kingdom domestic, commercial buildings and industry contribute 43%[1] of the total CO_2 emissions. These figures highlight the need for building owners, developers and designers to design environmentally sustainable buildings.

This report provides a review of the sustainability and efficiency benchmarks for the development and sets out targets for the development in terms of both sustainability and energy. Also included in this report is an overview of a number of sustainability and energy-efficiency technologies that are likely to be appropriate for the development.

As the design progresses, the strategies outlined in this report will be further developed and subjected to detailed financial feasibility studies. The environmental strategies and options outlined in this report are based on the current information available and are likely to evolve with the design. The energy calculations presented in this report will need to be continually updated through the detailed design stages to reflect any changes. The energy analysis presented here should be treated as preliminary information based on the currently available data.

1.1 The Development

The project involves the change of use and extension of the existing mixed-use building to provide high quality retail unit on ground and lower ground floors, office spaces on first to third floors and five residential units on first to fourth floors.

For a detailed description of the proposed development, please refer to the Design and Access Statement prepared by Squire & Partners Architects.

[1] Department for Environment, Food and Rural Affairs, http://www.defra.gov.uk/, 2008

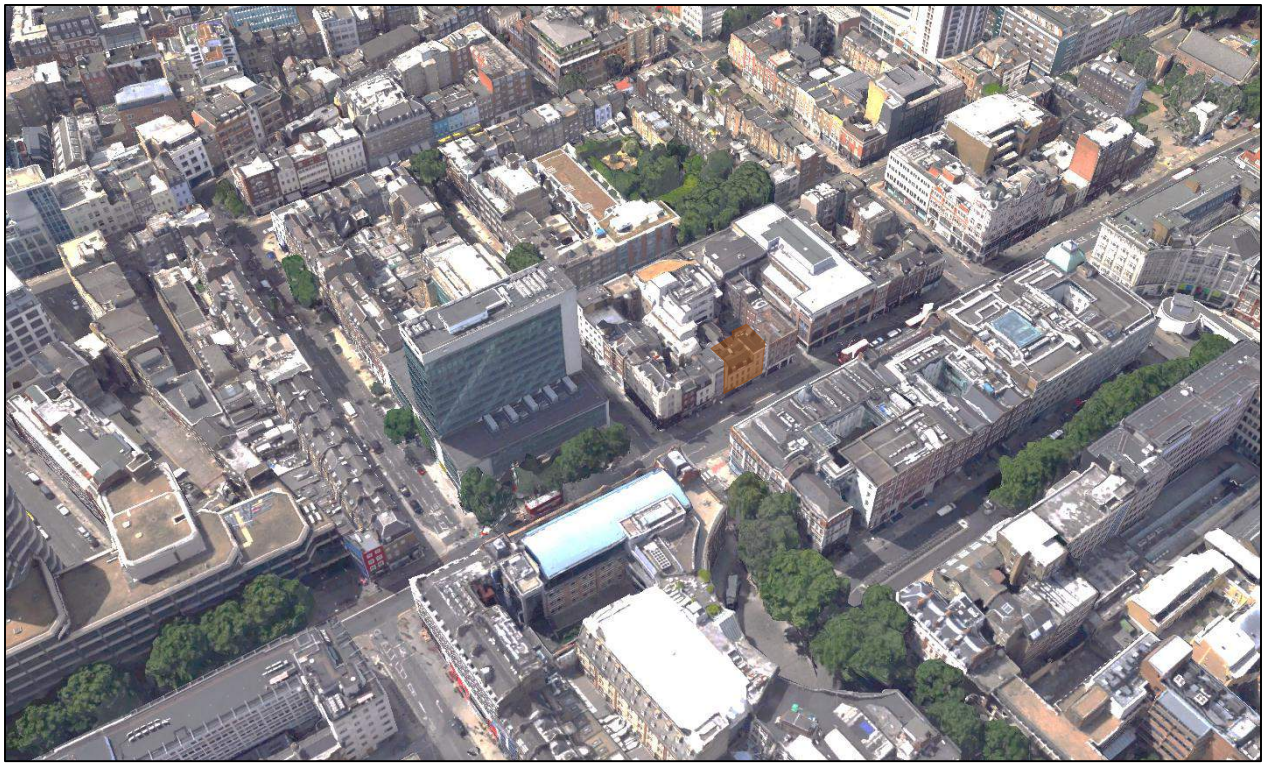

Figure 2: Existing Situation - Bird's Eye View

2 Overview of Energy Standards, Targets and Policies

This section provides an overview of the environmental rating schemes, mandatory regulations and policy documents applicable to the proposed development.

2.1 National Policy

2.1.1 Energy White paper

The Energy White Paper: Our Energy Future – Creating a Low Carbon Economy [2] is an energy policy in response to the increasing challenges faced by the UK, including climate change, decreasing domestic supplies of fossil fuel and escalating energy prices. The Energy White Paper sets four priorities:

- Cutting the UK's carbon dioxide emissions - the main contributor to global warming - by some 60% by about 2050, with real progress by 2020;
- Security of supply;
- A competitive market for the benefit of businesses, industries and households; and
- Affordable energy for the poor.

2.1.2 Climate Change Act 2008

Published in 2008 by the UK government, the Climate Change Act [3] is the world's first long-term legally binding framework to mitigate against climate change. The Act sets legally binding targets to increase greenhouse gas emission reductions through action in the UK and abroad from the 60% target to 80% by 2050.

2.1.3 National Planning Policy Framework

The National Planning Policy Framework ("NPPF") [4] was published in March 2012, setting out a key part of the Government's reforms to make the planning system less complex and more accessible, whilst protecting the environment and promoting sustainable growth. The NPPF supersedes the previous national planning guidance, namely the Planning Policy Statements and Planning Policy Guidance Notes.

2.2 Development Plan

2.2.1 The London Plan (including Further Alterations, March 2015)

The London Plan describes an integrated economic, social, environmental and transport framework for the development of London over the next 20-25 years. London boroughs' local plans need to work within this larger structure and its policies guide decisions on planning applications by councils and the Mayor. Below are policies that are relevant to this Energy & Sustainability report.

2 Dti, (2003); Energy White Paper Our Energy Future - Creating a Low Carbon Economy. TSO.
3 OPSI, (2008); Climate Change Act. HMSO.
4 DCLG, (2012); National Planning Policy Framework. DCLG

Policy 5.2 Minimising Carbon Dioxide Emissions

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 (Code for Sustainable Homes level 4)*
2013 – 2016	*40 per cent*
2016 – 2031	*Zero carbon*

Non-domestic buildings:

Year	***Improvement on 2010 Building Regulations***
2010 – 2013	*25 per cent*
2013 – 2016	*40 per cent*
2016 – 2019	*As per building regulations requirements*
2019 – 2031	*Zero carbon*

C. *Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.*

D. *As a minimum, energy assessments should include the following details:*

a *calculation of the energy demand and carbon dioxide emissions covered by Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy*

b *proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services*

c *proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)*

d *proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.*

E. *The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.*

The strategy for minimising carbon dioxide emissions is outlined in this energy and sustainability statement. The energy and sustainability statement has been prepared in accordance with the GLA methodology. The energy statement demonstrates that the development exceeds the carbon dioxide target reduction by achieving an improvement which exceeds a 35% betterment against Part L 2013 (equivalent to 40% improvement on Part L 2010).

Policy 5.3 SUSTAINABLE DESIGN AND CONSTRUCTION

A. The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.

B. Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

C. Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

a minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)

b avoiding internal overheating and contributing to the urban heat island effect

c efficient use of natural resources (including water), including making the most of natural systems both within and around buildings…..

The scheme will use BREEAM for Non-Domestic Refurbishment & Fit-Out (2014) to demonstrate how sustainable design and construction are incorporated into the scheme for the retail and office units. This energy and sustainability statement provides detailed information on how the proposed energy savings will be achieved.

Policy 5.5 DECENTRALISED ENERGY NETWORKS

A. *The Mayor expects 25 per cent of the heat and power used in London to be generated through the use of localised decentralised energy systems by 2025. In order to achieve this target the Mayor prioritises the development of decentralised heating and cooling networks at the development and area wide levels, including larger scale heat transmission networks.*

B. *Within LDFs boroughs should develop policies and proposals to identify and establish decentralised energy network opportunities. Boroughs may choose to develop this as a supplementary planning document and work jointly with neighbouring boroughs to realise wider decentralised energy network opportunities. As a minimum boroughs should:*

a identify and safeguard existing heating and cooling networks

b identify opportunities for expanding existing networks and establishing new networks. Boroughs should use the London Heat Map tool and consider any new developments, planned major infrastructure works and energy supply opportunities which may arise

c develop energy master plans for specific decentralised energy opportunities which identify:

- *major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)*
- *major heat supply plant*
- *possible opportunities to utilise energy from waste*
- *possible heating and cooling network routes*
- *implementation options for delivering feasible projects, considering issues of procurement, funding and risk and the role of the public sector*

d require developers to prioritise connection to existing or planned decentralised energy networks where feasible.

There is no existing heat and energy network in the vicinity and the site does not fall into an opportunity area with decentralised energy potential as identified in the London Plan. The design team has nevertheless considered the potential of proposed development to link to future heat and energy network in the vicinity. The conclusion from this was that the intermittent and limited heating demands from non-domestic units and small number of domestic units means that providing such a connection would not be beneficial or economically viable.

Policy 5.6 DECENTRALISED ENERGY IN DEVELOPMENT PROPOSALS

A. *Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.*

B. *Major development proposals should select energy systems in accordance with the following hierarchy:*

1. *Connection to existing heating or cooling networks;*
2. *Site wide CHP network;*
3. *Communal heating and cooling*

C. *Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.*

As described above, feasibility study to incorporate Combined Heat and Power has been carried out for the proposal.

Policy 5.7 RENEWABLE ENERGY

A *The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London.*

B *Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.*

C *Within LDFs boroughs should, and other agencies may wish to, develop more detailed policies and proposals to support the development of renewable energy in London – in particular, to identify broad areas where specific renewable energy technologies, including large scale systems and the large scale deployment of small scale systems, are appropriate. The identification of areas should be consistent with any guidelines and criteria outlined by the Mayor.*

D *All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment and historical assets, and to avoid any adverse impacts on air quality.*

The roofscape has been designed to balance the impact of the development on the neighbourhood, provide space for building services plant, exploit opportunities for the enhancement of biodiversity and provide space for photovoltaic panels.
The development team have reviewed the roofscape and provided a zone for 13 high-efficiency photovoltaic panels. These will have a peak electricity generation capacity of approximately 4.16kW. The renewable energy generated by these panels will be connected into the residential electrical distribution system.

Policy 5.9 OVERHEATING AND COOLING

A *The Mayor seeks to reduce the impact of the urban heat island effect in London and encourages the design of places and spaces to avoid overheating and excessive heat generation, and to reduce overheating due to the impacts of climate change and the urban heat island effect on an area wide basis.*

B *Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:*

1. *minimise internal heat generation through energy efficient design*
2. *reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls*
3. *manage the heat within the building through exposed internal thermal mass and high ceilings*
4. *passive ventilation*
5. *mechanical ventilation*
6. *active cooling systems (ensuring they are the lowest carbon options).*

C *Major development proposals should demonstrate how the design, materials, construction and operation of the development would minimise overheating and also meet its cooling needs. New development in London should also be designed to avoid the need for energy intensive air conditioning systems as much as possible. Further details and guidance regarding overheating and cooling are outlined in the London Climate Change Adaptation Strategy.*

D *Within LDFs boroughs should develop more detailed policies and proposals to support the avoidance of overheating and to support the cooling hierarchy.*

For the residential units, detailed SAP calculations have been completed. These calculations demonstrate that the solar gain to the residential units are within the limits set by Part L of the Building Regulations with an overheating risk classified as 'none' or 'slight'. The SAP overheating calculation is much simplified but does indicate if there are significant overheating issues within the development. The provision of active cooling in non-domestic spaces is being driven by a requirement to provide high-specification units rather than because of a need driven by overheating.

Policy 5.10 URBAN GREENING

A *The Mayor will promote and support urban greening, such as new planting in the public realm (including streets, squares and plazas) and multifunctional green infrastructure, to contribute to the adaptation to, and reduction of, the effects of climate change.*

B *The Mayor seeks to increase the amount of surface area greened in the Central Activities Zone by at least five per cent by 2030, and a further five per cent by 2050,*

C *Development proposals should integrate green infrastructure from the beginning of the design process to contribute to urban greening, including the public realm. Elements that can contribute to this include tree planting, green roofs and walls, and soft landscaping. Major development proposals within the Central Activities Zone should demonstrate how green infrastructure has been incorporated.*

There are limited opportunities for enhancing green infrastructure due to the reuse of the existing building and the retention of its footprint. As the application building fills the extent of the site boundary there is no external landscaping at present. The balcony spaces at third and fourth floor level provide some scope for potted plants to be introduced.

Policy 5.12 FLOOD RISK MANAGEMENT

A *The Mayor will work with all relevant agencies including the Environment Agency to address current and future flood issues and minimise risks in a sustainable and cost effective way*

B *Development proposals must comply with the flood risk assessment and management requirements set out in the NPPF and the associated technical Guidance on flood risk1 over the lifetime of the development and have regard to measures proposed in Thames Estuary 2100 (TE2100 – see paragraph 5.55) and Catchment Flood Management Plans……*

The Environmental Agency map does not show risk of flooding for the area, implying the flood risk in the area is low.

Policy 5.13 SUSTAINABLE DRAINAGE

A *Development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:*

1 *store rainwater for later use*

2 *use infiltration techniques, such as porous surfaces in non-clay areas*

3 *attenuate rainwater in ponds or open water features for gradual release*

4 *attenuate rainwater by storing in tanks or sealed water features for gradual release*

5 *discharge rainwater direct to a watercourse*

6 *discharge rainwater to a surface water sewer/drain*

7 *discharge rainwater to the combined sewer.*

Drainage should be designed and implemented in ways that deliver other policy objectives of this Plan, including water use efficiency and quality, biodiversity, amenity and recreation…..

The non-permeable area of the site is not increased in comparison with the existing situation. Therefore, there is no negative impact on the rainwater runoff. The site is an existing site with very limited potential for storing rain water or attenuating it on site.

Policy 5.14 WATER QUALITY AND WASTEWATER INFRASTRUCTURE

A *The Mayor will work in partnership with the boroughs, appropriate agencies within London and adjoining local planning authorities to:*

a) ensure that London has adequate and appropriate wastewater infrastructure to meet the requirements placed upon it by population growth and climate change

b) protect and improve water quality having regard to the Thames River Basin Management Plan.

B *Development proposals must ensure that adequate wastewater infrastructure capacity is available in tandem with development. Proposals that would benefit water quality, the delivery of the policies in this Plan and of the Thames River Basin Management Plan should be supported while those with adverse impacts should be refused.……*

The residential units are designed to meet a target of 105 litres or less per head per day. All other sanitary ware installed for the building will be fitted out with water efficient fittings.

Policy 7.14 IMPROVING AIR QUALITY

Policy 7.15 REDUCING AND MANAGING NOISE, IMPROVING AND ENHANCING THE ACOUSTIC ENVIRONMENT AND PROMOTING APPROPRIATE SOUNDSCAPES

Improving Air Quality

Development proposals should:

a minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (AQMAs) and where

development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3) *b promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition'* *c be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs)).* *d ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning …..* ***Reducing Noise*** *Development proposals should seek to manage noise by:* *a avoiding significant adverse noise impacts on health and quality of life as a result of new development;* *b mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens on existing businesses;* *c improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)….*
The air quality and noise impacts are addressed in the separate Air Quality Assessment and Acoustic Assessment. The Acoustic demonstrated that the proposed design meets all relevant local and national criteria. The Air Quality Assessment demonstrated the development will have an insignificant impact on local air quality.

2.2.2 Camden Council Planning Requirements

The development falls under the planning requirements of Camden Core Strategy and Camden Development policies. The energy strategy will comply also with the London Plan's energy hierarchy i.e. be lean, be clean, be green by firstly using less energy, then supplying energy efficiently and finally using renewable energy, wherever that is feasible.

The details of requirement of the relevant policies are listed in the tables below.

As the development has more than ten residential units, it will be considered a Major Development.

POLICY CS13 – Tackling climate change through promoting higher environmental standards
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:* *a) ensuring patterns of land use that minimise the need to travel by car and help support local energy networks;* *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,

2. making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralised energy networks;

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 Council will have regard to the cost of installing measures to tackle climate change as well as the cumulative future costs of delaying reductions in carbon dioxide emissions

Local energy generation

The Council will promote local energy generation and networks by:

e) working with our partners and developers to implement local energy networks in the parts of Camden most likely to support them, i.e. in the vicinity of:

– housing estates with community heating or the potential for community heating and other uses with large heating loads;

– the growth areas of King's Cross; Euston; Tottenham Court Road; West Hampstead Interchange and Holborn;

– schools to be redeveloped as part of Building Schools for the Future programme;

– existing or approved combined heat and power/local energy networks (see Map 4); and other locations where land ownership would facilitate their implementation.

f) protecting existing local energy networks where possible (e.g. at Gower Street and Bloomsbury) and safeguarding potential network routes (e.g. Euston Road);

Water and surface water flooding

We will make Camden a water efficient borough and minimise the potential for surface water flooding by:

g) protecting our existing drinking water and foul water infrastructure, including Barrow Hill Reservoir, Hampstead Heath Reservoir, Highgate Reservoir and Kidderpore Reservoir;

h) making sure development incorporates efficient water and foul water infrastructure;

i) requiring development to avoid harm to the water environment, water quality or drainage systems and prevents or mitigates local surface water and downstream flooding, especially in areas up-hill from, and in, areas known to be at risk from surface water flooding such as South and West Hampstead, Gospel Oak and King's Cross

The proposed development has cycle store at basement level and there is no car park on site. Development will thus ensure that travelling by car will be minimised. A travel plan has been prepared and will be adopted to ensure public transport and cycling will be promoted as main means to travel to and from the development.

The development makes efficient use of land within the borough by providing high-density of occupation within the footprint of the existing site.

The development is designed to reduce carbon emission by more than 35% in line with London Plan. Energy will be generated on site using PV panels. Details of energy hierarchy, efficiency strategies and renewable technologies proposed for the building can be found in the energy section of this report.

The scheme has been designed to have mechanical ventilation with heat recovery with careful consideration having been given to the development of the façade and the balance between adequate daylighting, passive solar heat gain and risk of overheating in summer.

The development incorporates water-efficient sanitary ware and fittings throughout reducing the use of potable water within the development.

POLICY DP22 (Camden Development Policies) Promoting Sustainable Design and Construction
The Council will require development to incorporate sustainable design and construction measures. Schemes must: *a) demonstrate how sustainable development principles, including the relevant measures set out in paragraph 22.5 below, have been incorporated into the design and proposed implementation; and* *b) incorporate green or brown roofs and green walls wherever suitable.* *The Council will promote and measure sustainable design and construction by:* *c) expecting new build housing to meet Code for Sustainable Homes Level 3 by 2010 and Code Level 4 by 2013 and encouraging Code Level 6 (zero carbon) by 2016.;* *d) expecting developments (except new build) of 500 sq m of residential floorspace or above or 5 or more dwellings to achieve "very good" in EcoHomes assessments prior to 2013 and encouraging "excellent" from 2013;* *e) expecting non-domestic developments of 500sqm of floorspace or above to achieve "very good" in BREEAM assessments and "excellent" from 2016 and encouraging zero carbon from 2019.* *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 development team have adopted sustainable development principles from the very earliest stages of the project. Mecserve have been appointed as BREEAM Accredited Professionals from the earliest stages of the development to provide advice and guidance. This report includes a BREEAM pre-assessment for the non-domestic part of the development. The scheme is currently targeting a BREEAM 'Very Good' rating in accordance with the guidance.

Camden Planning Guidance, Sustainability (CPG3)
Renewable energy *• There are a variety of renewable energy technologies that can be installed to supplement a development's energy needs.* *• Developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies.*
Development achieves carbon reduction in excess of 11.4% from introduction of renewable technologies in the form of PV and ASHP. Due to the relatively small scale of the development and restriction imposed by existing building in dense surrounding, target of 20% reduction from on-site renewable technologies was not achieved despite best efforts of the design team.
Sustainable use of materials *• Reduce waste by firstly re-using your building, where this is not possible you should implement the waste hierarchy.* *• The waste hierarchy prioritises the reduction, re-use and recycling of materials.* *• Source your materials responsibly and ensure they are safe to health.*
By retaining and reusing the majority of the existing structure, it is anticipates that a significant proportion of the materials used in the development will be considered to be sustainably sourced. The

BREEAM Assessment process will be used to monitor and track this through the development. The contractor will be required to comply with the requirements set by the development team for both using and sourcing materials in a sustainable manner.
Sustainability assessment tools • *The Code for Sustainable Homes has been withdrawn however the Council will continue to require new residential development to submit a sustainability statement demonstrating how the development mitigates against the causes of climate change and adapts to climate change.* • *The creation of 5 or more dwellings, or 500sq m or more of floorspace, from an existing building will need to be designed in line with BREEAM Domestic Refurbishment.* • *Development of 500sq m or more of non-residential floorspace will need to be designed in line with BREEAM.*
Since proposed development includes creation more than 500 sq. m of non-residential floorspace, BREEAM UK Non-Domestic Refurbishment & Fit-Out pre-assessment is carried out to demonstrate how development will achieve BREEAM ratings required by Camden policies. In relation to domestic element of the scheme, even though total number of proposed domestic units is five, only three of them can be assessed under BREEAM Domestic Refurbishment scheme. For this reason, it has been concluded that BREEAM requirements relating to dwellings within existing buildings do not apply to the proposed development.

2.2.3 Building Regulations: Part L 2013

The Building Regulations Part L (Conservation of Fuel and Power) applies to all components of the development. The most recent version of the regulations came into effect on the 6th April 2014. In order to meet the performance requirements of Part L, the design of the building must comply with the prescriptive provisions laid out in the Compliance Checklist.

Table 3: Part L1B 2013 criteria

Part L Requirements	
A	Limiting heat gains and losses i. through thermal elements and other parts of the building fabric; and ii. from pipes, ducts and vessels used for space heating, space cooling and hot water services
B	Providing fixed building services which i. are energy efficient; ii. have effective controls; and iii. are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances
C	Providing to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a way as to use no more fuel than is reasonable in the circumstances.

Three units within the residential part of the development falls under the Building Regulations Part L category L1B – Conservation of fuel and power in existing dwellings while two units created in the new extension fall under Part L category L1A – Conservation of fuel and power in new dwellings . Similarly,

proposed retail space on basement & ground floor and office spaces on first and second floor fall under the Part L category L2B – Conservation of fuel and power in existing buildings other than dwellings while proposed office space on the third floor falls under Part L category L2A – Conservation of fuel and power in new buildings other than dwellings The criteria of Part L are outlined in the table below.

The development will comply with all the design limits on building fabric, heating, cooling, hot water and lighting efficiencies where feasible and practicable. The building will be designed to limit the effects of solar gains. Detailed energy calculations have been completed to assess the energy impact of this residential development.

3 Energy Efficiency Assessment

The following section of this report details the energy demand for the development. The building is first assessed against the requirements of Building Regulations Part L to establish a baseline energy performance. Then the improvements in energy efficiency from passive and active energy measures are introduced. A feasibility assessment is then completed to look at the most appropriate low and zero carbon technologies for the development.

This approach conforms to the GLA energy hierarchy of improving energy efficiency and providing on-site renewables. Our approach also follows the emerging London plan policy of prioritising reductions in carbon emissions over provision of on-site LZC technologies.

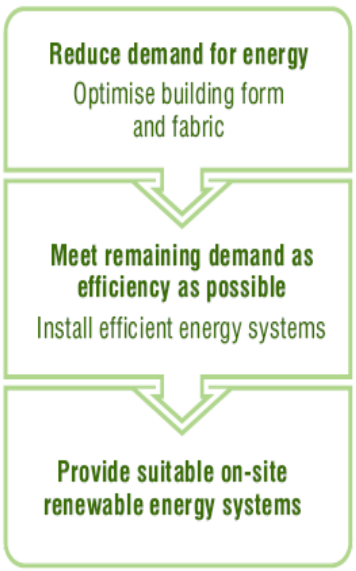

Figure 3 Energy Optimisation Process

3.1 Energy Calculations

STROMA FSAP 2012 software, approved by BRE for full implementation of the Standard Assessment Procedure (SAP 2012) was used to assess the energy performance and annual carbon emissions of the scheme after energy efficient measures have been applied. SAP calculations for three refurbished flats were first calculated using minimum requirements specified in the approved document L1B. Emission rate of these L1B compliant flats was considered as Target Emission Rate (TER) for the purpose of energy analysis. For two new build flats, TER value calculated by FSAP 2012 software can be used for the energy analysis without further modification. Area weighted average TER value was derived from two methods described above to arrive at TER value for the residential part of the development.

Similar process described above for residential part was followed in IES software to arrive at area weighted Target Emission Rate for non-domestic elements of the scheme that included both refurbished and new build areas. This calculation is explained in more detail in following section of this report.

3.2 Baseline Regulated Emissions

Target Emission Rate 2013 ($kgCO_2/m^2/year$)			
Unit	Area of all represented flats	TER	Total Carbon Emissions
	A	B	(A x B)
	m^2	$kgCO_2/m^2/yr$	$kgCO_2/yr$
Flat 1 (Refurbished)	68	27.80	1890.40
Flat 2 (Refurbished)	55	29.03	1596.65
Flat 3 (Refurbished)	69	22.62	1560.78
Flat 4 (New Build)	100	15.64	1564.00
Flat 5 (New Build)	162	14.88	2410.56
Retail, Office and Ancillary Spaces (Non-domestic Refurbished)	709.2	34.2	24254.64
Office and Ancillary Spaces (Non-domestic New Build)	126.6	17.1	2164.86
Area Weighted TER = ∑(AxB) / ∑A			**27.48** $kgCO_2/m^2/yr$

Table 4: Area weighted TER calculation using SAP 2012

Calculated TER values are applied to the total area of all units to arrive at site carbon emissions as shown in the table above. All subsequent Dwelling Emission Rate (DER) figures quoted in this energy report are also area weighted figures for the whole development and have been calculated by following the method similar to the one shown above.

4 Energy Efficient Building Design (Be Lean)

In order to comply with the requirements of Part L of the building regulations it is necessary to reduce energy consumption by good design. The newly created units must comply with Part L1A, L1B, L2A and L2B 2013: Conservation of fuel and in regards to the upgraded and new built building fabric and the new systems introduced. The first step in the hierarchy is to reduce greenhouse gas emissions through energy efficient building design. Our approach to this has been to concentrate on passive design measures that will reduce energy demand in the first instance before looking at active energy efficiency measures.

4.1 Passive Energy Efficiency Design

The first stage of the energy strategy is to reduce the energy demand as much as possible before considering active and renewable energy technologies. The aspiration is to build a high quality residential scheme with an enhanced energy performance.

This will be achieved through:

- **Building Orientation**- The internal layout of the dwellings has been set out to maximise the number of habitable rooms that can take advantage of solar gain and natural light.
- **Passive Solar Design and Daylight**- The make-up of the existing and proposed façade has balanced proportion of solid wall to glazing, thus providing optimum amount of daylight and winter solar heating, without excessive solar gains during the summer.
- **Thermal performance of the fabric**- the proposed building fabric exceeds the requirements set in the Part L regulations.
- **Thermal bridges** - Accredited construction details will be used in the new build part of the scheme to minimise the impact of thermal bridges within the building envelope.
- **Air-tightness**- Using enhanced construction skills and rigorous detailing to reduce the air permeability of the building.

The table below shows the proposed specifications for the fabric of the development.

Fabric Elements		Proposed Specification
Fabric U values [W/m^2.K]	New roof	0.13
	New External walls	0.20
	Upgraded existing walls	0.20
	New Basement floor	0.20
	Floor between Ground floor retail and first floor flats	0.40
	New & Replacement windows (domestic)	1.40 (g-value: 0.7)
	New & Replacement windows (non-domestic)	1.40 (g-value: 0.4)
	Display windows (retail unit)	4.6
	New & Replacement doors (domestic element)	1.40
	High usage entrance doors (retail unit)	3.5

Air permeability [m^3/m^2.hr@50pa]	5.0
Construction Details	**New construction** - All junctions to have approved construction details to achieve linear thermal transmittance y values <= 0.1 **Refurbished elements** - None

Table 5: Target Specifications for domestic development

Achieving the above values will reduce the energy demand of the development in advance of adding any active energy efficiency measures or renewable energy systems to the development.

4.2 Non-Regulated Energy Use

The London Plan (2015) requires that the energy demand and carbon dioxide emissions of the non-regulated end uses should also be calculated and reported in the energy assessments.

In accordance with BRE SAP calculation procedures for estimating the non regulated carbon emissions, the carbon emission from appliances in the development will be circa 14.79 tonnes per year and total emissions from cooking in all dwellings are approximately 1.94 tonnes per year. The total carbon emissions of the residential units from non-regulated energy use is therefore 16.73 tonnes per year. According to SBEM calculations, total carbon emissions of the non-domestic units from non-regulated energy use is 7.25 tonnes per year.

The following strategies are proposed to reduce the non-regulated energy demand of the development:

- A rated appliance: The kitchens will be fitted out with highly efficient A rated appliances (where applicale) or alternatively information about high efficiency units will be provided to future owners.
- Installation of energy meters with display monitors for each unit. This will encorage the occupants to become more interested and involved in how energy is being used in their unit.
- Information will be provided to occupants which will explain the operations of heating system and PV panels and how energy efficient behaviour can reduce the cost/carbon emissions of the development.

4.3 Carbon Emission of the Efficient Building

Implementing all the passive and active energy strategies listed in sections 4.1 and 4.2, the carbon dioxide emission of the buildings is reduced from 28.70 $kgCO_2/m^2$ to 20.23 $kgCO_2/m^2$. The following table demonstrates that the reduction in Carbon Emission of the buildings is 29.5%.

	Annual Carbon Emissions	Reduction
	$kgCO_2/m^2$/year	(%)
Part L 2013 Target Emission Rate	27.48	
DER of energy Efficient Scheme	19.99	27.3

Table 6: Carbon Dioxide Emission reduction of domestic element after Energy Efficiency

5 Supplying Low Carbon Energy (Be Clean)

5.1 District Energy Networks

In response to the second tier of the Energy Hierarchy and the GLA's requirement that developments seek to connect to optimise energy supply, a preliminary investigation into the adjacent heat loads and infrastructure has been undertaken. There is no existing or proposed district heating scheme within the immediate vicinity of the development.

5.2 Combined Heat & Power (CHP)

Since there is no viable source of heat in the vicinity for the development to connect to, design team have looked into the possibility of installing a CHP system within the proposed development.

As CHP usually has significantly higher capital cost compared to conventional gas fired boilers, to maximise its efficiency it is it is important that the CHP plant operates for as many hours as possible and matches closely the base heat and power loads so that neither the generated heat nor electricity is wasted. As there are only five residential units on site, the heating and hot water demand is low and only very small CHP could deal with the very low heating/hot water demand. However, the number of available micro CHP units in the market is very limited and they are not very robust or efficient. Therefore the amount of the carbon saved using these units is also limited. The non-residential units has no constant heating or hot water demand throughout the year either.

Due to the size of the development, we would not recommend a CHP system for the proposed development.

6 On-site Low and Zero Carbon Technologies (Be Green)

The WCC policy requirement for a 20% reduction in carbon emissions through the application of on-site renewable energy systems applies to major schemes. The design team have looked at the feasibility of integrating each technology into the scheme. The following section of the report briefly assesses the technologies available for the development.

6.1 Low and zero carbon technology appraisal

6.1.1 Biomass Boilers

A biomass boiler would work effectively against a consistent heating load. Within inner London areas, there are concerns about the effect of small scale biomass systems on air-quality particularly with respect to particulates released through the boiler flue. Within this constrained site it would be difficult to provide sufficient space for biomass storage. For these reasons we would not recommend a biomass boiler for this development.

6.1.2 Wind Turbines

Wind turbines' performance in urban areas is normally not very good and unpredictable due to turbulences on air movement caused by the surrounding built environment. Wind turbines may also raise issues due to noise disturbance and their visual impact. Therefore, this technology is not suitable for this site.

6.1.3 Photovoltaic Panels

Installation of Photovoltaic panels on refurbished building's roof is considered an appropriate renewable technology. As there are no taller buildings or other topographical features in close proximity that could overshadow the roof, the installed PV panels would receive maximum solar energy throughout the day. Proposed roof provides a location for PVs that will keep them well hidden from the main façade and will thus have minimal visual impact from the street level views.

6.1.4 Ground Source Heating & Cooling

Most part of the lower ground floor is occupied by the existing building. Therefore, there is not enough space for digging a trench or boreholes to install such a system. In addition, the heating and cooling demand of the building is not balanced throughout the year and given the high capital cost of the system, installing a ground source heat pump would not be recommended for the scheme.

6.1.5 Solar Hot Water Heating (SHWH)

Solar thermal hot water systems can work well on residential developments. However, there is only a limited space available on the roof. Due to having very limited space inside the apartments for risers and hot water storage and for maintenance issues, it is decided that the limited space available on the roof will be used for installation of PV panels.

In summary, roof mounted PV panels and community heating system incorporating CHP is recommended for the scheme.

6.2 Proposed Renewable System

6.2.1 Photovoltaic Panels

Details of the proposed PV panels will be confirmed at the detailed design stage by MCS accredited body responsible for design and installation of PV panels. The current layout as shown in the figure below is indicative and is based on South-West facing panels.

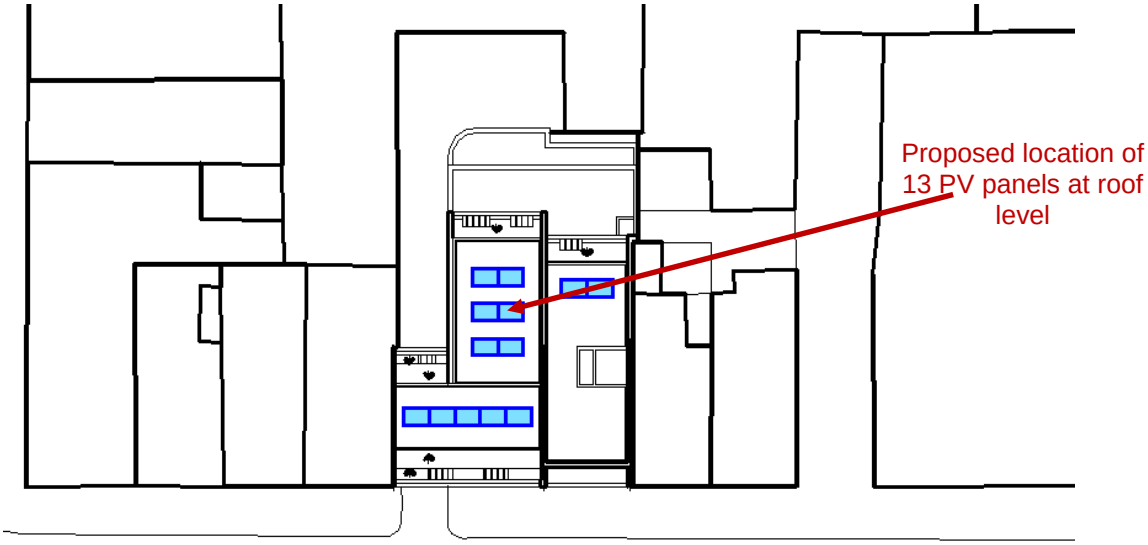

Figure 4: Proposed PV panel installation on the roof

The energy output of the PV panels will either be used to meet the demand of the development, or will be exported to the grid. Feed in Tariffs will be applicable to the installation according to current legislation and the PV panels will generate revenue each year.

A total of 13 PV panels are proposed to be installed on the roof. The total peak power generated by photovoltaic panels will be around 4.16 kW. The installation will result in a saving of approximately 1.8 tonnes of carbon per year.

6.2.2 Air Source Heat Pumps

Air source heat pump extract the heat available in the air and transfers it efficiently to the building. Although the system uses electricity it is highly efficient and therefore it reduces carbon mission in comparison with traditional gas fired boilers. Air source heat pumps are proposed for the offices and it is assumed the tenants of the retail units will be required to install these as well.

6.3 Carbon Emissions Calculation Results

As outlined in the Sustainable Design and Construction SPG, since 6 April 2014, the Mayor has applied a 35 per cent carbon reduction target beyond Part L 2013 of the Building Regulations - this is deemed to be broadly equivalent to the 40 per cent target beyond Part L 2010 of the Building Regulations, as set out in London Plan Policy 5.2 for 2013-2016 and mentioned in section 2.2.1 of this report. Figure 5 below shows the reduction in CO2 emissions over Part L 2013 standards due to integration of the measures outlined above in the proposed strategy. The energy efficiency measures incorporated into the development reduce predicted carbon emissions by 35.6 % with the introduction of ASHP and PV panels. This is greater than the minimum requirement of various applicable planning policies discussed earlier in the report. Table 7 summarises the reduction in annual carbon emissions of the development.

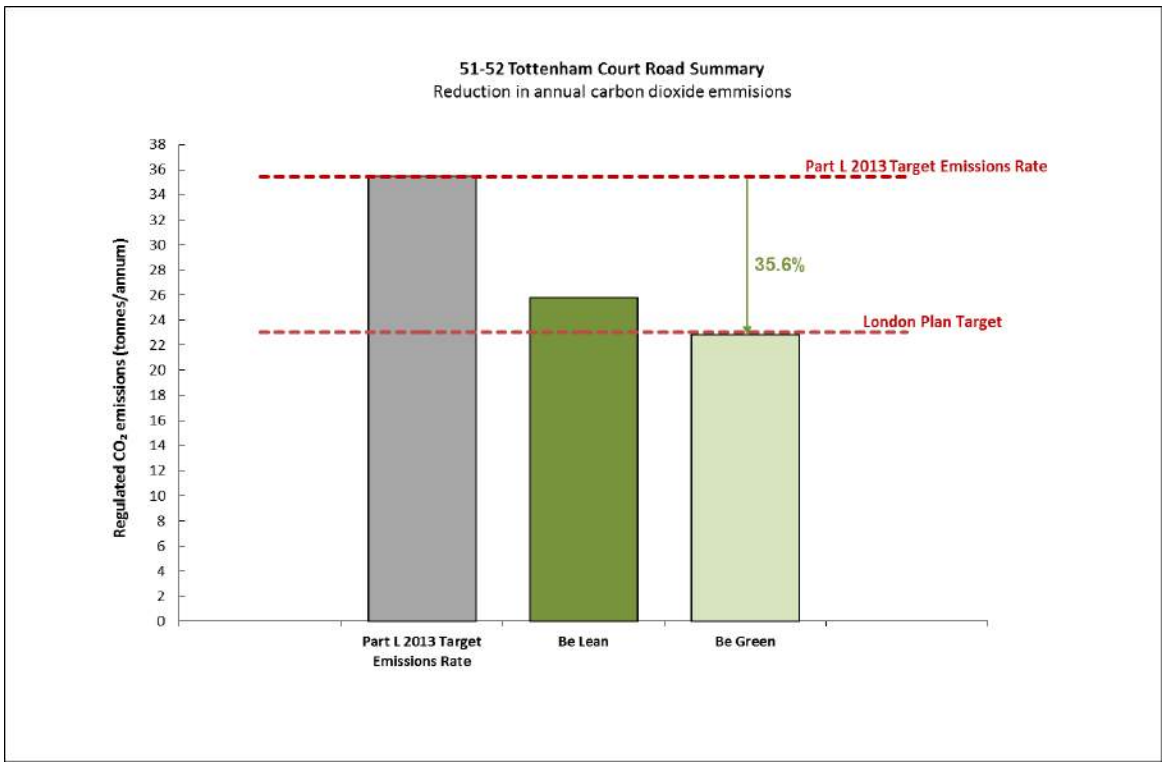

Figure 5: Carbon Emissions Results

	Annual Carbon Emissions
	$kgCO_2/m^2/year$
Part L1 2013 Target Emission Rate	27.48
DER of energy Efficient Scheme	19.99
DER of Energy Efficient Scheme with PV panels	17.71

Table 7: Summary of Building Baseline Emission Rates

7 Sustainability Appraisal

7.1 BREEAM Non-domestic Refurbishment & Fit-out (2014)

The BREEAM Non-domestic Refurbishment & Fit-out scheme is designed to help building owners and occupiers to save operating costs, reduce the environmental impacts of refurbishments and increase the sustainability of existing building stock. It is used to assess the environmental life cycle impacts of refurbishment projects including existing non-domestic buildings undergoing refurbishment, extensions, conversions and change of use projects in the UK.

To maintain a flexible system BREEAM adopts a 'balanced score-card' approach to the assessment and rating of a building or project. This means that, to achieve a particular level of performance the majority of BREEAM credits can be traded i.e. not meeting a credit in one area can be off-set by achieving a credit in another to achieve the target BREEAM rating. However, to ensure that performance against fundamental environmental issues is not over-looked in pursuit of a particular rating, BREEAM sets minimum standards of performance in key areas e.g. energy, water, ventilation etc. The BREEAM Domestic Refurbishment categories are listed below. The score is totalled and converted to a BREEAM rating. The minimum score required for each rating is shown in table below.

Table 8: Minimum score required for each rating regarding BREEAM Domestic Refurbishment assessment.

BREEAM Categories		BREEAM Ratings	
Management	Pollution	PASS	**30**
Energy	Waste	GOOD	**45**
Water	Health & Wellbeing	VERY GOOD	**55**
Materials	Innovation	EXCELLENT	**70**
		OUTSTANDING	**85**

A preliminary BREEAM Non-domestic Refurbishment & Fit-out Pre-assessment has been completed for the scheme that shows that BREEAM "Very Good" rating can be achieved for the non-domestic units. The following key elements/strategies are considered in the development:

- Refurbishment of the existing elements to upgrade their thermal performance
- Installation of energy efficient systems to meet space heating and domestic hot water demand.
- Energy efficient light fittings for internal and external lighting
- Water efficient sanitary ware to be installed so as to reduce water consumption
- New materials and insulation used will be responsibly sourced
- Responsible construction practices will be adopted for the scheme

A detailed BREEAM Pre-assessment can be found in Appendix B.

8 Overheating and Cooling Policy

The project design has followed the overheating and cooling hierarchy as required by London Plan.

- **Minimising internal heat gain-efficient design:** where possible the internal gains are minimised. This includes highly efficient design of light fittings and where applicable, selecting highly efficient A rated equipments to reduce the small power and internal gain
- **Reducing the solar and heat gain:** the areas of the existing and proposed windows are not excessive.
- **Manage the heat within the building (thermal mass):** the internal leaf of the walls has high thermal mass and the area of the light weight windows is not excessive, therefore the internal temperature will benefit from the wall's thermal mass.
- **Passive ventilation**: Ventilation is provided by openable windows when additional air flow will be needed.
- **Mechanical Ventilation:** Mechanical ventilation system with heat recovery is proposed for the development.
- **Active cooling systems (lowest carbon option**): Retail and office areas of the development will have cooling provided by highly efficient Air Source heat Pumps.

9 Conclusions

This report and the accompanying pre-assessment demonstrate that sustainable design issues have been carefully considered by the development team and will provide new accommodation that exceeds the statutory minimum requirements across a wide range of environmental design criteria.

Based on our initial assessment, the retail and office element of the scheme will achieve 2014 BREEAM Non-domestic Refurbishment & Fit-out 'Very good' rating. The BREEAM pre-assessment presented in Appendix B of this report demonstrates how this rating could be achieved.

SAP 2012 and SBEM energy calculations, carried out for the scheme, demonstrate how the development responds to the Camden Council policies relating to energy efficiency. The project involves the conversion of an existing mixed-use building and building works include refurbishment of the existing building facade. Therefore, the scheme is constrained. This has made improving energy performance of the development more challenging than a new one of similar scale. However, the analysis shows that the change-of-use and redevelopment has provided a theoretical reduction in carbon emissions of around 35.6% over Part L 2013 requirements. This meets the Camden Council target for Major Developments.
Furthermore, since an attempt has been made to retain as much of the original building as possible, the amount of embodied carbon in the building is reduced.

This report has demonstrated how energy efficiency measures have been incorporated into the development in order to deliver CO_2 emissions savings. These measures include:

- All new building fabric performance generally to meet the requirements of Part L1B 2013
- Provision of a new energy efficient heating and cooling systems.
- Extensive provision of metering and controls.
- Energy efficient lighting with sophisticated controls used extensively within the development.

The energy efficiency section of this report has demonstrated that with the application of good energy efficient design the predicted carbon emissions from the development are over 35.6% below the baseline emissions based on Part L 2013 standards. The development demonstrates how despite the constraints of the site significant emissions reductions can be achieved.

APPENDIX A - SAP 2012 and SBEM Calculations Parameters

STROMA FSAP 2012 software package, approved by BRE for full implementation of the Standard Assessment Procedure (SAP 2012), was used to assess the energy performance and annual carbon emissions of **51-52 TOTTENHAM COURT ROAD** scheme after energy efficient measures have been applied. SAP Calculations were based on architectural layouts and the following assumptions on building fabric and service systems:

Domestic element

Building Fabric Performance		
U-values [W/m2.K]	Wall	0.20 – Upgraded existing walls 0.20 - New External walls
	Roof	0.13 – New roof & Upgraded existing roof
	Floor	0.40 – Floor between Ground floor shop and First floor
	Windows & Roof lights Doors	1.40 – New & Replacement windows (g value 0.7) 1.40 – New & Replacement doors

Thermal Bridging
New dwellings - All junctions to have approved construction details **Refurbished flats** - None

Air permeability
5 m3/m2.h @50 Pa; air pressure tested

Building HVAC systems	
Heating system	Gas fired boiler heating system with radiators: Condensing combi boiler with >= 89.8% seasonal efficiency
	Secondary heating system: Not provided
Heating controls	Time and temperature zone control by suitable arrangement of plumbing and electrical services, Boiler interlock, Delayed start thermostat
Domestic Hot Water	Instantaneous hot water supply to dwellings through combi boiler
Ventilation	Whole house balanced mechanical ventilation system with heat recovery -Vent Axia Sentinel Kinetic or other brand with same or better performance for 1 bed flats, Vent Axia Sentinel Kinetic Plus or other brand with same or better performance for 2 bed flats and above.
Cooling	Not provided

Other Renewable Technology
13 PV panels in total, facing due South at 30° angle. Each panel to have 0.32 kWp installed peak power. Approx dimensions of each panel 1.05 X 1.56 mts

Lighting
All light fittings will be dedicated low energy types either LED or fluorescent

Office-Retail

IES-VE software (2014, Part L 2013 compliance) was used to assess the energy performance and annual carbon emissions of 51-52 Tottenham Court Road scheme office and retail areas. SBEM Calculations were based on architectural layouts and the following assumptions on building fabric and service systems:

Building Fabric Performance		
U-values [W/m^2.K]	Wall	0.20 – New External wall 0.20 – Upgraded retained external wall
	Ground floor/ Exposed floor	0.20 – New basement floor
	Roof	0.13 – New flat roof
	Windows/Rooflights	1.40 – Double glazed, draught proofed units (g value 0.4)
	Display window	4.6 – Single glazed
	High usage entrance door	3.5 – Double glazed, draught proofed units
	Door	1.8 – Double glazed, draught proofed units
Thermal Bridging		
All junctions in the new construction to have accredited construction details		
Air permeability		
5 m^3/m^2.h @50 Pa; air pressure tested		

Building HVAC systems	
Heating system	Electric ASHP Heating efficiency: 4
Heating controls	Time and temperature Control Optimum start/stop control
HVAC System leakage	CEN classification Class B or better for ductwork, CEN Class L2 or better for AHU
Domestic Hot Water	Instantaneous hot water, electrically heated
Ventilation	Office-Retail: Zonal supply and extract ventilation units with heat recovery efficiency 0.7 and SFP: 1.8 Toilets: MEV with SFP: 0.3
Cooling	Cooling efficiency: 4.5

Lighting	
Office and retail areas lighting efficacy	80 luminaire lumens per circuit-watt efficacy
Display area lighting	40 lamp lumens per circuit-watt efficacy
Ancillary area lighting efficacy	80 luminaire lumens per circuit-watt efficacy
Lighting control	Photoelectric sensors, Manual ON and Auto OFF with Occupancy sensing Foc=0.82

APPENDIX B - BREEAM Non-domestic Refurbishment & Fit-out (Pre-Assessment)

BREEAM®

Code for a Sustainable Built Environment
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BREEAM UK Refurbishment & Fit-out 2014 - Pre-assessment

51-52 TCR Office

Pre-assessment

51-52 Tottenham Court Road

01 October 2015 Assessment Report

PwC's BREEAM Outstanding rated One Embankment Place in London. Image Hufton + Crow.

bre

Assessment details

Assessment references

Registration number:	51-52 TCR Office	**Date created:**	1/10/2015
Assessor name: First:		**Surname:**	
Assessor licence number:			
Assessor organisation:			
Architect name:	Squires and Partners		
Developer name:			
Property owner			

Site details

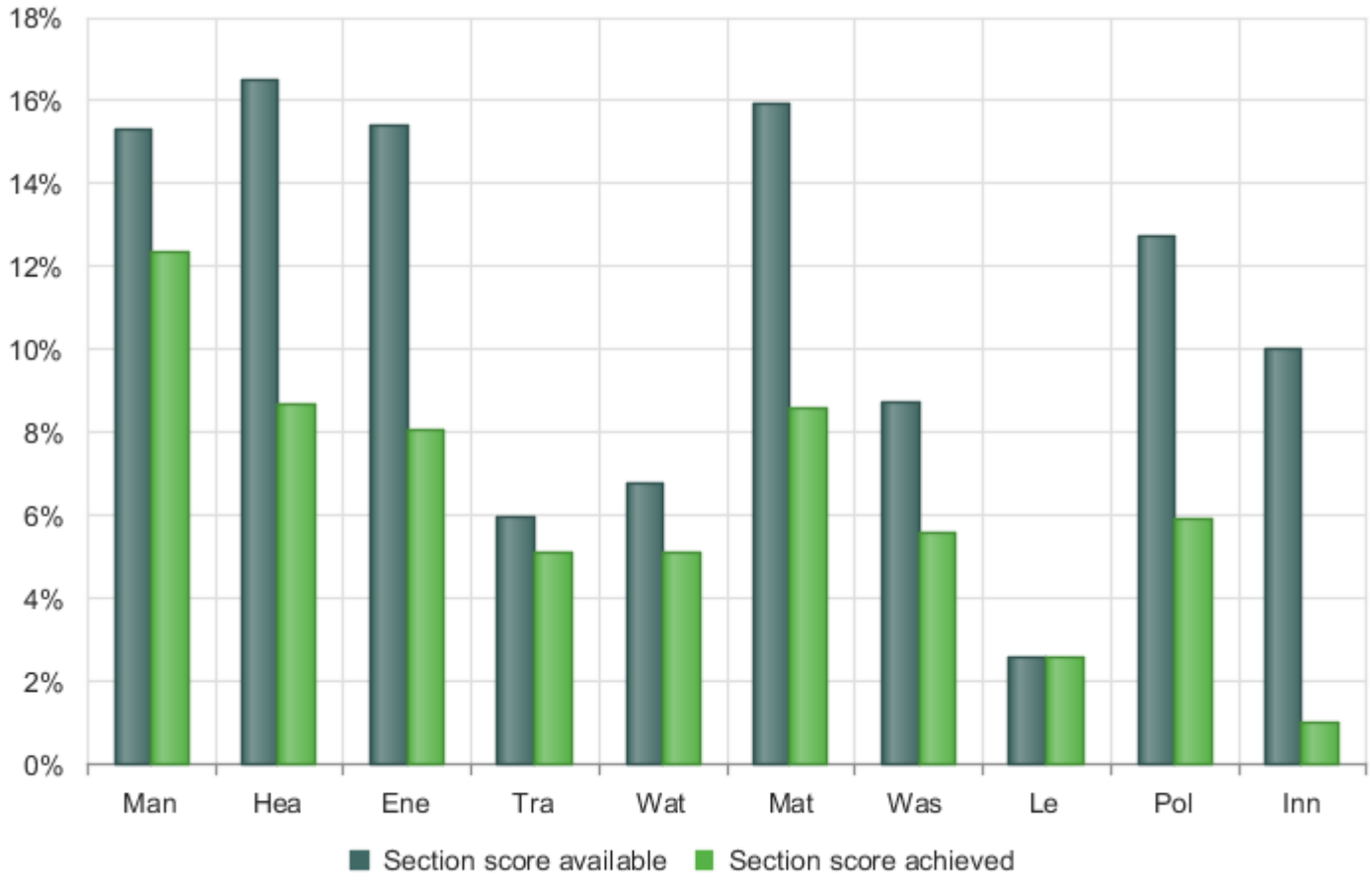
Site name:	51-52 Tottenham Court Road
Address:	51-52 Tottenham Court Road
Town:	London
County:	London
Post code:	
Country:	United Kingdom

BREEAM rating

BREEAM Rating

	Credits available	Credits achieved	% Credits achieved	Weighting	Category score
Man	21.0	17.0	80.95%	15.30%	12.38%
Hea	19.0	10.0	52.63%	16.51%	8.69%
Ene	21.0	11.0	52.38%	15.41%	8.07%
Tra	7.0	6.0	85.71%	5.95%	5.10%
Wat	8.0	6.0	75.00%	6.80%	5.10%
Mat	13.0	7.0	53.84%	15.93%	8.58%
Was	11.0	7.0	63.63%	8.76%	5.57%
Le	1.0	1.0	100.00%	2.55%	2.55%
Pol	13.0	6.0	46.15%	12.75%	5.88%
Inn	10.0	1.0	10.00%	10.00%	1.00%
Total	124.0	72.0	58.06%	-	62.95%
Rating	-	-	-	-	Very Good

Performance by environmental category



Issue scores

Please Note: X means the exemplary credit for the relevant issue

Management

Man Management	ManX
17 / 21	1 / 2

Health & Wellbeing

Hea Health & Wellbeing	HeaX
10 / 19	0 / 3

Energy

Ene Energy	EneX
11 / 21	0 / 5

Transport

Tra Transport
6 / 7

Water

Wat Water	WatX
6 / 8	0 / 1

Materials

Mat Materials	MatX
7 / 13	0 / 2

Waste

Was Waste	WasX
7 / 11	0 / 4

Land use and ecology

Le Land use and ecology
1 / 1

Pollution

Pol Pollution	PolX
6 / 13	0 / 1

Innovation

Inn Innovation	InnX
N/A	0 / 10

Initial details

51-52 Tottenham Court Road

Stage 1 filtering: Scope of the assessment

Part 1 : Fabric and structure : Yes

Part 2 : Core services : Yes

Part 3 : Local services : Yes

Part 4 : Interior design : Yes

Stage 2 filtering: Project specific filtering

Is the project a change of use? (e.g. change from office to a hotel) : No

Are transportation systems specified or present within the refurbishment or fit-out zone? (lifts, escalators, moving walks) : No

Are there laboratories present and if so what % of total building area do they represent : No laboratories present

Laboratory containment area : No laboratories present

Is cold storage specified or present within the refurbishment or fit-out zone? : No

Are soft landscaped areas within the scope of refurbishment or fit-out zone? : No

If the asset undergoing refurbishment or fit-out is part of a larger building, is the cooling generation plant centralised or localised? : Central

If the asset undergoing refurbishment or fit-out is part of a larger building, is the heating generation plant centralised or localised? : Central

Is Wat01 within the scope of the assessment in accordance with Table 42? : Yes

What is the building type? : Offices

If Industrial, does the building have office areas? : N/A

Does the building have any unregulated water demands? e.g. irrigation, car washing, or other process related water use : No

Does the building have unregulated energy demands from significantly contributing systems? : No

Is the project a simple building? : No

Does the building have external lighting within the scope of works? : Yes

Does the building have any existing or newly specified externally mounted plant? : Yes

If undertaking a Part 4 assessment, is there any equipment specified that requires commissioning (see Man04 CN13) : No

Historic building (listed building or building in a conservation area) : No

Category assessment

Management | Man

Man Management

51-52 Tottenham Court Road

MAN 01 PROJECT BRIEF AND DESIGN	
Stakeholder consultation (project delivery) :	1
Stakeholder consultation (third party) :	0
Sustainability champion (design) :	1
Sustainability champion (monitoring progress) :	1
MAN 02 LIFECYCLE COST AND SERVICE LIFE PLANNING	
Elemental lifecycle cost :	2
Componnent level LCC plan :	1
Capital cost reporting :	1
MAN 03 RESPONSIBLE CONSTRUCTION PRACTICES	
Environmental management :	1
Has criterion 2 been met? :	Yes
Sustainability champion (construction) :	1
Considerate construction :	1
Exemplary level criteria :	
Monitoring of refurbishment or fit-out site impacts :	1
MAN 04 COMMISSIONING AND HANDOVER	
Commissioning and testing schedule and responsibilities :	1
Commissioning building services :	1
Testing and inspecting building fabric :	0
Handover :	1
Has criterion 9 been met? :	No
MAN 05 AFTERCARE	
Aftercare support :	1
Exemplary level criteria :	Yes
Seasonal commissioning :	1
Post occupancy evaluation :	1

Credits awarded : 17.0
Exemplary credits awarded : 1.0

Health & Wellbeing | Hea

Hea Health & Wellbeing

51-52 Tottenham Court Road

HEA 01 VISUAL COMFORT	
Glare control :	1
Daylighting :	1
Exemplary level criteria :	No
View out :	1
Internal and external lighting :	1

HEA 02 INDOOR AIR QUALITY	
Indoor air quality plan :	1
Ventilation :	0
Volatile organic compounds :	1
Exemplary level criteria :	0
Potential for natural ventilation :	0

HEA 03 SAFE CONTAINMENT IN LABORATORIES - NA

HEA 04 THERMAL COMFORT	
Thermal modelling :	1
Adaptation - for a projected climate change scenario :	0
Thermal zoning and controls :	1

HEA 05 ACOUSTIC PERFORMANCE	
Acoustic performance :	1

HEA 06 SAFETY AND SECURITY	
Security of site and building :	1

Credits awarded : 10.0

Energy | Ene

Ene Energy

51-52 Tottenham Court Road

ENE 01 ASSESSMENT OPTION

Which option is being followed :	Option 1a simple estimate (whole building)

ENE 01 - OPTION 1A

Credits :	5
Exemplary credits :	0

ENE 02 ENERGY MONITORING

Sub-metering of major energy consuming systems :	1
Sub-metering of high energy load and tenancy areas :	1

ENE 03 EXTERNAL LIGHTING

External lighting :	1

ENE 04 LOW CARBON DESIGN

Passive design analysis :	1
Free cooling :	1
Low and zero carbon technologies :	1

ENE 05 ENERGY EFFICIENT COLD STORAGE - NA

ENE 06 ENERGY EFFICIENT TRANSPORTATION SYSTEMS - NA

ENE 07 ENERGY EFFICIENT LABORATORY SYSTEMS - NOTAPPLICABLE

ENE 08 ENERGY EFFICIENT EQUIPMENT

ENE 09 DRYING SPACE

Credits awarded : 11.0

Transport | Tra

Tra Transport

51-52 Tottenham Court Road

TRA 01 SUSTAINABLE TRANSPORT SOLUTIONS

Sustainable transport options :	3

TRA 02 PROXIMITY TO AMENITIES

Proximity to amenities :	1

TRA 03 CYCLIST FACILITIES

Cycle storage :	1
Cylist facilities :	0

TRA 04 MAXIMUM CAR PARKING CAPACITY - NA

TRA 05 TRAVEL PLAN

Travel plan :	1

Credits awarded : 6.0

Water | Wat

Wat Water

51-52 Tottenham Court Road

WAT 01 WATER CONSUMPTION

Water consumption :	3
Exemplary level criteria :	No

WAT 02 WATER MONITORING

Water monitoring :	1
Has criterion 1 been met? :	Yes

WAT 03 LEAK DETECTION

Leak detection system :	1
Flow control devices :	1

WAT 04 WATER EFFICIENT EQUIPMENT - NA

Credits awarded : 6.0

Materials | Mat

Mat Materials

51-52 Tottenham Court Road

MAT 01 ENVIRONMENTAL IMPACT OF MATERIALS	
Environmental impact of materials :	2
Exemplary level criteria :	No
MAT 03 RESPONSIBLE SOURCING OF MATERIALS	
Sustainable procurement plan :	1
Has criterion 1 been met? :	Yes
Responsible sourcing of materials :	1
Exemplary level criteria :	No
MAT 04 INSULATION	
Insulation :	1
MAT 05 DESIGNING FOR DURABILITY AND RESILIENCE	
Designing for durability and resilience :	1
MAT 06 MATERIAL EFFICIENCY	
Material efficiency :	1

Credits awarded : 7.0

Waste | Was

Was Waste

51-52 Tottenham Court Road

WAS 01 CONSTRUCTION WASTE MANAGEMENT	
Pre-refurbishment audit :	1
Re-use and direct recycling of materials :	1
Resource efficiency :	1
Exemplary level criteria :	No
Diversion of waste from landfill :	1
Exemplary level criteria :	No
WAS 02 RECYCLED AGGREGATES	
Recycled aggregates :	0
Exemplary level criteria :	No
WAS 03 OPERATIONAL WASTE	
Operational waste :	1
WAS 04 SPECULATIVE FINISHES	
WAS 05 ADAPTATION TO CLIMATE CHANGE	
Adaptation to climate change - structural and fabric resilience :	1
Exemplary criteria: Responding to adaptation to climate change :	No
WAS 06 FUNCTIONAL ADAPTABILITY	
Functional adaptabiliy :	1
Credits awarded : 7.0	

Land use and ecology | Le

Le Land use and ecology

51-52 Tottenham Court Road

LE 02 PROTECTION OF ECOLOGICAL FEATURES

Protecting ecological value :	1

LE 04 ECOLOGICAL ENHANCEMENT - NA

LE 05 LONG TERM IMPACT ON BIODIVERSITY

Credits awarded : 1.0

Pollution | Pol

Pol Pollution

51-52 Tottenham Court Road

POL 01 IMPACT OF REFRIGERANTS	
Impact of refrigerants :	1
Leak detection :	0
POL 02 NOX EMISSIONS	
NOx emissions :	1
POL 03 FLOOD RISK AND REDUCING SURFACE WATER RUN-OFF	
Flood risk management :	1
Exemplary level criteria :	No
Surface water run-off :	1
Minimising watercourse pollution :	0
POL 04 REDUCTION OF NIGHT TIME LIGHT POLLUTION	
Reduction of night time light pollution :	1
POL 05 NOISE ATTENUATION	
Noise attenuation :	1
Credits awarded : 6.0	

Innovation | Inn

Inn Innovation

51-52 Tottenham Court Road

INN 01 APPROVED INNOVATIONS

Approved innovations :	0

Credits awarded : 0.0

BREEAM®

Code for a Sustainable Built Environment
www.breeam.com

BREEAM UK Refurbishment & Fit-out 2014 - Pre-assessment

5152TCR-Retail

Pre-assessment

Tottenham Court Rd

01 October 2015 Assessment Report

PwC's BREEAM Outstanding rated One Embankment Place in London. Image Hofton + Crow.

bre

Assessment details

Assessment references

Registration number:	5152TCR-Retail	**Date created:**	1/10/2015
Assessor name: First:		**Surname:**	
Assessor licence number:			
Assessor organisation:			
Architect name:	Squire & Partners		
Developer name:			
Property owner			

Site details

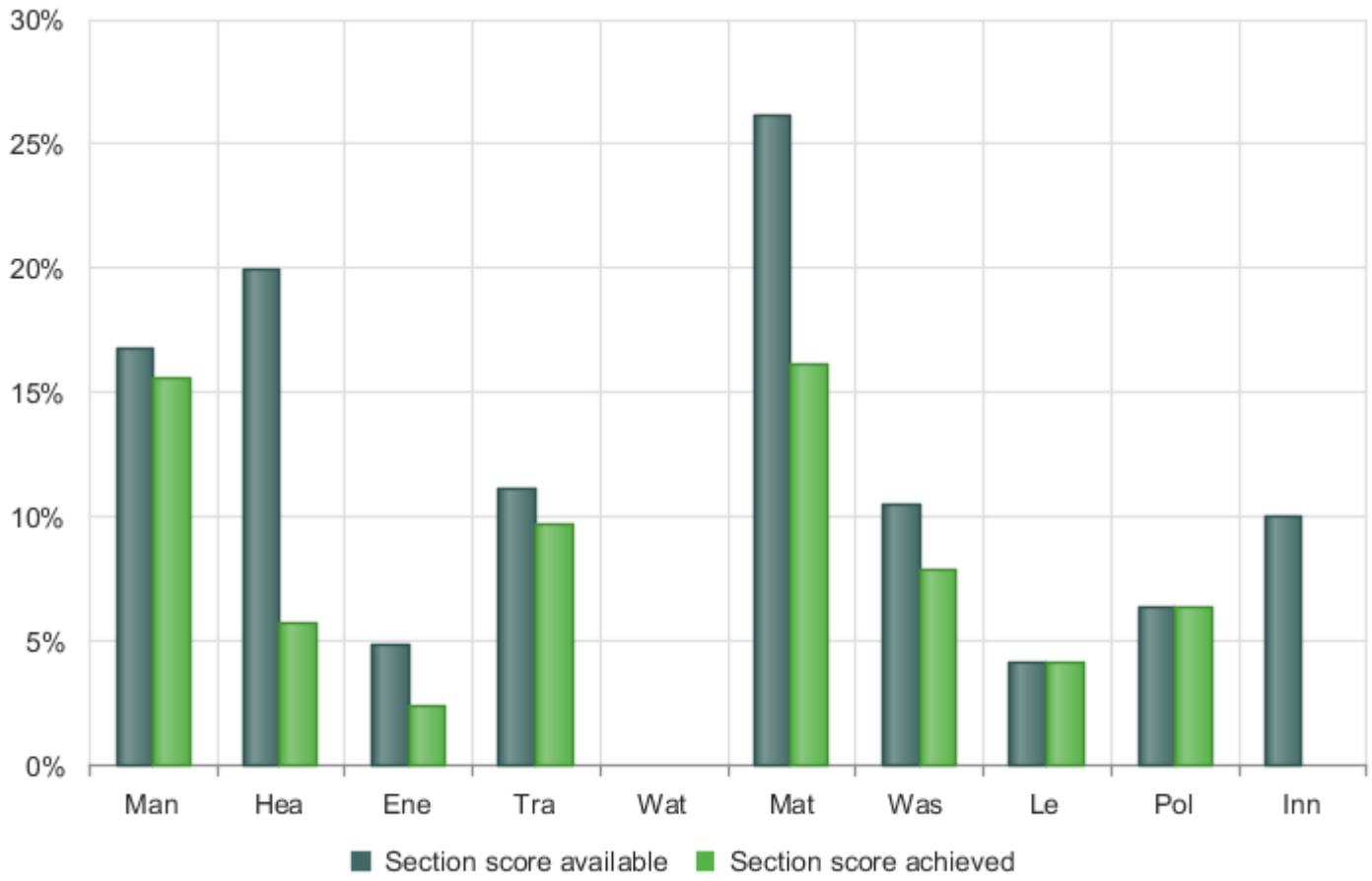
Site name:	Tottenham Court Rd
Address:	51-52 Tottenham Court Road
Town:	London
County:	London
Post code:	
Country:	United Kingdom

BREEAM rating

BREEAM Rating

	Credits available	Credits achieved	% Credits achieved	Weighting	Category score
Man	14.0	13.0	92.85%	16.75%	15.55%
Hea	14.0	4.0	28.57%	19.98%	5.71%
Ene	4.0	2.0	50.00%	4.82%	2.41%
Tra	8.0	7.0	87.50%	11.16%	9.77%
Wat	0.0	0.0	0.00%	0.00%	0.00%
Mat	13.0	8.0	61.53%	26.17%	16.10%
Was	8.0	6.0	75.00%	10.46%	7.85%
Le	1.0	1.0	100.00%	4.18%	4.18%
Pol	4.0	4.0	100.00%	6.44%	6.44%
Inn	10.0	0.0	0.00%	10.00%	0.00%
Total	76.0	45.0	59.21%	-	68.03%
Rating	-	-	-	-	Very Good

Performance by environmental category



Issue scores

Please Note: X means the exemplary credit for the relevant issue

Management

Man Management	ManX
13 / 14	0 / 2

Health & Wellbeing

Hea Health & Wellbeing	HeaX
4 / 14	0 / 1

Energy

Ene Energy	EneX
2 / 4	0 / 5

Transport

Tra Transport
7 / 8

Water

Wat Water
N/A

Materials

Mat Materials	MatX
8 / 13	0 / 2

Waste

Was Waste	WasX
6 / 8	0 / 2

Land use and ecology

Le Land use and ecology
1 / 1

Pollution

Pol Pollution	PolX
4 / 4	0 / 1

Innovation

Inn Innovation	InnX
N/A	0 / 10

Initial details

51-52 Tottenham Court Road

Stage 1 filtering: Scope of the assessment

Part 1 : Fabric and structure : Yes

Part 2 : Core services : No

Part 3 : Local services : No

Part 4 : Interior design : No

Stage 2 filtering: Project specific filtering

Is the project a change of use? (e.g. change from office to a hotel) : No

Are transportation systems specified or present within the refurbishment or fit-out zone? (lifts, escalators, moving walks) : No

Are there laboratories present and if so what % of total building area do they represent : No laboratories present

Laboratory containment area : No laboratories present

Is cold storage specified or present within the refurbishment or fit-out zone? : No

Are soft landscaped areas within the scope of refurbishment or fit-out zone? : No

If the asset undergoing refurbishment or fit-out is part of a larger building, is the cooling generation plant centralised or localised? : Local

If the asset undergoing refurbishment or fit-out is part of a larger building, is the heating generation plant centralised or localised? : Local

Is Wat01 within the scope of the assessment in accordance with Table 42? : No

What is the building type? : Retail

If Industrial, does the building have office areas? : N/A

Does the building have any unregulated water demands? e.g. irrigation, car washing, or other process related water use : No

Does the building have unregulated energy demands from significantly contributing systems? : No

Is the project a simple building? : Yes

Does the building have external lighting within the scope of works? : Yes

Does the building have any existing or newly specified externally mounted plant? : Yes

If undertaking a Part 4 assessment, is there any equipment specified that requires commissioning (see Man04 CN13) : N/A

Historic building (listed building or building in a conservation area) : No

Category assessment

Management | Man

Man Management

51-52 Tottenham Court Road

MAN 01 PROJECT BRIEF AND DESIGN	
Stakeholder consultation (project delivery) :	1
Stakeholder consultation (third party) :	0
Sustainability champion (design) :	1
Sustainability champion (monitoring progress) :	1
MAN 02 LIFECYCLE COST AND SERVICE LIFE PLANNING	
Capital cost reporting :	1
MAN 03 RESPONSIBLE CONSTRUCTION PRACTICES	
Environmental management :	1
Has criterion 2 been met? :	Yes
Considerate construction :	2
Exemplary level criteria :	
Monitoring of refurbishment or fit-out site impacts :	2
MAN 04 COMMISSIONING AND HANDOVER	
Commissioning and testing schedule and responsibilities :	1
Handover :	1
Has criterion 9 been met? :	Yes
MAN 05 AFTERCARE	
Aftercare support :	1
Exemplary level criteria :	No
Post occupancy evaluation :	1
Credits awarded : 13.0	

Health & Wellbeing | Hea

Hea Health & Wellbeing

51-52 Tottenham Court Road

HEA 01 VISUAL COMFORT	
Glare control :	0
Daylighting :	0
Exemplary level criteria :	No
View out :	0
HEA 02 INDOOR AIR QUALITY	
Ventilation :	0
Potential for natural ventilation :	0
HEA 03 SAFE CONTAINMENT IN LABORATORIES - NA	
HEA 04 THERMAL COMFORT	
Thermal modelling :	1
Adaptation - for a projected climate change scenario :	1
HEA 05 ACOUSTIC PERFORMANCE	
Acoustic performance :	1
HEA 06 SAFETY AND SECURITY	
Security of site and building :	1
Credits awarded : 4.0	

Energy | Ene

Ene Energy

51-52 Tottenham Court Road

ENE 01 ASSESSMENT OPTION

Which option is being followed :	Option 2a simple estimate (elemental)

ENE 01 - OPTION 2A

Credits :	1
Exemplary credits :	0

ENE 03 EXTERNAL LIGHTING

ENE 04 LOW CARBON DESIGN

Passive design analysis :	1
Free cooling :	0

ENE 05 ENERGY EFFICIENT COLD STORAGE - NA

ENE 06 ENERGY EFFICIENT TRANSPORTATION SYSTEMS - NA

ENE 07 ENERGY EFFICIENT LABORATORY SYSTEMS - NOTAPPLICABLE

ENE 09 DRYING SPACE

ENE 08 ENERGY EFFICIENT EQUIPMENT - NA

Credits awarded : 2.0

Transport | Tra

Tra Transport

51-52 Tottenham Court Road

TRA 01 SUSTAINABLE TRANSPORT SOLUTIONS

Sustainable transport options :	5

TRA 02 PROXIMITY TO AMENITIES

Proximity to amenities :	1

TRA 03 CYCLIST FACILITIES

Cycle storage :	1
Cylist facilities :	0

TRA 04 MAXIMUM CAR PARKING CAPACITY - NA

TRA 05 TRAVEL PLAN

Credits awarded : 7.0

Water | Wat

Wat Water

51-52 Tottenham Court Road

WAT 01 WATER CONSUMPTION - NA

WAT 02 WATER MONITORING - NA

WAT 04 WATER EFFICIENT EQUIPMENT - NA

Credits awarded : 0.0

Materials | Mat

Mat Materials

51-52 Tottenham Court Road

MAT 01 ENVIRONMENTAL IMPACT OF MATERIALS	
Environmental impact of materials :	3
Exemplary level criteria :	

MAT 03 RESPONSIBLE SOURCING OF MATERIALS	
Sustainable procurement plan :	1
Has criterion 1 been met? :	Yes
Responsible sourcing of materials :	1
Exemplary level criteria :	

MAT 04 INSULATION	
Insulation :	1

MAT 05 DESIGNING FOR DURABILITY AND RESILIENCE	
Designing for durability and resilience :	1

MAT 06 MATERIAL EFFICIENCY	
Material efficiency :	1

Credits awarded : 8.0

Waste | Was

Was Waste

51-52 Tottenham Court Road

WAS 01 CONSTRUCTION WASTE MANAGEMENT	
Pre-refurbishment audit :	1
Re-use and direct recycling of materials :	1
Diversion of waste from landfill :	1
Exemplary level criteria :	

WAS 02 RECYCLED AGGREGATES	
Recycled aggregates :	0
Exemplary level criteria :	

WAS 03 OPERATIONAL WASTE	
Operational waste :	1

WAS 04 SPECULATIVE FINISHES

WAS 05 ADAPTATION TO CLIMATE CHANGE	
Adaptation to climate change - structural and fabric resilience :	1

WAS 06 FUNCTIONAL ADAPTABILITY	
Functional adaptabiliy :	1

Credits awarded : 6.0

Land use and ecology | Le

Le Land use and ecology

51-52 Tottenham Court Road

LE 02 PROTECTION OF ECOLOGICAL FEATURES

Protecting ecological value :	1

LE 04 ECOLOGICAL ENHANCEMENT - NA

LE 05 LONG TERM IMPACT ON BIODIVERSITY

Credits awarded : 1.0

Pollution | Pol

Pol Pollution

51-52 Tottenham Court Road

POL 01 IMPACT OF REFRIGERANTS - NA

POL 02 NOX EMISSIONS - NA

POL 03 FLOOD RISK AND REDUCING SURFACE WATER RUN-OFF

Flood risk management :	2
Exemplary level criteria :	No
Surface water run-off :	1
Minimising watercourse pollution :	1

POL 04 REDUCTION OF NIGHT TIME LIGHT POLLUTION - NA

POL 05 NOISE ATTENUATION

Credits awarded : 4.0

Innovation | Inn

Inn Innovation

51-52 Tottenham Court Road

INN 01 APPROVED INNOVATIONS

Approved innovations :	0

Credits awarded : 0.0