8 Warwick Court

Energy Efficiency and Renewable Energy Plan / Sustainability Plan

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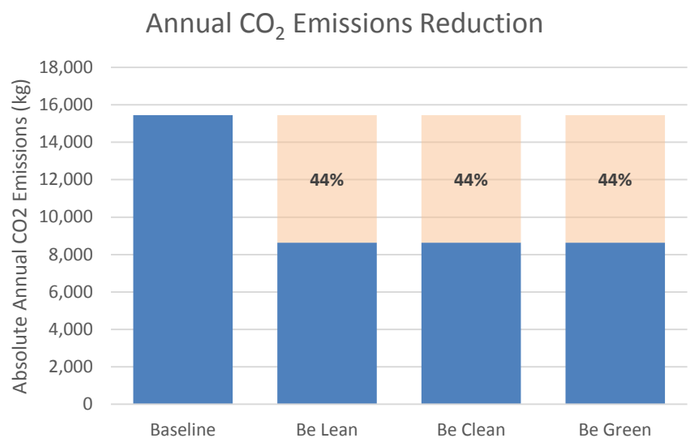


Carbon Emissions	Absolute (kg)	kgCO2/m2	Reduction (kg)	%
Baseline	15446	41.0	0	0%
Be Lean	8637	22.9	6809	44%
Be Clean	8637	22.9	6809	44%
Be Green	8637	22.9	6809	44%

Carbon Emission Reduction for 8 Warwick Court

1. Executive Summary

Low environmental impact will be an essential feature of the design of the proposed 8 Warwick Court redevelopment. This Sustainability Statement outlines the development's approach to sustainability, energy efficiency and renewable energy strategies in order to meet the targets set out in the guidance from Borough of Camden.

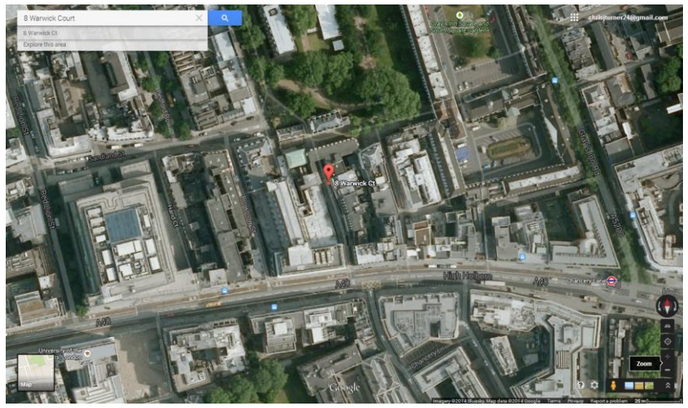
The development is a listed building located in the Bloomsbury Conservation Area and as such is subject to special consideration under Camden Planning Guidance 3.

To benchmark this process, the BREEAM Domestic Refurbishment methodology has been used. A number of the sustainable features included in the proposed design are listed below with consideration of their feasibility within the listed development accounted for:

- Thermal insulation levels for all the existing building elements will be increased beyond the new build standards, thereby substantially reducing the building's heat losses;
- The dwellings will be naturally ventilated, reducing the need for comfort cooling and mechanical systems;
- Natural day lighting with new, larger windows will improve occupancy comfort and reduce the requirement for lighting;
- High efficiency individual gas boilers for each dwelling will provide the heating and domestic hot water;
- The combination of proposed energy efficient measures (Be Lean) result in a reduction in CO2 emissions of 44%;
- The development will achieve at least a "Very Good" BREEAM 2012 Domestic Refurbishment rating;
- BREEAM credits ENE 04, ENE 06 and ENE 10 are unachievable due to the listed nature of the development and associated spatial constraints, meaning an 'Excellent' rating is unobtainable;
- The limited size of the development thermal load and the mismatch with its electrical profile suggest that CHP is not viable for this development (Be Clean);
- The London heat map indicates that there is currently no opportunities to connected to an existing or proposed district heating network;
- An extensive range of low and zero carbon technologies have been considered in terms of providing a proportion of the development's energy demand in line with ENE 04 (Be Green). The results indicated that planning and operational reasons, none of the investigated technologies are viable for meet a proportion of the building's energy demands;
- The development achieves Camden's mandatory 60% of Water credits required for BREEAM;
- The development achieves Camden's mandatory 40% of Materials credits required for BREEAM;
- However, as per document CPG-3, special consideration should be given to listed developments. Improvements have been made where feasible thus achieving a 'Very Good' rating;
- The existing building's structure and part of the façade will be retained and re-used;
- All timber used on site will be purchased from responsibly sources such as FSC approved vendors;
- New materials will be selected to take into account their overall environmental impacts and that they follow the Bloomsbury Conservation Area guidelines to preserve the look of the area;
- Recycling facilities will be provided for all occupants to reduce waste during operation;
- Secure, convenient & weather-proof communal cycle storage spaces will be provided for the residence on the ground floor;

- Water use will be minimised by the specification of water efficient taps, shower heads, dual flush toilets and low water use appliances;

- All construction on site will be managed in an environmentally sound manner in terms of resource use, storage, waste management, and potential sources of nuisance or pollution.



Proposed Site Location

Illustration of Proposed Development

2. Introduction

This Sustainability Statement has been prepared in support of the planning application for the proposed residential redevelopment at 8 Warwick Court, London, WC1R 5DJ. It aims to meet the energy and climate change requirements of the Borough of Camden and the Greater London Authority.

The format of the statement is intended to reflect and respond to the issues raised in the GLA's 'Spatial Development Strategy for Greater London' - the 'London Plan'.

The principal objectives are to reduce the site's contribution to the causes of climate change by minimising the emissions of CO_2, by reducing the site's needs for energy and providing some of the requirement by renewable/sustainable means. Issues such as water, waste, biodiversity, etc. have also been addressed in the study.

The GLA London Plan and GLA Energy Strategy are considered to be the benchmark for local planning regulation. Together they provide a useful tool against which to undertake energy and sustainability assessment. As this is not a major development and therefore not technically applicable they have been used in an advisory nature secondary to the requirements of the Borough of Camden, to help incorporate a number of energy efficiency measures into the proposed development.

To guide and benchmark this process, the Building Research Establishment's BREEAM Domestic Refurbishment 2012 methodology has also been used to assess the development. A preliminary assessment indicating that as a minimum a "Very Good" rating will be achieved (see Appendix A).

BREEAM considers the broad environmental concerns of climate change, pollution, impact on residents and the wider community. It balances these with the need for high-quality, safe and healthy internal living and working environment. These standards go beyond the requirements of the Building Regulations.

This Sustainability Statement forms a checklist of the sustainable initiatives considered for the proposed development. Each of the proposed initiatives is assessed on the relative sustainability potential, in addition to a "rule of thumb" financial/pay back implication, and suitability to this particular site.

2.1 Outline Description of Development

The proposals for the redevelopment of 8 Warwick Court will constitute a Material Change of Use from an office building to five new residential flats, consisting of one studio flat, three 2-bedroom flats and one 3-bedroom flat. The site consists of a five storey property arranged over lower ground to a third floor level.

There is ancillary storage present in the basement. The rear of the development is being extended to utilise more of the courtyard. New full height glazing will be installed to improve daylighting, with timber louvers placed over the windows facing the Law School to limit overlooking.

The site is located in central London just off the High Holborn Road within close proximity to the local shops, tube and rail stations. The site falls within the Bloomsbury Conservation Area, a protected area that aims to retain the look and quality of the Bloomsbury area.

The following accommodation schedule has been used as the basis for the energy assessment;

Floor	Unit	Beds	Area (m^2)
LG	Flat 01	2	87.9
G	Flat 02	2	63.0
1	Flat 03	2	76.9
2	Flat 04	1	41.1
2+3	Flat 05	3	107.9
	Sub Total	**10**	**376.8**
	Communal Core		55
	Total		**431.8**

Area Schedule for 8 Warwick Court

3. Planning Policy

The National Planning Policy Framework (NPPF) was published in March 2012, which states a clear presumption in favour of sustainable development. The NPPF supports the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, including conversion of existing buildings, and encourages the use of renewable resources.

The NPPF replaces PPS22 and in Section 10 outlines its energy and climate change policies. To support the move to a low carbon future, local planning authorities should:

- Plan for new development in locations and ways which reduce greenhouse gas emissions;
- Actively support energy efficiency improvements to existing buildings; and
- When setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards.

In determining planning applications, local planning authorities should expect new developments to:

- comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated that this is not feasible or viable; and
- take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption;
- have a positive strategy to promote energy from renewable and low carbon sources;
- consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure the development of such sources;
- Identify opportunities where development can draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

The key focus of the NPPF is to support local and regional planning authorities.

3.1 The London Plan

The GLA London Plan 2011, London Plan REMA October 2013 and GLA's Guidance on Preparing Energy Assessments September 2013 document are considered to be the benchmark for local planning regulation. Together they provide a useful tool against which to undertake energy and sustainability assessments. As the development does not qualify as 'major' the London Plan targets are not technically applicable and therefore they have been used in an advisory way secondary to the requirements of the Borough of Camden, to help incorporate a number of energy efficiency measures into the proposed development.

The London Plan sets out a number of core policies for major developments with regards reducing CO_2 emissions and providing energy in a sustainable manor. As this is not classified as a major development is does not technically have to comply with these requirements, but the design team have used them as guidance and sought to achieve them, where possible within the limitations of the existing constrained site.

Policy 5.2 - requires that major developments achieve a 40% improvement over the 2010 Building Regulation CO_2 Emission Target.

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

- Be lean: use less energy
- Be clean: supply energy efficiently
- Be green: use renewable energy

Policy 5.6 - requires all major developments to evaluate the feasibility of connecting to existing or proposed district heating networks and where no opportunity existing consider a site wide Combined Heat and Power (CHP) systems.

Policy 5.7 - requires that all major developments seek to reduce their CO_2 emissions by at least 20% through the use of onsite renewable energy generation wherever feasible. Individual development proposals will also help to achieve these targets by applying the energy hierarchy in Policy 5.2.

3.2 London Borough of Camden

The London Borough of Camden set out their approach to sustainable development through their Core Strategy, Development Policies and Supplementary Planning Documents. Core Strategy Policy 13 sets out the overarching approach to sustainability in the borough, with the aims of mitigating and adapting to climate change, promoting local energy generation, managing water resources and reducing carbon dioxide emissions

The Development Policies provide further detail as to how the Core Strategy policies can be achieved. In this instance *"Development Policy 22 – Promoting Sustainable Design and Construction*" provides the details as to how the targets of CS13 will be meet and states:

"The council will require development to incorporate sustainable design and construction measures. Schemes must:

- Demonstrate how sustainable development principles, including relevant measures set out in paragraph 22.5 below, have been incorporated into the design and proposed implementation; and
- Incorporate green or brown roofs and green walls wherever suitable."

The council will promote and measure the sustainable design and construction by:

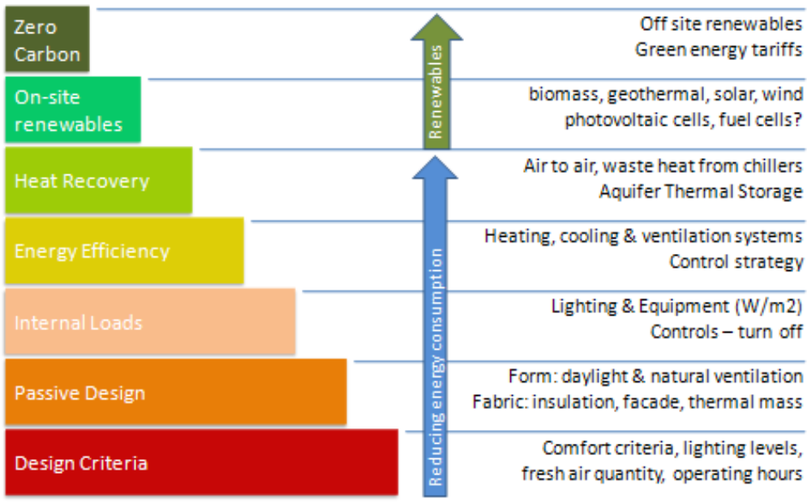
- Expecting non-domestic developments of 500sq m of floor space or above to achieve "very good" in BREEAM

assessments and “excellent” from 2016 and encouraging zero carbon from 2019.

The council will require developments to be resilient to climate change by ensuring scheme include appropriate climate change adaption measures, such as:

- Summer shading and planting;
- Limiting run-off;
- Reducing water consumption;
- Reducing air pollution;
- No locating vulnerable uses in basements in floor-prone areas.

In addition to this policy, the Supplementary Planning Document *“Camden Planning Guidance 3 – Sustainability”* provides greater detail on the targets for developments and the approach that should be adopted in meeting these targets.



Cundall's Steps to Low Carbon

4. Energy Strategy

The application proposes the change of use of the existing 8 Warwick Court building from disused B1 Office to C3 Residential. The new development will be integrated into the Borough of Camden's Sustainability guidance for the energy strategy.

The designs of the proposed dwellings have been developed to reduce their annual energy consumption, whilst providing energy in the most environmentally friendly way to reduce the annual CO_2 footprints. In order to achieve this, Cundall's "Steps to Low Carbon" methodology has been applied.

4.1 Passive Design

Substantial reductions in energy usage for the scheme will be achieved by enhancing the existing passive building elements.

4.1.1 Building Envelope

As the existing office building is being converted into new dwellings, which typically have higher heat requirements then office building the existing facades will be thermally enhanced. With new internal dry lining to the external walls, increased insulation levels in the roofs and floors and new energy efficient windows on the rear extension.

All retained and new thermal elements will therefore be specified to achieve the following area weighted U-values to reduce the heat losses though the building's fabric:

Building Element	Enhanced U-values
Floors	0.20 W/m^{2}K
Roofs	0.18 W/m^{2}K
External Walls	0.28 W/m^{2}K
Glazing	1.60 W/m^{2}K
Doors	1.60 W/m^{2}K

4.1.2 Accredited Construction Details

All new architectural details will ideally be assessed with their thermal bridging Ψ values calculated. Where this is not possible, all architectural details should be in accordance with the enhanced construction details listed on the Energy Trust's website or as an absolute minimum as per the requirements of the Accredited Construction Details document.

Accredited Construction Details (ACD's) have been developed to assist the construction industry to comply with the performance standards in Part L of the Building Regulations. They focus on issues concerning insulation continuity and airtightness and suggest a common approach to design, construction and testing methodology, and general improvements of the process.

4.1.3 Air Permeability

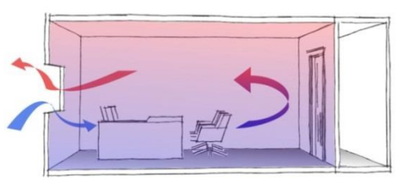
Although not required by Building Regulations, an air pressure test is being considered for the development in order to determine their air leakage rates and taken any remedial actions to improve it. An air leakage rate of 7m^3/hr/m^2 at 50Pa will be targeted for the development in comparison with the Building Regulation minimum standards under Part 1B of 15m^3/hr/m^2 at 50Pa.

Good air tightness will be achieved by prefabrication of a number of key building components under factory conditions, robust detailing of junctions, good building practices on site and making good of any existing details.

4.1.4 Natural Ventilation

The new dwellings will be naturally ventilated via the new and enhanced and enlarged windowing openings. The protected façade would make it difficult to incorporate MVHR units with supply and extract grills. Openable windows provide the occupants with an active control over the internal temperature.

This will provide fresh air all year around and remove heat gains in summer. This will also save energy related to fans and pumps that would otherwise be required and the associated annual CO_2 emissions.



4.2 Energy Efficient Systems & Appliances

After assessing the contribution of the passive elements to the overall energy balance, the aim is to further reduce CO_2 emissions by selecting efficient mechanical and electrical systems and efficient controls to manage the energy used during operation.

4.2.1 Eco-Labelled Goods

As lights and appliances account for about a third of the CO_2 emissions in dwellings, where domestic appliances are installed energy efficient units will be incorporated, including A and A+ rated appliances.

4.2.2 Low-Energy Lighting

To reduce the energy consumption associated with artificial lighting, 100% of all internal lighting fittings in each dwelling will be dedicated energy efficient light fittings*:

** Fittings that comprise the lamp, base, control gear, and an appropriate housing, reflector, shade or diffuser. The fitting must be dedicated in that it must be capable of only accepting lamps having a luminous efficacy greater than 40 lumens per circuit Watt. The fixing must be permanently fixed to the ceiling or wall.*

4.2.3 HVAC Plant Efficiencies

The design team will specify plant that meets or exceeded the minimum requirements of the domestic HVAC guide. It provides guidance on the means of complying with the requirements of Part L1B of the Building Regulations for conventional space heating systems, hot water systems and ventilation systems.

4.2.4 Energy metering

Separate metering of the energy uses within the development will help the building users identify areas of increased consumption and highlight potential energy-saving measures for the future, hence reducing the associated annual CO_2 emissions from these systems. All gas/heat and electrical supplies will be metered using smart meters to enable residents and tenant to be responsible for their own consumption and hence CO_2 emissions. There will be a central display area for tenants and utility companies to view the meter readings.

4.3 Estimated Annual Energy Consumption

Individual energy assessments have been carried out on a range of dwelling types, from the studio flat to the duplex flat, to determine their estimated energy consumption and associated CO_2 emissions. The SAP 2009 methodology has been used even though material change of use developments are not required to carry out an assessment or meet any targets under Part L1B of the Building Regulations. The London Plan's Energy Hierarchy has been adopted as a guide, as the development does not qualify as 'major' it is exempt from London Plan targets.

The results have been compared between a baseline case, based on the minimum fabric threshold standards for Part L1B and the minimum plant efficiencies under the Domestic Modelling Guide, and the proposed scheme with the aforementioned passive and energy efficient measures. The SAP Building Services Inputs outlines the design parameters used in the base case and proposed models.

The analysis indicates that the proposed dwellings are all performing significantly better than base case and achieving improvements of between 42% and 44% dependant on the dwelling type, with an area weighted improvement for the development of **43%**.

All SAP calculations have been carried out using the approved software Elmhurst Energy and the Part L1B SAP 2009 methodology.

4.3.1 Building Fabric Performance

Detail	Base Case (Back)	Design
Ground floor average U-value	0.70W/m^{2}K	0.20W/m^{2}K
External wall average U-value	0.70W/m^{2}K	0.28W/m^{2}K
Roof average U-value	0.35W/m^{2}K	0.18W/m^{2}K
Window U-value (including frame)	3.50W/m^{2}K	1.60W/m^{2}K
Glazing total solar transmission	60%	60%
Y-value	0.15	0.15
Air permeability @ 50 Pascals	15.0m^3/hr/m^3	7.0m^3/hr/m^2

4.3.2 Fixed Building Services

Detail	Base Case	Design
Heating type	Individual Boilers	Individual Boilers
Heating fuel	Natural gas	Natural gas
Gross boiler seasonal efficiency	88%	90%
Heating Emitters	Radiators	Radiators
Boiler Compensator	None	Weather
Heating system controls	Time, thermostat	Programmer, thermostat, TRV
Ventilation	Naturally Ventilated	Naturally Ventilated
Hot water pipework insulated	Yes	Yes
Cooling SEER	2.5	3.5
Low energy light fittings	None	100%
Hot water daily usage	> 125 l/p/day	< 125 l/p/day

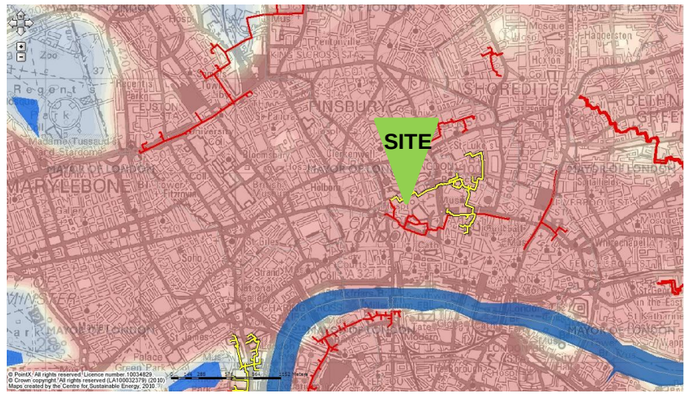
4.3.3 Area Weighted SAP 2009 Results

Area Weighted Results	Base Case		Design	
	Absolute	per sqm	Absolute	per sqm
Heating (kWh)	54082	143.5	24557	65.2
Hot water (kWh)	12638	33.5	11905	31.6
Lights (kWh)	3373	9.0	1686	4.5
Fans & Pumps(kWh)	730	1.9	730	1.9
Cooling (kWh)	222	0.6	325	0.9
Total Energy (kWh)	71044	188.5	39204	104.0
DER (kgCO_2)	16027	42.5	9103	24.2
Improvement (%)			**43%**	

4.4 Decentralised Energy Networks

The feasibility of connecting to an existing or proposed district network has been investigated for the site in accordance with Policy 5.6 of the London Plan.

The London Heat Map indicates that there are no potential district heat networks planned in the vicinity of the site. The nearest existing network is the Citigen network, approximately 600m away to the East, a distance that is considered unfeasible to connect with. Therefore, it is unviable to connect to a district network at this moment:

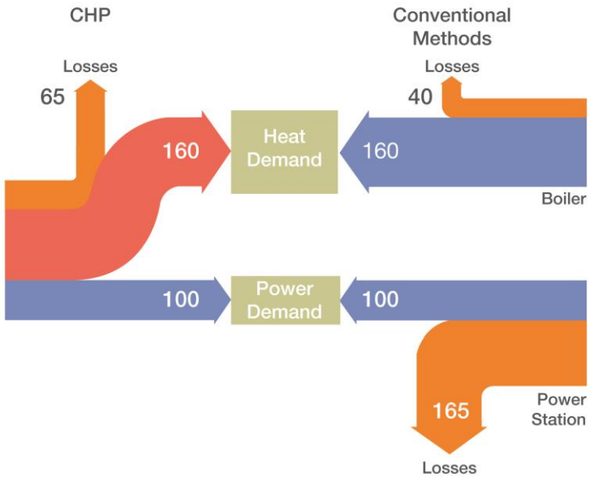


District Heating Networks in Proximity to the site (yellow = potential, red = installed)

The proposed high efficiency boilers in conjunction with the enhanced thermal properties of the new and retained fabric reduce the potential emissions reductions possible through connection to a district heating network. The heating load on the development is not considered large enough to act as an anchor for any local district system stemming from 8 Warwick Court.

4.5 Combined Heat & Power (CHP)

In accordance with the Decentralised Energy Hierarchy in Policy 5.6 (Be Clean) the feasibility of a site wide CHP network has been investigated. However the development's predicted energy demands are insufficient to support the efficient operational of a CHP unit.



CHP Efficiency Diagram

The development's heat load is predominately associated with its domestic hot water requirement, with peaks in the morning and evening. Even if substantial hot water cylinders were incorporated into the design to' level out' the peaks in order to increase the operational hours of the system, the base heat load for the five dwellings is not sufficient to support the efficient operational of a CHP system.

Additionally the building's thermal and electrical load profile are un-aligned, meaning that when heat is required in the morning there is only a limited electrical requirement, and vice versa during the day.

Furthermore the building is in an air quality management zone and the running a CHP will have higher NOx and PM10 particles compared to a gas boiler.

Therefore CHP is not considered viable for the proposed development.

4.6 Low and Zero Carbon Energy Sources

Policy 5.7 of the London Plan requires that all major developments seek to reduce their CO2 emissions by at least 20% through the use of onsite renewable energy generation wherever feasible. Despite this not being a major development, the following technologies have been investigated to determine the feasibility of delivering a reduction in the CO_2 emissions through renewables. The feasibility of each of the energy sources listed has been assessed with regard to the potential contribution each could make to supply a proportion of the development's delivered energy requirement, whilst considering the technical, planning, land use and financial issues.

A 20% reduction in CO_2 emissions equates to approximately 1.7 tonnes of CO_2 annually.

	Annual CO_2 Emissions
Grid Supplied Electricity	1417 kgCO2/yr
Natural Gas	7219 kgCO2/yr
Site Total	**8637 kgCO2/yr**
20% Renewable Target	1727 kgCO2/yr

20% Renewable Target for 8 Warwick Court

4.6.1 ASHP (Air Source Heat Pump)

Air source heat pumps exchange heat between the outside air and a building to provide space heating in winter and cooling in the summer months. The efficiency of these systems are inherently linked to the ambient air temperatures.

Heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pumps can supply as much as 3kW of heat output for just 1kW of electrical energy input. They can also be used to provide cooling, however the development has been designed to be natural ventilated in summer negating the requirement for cooling on site.

They are most efficient when they work at lower temperatures, typically around 40ºC. As the output temperature increases above this the efficiency of the system drops off. Therefore, as DHW is required at 60-65ºC, two systems would need to be installed if a heat pump system was considered; a conventional LTHW / CHP system for the DHW and either a under floor heating system for space heating or a heating coil on the MVHR feed off the heat pumps.

There is insufficient space available to incorporate individual heating systems with separate hot water generators.

Coupled this with the limitations on locating the external heat pump units on the listed facades ASHPs are not considered a viable technology for this development.

4.6.2 GSHP (Ground Source Heat Pumps)

As this is an existing building on a constrained site it not feasible to drill new boreholes under the site. As no major excavations are planned neither vertical piles or horizontal trenches are considered viable for this site. Furthermore the site has a relatively small cooling requirement compared to the heating requirement that would result in the ground warming up over time.

4.6.3 Wind Turbines

The output from wind turbines are highly sensitive to wind speed. Hence it is essential that turbines should be sited away from obstructions, with a clear exposure or fetch for the prevailing wind.

The urban location of the site coupled with the adjacent buildings will result in a turbulent flow regime across the site. As such it is not proposed to include wind turbines as part of the development. Furthermore the protected conservation area of Bloomsbury forbids additions that could detract from the visual aesthetic of the area, which makes wind turbines unviable for the site.

4.6.4 Photovoltaics

Photovoltaic solar cells convert solar energy directly into electricity. The cells consist of two layers of silicon with a chemical layer between. The incoming solar energy charges the electrons held within the chemical. The energised electrons move through the cell into a wire creating an electrical current.

A study into the feasibility of onsite electric generation using south facing photovoltaic panels at 30º on the roof of the development to meet a proportion of the residential development's electricity demand has been undertaken.

The building's listing and its location within the Bloomsbury Conservation Area, a famed example of formal town planning with a predomination of terraced townhouses, many of which have retained their facades and enhanced the quality and heritage of the conservation area means that South facing solar panels are unviable for the 8 Warwick Court development.

4.6.5 Solar Thermal

Solar thermal collectors utilises solar radiation to heat water for use in water heating of a building. The optimum orientation for a solar collector in the UK is a south facing surface, tilted at an angle of 30º from the horizontal.

Solar collectors are typically designed to meet a development's base heat load, associated with its domestic hot water requirements. For residential development these usually equates to 60-70% of the total DHW annual load, with the natural gas-fired boilers meeting the remainder of the load.

However, as previously stated the proposed roof structure has been design to be in keeping with the local styles within the conservation area and the building orientation makes the inclusion of solar thermal collectors unviable.

4.6.6 Biomass Heating

Although the development's thermal load profile suggests that a biomass boiler could operate as a lead boiler in a modular arrangement with a number of conventional gas-fired boilers and provide a significant reduction in its CO_2 emissions, biomass boilers are not recommended for the proposed development. A biomass boiler would need to be part of a centralised energy strategy as the individual dwelling heat loads are too small to efficiently run.

Biomass boilers require significant space for storage and delivery of fuel. They have higher particulate emissions than gas boilers which typically raises concerns with the Environment Agency as central London suffers from poor air quality. Furthermore the individual boiler strategy proposed does not mesh with a biomass strategy. Therefore biomass boilers have not be considered feasible for the proposed re-development.

4.7 Proposed Energy Strategy

Although the proposed development is not a major development, we have followed the methodology of the Mayor's Energy Hierarchy and the Borough of Camden's policy, with the estimated energy consumption for the development based on the National Calculation Methodology (NCM) calculated with the approved software Elmhurst Energy SAP 2009.

Energy Strategy

The dwellings will be well insulated ensuring heat losses are kept to a minimum with enhanced fabric U-values in both the retained and new fabric and improved detailing making the development significantly more air tight. The units will be naturally ventilated during the summer, making use of the free cooling on offer and saving energy compared to a mechanical system. Energy efficient lighting and metering will be used to ensure that the tenants will be informed on the performance of the development.

High efficiency individual gas boilers will provide each dwelling with heat and domestic hot water.

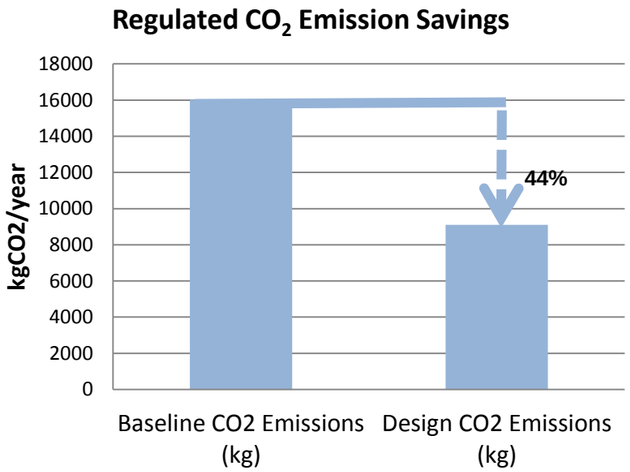
The combination of passive and energy efficiency systems result in the residential development achieving an area weighted improvement of **44%** over the baseline Building Regulations (Be Lean).

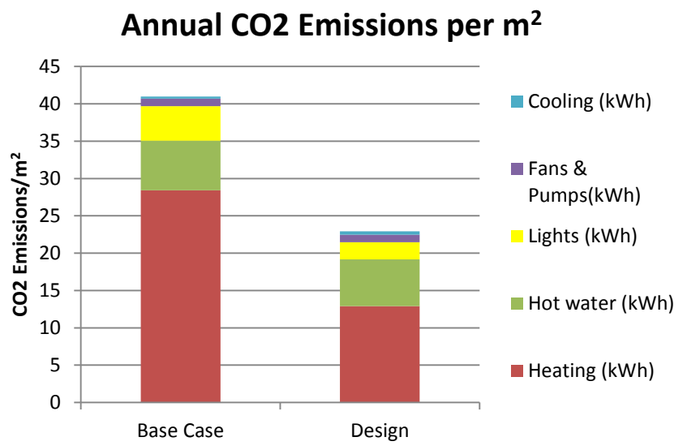
Renewable Energy Strategy

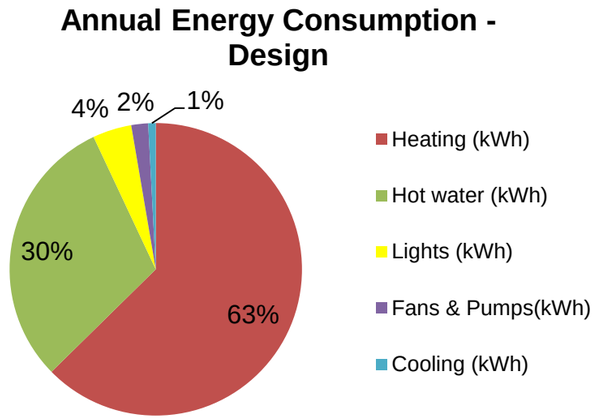
In accordance with the Decentralised Energy Hierarchy in Policy 5.6 (Be Clean) the feasibility of a site wide CHP network has been investigated. However the development's predicted energy demands are insufficient to support the efficient operational of a CHP unit.

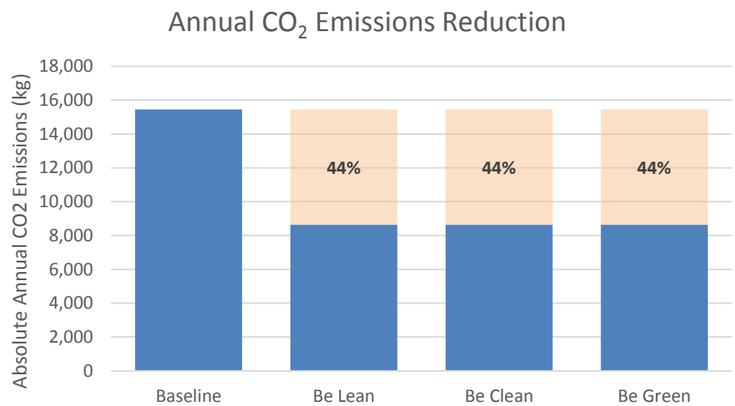
In accordance with Policy 5.7 (Be Green) of the London Plan, investigations into providing a proportion of the site's energy requirements through renewables were undertaken.

The constraints of the site, caused by its location in a built up area, its position within the Bloomsbury Conservation Area and the fact that the development is in an existing building make it unviable to incorporate any renewables into the development.









Carbon Emissions	Absolute (kg)	kgCO2/m2	Reduction (kg)	%
Baseline	15446	41.0	0	0%
Be Lean	8637	22.9	6809	44%
Be Clean	8637	22.9	6809	44%
Be Green	8637	22.9	6809	44%

5. Materials

The aim for the proposed 8 Warwick Court development will be for its overall environmental impact to be minimised through the specification of sustainable materials.

The existing building's structure and street-facing facade will be retained and re-used and existing materials will be reused where practical. Any existing elements within the building that are reused in-situ are automatically rated highly in BREEAM as the environmental impact of replacing that element is far greater than reusing the element already in place. Scope for increased recycling will be incorporated by specifying recycled materials where possible and ensuring that even where new materials are used, as much as possible can be recycled at the end of the buildings' life.

The specific material details preferred by the Bloomsbury Conservation Area's guidelines means that sustainable sources of red brick, stone and stucco should be utilised. The prevalence of these materials in the local area should mean material could be reused from another building.

5.1 Environmental Impact of Materials

New materials with low overall environmental impact will be chosen and advice from the Green Guide to Specification will be taken into consideration for the selection. The Green Guide rates the environmental impact of different materials and components, taking into account factors like toxicity, ozone depletion, ease of recycling, waste disposal etc. Where viable, at least 80% (by area) of the new main elements in the building, fabric & building services insulation should be specified to achieve the best performing "A" and "A+" ratings from the Green Guide. Insulation materials containing substances known to contribute to stratospheric ozone depletion or with the potential to contribute to global warming must not be used. Developments should also minimise use of new aggregates.

Another Essential Standard will be met through the specification of insulation materials with a Global Warming Potential (GWP) of less than 5.

5.2 Sustainable Timber

All timber used for basic or finishing building elements such as the timber louvers specified on the new windows to the rear of the scheme will be sourced from responsibly managed and sustainable forests or plantations. Such timber products are the only truly renewable construction material in common use and growing trees also absorb and fix CO_2. Forests can also provide the habitat for a wide variety of plant and animal life, preserving important ecology and promoting biodiversity.

5.3 Locally Sustainable Materials

GLA's SPG states that 50% of timber and timber products are to be sourced from Forest Stewardship Council (FSC) approved timber and balance from a known temperate source. The design team will commit to at least 50% FSC approved timber and 100% legally sourced timber for the proposed development. Where practicable, materials should be sourced from local suppliers, reducing the environmental impacts and CO_2 emissions associated with transportation to the site.

5.4 Recycled Materials

Scope for increased recycling will be incorporated by specifying recycled materials where possible and ensuring that even where new materials are used, as much as possible can be recycled at the end of the buildings' life.

The design team will also commit to minimising the use of new aggregates thus complying with the Mayor's Essential Standards.

Specifying materials with a high-recycled content is also another method of saving processing or manufacturing energy. The recycled content of a material can be described as either post-consumer or post-industrial to indicate at what point in the life cycle a material is reclaimed.

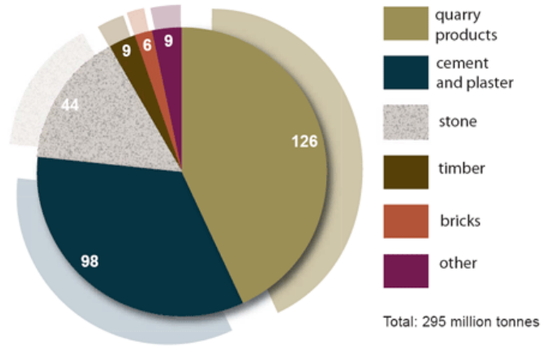
As the development is retaining the original front facade, the embodied carbon associated with the construction of new facades can be saved. Further reuse of the structure will decrease the amount of embodied carbon in the development.

5.5 Ozone Depletion and Global Warming

CFCs and HCFCs, compounds commonly used in insulation materials and refrigerants, can cause long-term damage to the Earth's stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also significantly increase global-warming if they leak into the atmosphere. Following the Montreal Protocol, production and use of CFCs is no longer permitted and EC regulations will require phasing out of HCFCs by 2015. However, products that replace these gases are often still potent global warming contributors.

All insulation materials specified for the proposed scheme will have zero Ozone Depleting Potential and low Global Warming Potential, (GWP<5) in either manufacture or composition in line with the BREEAM requirements. This will include insulation for building elements (roof, internal & external walls, floor – including foundations) as well as insulation for hot water vessels and pipe or duct work.

Construction related UK consumption of primary resources (2006)



6. Water Conservation

Water consumption in the UK has risen by 70% over the last 30 years. Trying to meet the increasing demand by locating new sources of water supply is both expensive and damaging to the environment. Therefore, the design team have focused on reducing the demand for water and managing the existing resources.

6.1 Demand Reduction and Water Efficiency

The aim is to minimise internal and external potable water use within the development. Good water management can contribute to reducing the overall level of water consumption maintaining a vital resource and having environmental as well as cost benefits in the life-cycle of the building. The following water saving measures are being considered for a range of areas in line with the BREEAM requirements:

Dual Flush Cisterns on WC's - These units have the ability to provide a single flush of 4L and/or a full flush of 6L.

Flow Restrictors to Taps - Flow restrictors reduce the volume of water discharging from the tap. Spray taps have a similar effect and are recommended to reduce both hot and cold-water consumption. Low flow taps in one of the above forms will be installed in all of areas.

Low Flow Showers - The average shower uses 15 litres of water a minute, by restricting the output of the showers in the development to a maximum of 9 litres/ min a 40% water saving can be achieved. Flow rate can be reduced down to 6 litres/ min without compromising on water pressure and hence should be considered.

Water Leak Detection - Water leaks can result in significant losses and costs and have the potential to cause major damage. Therefore, leak detection systems will be installed around the site linked to the site wide Building Management System.

Water Meters - In 1995 approximately 33,200 million litres of water a day were extracted in England and Wales, this increased to 44,130 million litres/day in 2001, and much of this was for domestic water supply. To reduce this figure, accurate information on usage is required for management of a building's consumption. Water meters will be specified on the main supply.

7. Sustainable Urban Drainage

The site is currently completely impermeable with hard landscaping and building areas. The main aim for the redevelopment will be to improve the water retention of the site and minimise the risk of flooding from all water sources. As part of the BREEAM assessment a Flood Risk Assessment should be prepared.

As a minimum, the design will ensure that the peak rate of runoff into watercourses no worse than the existing site's run off rate. This will comply with the Interim Code of Practice for Sustainable Drainage systems (SUDS) (CIRIA, 2004) or for at least the 1 year and 100 year return period events.

8. Waste Management

Buildings and building sites produce a significant amount of waste per year. Most of the waste produced in the UK is disposed of in landfill sites and only a small percentage of it is recycled or reused.

8.1 Waste Targets

Under EU legislation the UK will have to ensure that less than a third of its waste is sent for burial in landfill sites by 2020 and the figure at present is about 80%. To achieve this target a number of measures are implemented, including landfill tax, aiming to discourage disposal of waste to landfill. Good waste management is a key component of sustainable development. Reducing waste is an important means of:

- Reducing unnecessary expenditure
- Reducing the amount of natural resources used for production of new materials
- Reducing energy for waste disposal
- Reducing levels of contamination and pollution arising from waste disposal

The proposed development will minimise the impact of waste in the environment.

8.2 Demolition & Construction

During the construction phase a large amount of waste material will be generated through construction, demolition and land clearing procedures. In building construction, the primary waste products in descending percentages are: wood, asphalt/concrete/masonry, drywall, roofing, metals, and paper products.

Prior to commencement on a Site Waste Management Plan (SWMP) that complies with the requirements of current legislation and BREEAM will be prepared. This plan will identify the local waste haulers and recyclers, determine the local salvage material market, identify and clearly label site spaces for various waste material storage and require a reporting system that will quantify the results and set targets. As a minimum the SWMP will contain:

a. The target benchmark for resource efficiency e.g. m^3 of waste per $100m^2$ or tonnes of waste per $100m^2$;

b. Procedures and commitments for minimising non-hazardous waste in line with the benchmark;

c. Procedures for minimising hazardous waste;

d. Procedures for monitoring, measuring and reporting hazardous and non-hazardous site waste;

e. Procedures for sorting, reusing and recycling construction waste into defined waste groups either on site or through a licensed external contractor;

f. The name or job title of the individual responsible for implementing the above.

As the proposed development is on land that has previously been built upon, there is the potential for using waste materials from the existing buildings and hard paved areas. Bricks and concrete could possibly be reused as hard-core materials etc. Opportunities for introducing more reused or reusable materials / components will be explored during detailed design.

8.3 Waste Management & Reporting in Operation

The detailed design phases will identify the potential waste streams that the development will produce. At a minimum, plans will be formulated to handle the separation, collection, and storage of common recyclable materials such as paper, glass, plastics, and metals. The collection points will be easily accessible to all of the users.

The main aim will be to recycle as much waste as possible; this will be achieved by making sure that waste recycling facilities are strategically placed in convenient locations.

Dedicated storage space for recyclable materials generated by the site during occupation, will include the following:

- Be clearly labelled for recycling
- Be placed within accessible reach of the buildings
- Be in a location with good vehicular access to facilitate collections.

Storage of household waste

The space allocated for waste storage should be able to accommodate containers with at least the minimum volume recommended by British Standard 5906 (British Standards, 2005) based on a maximum collection frequency of once per week. This is 100 litres volume for a single bedroom dwelling, with a further 70 litres volume for each additional bedroom.

Large integrated recycling bin with at least 3 containers for recyclable waste and one general waste will be considered for each dwelling similar to the following image:

80 Litre Capacity (2 x 32L & 2 x 8L)
Cabinet size - 600mm

Waste collection points

At ground floor there will be a number of colour coded waste recycling collection points, these will be emptied on a regular basis. The large basement storage room could also accommodate the required separate recycling bins.

9. Environmental Management

Construction sites are responsible for significant impacts, especially at a local level. These arise from noise, potential sources of pollution and waste and other disturbances. Impacts such as increased energy and water use are also significant. Therefore attention is being given to site-related parameters with the aim to protect and enhance the existing site & its ecology.

The aim is to have a construction site managed in an environmentally sound manner in terms of resource use, storage, waste management, pollution and good neighbourliness. To achieve this, there will be a commitment to comply with the Considerate Constructors Scheme and get a formal certification under the scheme in line with the CfSH requirements. As a minimum a score of greater than 35 of out 50 will be achieved with an aspiration to exceed 40, with no individual section achieving a score of less than 7.

Areas that can be taken into consideration in order to minimise the impact of the construction site on its surroundings and the global environment as outlined in the BREEAM methodology:

- Monitor, report and set targets for CO_2 or energy usage arising from site activities
- Monitor, report and set targets for CO_2 or energy usage arising from transport to and from site
- Monitor, report and set targets for water consumption arising from site activities
- Monitor construction waste on site, sorting and recycling construction waste where applicable
- Adopt best practice policies in respect of air and water pollution arising from site activities
- Operates an Environmental Management System
- Additionally, all timber used on site should be responsibly sourced

10. Land Use and Ecology

The site currently comprises of a mix of existing buildings and hard landscaping, with no ecological value to the site.

The proposed development will result in no negative change to the ecology of the site. The architects have proposed planting a tree in the redeveloped courtyard.

11. Pollution

Global concern for environmental pollution has risen in recent years, as concentrations of harmful pollutants in the atmosphere are increasing. Buildings have the potential to create major pollution both from their construction and operation, largely through pollution to the air (dust emissions, NOx emissions, ozone depletion and global warming) but also through pollution to watercourses and ground water. The proposed development will aim to minimise the above impacts, both at the design stage and onsite.

11.1 Ozone Depletion

CFCs and HCFCs, compounds commonly used in insulation materials and refrigerants, can cause long-term damage to the Earth's stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also significantly increase global-warming if they leak into the atmosphere. Following the Montreal Protocol, production and use of CFCs is no longer permitted and EC regulations will require phasing out of HCFCs by 2015. However, products that replace these gases are often still potent global warming contributors. Where refrigerants are used for air-conditioning and comfort cooling they will be CFC and HCFC-free.

11.2 Internal pollutants

Volatile organic compounds (VOCs) are emitted as gases (commonly referred to as offgassing) from certain solids or liquids. VOCs include a variety of chemicals, some of which are known to have short-term and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.

VOCs are emitted by a wide array of products numbering in the thousands. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials, furnishings, adhesives, Urea-formaldehyde foam insulation (UFFI), pressed wood products (hardwood plywood wall panelling, particleboard, fibreboard) and furniture made with these pressed wood products.

'No' or 'low' VOC paints are available from most standard mainstream paint manufacturers. There 'eco-friendly' paints are made from organic plant sources and also powdered milk based products.

The design team will seek to select internal finishes and fittings with low or no emissions of VOCs and comply with European best practice levels as a minimum.

11.3 NOx emissions from boilers

Nitrous oxides (NOx) are emitted from the burning of fossil fuels and contribute to both acid rain and to global warming in the upper atmosphere. At ground level, they react to form ozone, a serious pollutant and irritant at low level. Burners in heating systems are a significant source of low-level NOx, while power stations (and therefore electric heating) are a significant source of NOx in the upper atmosphere.

The amount of NOx emissions varies between products. New gas boilers vary from 40 NOx/kW to <70mg NOx/kWh (class 5). The proposed high efficiency gas boilers will be specified to have less than 40 NOx/kWh.

11.4 Night Sky Pollution

External lighting encompasses vehicle and pedestrian access lighting, security lighting, facility illumination and general feature lighting. Where present it will be designed on a site wide basis to meet the mandatory requirements and aesthetic considerations. The strategy is to provide a balance between adequate external lighting for safe and secure operation of the site without unnecessary illumination or power consumption.

The intention is to be a good neighbour and not to introduce nuisance glare or light pollution of the night sky from miss directed or unnecessary lighting. Feature lighting, where required, will be focussed to the task/subject. Where necessary luminaires will be further screened in cases where there may be an issue of close proximity and light spill to the adjacent neighbouring residential areas, although the intention is to avoid this situation arising wherever possible from the outset. The external lighting design will take into consideration the relevant guidance from the British Standards and other recommended

documents including the following Standards and Design Guides:

- CIBSE Lighting Guide for the Outdoor Environment
- CIBSE Lighting Design Guides
- BS5489 Code of Practice for the Design of Road Lighting
- BS EN 13201-1 Road Lighting, Selection of Lighting Classes
- BSEN 13201-2 Road Lighting, Performance requirements
- Institute of Lighting Engineers Guidance Notes for the Reduction of Obtrusive Light

Good	Poor
	

12. Green Transport

The transport of people between buildings is the second largest source of CO_2 emissions in the UK after energy use in buildings and remains the main source of many local pollutants. Energy use and emissions from transport are growing at 4% per year, and at the same time, the effects of climate change are becoming more severe; there will be greater pressure to control CO_2 emissions from transport and sites without good access to public transport will be at much greater risk from these controls.

12.1 Site location

The site for the proposed 8 Warwick Court development is located in central London, off the A40 (High Holborn Road). It has excellent access to the shops and offices of Tottenham Court Road and Oxford Circus.

The site is within 100m of Chancery Lane Underground station and 550m of Holborn Underground station. Farringdon Station, which has both Underground and National Rail services and from 2018 will be a Crossrail hub, is 850m away.

The London PTAL (Public Transport Accessibility) analysis indicates that 21 different bus routes have stops within 8 minutes' walk of the site. The Accessibility Index for the site is 69.76, with a PTAL rating of 6b, the highest possible.

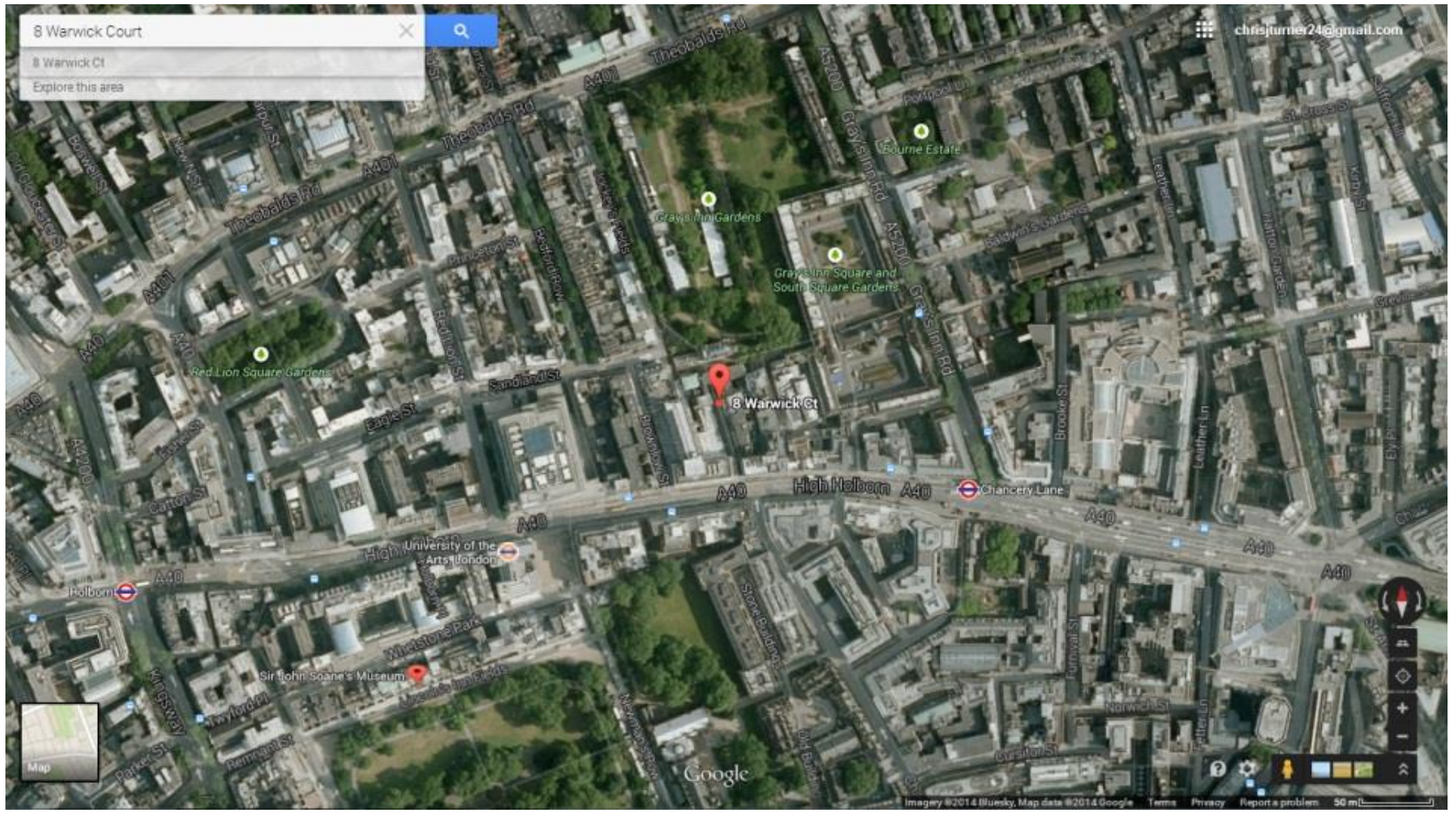
12.2 Cycling Facilities

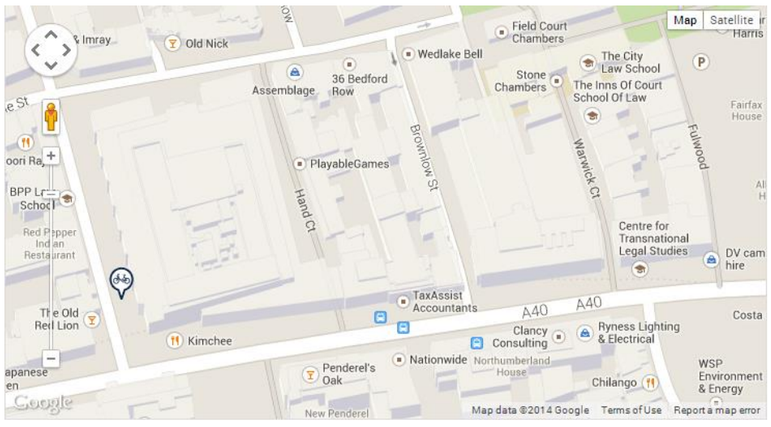
Secure cycling spaces will be provided for the residences in order to encourage the occupants to use this carbon-free mode of transport. Secure, convenient and weather-proof communal cycle storage areas for use by the residential units will be located on the lower ground floor of the development.

The nearest Barclays Cycle Hire scheme is 100m away.

12.3 Car Parking Spaces

No car parking spaces haven been provided for the proposed development so as to encourage the occupants to use the local public transport facilities.





13. Appendix A – Preliminary BREEAM Assessment

BREEAM Domestic Refurbishment 2012 Pre-Assessment Estimator v0.4 BREEAM

This assessment and indicative BREEAM rating is not a formal certified BREEAM assessment or rating and must not be communicated as such. The score presented is indicative of a dwelling's potential performance and is based on a simplified pre-formal BREEAM assessment and unverified commitments given at an early stage in the design process.

Building name	8 Warwick Court
Indicative building score (%)	61.03%
Indicative BREEAM rating	BREEAM Very Good
Indicative Minimum Standards level achieved	BREEAM Very Good

Management | Health & Wellbeing | Energy | Water | Materials | Waste | Pollution

INNOVATION Section Weighting: 10% Indicative Section Score 1.00%

Comments

MANAGEMENT Section Weighting: 12% Indicative Section Score 9.82%

Man 01 Home Users Guide

No. of BREEAM credits available	3	Available contribution to overall score	3.27%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria: Where a Home Users Guide be provided to all dwellings, covering all issues set out in the 'Users Guide Contents list', three credits may be awarded

Indicative Credits Achieved: 3

Comments

Man 02 Responsible Construction Practices

No. of BREEAM credits available	2	Available contribution to overall score	2.18%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria: Where a compliant considerate construction scheme will be used, credits are awarded depending the score achieved as outlined below:

Indicative Credits Achieved: 2

Large Scale - project with more than 5 units

	One Credit	Two Credits
Considerate Constructors Scheme	Score of 24 - 31.5	Score of 32 - 35.5
Alternative Compliant Scheme	Compliance	Beyond Compliance

Small Scale - project with 5 units or fewer

	One Credit	Two Credits
Considerate Constructors Scheme	24 - 31.5	32 - 35.5
Alternative Compliant Scheme	Compliance	Beyond Compliance
Checklist A-4	50% of the optional items	80% of the optional items

Exemplary Credit

Considerate Constructors Scheme	Score of >36	Indicative Innovation Credits Achieved
Alternative Compliant Scheme	Exemplary Level Compliance	
Checklist A-4*	All Items (Optional & Mandatory)	* Small Scale Project Only

Comments

Man 03 Construction Site Impacts

No. of BREEAM credits available	1	Available contribution to overall score	1.09%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria: Where evidence demonstrate that site impacts will be monitored, as detailed below:

Indicative Credits Achieved: 1

Requirements	One Credit
Large Scale	Where there is evidence to demonstrate that **2 or more** of the sections in **Checklist A-5** are completed
Small Scale	Where there is evidence to demonstrate that **2 or more** of the sections in **Checklist A-6** are completed

Sections of Checklist	
Large Scale - Checklist A-5	Small Scale - Checklist A-6
Monitor, report and set targets for CO2 production of energy use arising from site activities	Set objectives for reducing CO2 production from energy use arising from site activities
Monitor, report and set targets for water consumption arising from site activities	Set objectives for reducing water use arising from site activities
A main contractor with an environmental materials policy	Main contractor environmental materials statement
A main contractor that operates an Environmental Management System	80% of site timber is reclaimed, re-used or responsibly sourced
80% of site timber is reclaimed, re-used or responsibly sourced	

Same definition of small and large scale as in Man 02

Comments

Man 04 Security

No. of BREEAM credits available	2	Available contribution to overall score	2.18%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria: Where the following requirements will be met:

Indicative Credits Achieved: 0

Requirements	
One Credit – Secure windows and doors	External doors and accessible windows meet minimum standards and appropriately certified
Two Credits – Secured by design	Principles and guidance of Secured by Design Section 2 are complied with A suitably qualified security consultant is consulted at the design stage and their recommendations are incorporated into the refurbishment

Comments: Retained façade, assuming that replacement of doors and windows not possible, architects to confirm.

Man 05 Protection and Enhancement of Ecological Features

No. of BREEAM credits available	1	Available contribution to overall score	1.09%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria: Where the following requirements will be met:

Indicative Credits Achieved: 1

Requirements	
One Credit – Protecting Ecological Features	Site survey carried out to determine presence of ecological features
	Statutory Nature Conservation Organisation notified of protected species
	Features of ecological value protected during refurbishment works

Requirements		Indicative Innovation Credits Achieved
Exemplary Credit – Ecological enhancement	A suitably qualified ecologist recommends features to enhance ecology of the site	0
	adopts all general ecological recommendations	
	adopts 30% of additional recommendations	

Comments: Requires an appointment of an ecologist, Project Manager to confirm.

Man 06 Project Management			
No. of BREEAM credits available	2	Available contribution to overall score	2.18%
No. of BREEAM innovation credits	2	Minimum Standards applicable	No

Assessment Criteria
Where the following requirements will be met:

Indicative Credits Achieved
2

	Requirements
One Credit **Project Roles and Responsibilities**	Where all of the project team are involved in the project decision making **Small Scale** - the project manager assigns individual and shared responsibilities amongst the project team including all trades on site **Large Scale** - the project manager assigns individual and shared responsibilities across the following key design and refurbishment stages: i. Planning and Building control notification ii. Design iii. Refurbishment iv. Commissioning and handover v. Occupation

Small Scale projects: five units or fewer or less than £100k
Large Scale projects: more than five units or more than £100k

	Requirements
One Credit **Handover and Aftercare**	Handover meeting arranged 2 or more of the following committed to: - A site inspection within 3 months of occupation - Conduct post occupancy interviews with building occupants or a survey via phone or posted information within 3 months of occupation - Longer term after care e.g. a helpline, nominated individual or other appropriate system to support building users for at least the first 12 months of occupation

Exemplary Credits

	Requirements	Indicative Credits Achieved
One Exemplary Credit **Early Design Input**	Where A BREEAM Accredited Professional has been appointed to oversee key stages within the project. OR Where a BREEAM Domestic Refurbishment Assessor has been appointed at an early stage of the project, prior to the production of a refurbishment specification	1

	Requirements
One Exemplary Credit **Thermographic Surveying and Airtightness Testing**	Where Thermographic surveying and Airtightness testing have been carried out at both pre and post refurbishment stages Where an improved air tightness target has been set at design stage and testing demonstrates that this has been achieved post refurbishment

Comments

HEALTH & WELLBEING	Section Weighting: 17%	Indicative Section Score	11.33%

Hea 01 Daylighting			
No. of BREEAM credits available	2	Available contribution to overall score	2.83%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria
Where the refurbishment results in a neutral impact on daylighting or where minimum daylighting standards are met, up to two credits may be awarded as follows:

Indicative Credits Achieved
2

For Existing Dwellings and Change of Use Projects

First Credit **Maintaining Good Daylighting**	The refurbishment results in a neutral impact on the dwellings daylighting levels in the kitchen, living room, dining room and study

Where the property is being extended

First Credit **Maintaining Good Daylighting**	New spaces achieve minimum daylighting levels The extension does not reduce daylighting levels in the kitchen, living room, dining room or study of neighbouring properties

For All Properties

Second Credit **Minimum Daylighting**	The dwelling achieves minimum daylighting levels in the kitchen, living room, dining room and study

Comments
2 credits assumed, architect to confirm.

Hea 02 Sound Insulation			
No. of BREEAM credits available	4	Available contribution to overall score	5.67%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria
To ensure the provision of acceptable sound insulation standards and so minimise the likelihood of noise complaints.

Indicative Credits Achieved
2

Properties where sound testing has been carried out:

Up to Four Credits	Four credits awarded according to the improvement over building regulations. See table in additional information in Technical Manual

Properties where sound testing is not feasible and not required by the appointed Building Control body

Two Credits	Where existing separating walls and floors are designed to meet the requirements of Building Regulations with compliant construction details
Up to Four Credits	Where a Suitably Qualified Acoustician (SQA) provides recommendations for the specification of all existing separating walls and floors SQA confirms in their professional opinion that they have the potential to meet or exceed the sound insulation credit requirements Where these recommendations are implemented See table in additional information in Technical Manual

Historic Buildings

Up to Four Credits	Where the dwelling is a Historic Building and sound testing results demonstrate existing separating walls and floor meet the Historic Building credit requirements See table in additional information in Technical Manual

Detached Properties

Four Credits	By Default

Properties with separating walls or floors only between non habitable rooms OR Testing not required by building control body

Four Credits	By Default

Comments
2 credits assumed, 4 credits possible, acoustician to advise.

Hea 03 Volatile Organic Compounds			
No. of BREEAM credits available	1	Available contribution to overall score	1.42%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the refurbishment avoids the use of VOCs with new products meeting the following requirements:

Indicative Credits Achieved: 1

One Credit Avoiding the use of VOCs	Where all decorative paints and varnishes used in the refurbishment have met the requirement listed in table 5.4 in the Technical Manual
	Where at least five of the eight remaining product categories listed in table 5.4 have met the testing requirements and emission levels for Volatile Organic Compound (VOC) emissions against the relevant standards identified within table 5.4 in the Technical Manual
	Where five or less products are specified within the refurbishment, all must meet the requirements in order to achieve this credit.

Comments

Hea 04 Inclusive Design			
No. of BREEAM credits available	2	Available contribution to overall score	2.83%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where an access statement has been carried out using Checklist A-8 of the Technical Manual to optimise the accessibility of the home as follows:

Indicative Credits Achieved: 0

	Checklist A-8 of the Technical Manual	
	Section 1	Section 2
One Credit Minimum Accessibility	Completed with Evidence	[redacted]
Two Credits Advanced Accessibility	Completed with Evidence	Completed with Evidence

Exemplary Performance

Indicative Innovation Credits Achieved:

One Credit	Where an access expert suitably qualified member of the design team has completed sections 1, 2 and 3 of Checklist A-8, access statement template with evidence provided of the measures implemented in the refurbishment

Comments

Architect to confirm, plans indicate a lift but no disabled access.

Hea 05 Ventilation			
No. of BREEAM credits available	2	Available contribution to overall score	2.83%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria

Where the dwelling meets the following ventilation requirements:

Indicative Credits Achieved: 2

One Credit Minimum Ventilation Requirements	A minimum level of background ventilation is provided (with trickle ventilators or other means of ventilation) for all habitable rooms, kitchens, utility rooms and bathrooms compliant with section 7, Building Regulations Approved Document Part F, 2010
	A minimum level of extract ventilation is provided in all wet rooms (e.g. kitchen, utility and bath-rooms), compliant with section 5, Building Regulations Approved Document Part F 2010.
	A minimum level of purge ventilation is provided in all habitable rooms and wet rooms, compliant with section 7, Building Regulations Approved Document Part F, 2010. It is an historic building and meets historic building requirements in CN4 of the technical manual
Two Credits Advanced Requirements	Ventilation is provided for the dwelling that meets the requirements of Section 5 of Building Regulations Part F in full
	Where the building is a historic building and meets the requirements for Historic Buildings in compliance note 4 of the technical manual

Comments

2 credits dependent on air pressure testing. Not required for Building Regs but we recommend that one is carried out, included in the Planning Support.

Hea 06 Safety			
No. of BREEAM credits available	1	Available contribution to overall score	1.42%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria

Where a fire and carbon monoxide (CO) detection and alarm system is specified as follows:

Indicative Credits Achieved: 1

One Credit Fire and Carbon Monoxide (CO) Detection and Alarm Systems	Carbon Monoxide detector installed if dwelling is supplied with mains gas or other fossil fuel
	Where a compliant fire detection and fire alarm system is provided
	Mains supplied fire detection and alarm system if project involves re-wiring
	Battery operated fire detection and alarm system if no re-wiring is to take place

Comments

ENERGY

Section Weighting: 43% **Indicative Section Score** 24.47%

Ene 01 Improvement in Energy Efficiency Rating			
No. of BREEAM credits available	6	Available contribution to overall score	8.90%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following targets are met for the improvement in Energy Efficiency Rating achieved as a result of refurbishment:

Indicative Credits Achieved: 4

Improvement in EER	Credits
≥ 5	0.5
≥ 9	1
≥ 13	1.5
≥ 17	2
≥ 21	2.5
≥ 26	3
≥ 31	3.5
≥ 36	4
≥ 42	4.5
≥ 48	5
≥ 54	5.5
≥ 60	6

Comments

Ene 02 Energy Efficiency Rating Post Refurbishment			
No. of BREEAM credits available	4	Available contribution to overall score	5.93%
No. of BREEAM innovation credits	2	Minimum Standards applicable	Yes

Assessment Criteria

Where the following Energy Efficiency Rating benchmarks will be met as a result of refurbishment:

Indicative Credits Achieved: 2.5

EER post refurbishment	Credits	Minimum requirements
≥50	0.5	'Pass' level EER of 50
≥55	1	'Good' level EER of 58
≥60	1.5	
≥65	2	'Very Good level' EER of 65
≥70	2.5	'Excellent' level EER of 70
≥75	3	
≥80	3.5	'Outstanding' level EER of 81
≥85	4	

Exemplary	Credits
≥90	1
≥100	2

Indicative Innovation Credits Achieved:

Comments

CUNDALL

Ene 03 Primary energy demand			
No. of BREEAM credits available	7	Available contribution to overall score	10.38%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following Primary Energy Demand benchmarks will be met as a result of refurbishment:

Indicative Credits Achieved
4

Primary Energy Demand Post Refurbishment (kWh/m²/year)	Credits
≤ 400	0.5
≤ 370	1
≤ 340	1.5
≤ 320	2
≤ 300	2.5
≤ 280	3
≤ 260	3.5
≤ 240	4
≤ 220	4.5
≤ 200	5
≤ 180	5.5
≤ 160	6
≤ 140	6.5
≤ 120	7

Comments

Ene 04 Renewable Technologies			
No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the dwelling will meet the following % contribution from renewables and primary energy demand targets as a result of refurbishment

Indicative Credits Achieved
0

Dwelling Type	Primary Energy Demand	Percentage from Renewables	
		1 Credit	2 Credits
Detached	≤ 250 kWh/m²/year	≥10%	≥20%
Semi-Detached		≥10%	≥20%
Bungalow		≥10%	≥20%
End of Terrace		≥10%	≥20%
Mid Terrace	≤ 220 kWh/m²/year	≥10%	≥20%
Low Rise Flat		≥10%	≥20%
Mid Rise Flat		≥10%	≥15%
High Rise Flat		≥10%	≥15%

Comments

As this is a listed building it is unexpected that any LZCs will be incorporated into the development.

Ene 05 Energy Labelled White Goods			
No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where Energy Efficiency White goods are to be provided as follows:

Indicative Credits Achieved
1

First Credit

Appliance	Appliance provided	Appliance not to be provided
Fridges, Freezers and Fridge-Freezers	Energy Saving Trust Recommended appliances specified	EU Energy Efficiency Labelling Scheme Information Leaflet provided to all dwellings

Second Credit

Appliance	Appliance provided	Appliance not to be provided
Washing Machines and Dishwashers	Energy Saving Trust Recommended appliances specified	Second credit not achieved
Washer-Dryers and Tumble Dryers	Appliances specified with B Rating under EU Energy Efficiency Labelling Scheme	EU Energy Efficiency Labelling Scheme Information Leaflet provided to all dwellings

Comments

1 credit assumed for providing information, 2 credits if the white goods are supplied with the units.

Ene 06 Drying Space			
No. of BREEAM credits available	1	Available contribution to overall score	1.48%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where adequate, secure internal or external space with posts and footings or fixings is provided with the following:

Indicative Credits Achieved
0

1 Credit

Number of bedrooms	Drying line required
1-2	4m+
3+	6m+

Comments

Possible if drying lines incorporated into bathrooms.

Ene 07 Lighting			
No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where energy efficient internal and external lighting is provided as follows:

Indicative Credits Achieved
2

External Lighting - 1 Credit

Energy Efficient Space Lighting and Energy Efficient Security Lighting OR
Where Energy Efficient Space Lighting is provided ONLY

Internal Lighting - 1 Credit

Maximum average wattage across the total floor area of the dwelling of 9 watts/m2

Comments

Ene 08 Display Energy Devices			
No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria

Where consumption data is displayed to occupants by a compliant energy display device

Indicative Credits Achieved
2

Electricity usage data displayed	Primary Heating Fuel	
	Electricity	Other
Electricity usage data displayed	2 credits awarded	1 credit awarded
Primary Heating Fuel usage data displayed	N/A	1 credit awarded
Electricity & Primary Heating Fuel usage displayed	N/A	2 credits awarded

Exemplary Credits

One credit	Where any compliant Energy Display Device is capable of recording consumption data	Indicative Innovation Credits Achieved
Recording consumption data		

Comments

Ene 09 Cycle Storage			
No. of BREEAM credits available	2	Available contribution to overall score	2.97%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where individua lor communal compliant cycle storage is provided as follows:

Indicative Credits Achieved
1

Dwelling Size	One Credit	Two Credits
Studios/ 1 bedroom	1 per two dwellings	1 per dwelling
2-3 bedrooms	1 per dwelling	2 per dwelling
4 bedrooms	2 per dwelling	4 per dwelling

Comments

For one credit, 5 cycle spaces required, for two credits, 9 spaces required.

Ene 10 Home Office			
No. of BREEAM credits available	1	Available contribution to overall score	1.48%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where sufficient space and services will be provided to allow occupants to set up a home office in a suitable room with adequate ventilation

Indicative Credits Achieved
0

Comments

Architect to confirm whether there is space in bedrooms for a home office.

WATER

Section Weighting: 11% | Indicative Section Score: 6.60%

Wat 01 Internal Water Use

No. of BREEAM credits available	3	Available contribution to overall score	6.60%
No. of BREEAM innovation credits	1	Minimum Standards applicable	Yes

Assessment Criteria

Where the dwellings water consumption meets the following consumption benchmarks, or where termina fittings meet the following water consumption standards:

Indicative Credits Achieved: 1

Calculated Water Consumption (litres/person/day)	Equivalent terminal fitting standards	Minimum Standard	Credits
>150	Typical baseline performance	N/A	0
140-150	All showers specified to 'Good' **OR** All taps and WC's to 'Good' **OR** Kitchen fittings specified to 'Excellent'	N/A	0.5
129-139	All showers specified to 'Excellent' **OR** All showers and bathroom taps to 'Good'	BREEAM Very Good	1
118-128	All bathroom and WC room fittings specified to 'Good' **OR** All bathroom fittings specified to 'Excellent'	N/A	1.5
107-117	All Bathroom and WC room fittings specified to 'Excellent' **OR** All Bathroom fittings Specified to 'Excellent' and WC room fitting specified to 'Good' **OR** All Bathroom fittings, kitchen and utility sittings specified to 'Good'	BREEAM Excellent	2
96-106	All kitchen, bathroom, utility room and WC room fittings specified to 'Good' **OR** All bathrooms, kitchens and utility rooms specified to 'Excellent'	N/A	2.5
<95	All bathroom fittings specified to 'Excellent' and WC room, kitchen and utility room fittings specified to 'Good'	BREEAM Outstanding	3

NOTE: 'Good' fittings are equivalent to good practice fittings with "Excellent" fittings equivalent to best practice fittings (see the technical manual for full details.

Exemplary Credit		Indicative Innovation Credits Achieved
	If the water consumption is less than 80l/person/day	

Comments

Wat 02 External Water Use

No. of BREEAM credits available	1	Available contribution to overall score	2.20%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where the following requirements will be met:

Indicative Credits Achieved: 1

Requirements:

One Credit	Where a compliant rainwater collection system for external/internal irrigation use has been provided to dwellings. **OR** Where dwellings have no individual or communal garden space.

Comments

Wat 03 Water Meter

No. of BREEAM credits available	1	Available contribution to overall score	2.20%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where an appropriate water meter for measuring usage of mains potable water meter has been provided to dwelling(s), one credit may be awarded

Indicative Credits Achieved: 1

Comments

MATERIALS

Section Weighting: 8% | Indicative Section Score: 3.02%

Mat 01 Environmental Impact of Materials

No. of BREEAM credits available	25	Available contribution to overall score	4.44%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Up to 25 credits can be awarded, with credits calculated using the Mat 01 calculator tool. The table below shows the maximum number of credits available for each element:

Indicative Credits Achieved: 5

Elements	Green Guide Rating credits available	Thermal performance credits available*
Roof	5	3
External walls	5	3.8
Internal walls (including separating walls)	5	-
Upper and Ground Floor	5	1.2
Windows	5	2

The full 25 credits represents all of the elements containing refurbished or existing materials that meet the Green Guide Rating of A+(6)

GG Rating	Points for existing / refurbished elements	Points for new elements
A+ (6)	5	[redacted]
A+ (5)	4.6	
A+ (4)	4.2	
A+ (3)	3.8	
A+ (2)	3.4	
A+	3	3
A	2	2
B	1	1
C	0.5	0.5
D	0.25	0.25
E	0	0

Where the full 25 credits cannot be achieved the score can be 'topped up' with thermal performance credits. The full number of thermal performance credits for each element can be achieved when achieving the minimum U-values shown below.

Elements	Minimum U-Value (W/m2K)
Roof	0.11
External walls	0.15
Internal walls (including separating walls)	-
Upper and Ground Floor	0.15
Windows	1.4

Comments

Architect to confirm.

Mat 02 Responsible Sourcing of Materials			
No. of BREEAM credits available	12	Available contribution to overall score	2.13%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria

Where new materials are responsibly sourced, up to 12 credits may be awarded where 80% of new materials for an element are responsibly sourced. The credits achieved are dependent on % of point achieved which is based upon the responsible sourcing tier level of each material sourced as detailed below:

Indicative Credits Achieved
4

Table 1

Tier level	Points
1	4
2	3.5
3	3
4	2.5
5	2
6	1.5
7	1
8	0

Table 2

BREEAM credits	% of available points achieved
12	≥54%
10	≥45%
8	≥36%
6	≥ 27%
4	≥ 18%
2	≥ 9%

Will all new timber used in the project be sourced in accordance with the UK Government's Timber Procurement Policy
Yes

Comments

Architect to confirm.

Mat 03 Insulation			
No. of BREEAM credits available	8	Available contribution to overall score	1.42%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where any new insulation specified for use within external walls, ground floor, roof and buildings services meet the following requirements:

Indicative Credits Achieved
8

	Requirements
4 Credits	Where the Insulation Index for new insulation used in the buildings is ≥2
	Where Green Guide ratings are determined using the Green Guide to specification tool
	Requirements
4 Credits	Where ≥ 80% of the new thermal insulation used in the building elements is responsibly sourced.

Comments

WASTE	Section Weighting: 3%	Indicative Section Score	1.80%

Was 01 Household Waste			
No. of BREEAM credits available	2	Available contribution to overall score	1.20%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria

Where compliant recycling and composting facilities are provided, up to two credits may be awarded as follows

Indicative Credits Achieved
1

First Credit - Recycling Facilities	
Scenario	**Internal recycling storage requirements**
Compliant collection scheme in place	3 internal recycling containers provided where recycling is not sorted post collection
	1 internal recycling container provided where recycling is sorted post collection
	Minimum 30 litre total capacity, no single container less than 7 litre capacity
	Dedicated position in accordance with compliance note 1
No compliant collection scheme in place No adequate external storage	3 internal recycling containers provided
	Minimum 60 litre total capacity
	Dedicated position in accordance with compliance note 1
No compliant collection scheme in place Adequate external storage provided	3 internal recycling containers provided
	Minimum 30 litre total capacity, no single container smaller than 7 litre capacity
	Dedicated position in accordance with compliance note 1

Second credit - Composting facilities	
With external space	**Without external space**
Where a composting service or facility is provided for green/garden waste	Where a composting service or facility is provided for kitchen waste
Where a composting service or facility is provided for kitchen waste	Where an interior container is provided for kitchen composting waste of at least
Where an interior container is provided for kitchen composting waste of at least 7 litres	

Comments

Was 02 Refurbishment Site Waste Management			
No. of BREEAM credits available	3	Available contribution to overall score	1.80%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria	Indicative Credits Achieved
Up to three credits are available depending on the site waste management plan to be implemented as follows	2

Projects up to £100k

		Indicative Innovation Credits Achieved
Three Credits	Where waste generated through the refurbishment process is managed in accordance with Checklist A-9	
Exemplary Credit	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place	0

Projects up to £300k

Three Credits	Where a compliant Level 1; Site Waste Management Plan (SWMP) is in place
Exemplary Credit	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
	Non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark
	The percentage of non-hazardous construction waste and demolition waste generated by the project has been diverted from landfill and meets or exceeds the refurbishment & demolition waste diversion benchmarks

Projects over £300k

First Credit Management Plan	Where a compliant Level 2; Site Waste Management Plan (SWMP) is in place
Second Credit Good Practice Waste Benchmarks	First credit achieved
	Non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the resource efficiency benchmark
	Amount of waste generated against £100,000 of project value is recorded in the SWMP
	Pre-refurbishment audit of the existing building is completed
	If demolition is included as part of the refurbishment programme, then the audit should also cover demolition materials
Third Credit Best Practice Waste Benchmarks	Where the first two credits have been achieved achieved
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the refurbishment & demolition waste diversion benchmarks
Exemplary Credit	Where non-hazardous construction waste generated by the dwellings refurbishment meets or exceeds the *exemplary level resource efficiency benchmark*
	Where Non-hazardous demolition waste generated by the dwellings refurbishment meets or exceeds the exemplary level diversion benchmarks

Comments

POLLUTION	Section Weighting: 6%	Indicative Section Score	3.00%

Pol 01 NOx Emissions			
No. of BREEAM credits available	3	Available contribution to overall score	2.25%
No. of BREEAM innovation credits	0	Minimum Standards applicable	No

Assessment Criteria	Indicative Credits Achieved
Credits are awarded on the basis of NOx emissions arising from the operation of space heating and hot water systems for each refurbished dwelling as follows:	2

	Dry NOx Emissions
One Credit	≤100 mg/kWh (NOx class 4 boiler)
Two Credits	≤70 mg/kWh (NOx class 5 boiler)
Three Credits	≤40 mg/kWh

Comments

Pol 02 Surface Water Runoff			
No. of BREEAM credits available	3	Available contribution to overall score	2.25%
No. of BREEAM innovation credits	1	Minimum Standards applicable	No

Assessment Criteria	Indicative Credits Achieved
Where impacts of the refurbishment on surface water runoff are neutralised or where runoff is reduced as a result of refurbishment, up to three credits can be awarded as follows:	0

	Requirements
First Credit Neutral Impact on Surface Water	New hard standing areas must be permeable
	If building on to previously permeable area additional run-off must be managed on site
	Calculations should be carried out by an appropriately qualified professional
Second Credit	**Requirements**
Reducing Run-Off From Site: Basic	Where all run-off from the roof for rainfall depths up to 5 mm, have been managed on site using source control methods
	Include runoff from all existing and new parts of the roof.
	An appropriately qualified professional should be used to design an appropriate drainage strategy for the site
Third Credit	**Requirements**
Reducing Run-Off From Site: Advanced	Where run-off as a result of the refurbishment is managed on site using source control
	An appropriately qualified professional should be used to design an appropriate drainage strategy for the site.
	The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event has been reduced by 75% from the existing site.
	The total volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration has been reduced by 75%.
	An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).
	Requirements
Exemplary Credit	Where all run-off from the developed site is managed on site using source control
	The peak rate of run-off as a result of the refurbishment for the 1 in 1 year event is reduced to zero.
	The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event is reduced to zero.
	There is no volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration.
	An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).

Indicative Credits Achieved

Comments

Pol 03 Flooding			
No. of BREEAM credits available	2	Available contribution to overall score	1.50%
No. of BREEAM innovation credits	0	Minimum Standards applicable	Yes

Assessment Criteria	Indicative Credits Achieved
Where the dwelling is located in a low flood risk zone, or where in a medium to high flood risk zone and a flood resilience/resistance strategy has been implemented, up to two credits can be awarded as follows:	2

Minimum Standards	A minimum of two credits must be achieved for this issue at the Excellent and Outstanding levels

Option 1 - Low Flood Risk

Two Credits	Where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a low annual probability of flooding.

Option 2 - Medium / High Flood Risk

Two Credits	Where a Flood Risk Assessment (FRA) has been carried out and the assessed dwellings are defined as having a medium or high annual probability of flooding.
	Two credits are awarded where as a result of the dwellings floor level or measures to keep water away the dwelling is defined as achieving avoidance from flooding by following Checklist A-10; Decision Strategy Flow Chart.
	Where avoidance is not possible, two credits are achieved where a full flood resilience/resistance strategy is implemented for the dwellings in accordance with recommendations made by a Suitably Qualified Building Professional

Comments
Project Manager to undertake a Flood Risk Assessment for the development.