BLOOMSBURY RESEARCH INSTITUTE

ENERGY AND SUSTAINABILITY STATEMENT

JUNE 2015

WSP | PARSONS BRINCKERHOFF

BLOOMSBURY RESEARCH INSTITUTE

ENERGY AND SUSTAINABILITY STATEMENT

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1 EXECUTIVE SUMMARY

WSP | Parsons Brinkerhoff was commissioned by University College London (UCL) and the London School of Hygiene and Tropical Medicine (LSHTM) to complete the energy and sustainability strategy for the proposed Bloomsbury Research Institute development at Tavistock Place Camden, which is submitted as part of the planning application in June 2015.

The building is a new build laboratory comprising of three above ground levels, and two basement levels. The building includes predominantly research laboratories, open plan write up spaces, cellular offices and meeting rooms and a limited amount of category 3 containment laboratory below ground.

1.1 ENERGY AND CARBON TARGETS

Multiple layers of energy and carbon requirements apply to the development at a national, regional and local level, each of which requires different targets to be met. The development will be designed to target the most onerous requirements applicable at each phase of development. On that basis, the implications of the relevant targets for the proposed development can be summarised as follows:

- All development must meet the prevailing Building Regulations requirements. The development will be brought forward under Part L 2013 and this has been used as the basis of this energy statement.
- Camden's planning requires new developments to achieve a 35% reduction in carbon emissions compared to the minimum requirements of Part L 2013.

1.2 ENERGY STRATEGY

The energy statement has been structured in accordance with the energy hierarchy: Be Lean, Be Clean, Be Green.

The proposals for the scheme have been developed in accordance with the desire to achieve an energy efficient and sustainable development.

The building will be designed to achieve optimum energy performance and will incorporate the following design features:

- Significantly exceed the minimum fabric requirements of Part L2A (2013) of the Building Regulations.
- Include extensive solar shading
- All spaces will include 100% low energy lighting.
- Include highly efficient heating and cooling plant
- Use mixed mode ventilation to perimeter areas
- Use low fan power ventilation
- Incorporate Ground Source Heat Pumps
- Allow for future connection to a District Energy Network for heating (potentially fed from Camden Town Hall).
- Include significant PV array

1.3 ENERGY RESULTS

Accredited Design Dynamic thermal simulation software was used to determine the regulated and non-regulated carbon emissions.

The completed models include baseline carbon emissions, carbon emissions after the application of energy efficiency measures and the carbon emissions after the application of low and zero carbon technologies. The results are shown in Table 1-1 below.

Table 1-1 Carbon emissions reductions

	REGULATED EMISSIONS (TONNES CO_2 PER ANNUM)	UNREGULATED EMISSIONS (TONNES CO_2 PER ANNUM)	% REDUCTION IN REGULATED CARBON EMISSIONS
Part L 2013 Compliant design (based on Target Emission Rate – TER)	150.0	164.0	-
After 'lean' energy demand reduction	144.3	164.0	3.8%
After 'clean' energy demand reduction	141.9	164.0	5.4%
After 'green' energy demand reduction	120.8	164.0	19.5%

1.4 SUSTAINABILITY

In addition to the energy assessment, a BREEAM pre-assessment has also been completed. The following points highlight the main features:

- A score of **81.30%** has been achieved giving **"Excellent"** overall
- Credit scorings of 70.59%,66.67% and 76.92% for the Energy, Water and Materials credits respectively
- Use of low water flow fittings
- Water metering connected to the BMS
- Leak detection
- Significant covering of green roof to aid bio-diversity, rain water attenuation and evaporative cooling
- Green Guide A or A+ materials
- Responsible sourcing of materials

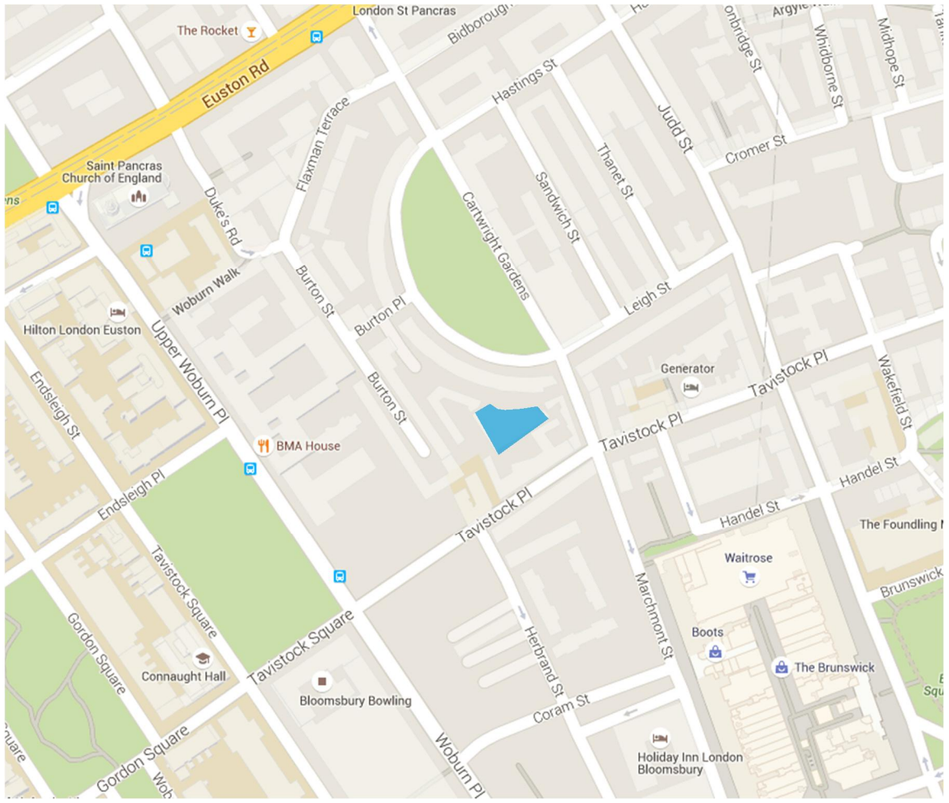
2 PROJECT BACKGROUND

2.1 DEVELOPMENT DESCRIPTION

The existing buildings on the site consist of the London School of Hygiene and Tropical Medicine's buildings along with a storage shed (a former milk distribution depot) that now houses electricity sub-stations and storage areas.

The proposal will redevelop the back yard site of 15-17 Tavistock Place to form a new Medical Research Institute. The proposal seeks to demolish the existing main storage shed, the two storey wing of the London School of Hygiene and Tropical Medicine's building and the smaller storage accommodation.

The proposal is a new build laboratory comprising of three above ground levels, and two basement levels. The building includes predominantly research laboratories, open plan write up spaces, cellular offices and meeting rooms and a limited amount of category 3 containment laboratories below ground.



Map 2-1 Site Location Map for the Proposed Development

3 POLICY CONTEXT

Camden's approach to sustainable development is underpinned by policies from the London Plan, the Camden Core Strategy 2010-2025 – Local Development Framework and Camden Planning Guidance – Sustainability (CPG3)

3.1 THE LONDON PLAN

The Mayor of London published the London Plan in July 2011. Key policies underpinning London's approach to sustainable development include:

- Policy 5.2 – Minimising Carbon Dioxide Emissions
- Policy 5.3 – Sustainable Design and Construction
- Policy 5.5 – Decentralised Energy Networks
- Policy 5.6 - Decentralised Energy in Development Proposals
- Policy 5.7 – Renewable Energy
- Policy 5.9 – Overheating and cooling

The Mayor's London Plan sets out policy in the London context and identifies a number of objectives to improve the City as a place to work and live. Policy 5.2 sets out the requirements to minimise CO_2 emissions through the application of the energy hierarchy:

1. **Be lean**: use less energy
2. **Be clean**: supply energy efficiently
3. **Be green**: use renewable energy

London Plan policy requires new buildings to achieve a 40% carbon emissions reduction over Part L (2010) of the Building Regulations between 2013 and 2016.
From 5th July 2014 this target was rebased against Part L 2013, to require new development to achieve a 35% against the Part L 2013. This is considered to be equivalent to a 40% reduction over Part L 2010.
The London Plan requires an assessment of energy demand that demonstrates the steps taken to apply the Mayor's energy hierarchy. The London Plan includes planning policies both for reducing energy consumption within buildings and the use of renewable energy. These policies cover the role of the boroughs in supporting the Mayor's energy strategy and the requirements of planning applications.

3.2 CAMDEN CORE STRATEGY AND DEVELOPMENT POLICIES

The Camden Core Strategy was adopted in November 2010 sets out the key elements of the borough's vision and is central to the Local Development Framework (LDF). The Core Strategy is the key spatial planning document for Camden, setting out the vision for the Borough over the next 15 years and how it will be achieved.

The Camden Core Strategy requires all new developments to provide a 20% reduction in carbon dioxide emissions through on-site renewable energy generation where feasible.

Core Strategy CP13 – *Tackling climate change through promoting higher environmental standards* promotes higher environmental standards through:

- Ensuring developments use less energy
- making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and Euston Road decentralised energy networks;
- Generate renewable energy on-site
- Promoting the development of new decentralised energy facilities that have the potential to link into a wider sub-regional network, in particular in the vicinity of housing estates with community heating or the potential for community heating, schools, or other suitable locations.

Development Policy DP22 – *Promoting sustainable design and construction* works in conjunction with the strategy in policy CS13 by providing detail of the sustainability standards expected in developments:

- Demonstrate how sustainable development principles have been incorporated into the design and proposed implementation
- Incorporate green or brown roofs and green walls wherever suitable
- Expect non-domestic developments of 500m² of floor space or above to achieve "very good" in BREEAM assessments and "excellent" from 2016 and encouraging zero carbon from 2019.
- Developments must be resilient to climate change by ensuring schemes include appropriate climate change adaptation measures, such as:
  - Summer shading and planting
  - Limiting run-off
  - Reducing water consumption
  - Reducing air pollution
  - Not locating vulnerable uses in basements in flood-prone areas

3.3 CAMDEN PLANNING GUIDANCE – SUSTAINABILITY CPG3

The Camden Planning Guidance CPG3 supports the policies in the Local Development Framework (LDF). This guidance is therefore consistent with the Core Strategy and the Development Policies, and forms a Supplementary Planning Document (SPD) which is an additional "material consideration" in planning decisions.

- Developments of 500m² (gross internal) floor space or more are required to submit an energy statement which demonstrates how carbon dioxide emissions will be reduced in line with the energy hierarchy
- All new developments are to be designed to minimise carbon dioxide emissions by being as energy efficient as is feasible and viable
- Where feasible and viable the development will be required to connect to a decentralised energy network or include CHP
- Developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies.

In addition to energy requirements, CPG3 also outlines wider sustainability objectives for new developments:

- Post 2013, all new developments greater than 500m² shall achieve **BREEAM excellent**, with the following un-weighted category scores
  - Energy 60%
  - Water 60%
  - Materials 40%
- All developments are to be **water efficient** and developments over 1000m² should include grey water recycling unless the applicant demonstrates to the Council's satisfaction that this is not feasible
- Use the **waste** hierarchy to prioritise reduction, re-use and recycling of materials. **Materials** should be sourced responsibly and ensure they are safe to health
- All developments should incorporate **green and brown roofs**. The appropriate roof or wall will depend on the development, the location and other specific factors. Specific information needs to be submitted with applications for green/brown roofs and walls
- All developments are required to prevent or mitigate against **flooding**. All developments are expected to manage drainage and surface water
- All development should consider how it can be occupied in the future when the weather will be different due to **climate change**
- Proposals should demonstrate how **biodiversity** considerations have been incorporated into the development, what mitigation measures will be included and what positive measures for enhancing biodiversity are planned
- Development proposals should consider the opportunities for **food growing**. If food growing is appropriate, the necessary infrastructure should be successfully incorporated the into building and site design

3.4 BUILDING REGULATIONS (PART L)

All new buildings constructed in the UK must meet the minimum requirements of the UK Building Regulations. Specifically with regards to energy and carbon compliance, all buildings must meet the building regulations Part L 'Target Emission Rate' (TER) requirements for the Part L revision which is current at the time of initial construction works for each particular developmental phase. The requirements of Part L 2013 will apply to the Bloomsbury Research Institute.

4 BASELINE CARBON EMISSIONS

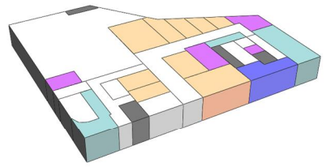
To show the potential improvements to the Bloomsbury Research Institute to limit carbon emissions, a ‘baseline’ model has been constructed in the IES-ve software using a Dynamic Thermal Model (IES-ve version 2014 - 7.0.1.0).

The initial baseline model has been constructed to be broadly compliant with the minimum, or backstop (criterion 2), requirements of Part L of the Building Regulations 2013. The method of compliance is to demonstrate that the carbon emissions from the design, or Building Emissions Rate (BER), are no greater than a Target Emissions Rate (TER). The TER is determined from a ‘Notional’ building which is of the same size, shape and usage as the actual design, but has standardised fabric and system efficiencies. It should be noted that as the baseline design follows the minimum (or backstop) requirements of Part L (criterion 2), the baseline model is not expected to pass the criterion 1 carbon emissions check in the first instance.

The model geometry used to complete the analysis is provided in Figure 4-1 and a floor-by-floor breakdown is shown in Figure 4-2. A summary of the baseline building’s fabric and services efficiency is overleaf in Table 4-1.

Table 4-2 summarises the baseline carbon emissions for the whole development in the baseline model.

Figure 4-1 Render of the IES model of the development



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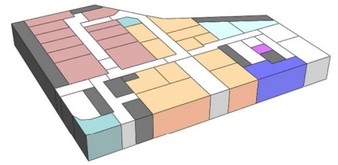

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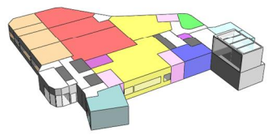

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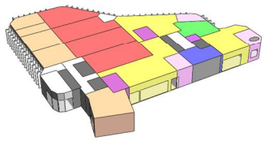

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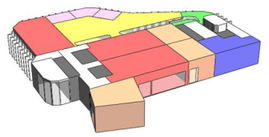

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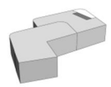

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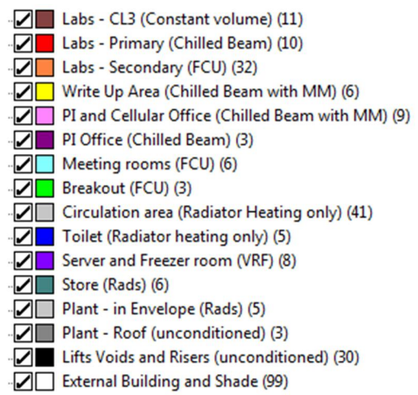

Figure 4-2 Floor-by-floor breakdown showing room type and system assignment

Table 4-1 Breakdown of model parameters for baseline building

MODEL PROPERTY	UNIT	VALUE IN BASELINE BUILDING
Building Fabric		
External wall U-value	W/m²K	0.35
Roof U-value	W/m²K	0.25
Floor U-value	W/m²K	0.25
Window U-value	W/m²K	2.0
Window g-value	-	0.64
Air permeability	m³/hr.m² @50Pa	10.0
Constant Volume (CL3 Labs only)		Constant Volume System (fixed fresh air)
Heating efficiency	%	86.0 (natural gas)
Cooling efficiency (seasonal EER)	-	3.0 (electricity)
Specific Fan Power	W/l/s	1.6
Heat recovery	%	None
Mixed Mode (MM)	-	No
Demand based control	-	No
Heating Pump type	-	Constant speed
Chilled Beams (Primary Labs, Write up areas and PI offices)		Active Chilled Beam
Heating efficiency	%	86.0 (natural gas)
Cooling efficiency (seasonal EER)	-	3.0 (electricity)
Specific Fan Power	W/l/s	1.6
Heat recovery	%	None
Mixed Mode (MM)	-	No
Demand based control	-	No
Heating Pump type	-	Constant speed
Fan Coil System (Secondary labs and meeting rooms)		Fan Coil System
Heating efficiency	%	86.0 (natural gas)
Cooling efficiency (seasonal EER)	-	3.0 (electricity)
Specific Fan Power	W/l/s	1.6
Heat recovery	%	None
FCU Terminal Unit SFP	W/l/s	0.5
Mixed Mode (MM)	-	No
Demand based control	-	No
Heating Pump type	-	Constant speed
DX Cooling (IT server room, freezer rooms, IT hubs)		Split or multi-split system
Heating efficiency	%	86.0 (natural gas)
Cooling efficiency (seasonal EER)	-	3.0 (electricity)
Mixed Mode (MM)	-	No
Radiator System (Ancillary spaces, corridors, WCs, stores)		Radiator system
Heating efficiency	%	86.0 (natural gas)
Heating Pump type	-	Constant Speed
Ancillary Systems		
DHW efficiency	%	86
DHW Storage	litres	460
DHW Standing Losses	kWh/litre.day	0.0124
General lighting efficiency	Lm/W	60
Lighting control	-	none
Target Emission Rate (TER)	$kgCO_2/m^2$	30.1
Building Emission Rate (BER)	$kgCO_2/m^2$	37.9
Percentage Pass	%	(25.8%)

Table 4-2 Overall baseline regulated and unregulated carbon emissions for baseline building and Part L 2013 compliant design

	REGULATED EMISSIONS (TONNES CO_2 PER ANNUM)	UNREGULATED EMISSIONS (TONNES CO_2 PER ANNUM)
Baseline Building (BER	188.6	164.0
Part L 2013 Compliant design (based on Target Emission Rate – TER)	150.0	164.0

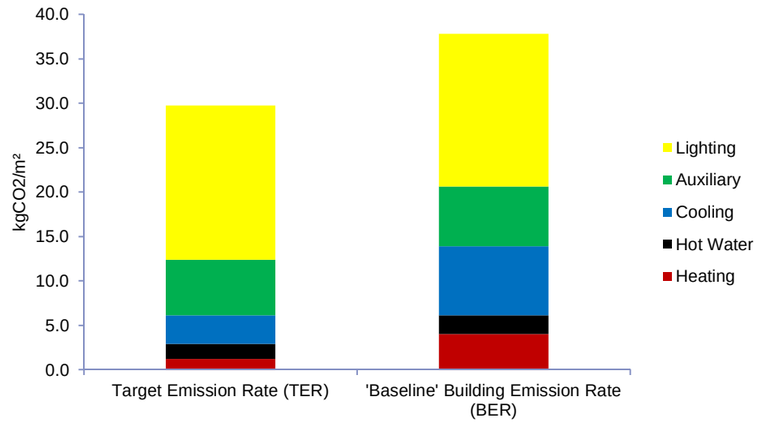

Figure 4-3 Plot of regulated CO_2 emissions for Baseline and Compliant (TER) design

5 BE LEAN: REDUCE ENERGY DEMAND

Following the completion of the baseline model, the 'lean' improvements aim to reduce energy demand by further improving the fabric and systems within the building. The objective of this model is to achieve compliance with the Building Regulations Part L 2013 without the use of CHP or renewable technologies.

The general assumptions applied are outlined below and the following table provides the detail used in the Part L model.

5.1 IMPROVEMENTS TO BUILDING FABRIC:

The efficiency of the fabric assumed in the baseline model is compliant with the minimum requirements of the Building Regulations Part L. The lean model has improved these values further, which will have a direct bearing on space heating load.

- U-Value has been improved for the walls, windows and roof.
- Infiltration rate has been dropped in line with the 'notional building' assumptions for a new building of this type. Whilst the value is low, it is achievable for a high quality building of this type.

5.2 EFFICIENT VENTILATION SYSTEMS:

The nature of laboratory work means high levels of ventilation are required. Significant improvement to energy demand is possible through:

- The fresh air rate to fan coil units has been set to demand based using return air gas sensors to limit running hours.
- The heating system to the ventilation units has been made variable speed to reduce pumping power.
- We have assumed use of run-around coil for heat recovery from the laboratories (with a modest efficiency of 50%) to remove risk of cross contamination.
- Terminal unit Specific fan power has been reduced in FCUs

5.3 EFFICIENT LIGHTING:

The high carbon intensity of electricity and long operational hours of the building means significant savings will be achieved through lighting:

- Where possible, daylight will be utilised to reduce the demand for electrical lighting (particularly for perimeter write-up areas and ancillary space),
- Use of absence detection to switch off lights when a space is vacated,
- Reduction of background lighting, and use of low-energy task lighting, where possible.
- Generally efficient lighting systems have been assumed for the baseline design with a luminaire efficiency of 60 lm/W. These have been further improved for the lean model to a value of 70 lm/W. This value is taken as an average across the building and will be reviewed in design development.

5.4 UTILISATION OF NATURAL VENTILATION:

Where applicable (i.e. to write-up areas and PI offices only), natural ventilation may be provided to limit cooling demand and remove need for mechanical cooling. A mixed-mode approach has been assumed, although viability (due to local noise and traffic pollution) will be investigated in design development.

- Window openings to non-lab areas shall allow high and low level ventilation where spaces are ventilated on one elevation.
- Promotion of cross ventilation where possible
- Exposure of thermal mass and generous floor to ceiling heights to improve ventilation effectiveness and improve thermal comfort in naturally ventilated areas

5.5 ADDITION OF GROUND SOURCE HEATING:

A significant improvement has been made to the boiler efficiency as part of the lean improvements. However in addition to this inclusion of a Ground Source Heat Pump (GSHP) has been assumed. To model this technology, it, is assumed the GSHP can provide a heating and cooling CoP/EER of 4.0, and deliver 80% of the buildings annual heat demand for space heating (based on information provided by the manufacturer).

The system has been provisionally sized to provide a peak heating output of 135kW and provide 148,500kWh annually. For cooling the system is sized to allow 120kW peak and 84,000kWh annually.

The current proposals for the building fabric, building services and lighting systems are summarised on the following page in Table 5-1.

Table 5-1 Fabric, Building Services and Lighting values provided in Lean model

MODEL PROPERTY	UNIT	VALUE IN BASELINE BUILDING	VALUE IN 'LEAN' BUILDING
Building Fabric			
External wall U-value	W/m²K	0.35	**0.16**
Roof U-value	W/m²K	0.25	**0.15**
Floor U-value (inc. basement)	W/m²K	0.25	**0.12**
Window U-value	W/m²K	2.0	**1.6**
Window g-value	-	0.64	**0.41**
Air permeability	m³/hr.m² @50Pa	10.0	**3**
Constant Volume (CL3 Labs only)		Constant Volume System (fixed fresh air)	Constant Volume System (fixed fresh air)
Heating efficiency	%	86.0 (natural gas)	**97.2 (gas) – 20% load 4.0 (elec) – 80% load**
Cooling efficiency (seasonal EER)	-	3.0 (electricity)	**4.05 (elec)**
Specific Fan Power	W/l/s	1.6	1.6
Heat recovery	%	None	**50 (run around)**
Mixed Mode (MM)	-	No	No (N/A)
Demand based control	-	No	No (N/A)
Heating Pump type	-	Constant speed	Constant speed
Chilled Beams (Primary Labs, Write up areas and PI offices)		Active Chilled Beam	Active Chilled Beam
Heating efficiency	%	86.0 (natural gas)	**97.2 (gas) – 20% load 4.0 (elec) – 80% load**
Cooling efficiency (seasonal EER)	-	3.0 (electricity)	**4.05 (elec)**
Specific Fan Power	W/l/s	1.6	1.6
Heat recovery	%	None	**50 (run around)**
Mixed Mode (MM)	-	No	**Perimeter spaces only**
Demand based control	-	No	No (N/A)
Heating Pump type	-	Constant speed	**Variable speed**
Fan Coil System (Secondary labs and meeting rooms)		Fan Coil System	Fan Coil System
Heating efficiency	%	86.0 (natural gas)	**97.2 (gas) – 20% load 4.0 (elec) – 80% load**
Cooling efficiency (seasonal EER)	-	3.0 (electricity)	**4.05 (elec)**
Specific Fan Power	W/l/s	1.6	1.6
Heat recovery	%	None	**50 (run around)**
FCU Terminal Unit SFP	W/l/s	0.5	**0.3**
Mixed Mode (MM)	-	No	No
Demand based control	-	No	**Yes**
Heating Pump type	-	Constant speed	**Variable speed**
DX Cooling (IT server room, freezer rooms, IT hubs)		Split or multi-split system	Split or multi-split system
Heating efficiency	%	86.0 (natural gas)	**3.6 (elec)**
Cooling efficiency (seasonal EER)	-	3.0 (electricity)	**3.6 (elec)**
Mixed Mode (MM)	-	No	No (N/A)
Radiator System (Ancillary spaces, corridors, WCs, stores)		Radiator system	Radiator system
Heating efficiency	%	86.0 (natural gas)	**97.2 (gas) – 20% load 4.0 (elec) – 80% load**
Heating Pump type	-	Constant Speed	**Variable speed**
Ancillary Systems			
DHW efficiency	%	86	**96**
DHW Storage	litres	460	460
DHW Standing Losses	kWh/litre.day	0.0124	0.0124
General lighting efficiency	Lm/W	60	**70**
Lighting control	-	none	**Daylight sensing and absence detection to appropriate areas**
Target Emission Rate (TER)	$kgCO_2/m^2$	30.1	30.1
Building Emission Rate (BER)	$kgCO_2/m^2$	37.9	29.0
Percentage Pass	%	(25.8%)	3.8%

5.6 CARBON EMISSION REDUCTION

Based upon the energy efficiency measures outlined, and excluding the contribution of CHP, District Energy Networks or other renewable energy systems the following total carbon emissions are calculated (see Table 5-2).

The carbon emissions for the development are shown to be lower than the minimum requirements of the Building Regulations by 4%.

Table 5-2 Be Lean: Carbon emissions after the application of energy efficiency measures

	REGULATED EMISSIONS (TONNES CO_2 PER ANNUM)	UNREGULATED EMISSIONS (TONNES CO_2 PER ANNUM)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline Building (BER	188.6	164.0	-
Part L 2013 Compliant design (based on Target Emission Rate – TER)	150.0	164.0	-
After 'lean' energy demand reduction	144.3	164.0	3.8%

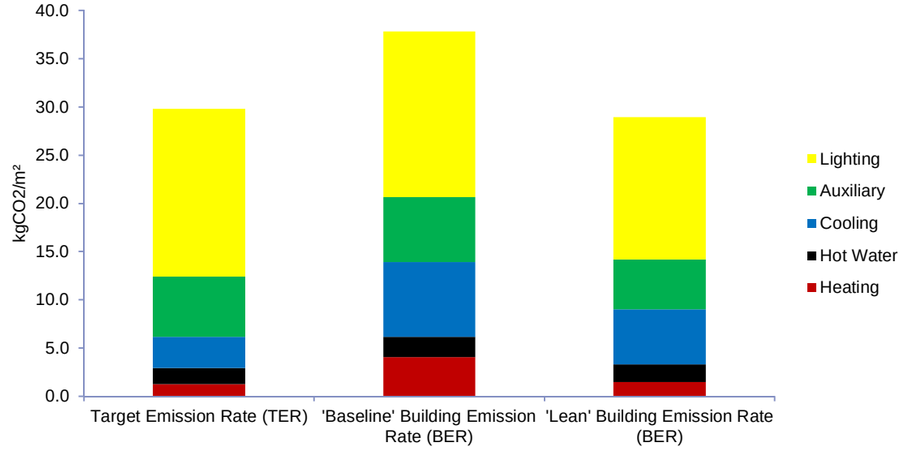

Figure 5-1 Plot of regulated CO_2 emissions for Baseline, Compliant (TER) and Lean design

5.7 SOLAR CONTROL

Section 3.8 of CPG3 requires demonstration of the optimisation of solar control and daylighting.

The proposal includes significant solar shading to the first and second floor elevations. This is also provided to limit overlooking into neighbouring properties.

Given the primary façade is North facing, vertical shading elements have been included to limit solar heat gain from low sun angles. The shading type has been selected to significantly limit solar gain, whilst at the same time allowing diffuse light into the space (via tall windows) to enhance daylight facto. This is illustrated in the images below.

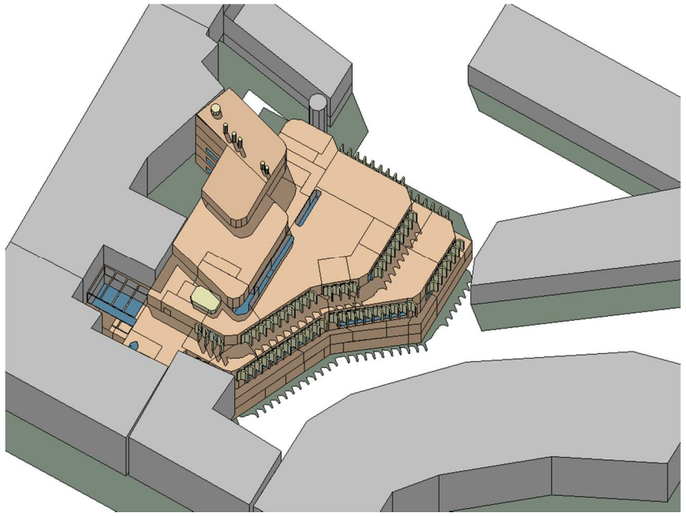

Figure 5-2 Solar Control

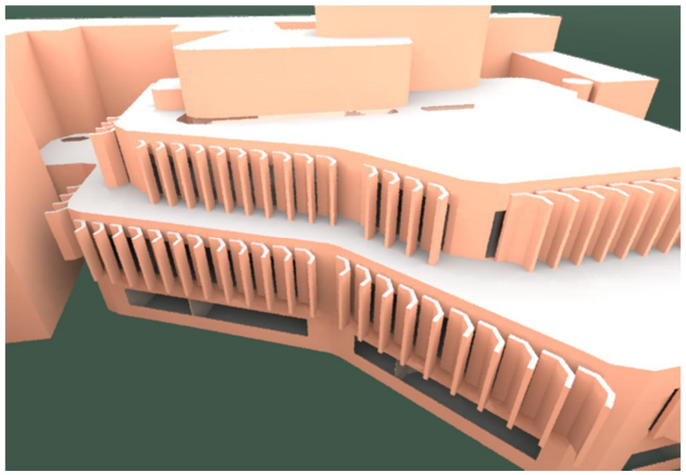

Figure 5-3 Radiance Image of solar shading elements

Figure 5-4 Internal lux plot

Figure 5-5 below shows the cooling load placed on a typical write-up space with (green) and without (red) the solar shading in place. The image demonstates the importance of the shading in reducing cooling demad via solar gain reduction to the space.

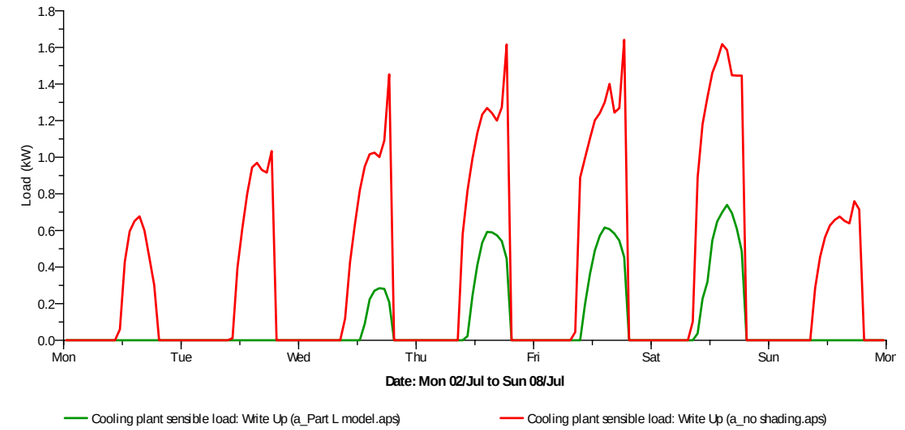

Figure 5-5 Internal lux plot

5.8 JUSTIFICATION OF COMFORT COOLING

Section 3.8 of CPG3 also requires the justification of mechanical cooling systems over a purely natural ventilation approach.

Clearly the use of natural ventilation to much of the building is not applicable due to the containment requirements of the laboratories. However, natural ventilation has been considered to write up spaces and perimeter offices.

The current proposal considers a mixed-mode approach to cooling based on the seasonal application of active chilled beams. A full natural ventilation scheme has not been considered due to the deep plan shape of the site and lack of opportunities for cross ventilation. It is expected that natural ventilation will be used for as much of the year as possible to maintain comfort conditions. The chilled beams will be used in write up spaces and offices in the summer months.

5.9 JUSTIFICATION OF HEAT PUMP

Section 3.18 of CP3 requires that the use of electric heating (including heat pumps) is justified by demonstrating a lower CO_2 emission rate than conventional gas fired heating. This has been completed through considering the CO_2 emissions from generation of 1kWh of heat from the boiler system and from the GSHP system.

Assumptions:

CO_2 intensity gas:	*0.216 kgCO_2/kWh*
CO_2 intensity electricity:	*0.519 kgCO_2/kWh*
Seasonal boiler efficiency:	*97.2%*
Seasonal GSHP efficiency:	*400%*

For Boiler:

1 kWh heat:	1/0.972 = 1.029 kWh of fuel
1.029 kWh fuel:	1.029 x 0.216 = **0.222 kgCO_2**

For GSHP:

1 kWh heat:	1/4.0 = 0.250 kWh of fuel
0.250 kWh fuel:	0.250 x 0.519 = **0.130 kgCO_2**

Clearly the emission from generation of 1kWh of heat from GSHP is considerably lower that the equivalent generation from the boiler. The GSHP is justified on these grounds.

6 BE CLEAN: SUPPLY ENERGY EFFICIENTLY

After consumption has been reduced through the application of energy efficiency measures, the next step is to consider low carbon technologies in order to provide further reduction in carbon dioxide emissions.
The following low carbon technologies have been investigated for the Proposed Development.

- District heating network
- Combined Heat and Power (CHP)

The **Borough of Camden** (CPG3) will "expect developments to connect to a decentralised energy network and use the heat unless developers can demonstrate it is not technically feasible or financially viable".

Borough of Camden Guidance (CPG3):

5.16 As a guide, developments and areas with the following characteristics will be suitable for decentralised and CHP systems:

- High heating demand;
- Mixed energy demands – a range of electricity and heating demands throughout the day; and
- Located close to an existing or emerging decentralised energy network.

5.17 Developments which fall within proposed within 1km of an existing decentralised energy network, or one that is likely to be operational within 3 years of occupation of the development, should assess the feasibility of connecting to the network...
…A connection should be made unless it can be clearly demonstrated that it would not be viable. Where no connection is made, a financial contribution will be sought.

5.18 Developments which are proposed within 500m of a potential network which have no timetable for delivery should ensure that the development is capable of connecting to a network in the future. A financial contribution will be sought to fund the future expansion of the network, unless on-site CHP is feasible and included as part of the development.

Figures 6-1 and 6-3 show the 1km and 500m radius from current DEN networks as provided in CPG3. Clearly the proposed site of the Bloomsbury Research Institute falls within both of these zones making the viability of connection worthy of further investigation.

Figures 6-3 and 6-4 are more recent maps of known schemes and potential future developments in Camden and also in the Russell Square area. These were provided by Camden in the recent 'Decentralising Camden' event of 21st May 2015.

In total, four potential schemes have been investigated:

- Connection to the potential Camden Town Hall scheme
- Connection to a new local DEN originating from Cartwright Court
- Connection to the existing Bloomsbury Heat and Power network
- Connection to the proposed Euston road DEN

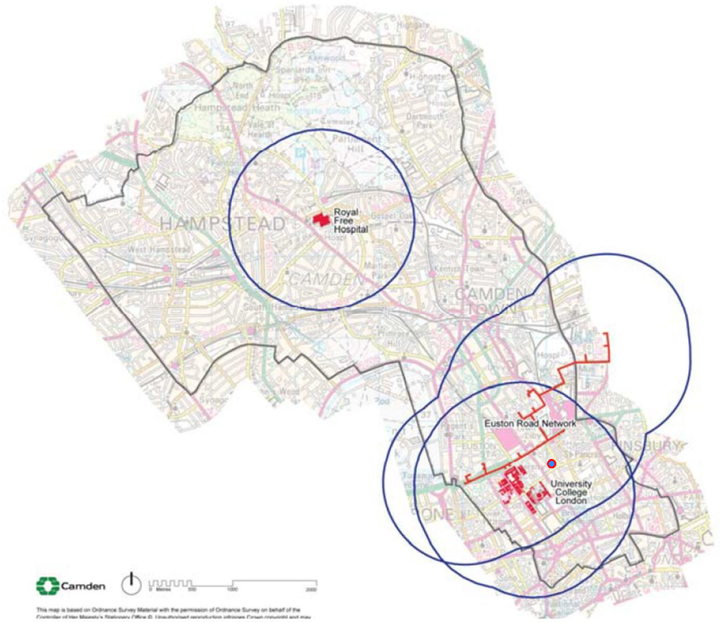

Figure 6-1 Developments within 1km radius of an existing or emerging network (CPG3)

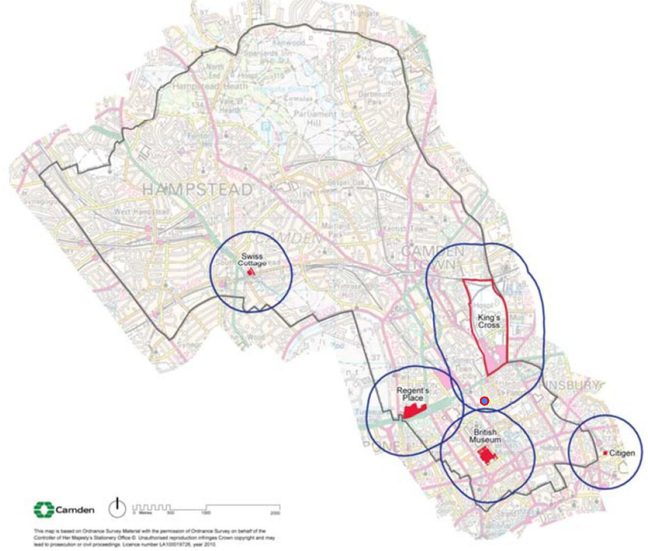

Figure 6-2 Developments within 500m radius of a potential network (CPG3)

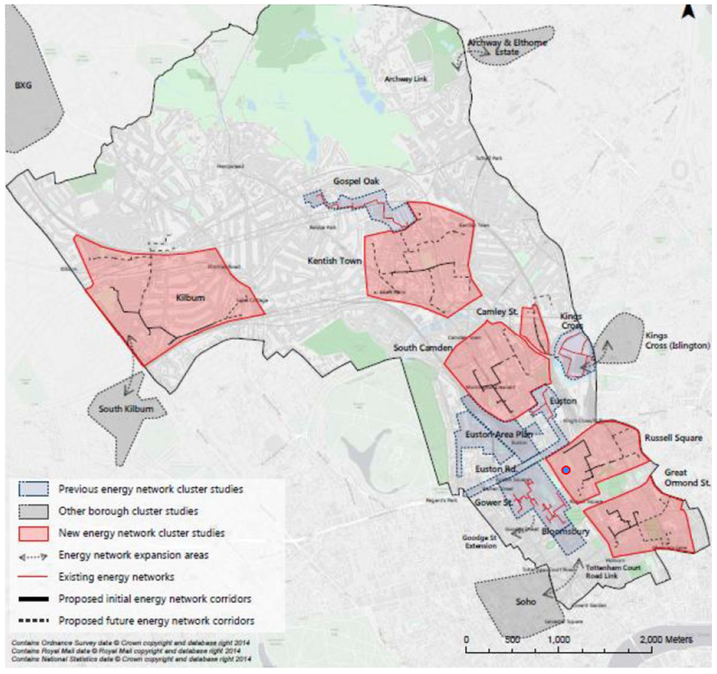

Figure 6-3 Current Cluster Areas (Decentralising Camden event of 21st May 2015)

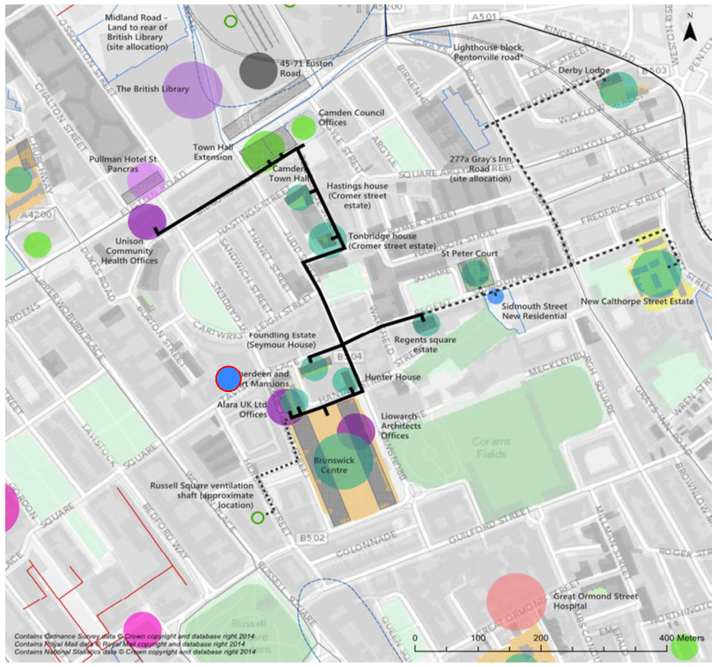

Figure 6-4 Russell Square Cluster (Decentralising Camden event of 21st May 2015)

From Figure 6-4, it is clear that there may be potential to connect to a future scheme in the Russell Square cluster zone. This potential network is fed from the Camden Town Hall project. To further investigate the viability of connecting to this network, further information was obtained from Camden.

6.1 CAMDEN TOWN HALL EXTENSION

Two studies have been made available to us based on the Camden Town Hall project. The first, produced by Max Fordham LLP in 2011, investigated the viability of small district network fed from a new CHP in the Town Hall picking up the Hastings and Tonbridge housing estates and the Argyle primary school. This study concluded that whilst CO_2 savings could be made, the scheme was not financially viable.

The second study was completed by Ove Arup and Partners Ltd in 2014 considered the Town Hall extension project (hotel) in addition to the buildings examined by Max Fordham. This study showed that a CHP system serving the Hotel alone would have financially viable payback periods. However, once the network was extended, to include the housing estates and school, the financial payback reached approximately 14 years.

From the information obtained, it is not clear if these schemes will be developed further. However, based on information in Figure 6-4 further extension of the proposed network down Judd Street to Tavistock Place is being considered.

With regard to the Bloomsbury Research Institute proposal, potential connection to this future network will be considered and is examined further in Section 6.5.

6.2 CARTWRIGHT HALLS ENERGY CENTRE

To consider the viability of a connection to this scheme, we met with the Cartwright Halls design team in the early stages of the project development. It was established that the current design incorporates three modular gas engine CHP units with a total capacity of circa 300kWth. These CHP units have been sized to meet at least 60-70% of the heating demand load for Cartwright Halls and appear to have a high utilisation, even in the summer months. There does not appear to be any potential to increase the utilisation of the CHP units in the winter, because all three units appear to operate at maximum output over a 24 hour period.

It is therefore not proposed that this source of heat would be suitable as a primary heat source for the BRI, however it is possible that because of the different operational profile of the BRI that there is the potential to supply a proportion of the BRI load from this heat source outside of the peak heating season. The use of a remote thermal store in the BRI would further increase the potential for utilising heat produced from these CHP units, if installed these vessels would charge with hot water at times when the Cartwright Halls load is lower than the output of the CHP units.

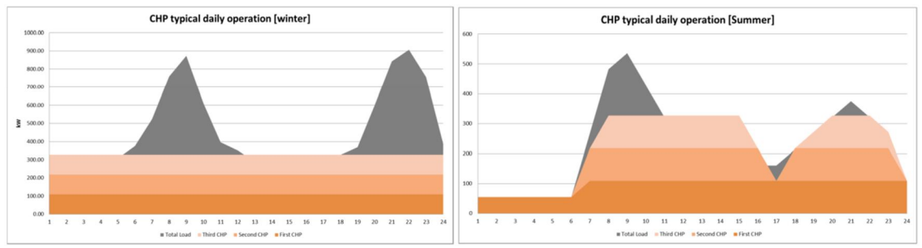

Figure 6-5 Winter and summer daily CHP operation at Cartwright Gardens (images by Mecserve)

Figure 6-6 Location of Cartwright Gardens relative to the BRI

6.3 BLOOMSBURY HEAT AND POWER NETWORK

The Bloomsbury Heat and Power (BHP) network supplies the University of London, SOAS, Institute of Education, UCL and Birkbeck College and other buildings in the vicinity of Russell Square. The network is currently supplied from two 750kWe gas engine CHP units, with top up and standby heat met from gas boilers. The BHP consortium is looking at the potential for expanding the scheme to supply other heat and power loads in the area.

Parsons Brinckerhoff has recently completed a study for the BHP consortium that looks at the technical feasibility of extending the network. The study identified a potential district heating network expansion route along Endsleigh Street to connect Conaught Hall and other student residences in this area.

The following map shows the location of the existing network in green and the potential expansion route in purple. The BRI site is less than 200m from the proposed network expansion. It is suggested that discussions are initiated with the BHP energy manager in order to determine the potential for including the BRI in the expansion of this network.

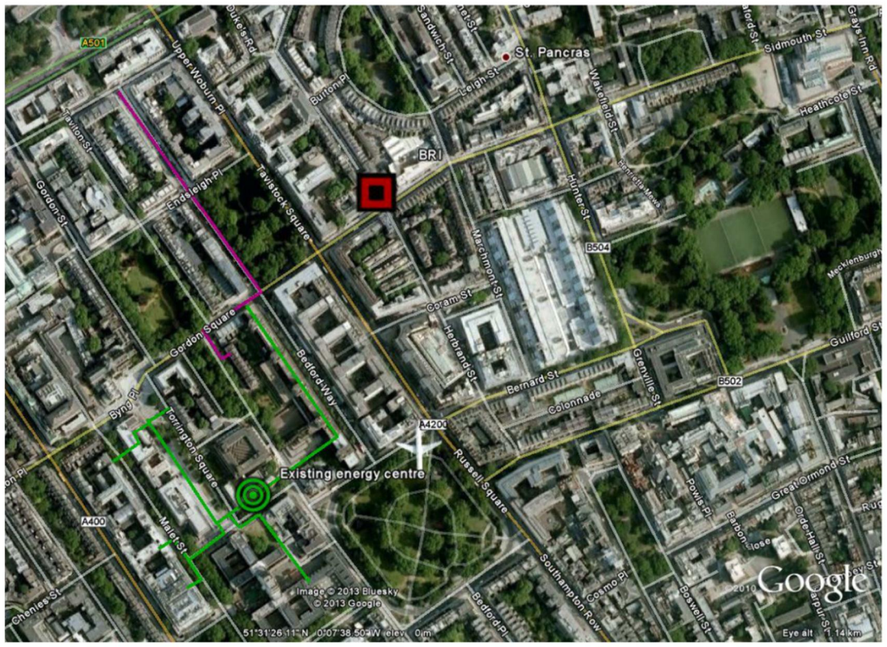

Figure 6-7 Existing Bloomsbury Heat and Power network (Green); proposed extension (Purple)

6.4 EUSTON ROAD DECENTRALISED ENERGY NETWORK

The London heat map has been produced by the GLA in order to assist developers and local authorities with identifying areas that have the potential to form a decentralised energy network. The following figure has been taken from the heat map, The red lines indicates potential future heat networks whilst the purple shading represents areas considered to have the potential for decentralised energy network development.

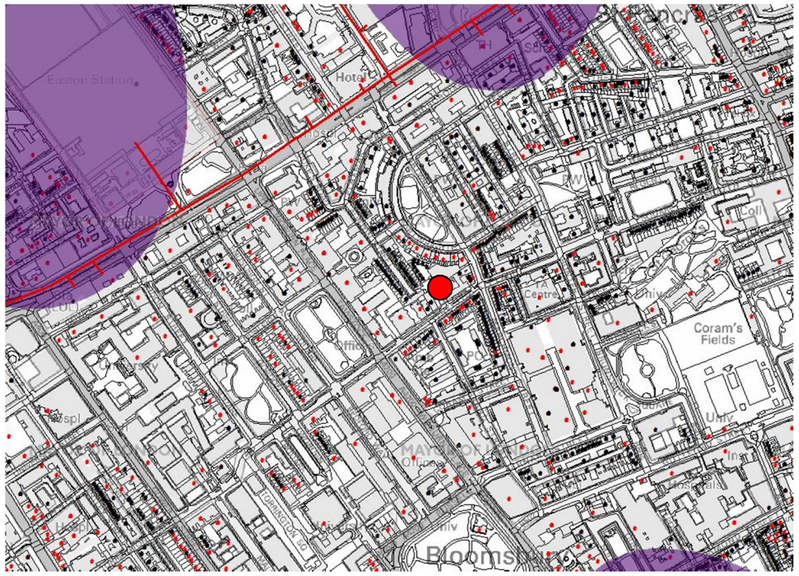

Figure 6-8 Extract form London Heat Map showing Euston Road DEN to North (www.londonheatmap.org.uk)

The BRI building is located approximately 350m from the proposed Euston Road decentralised energy network. At present this network is understood to be in the concept stage, however if the BRI building does not have its own CHP or connect to the BHP or Camden Town Hall networks then connection to this network should be investigated as and when the network is constructed.

Measures required to future proof the design for future connection to a DEN will include space allowance for a plate heat exchanger and associated pipe and valve arrangements.

6.5 POTENTIAL CLEAN SAVINGS DUE TO DISTRICT NETWORK CONNECTION

To consider the potential CO_2 savings from connection to a district energy network the Camden Town Hall scheme has been selected as the most viable. This is primarily due to its proximity to the site, as shown in Figure 6-4 and the relatively recent nature of the data available.

To determine the potential savings, the CHP values used in the Max Fordham (2011) analysis have been applied. For the Camden Town hall development, the following CHP values are suggested:

CHP Electrical Efficiency = 30%
CHP Thermal Efficiency = 48%

This gives an overall CHP efficiency of 78% and a heat to power ratio of 1.6.

It is assumed that the CHP unit would be installed in an Energy Centre arrangement that gave 60% of annual load from the CHP and 40% from gas fired boilers with a seasonal efficiency of 92%.

Based on these values, provision of 1kWh of heat from the system would result in 0.17kgCO_2. With estimated distribution losses of 5%, a final carbon intensity for the DEN system of 0.177kgCO_2/kWh has been assumed.

Given that the GSHP system is expected to include a lower CO_2 intensity of 0.130kgCO_2/kWh (see section 5.9), the total heating carbon intensity has been weighted to account for an 80/20 split between GSHP and CHP respectively. Accounting for losses, the final intensity of the heating system has been set to 0.158 kgCO_2/kWh.

With these values applied to the model, the following results have been generated. The final viability of the system towards 'Clean' savings will be considered after the suitability of local CHP as an alternative option. This is summarised in the next section.

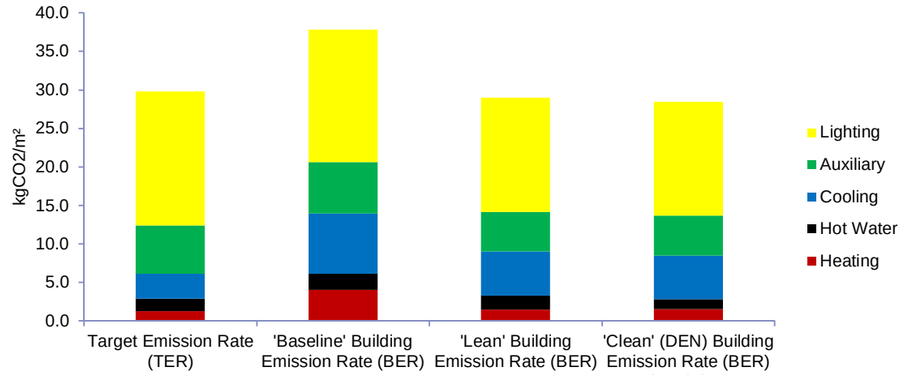

Figure 6-9 CO_2 reduction from Clean (DEN) measures

Table 6-1 Be Clean: Carbon emissions after the application of connection to a local District Energy Network (DEN)

		BASELINE	LEAN	CLEAN (DEN)
Target Emission Rate (TER)	kgCO_2/m²	30.1	30.1	30.1
Building Emission Rate (BER)	kgCO_2/m²	37.9	29.0	28.5
Percentage Pass	%	(25.8%)	3.8%	**5.4%**

6.6 COMBINED HEAT AND POWER (CHP)

On the basis of the modest CO2 savings resulting from connection to a future DEN, local CHP has also been considered.

The technical and economic viability of operating a CHP plant in new development is dependent on understanding the building heat and power demand profiles. A correctly designed CHP unit should be able to supply at least 60% of the annual heating and hot water demand whilst meeting the majority of the on-site electrical demand.

The Bloomsbury Research Institute is anticipated to have a 24-hour occupancy profile combined with a requirement for a high number of air changes per hour in some areas. These characteristics indicate that there would be a well-defined heating and electrical base load, therefore on-site CHP could potentially make a significant contribution towards the sites energy

demands. The size of the CHP that could supply the building is dependent on the energy efficiency (lean) measures that can be applied to the building.

To determine the indicative benefits of a CHP system, initial calculations have been completed using the dynamic thermal model for Part L. It is stressed that Part L of the building regulations stipulates use of these calculations are for compliance purposes only. The proper sizing of a CHP system (in the following stages of design development) must be completed using appropriate thermal design software. Calculations at this stage can only be considered indicative of the magnitude of savings.

To complete the calculations, a small CHP engine has been selected to determine the magnitude of potential CO2 savings. The unit is assumed to have a thermal output of 12.5kW, electrical output of 5.5kW and a total efficiency of 79%.

The plot below illustrates the benefit of a CHP as a 'clean' improvement. Note that the marginally increased heating and hot water emissions are due to the additional gas usage in the CHP engine. The grid displaced electricity (i.e. generated by the CHP) is shown as a negative emission. The aggregated emissions (i.e. accounting for the displaced electricity demand) are shown to the far right.

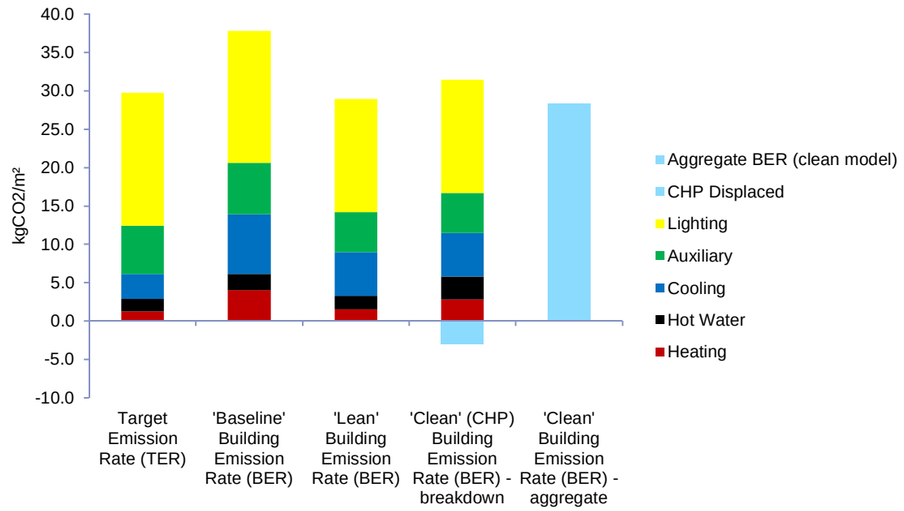

Figure 6-10 CO2 reduction from Clean (CHP) measures

Table 6-2 Be Clean: Carbon emissions after the application of connection to a local CHP

		BASELINE	LEAN	CLEAN (DEN)
Target Emission Rate (TER)	$kgCO_2/m^2$	30.1	30.1	30.1
Building Emission Rate (BER)	$kgCO_2/m^2$	37.9	29.0	28.4
Percentage Pass	%	(25.8%)	3.8%	**5.6%**

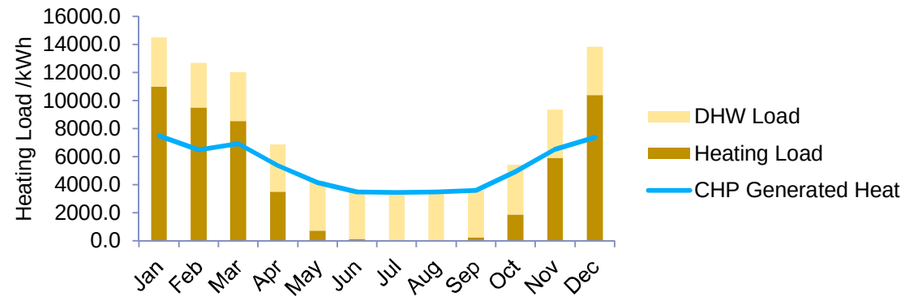

Figure 6-11 Annual heating showing provision from the CHP led heating system

6.7 CARBON EMISSIONS REDUCTION

With the addition of CHP, carbon reductions are taken to 5.6% below building regulations requirements. It is noted that the level of improvement offered by the CHP is very low. This is simply because the level of savings that can be made is heavily restricted due to the low heat demand of the building compared to the large electrical demand of the lighting and auxiliary ventilation (i.e. a heat demand led CHP will only run to meet the heat needs of the building, which are low in this case).

To assess the viability of installing CHP or using a future connection to a DEN, we have considered the cost saving potential of each option. This analysis is based on 12p/kWh for electricity and 4p/kWh for natural gas. Table 6-3 below summarises the savings potential for each system:

Table 6-3 Savings potential of 'clean' options

MODEL	ANNUAL FUEL COSTS	SAVINGS AGAINST LEAN MODEL
Lean	£69,126	-
Clean (DEN)	£67,500	£1,626
Clean (CHP)	£68,640	£486

Clearly the small annual savings resulting from CHP do not justify its inclusion in the proposal. The savings from connection to a future DEN are also modest. However, given the current unknowns allowance will be made for future connection. Space has been safeguarded in the basement plant for a plat heat exchanger, and a potential route into the building has been identified via the archway entrance from Tavistock Place.

Table 6-4 Be Clean: Carbon emissions after the provision of energy efficiency supply measures

	REGULATED EMISSIONS (TONNES CO_2 PER ANNUM)	UNREGULATED EMISSIONS (TONNES CO_2 PER ANNUM)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline Building (BER	188.6	164.0	-
Part L 2013 Compliant design (based on Target Emission Rate – TER)	150.0	164.0	-
After 'lean' energy demand reduction	144.3	164.0	3.8%
After 'clean' energy demand reduction	141.9	164	5.4%

7 BE GREEN: RENEWABLE ENERGY TECHNOLOGIES

After making improvements to the proposed Bloomsbury Research Institute building though 'lean' and 'clean' measures, 'green', or renewable energy measures have been considered.

The drivers for inclusion of renewable technologies also come from the BREEAM assessment in addition to Camden's targets. Criteria Ene01 Reduction of Carbon Emissions offers credit for carbon reduction, although this can arise from any building improvement (not just renewable technology). In addition, further credit is available from Ene05 Low zero carbon technologies for offsetting emissions through renewable technologies directly. In the present BREEAM pre-assessment, a 10% contribution from renewable technologies is targeted.

The London Borough of Camden Planning Guidance document CPG3 includes the following statement concerning renewable energy:

"All developments are to target at least a 20% reduction in carbon dioxide emissions through the installation of on-site renewable energy technologies. Special consideration will be given to heritage buildings and features to ensure that their historic and architectural features are preserved."

The Core Strategy policy CS13 document - Tackling climate change through promoting higher environmental standards goes on to state

"Developments will be expected to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation unless it can be demonstrated that such provision is not feasible".

As a new development within the Borough of Camden, the project is obliged to target 20% savings in emissions through renewable technologies, or demonstrate why it is not achievable. Given the constraints of the site, opportunities for low and zero-crbon technologies are limited. Initial considerations are as follows:

- **Combined Heat and Power (CHP)** has been shown to be of limited benefit due to the low-heat demand of the building – see 'clean' improvements
- **District Energy Networks** may be considered in the future, however current studies indicate no local networks are presently available. Allowance has been made to a future network, although estimates savings are expected to be small.
- **Ground Source Heat Pumps (GSHPs)** are currently being actively considered for the project. This technology has been included in the 'lean' model as an improvement to both heating and cooling demand.
- **Biomass heating** requires significant space for solid fuel storage. Given space is limited; this is likely to be unfeasible. In addition, initial analysis has suggested thermal energy requirements for the site are relatively low compared to electricity loads. The benefit biomass can offer to total carbon reductions will therefore be limited.
- **Solar hot water** may be feasible, but must be considered alongside a relatively low hot water demand. In addition, this technology will reduce base load heating demand, thereby reducing the running hours of potential CHP. Finally, the technology requires roof space that may be utilised for photovoltaic cells, which are generally a more effective (and economic) carbon reduction technology.
- **Building integrated wind systems** are generally ineffective in built-up areas due to turbulence. In addition, other technologies generally show larger carbon savings for a similar level of investment.
- **Solar photovoltaic cells** may be an effective technology for the Bloomsbury Research Institute. Recent equipment price reductions, coupled with 'feed-in tariffs', have made this technology economically viable in many situations. However, the conflicting need for roof space for ventilation plant and heat rejection equipment will reduce the available size to a relatively modest array. Additionally the "right to light" angles guiding the architectural massing limit the areas of roof on the new structure that can usefully accommodate photovoltaic arrays. The use of spare roof space on the adjacent existing Bloomsbury Research Institute Building should be considered for use in the next stage of design

The above points are by no means exhaustive, and will be returned to during design development. At the current time, inclusion of a Ground Source Heat Pump is likely to be feasible, along with potential installation of a limited PV array.

To demonstrate the effectiveness of PV, a 340m² monocrystalline array with a nominal efficiency of 15% (south facing at 35° inclination) has been considered. Figure 7-1 below illustrates the approximate area required by such an array, and the Figure 7-2 below shows the potential carbon reduction. Note the size of the generating area each cell is smaller than the physical area.

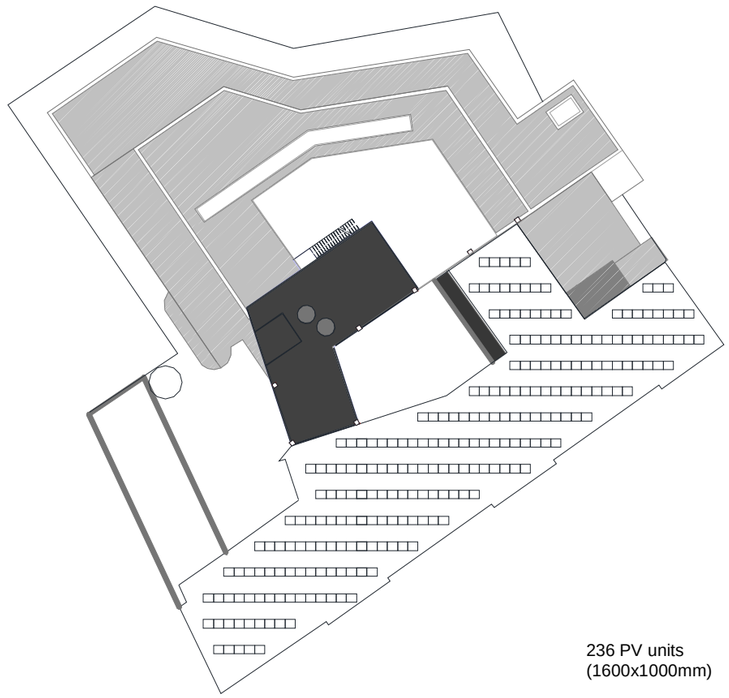

Figure 7-1 Potential use of Roof Space at 15-17 Tavistock Place for 340m² Photovoltaic array

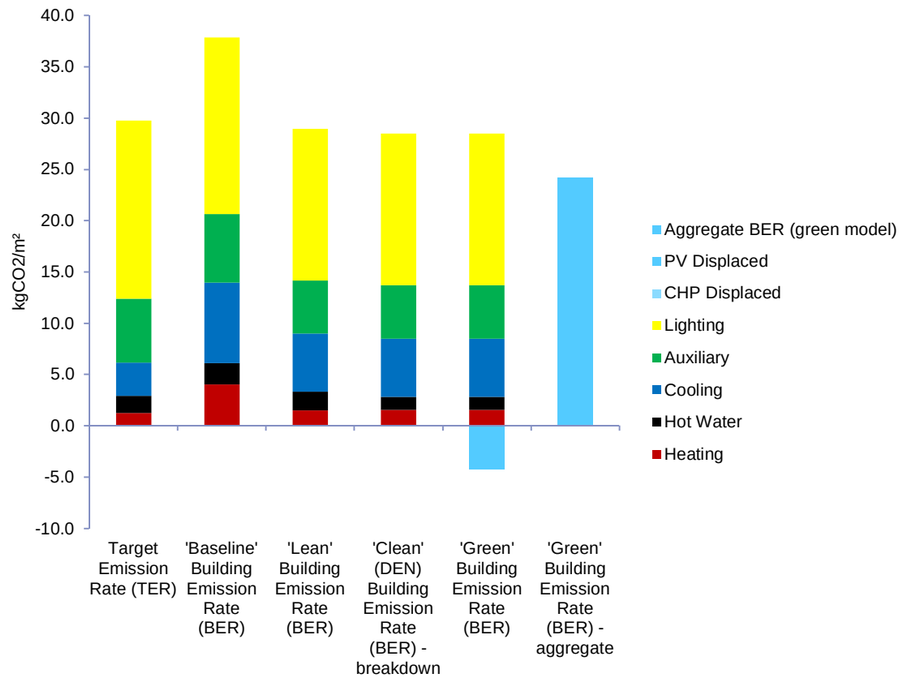

Figure 7-2 CO_2 Emissions from Target Building, Baseline Model, Lean Model, Clean Model and Green Model

Table 7-1 Be Green: Carbon emissions after the application of connection to a local District Energy Network (CHP)

		BASELINE	LEAN	CLEAN (DEN)	GREEN
Target Emission Rate (TER)	$kgCO_2/m^2$	30.1	30.1	30.1	30.1
Building Emission Rate (BER)	$kgCO_2/m^2$	37.9	29.0	28.4	24.3
Percentage Pass	%	(25.8%)	3.8%	5.6%	**19.5%**

7.1 CARBON EMISSIONS REDUCTION

With the final 'Green' improvements made, the building's CO2 emissions are now 14% below the Part L 2013 target. Clearly this is below the current planning objective of 35% reduction. Whilst this is frustrating, it is not unexpected, for the following reasons:

- When analysed using the rigid Part L 'National Calculation Methodology', the BRI is shown to have a low heat demand. This is due to the combination of good quality insulation levels coupled with high internal heat gains. The result of this is that CHP (or connection to a DEN) is of low benefit, as total heat demand is so low compared to other building loads.
- Similarly, when analysed using Part L, the lighting load is high relative to other loads. An efficient lighting scheme has been selected and any further reductions to lighting load will be challenging.

The Greater London Authority guidance on preparing energy assessments (April 2014), which provides an update to the 2011 London Plan, includes the following statement:

"The Mayor recognises that some building types will find it harder than others to achieve this target without the use of carbon offsetting payments. Should particular building types struggle to meet the target on site, developers will need to provide the Mayor sufficient evidence to demonstrate that this is the case. The 35 per cent target will apply to Stage 1 applications received by the Mayor on or after 6 April 2014."

The previous sections have demonstrated the technologies put in place to reduce CO2 emissions as far as possible. Further options for CO2 off set or possible payments are outlined in Section 8.

Table 7-2 Be Green: Carbon emissions from all energy saving technologies

	REGULATED EMISSIONS (TONNES CO_2 PER ANNUM)	UNREGULATED EMISSIONS (TONNES CO_2 PER ANNUM)	% REDUCTION IN REGULATED CARBON EMISSIONS
Baseline Building (BER	188.6	164.0	-
Part L 2013 Compliant design (based on Target Emission Rate – TER)	150.0	164.0	-
After 'lean' energy demand reduction	144.3	164.0	3.8%
After 'clean' energy demand reduction	141.9	164	5.4%
After 'green' energy demand reduction	120.8	164	19.5%

7.2 PERCENTAGE OF RENEWABLE ENERGY PROVISION

In addition to the requirement for 35% carbon reduction over Part L 2013, London Borough of Camden also requires a saving due to renewable energy technologies in isolation. Core Strategy policy CS13 states:

"Developments will be expected to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation unless it can be demonstrated that such provision is not feasible".

To investigate this provision, the final 'green' model in the previous section has been examined. Given that carbon savings due to the GSHP, DEN and the PV array can be considered renewable technology, the 'green' model has been compared to an identical model without these technologies in place. Figure 7-3 on the following page illustrates these results.

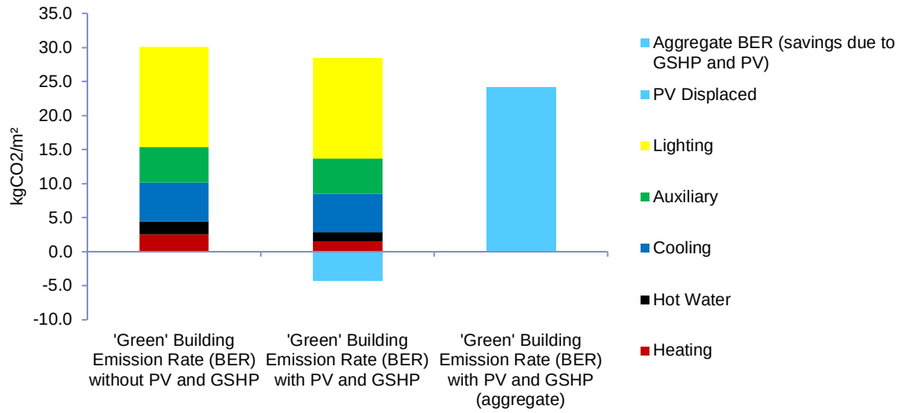

Figure 7-3 CO2 Emissions from Target Building, Baseline Model, Lean Model, Clean Model and Green Model

From this check, the BRI is currently showing a 19.5% CO_2 reduction due to the use of renewable technology using the Part L 2013 methodology. This almost meets the London Borough of Camden target, however, it has been demonstrated that further reduction is not feasible at this stage.

7.3 CARBON SAVINGS FOR BREEAM

Given the BRI is being assessed following the 'BREEAM 2011 New Construction' requirements, the analysis of CO_2 emissions must be completed using the 2010 version of Part L, not the 2013 version previously applied in this report.

Two assessments have been completed:

- CO_2 savings relative to Part L 2010 TER, for use in credit Ene01
- CO_2 savings due to use of renewables (following part L 2010 method), for use in credit Ene04

The following plot illustrates the level of CO_2 reduction using the Part L 2010 methods:

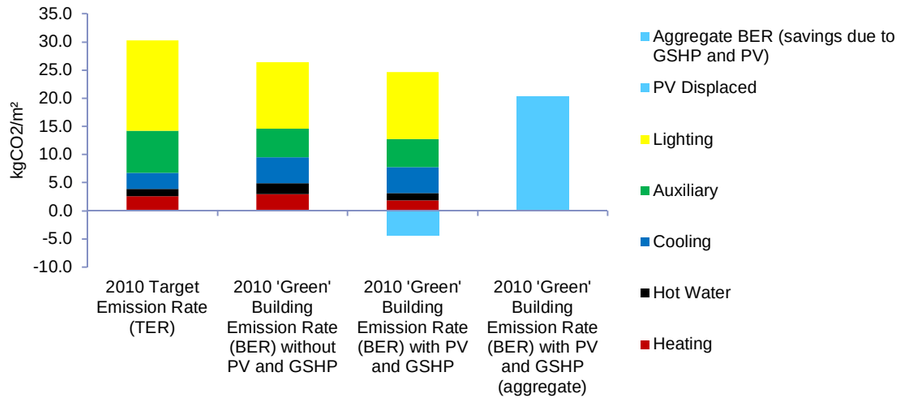

Figure 7-4 CO2 Emissions from Part L 2013 Target and 'Green' models with and without renewables

From this analysis, a saving of **33% in the BER relative to the TER** is found for use in Ene01, and a reduction of **23% due to renewable** (Low–Zero Carbon) technology is found for use in Ene04.

The following image is a screen shot from the BREEAM on-line calculator for credit Ene01 relating to the New Construction Assessment. This indicates that the current score represents a total of 10 credits out of a potential 15 available. This meets and exceeds the prerequisite for 6 credits for a score of Excellent.

However, given the early project stage, it is proposed that only 6 credits are assumed in criterion Ene01 due to uncertainty in onward design development.

In addition, the level of renewable technology is in excess of 20% CO_2 reduction, which means 3 credits may be awarded under category Ene04. Again due to the early project stage 2 credits are assumed due to uncertainty.

Energy & CO_2 Emissions Summary		
	Actual Performance	**Indicative Target**
Heating + Cooling demand [MJ/m^2]	133.99	123.22
Primary Energy [kWh/m^2]	115.34	162.07
Total CO_2 emissions [kgCO_2/m^2]	20.3	30.3

BREEAM New Construction 2011: Ene01 results	
EPR-Energy Demand:	0
EPR-Primary Energy:	0.3839
EPR-CO_2 Emissions:	0.234
Overall Energy Performance Ratio (EPR_{NC}):	0.6179
Number of BREEAM Ene01 credits achieved:	10

Minimum Standards		
Target	**Minimum Requirement - CO_2 emissions**	**Achieved?**
1 or more credits	BER better than TER	Yes
BREEAM Excellent Rating	25% reduction in CO_2 emissions	Yes
BREEAM Outstanding Rating	40% reduction in CO_2 emissions	No
15 credits	100% reduction in CO_2 emissions	No

Figure 7-5 Screen shot from BREEAM calculator tool for calculation of Ene01 credits

8 ENERGY RESULTS

The three principal steps taken; Be Lean (Use Less Energy), Be Clean (Supply Energy Efficiently) and finally Be Green (Renewable Technology measures) are summarised below. The target (Building Regulations compliant) carbon emissions for the Proposed Development are calculated to be 150.0 Tonnes CO_2 per annum.

8.1 ENERGY CONSERVATION AND ENERGY EFFICIENCY (BE LEAN)

Through the application of the measures identified in Section 5 the regulated carbon emissions are shown to be 144.3 Tonnes CO_2 per annum.

8.2 SUPPLY ENERGY EFFICIENTLY (BE CLEAN)

Due to the already efficient nature of the building and large internal equipment heat gains due to laboratory equipment, the building exhibits a low heating demand. For this reason, clean technologies (i.e. CHP and connection to a district energy network) have been shown to be of limited benefit.

However, to allow some savings to be made connection to a future DEN (potentially from Camden Town Hall) have been allowed for. This has reduced emission by 2.4 Tonnes CO_2 per annum to 141.9 Tonnes.

8.3 RENEWABLE TECHNOLOGY (BE GREEN)

The feasibility of a range of renewable technologies has been assessed in the context of the London Plan.

It is currently proposed that a Photovoltaic Array of 340m² be allowed for on the rooftop of the neighbouring building. The addition of this system has reduced emissions by a further 21.1 Tonnes of CO_2 per annum to the final value of 120.8 Tonnes.

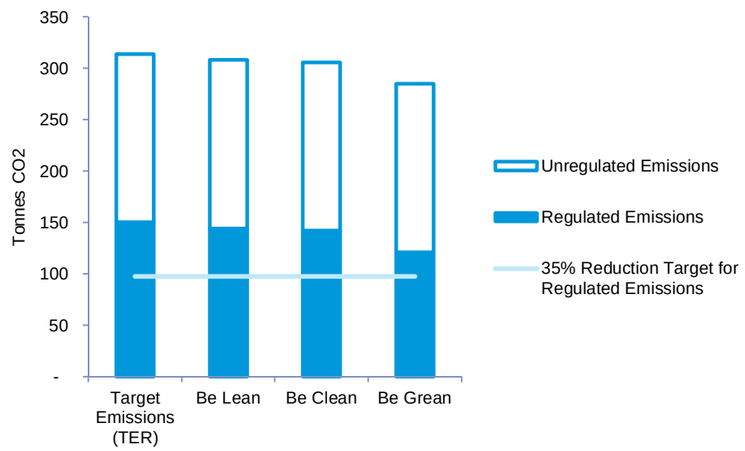

Figure 8-1 Total CO2 reductiosn form Lean, Clean and Grean measures

8.4 GLA GUIDANCE ON PREPARING ENERGY ASSESSMENTS

In direct response to the information outlined within the 2011 Greater London Authority (GLA) Guidance on preparing Energy Assessments, the results outlined previously are summarised in the tables below, with the results presented against the overall carbon reduction target.

Table 8-1 Carbon Dioxide Emissions after each stage of the Energy Hierarchy

	REGULATED EMISSIONS (TONNES CO_2 PER ANNUM)	UNREGULATED EMISSIONS (TONNES CO_2 PER ANNUM)
Part L 2013 of the Building Regulations Compliant Development	150.0	164.0
After energy demand reduction	144.3	164.0
After CHP (via District Energy Network)	141.9	164.0
After renewable energy	120.8	164.0

Table 8-2 Regulated carbon dioxide savings from each stage of the Energy Hierarchy

	REGULATED CARBON DIOXIDE SAVINGS (TONNES CO_2 PER ANNUM)	REGULATED CARBON DIOXIDE SAVINGS (%)
Savings from energy demand reduction	5.7	3.8%
Savings from CHP (via District Energy Network)	2.4	1.6%
Savings from renewable energy	21.1	14.1%
Total Cumulative Savings	29.2	19.5%
Total Target Savings	52.5	35%
Annual Surplus	-23.3	

Given there is a residual shortfall, the following table has been completed in line with GLA recommendations showing the cumulative shortfall over a 30 year period.

Table 8-3 Shortfall in regulated carbon dioxide savings

	ANNUAL SHORTFALL (TONNES CO_2 PER ANNUM)	CUMULATIVE SHORTFALL (TONNES CO_2)
Shortfall	23.3	699

8.5 OFFSET OF SHORTFALL

CPG3 states:

"Where the new London Plan carbon reduction target in policy 5.2 cannot be met onsite, we may accept the provision of measures elsewhere in the borough or a financial contribution which will be used to secure delivery of carbon reduction measures elsewhere. This process is known as carbon offsetting"

It is understood that the preferred method of mitigating the shortfall is via energy saving projects identified elsewhere. Where this is not possible a financial contribution will be pursued via Section 106 agreement as a final option.

The camden.gov.uk website currently states that the value of carbon to be applied in financial contributions is £90/Tonne for a 30 year period (or £2,700 when considering annually). Given the cumulative shortfall identified in Table 8-3, the financial contribution would be determined as follows:

Table 8-4 Financial Contribution to Offset Shortfall

	CUMULATIVE SHORTFALL (TONNES CO_2)	FINANCIAL CONTRIBUTION
Shortfall	699	£62,910

Following conversation with Camden's Sustainability Officer (Amy Farthing 08/04/15), we understand the following in relation to carbon offsetting alternatives:

"Camden would prioritise emissions offsetting through improvements to other buildings in the borough, before paying into the carbon offset fund.

In terms of rules, we would expect measures to be prioritised in line with the energy hierarchy, and CO_2 savings arising from the proposed measures would need to be made clear within the energy statement"

We have also referred to the GLA Sustainable Design and Construction - Supplementary planning Guidance (April 2014)

2.5.7 Boroughs may agree with a developer for the developer to directly off-set any shortfall in carbon dioxide reductions from a scheme by installing a carbon dioxide saving project off-site. Measures could include directly funding or installing community energy and retrofitting projects. For example, a developer could install photovoltaics on a nearby school. The CIL regulations need to be taken into account when securing these arrangements. The borough should ensure that the off-setting measure provides added value - that is, the measure would be unlikely to be funded through another means. Boroughs should secure off-setting measures through s106 agreements.

2.5.8 An assessment should be made by the Council or beneficiary of the off-setting measure so that the off-setting measures either have carbon dioxide or financial equivalence to the carbon dioxide saving that would otherwise be required on the development site.

From these statements, we have determined that off-setting projects should be prioritised against the energy hierarchy (i.e. focus on simple building improvements rather than renewable energy); they should be for projects unlikely to gain funding elsewhere; and should provide an equivalent saving in CO_2 as that in the shortfall.

To respond to these requirements, several building improvement projects have been identified in both the University College London and London School of Hygiene and Tropical Medicine estates. The projects identified are all to existing buildings in the Camden area and have been selected by energy managers as 'lean' improvements that will result practical and demonstrable savings.

Table 8-5 Potential Offsetting Projects in LSHTM Estate

BUILDING	ENERGY CONSERVATION PROJECT	CARBON SAVING (TONNES CO_2)
Tavistock Place	Lighting - Lighting system optimisation and T8 lighting upgrade	10
Keppel Street	Lighting - T8 Lighting Upgrade	67
Keppel Street	Freezer Audit and Rationalisation	35
Keppel Street	Boiler house insulation improvement	144

Table 8-6 Potential Offsetting Projects in UCL Estate

BUILDING	ENERGY CONSERVATION PROJECT	CARBON SAVING (TONNES CO_2)
Institute for Child Health	LED lighting and controls	119
School of Pharmacy	LED lighting and controls	60
Science library	LED lighting and controls	24
Rockefeller building	LED lighting and controls	161
Roberts building	LED lighting and controls	114
Christopher Ingold Building	LED lighting and controls	155
Christopher Ingold Building	Fume cupboard - conversion from fixed volume to variable volume	156

The summation of the savings in these potential offset projects is equal to 1,045 Tonnes CO_2.

Having identified these projects, we would propose further dialogue with Camden to determine the suitability of them as potential offsets and which would be best aligned with the objectives of the Core Strategy and GLA guidance.

9 BREEAM

London Borough of Camden requires that Post 2013, all new developments greater than 500m² shall achieve BREEAM excellent. This section outlines the completed BREEAM assessment to date.

In summary, a score of **81.30%** has been achieved giving **Excellent** overall.

9.1 BREEAM Assessment Process

The last BREEAM workshop was completed on 14th February 2015 during the RIBA Stage D design development by Parsons Brinckerhoff and the design team. Given the proposed work is a new development, the scheme has been considered against the BREEAM 2011 New Construction assessment. The following sections outline the primary issues under each of the BREEAM criteria. Full details of the pre-assessment are available in Appendix A. The project has also been registered with the BRE and assigned the reference BREEAM-0049-6505.

9.2 Credit Breakdown

9.2.1 Management

MANAGEMENT			
% of credits achieved	90.48%	Contribution to score	10.86%

Credits in this category relate to undertaking consultation, management of the construction site, undertaking commissioning and production of a building user guide. Most of these credits are currently being targeted. The general exception is those relating to appointment of a BREEAM AP. There may however be opportunities to target some of these credits at a later project stage. Consultation has been identified as a key credit to target. Due to the nature of the building use and proximity to the community, the project during the design, construction and occupation will have a great influence on the local and wider community. Town hall type meetings will be vital for external consultation and outreach to schools and colleges will be investigated. Additionally consultation of similar facilities and lesson learnt meetings will be beneficial in optimising the design for this project. Whole life cycle costing will looked to be assessed during Stage D. Example studies of merit would be analysing the benefits of a concrete structure over a steel frame construction.

9.2.2 Heath and well being

HEATH AND WELL BEING			
% of credits achieved	76.47%	Contribution to score	11.47%

This criterion concerns the health of building occupants, including lighting, thermal comfort, acoustics and airborne pollution. Again many credits have been achieved, and the criterion contributes significantly to the final score. Opportunities to enhance daylight and view (to BREEAM levels) will be difficult due to the built up nature of the site, and have therefore been omitted. Natural ventilation and daylight will be optimised where possible. Basement areas will be spaces identified for lab specific areas where mechanical ventilation and artificial lighting are a must. Areas where passive measures can be employed will be write up areas located above ground and positioned on the perimeter of the building to maximise daylight and the potential for natural ventilation. Due to the constrained nature of the central London site and the proximity to the road, indoor air quality credits will not be targeted. An acoustician will look to be appointed to assess the impacts the site will have on the building and vice-versa. Attenuation measures will look to be specified and tested during occupation.

9.2.3 Energy

ENERGY			
% of credits achieved	70.59%	Contribution to score	13.41%

Reduction in energy demand is a key feature of BREEAM and is weighted highly is when calculating results. CO_2 reduction (Ene01) is currently scored at 6 out of 15 which is equivalent to approximately a 25% reduction over Building Regulations Part L 2010 (and is comfortably achieved – see section 7.3). Whilst being achieved, this is a challenging target for a high energy use building such as the BRI and will rely on highly efficient building fabric and building services systems. In addition, a Low/Zero Carbon study has been completed and a 10% target for energy demand from renewable systems aimed for (and initially achieved – see section 7.3).

Passive measures will be identified first in the energy strategy and a concrete structure with high thermal mass will be targeted. Optimising natural daylight and ventilation where possible will be assessed through thermal modelling. District Energy Networks are currently being investigated for potential future connection. Onsite renewable technologies including GSHP coupled to thermal piles extract both heating in Winter and cooling in Summer are proposed. This will be dependent on the results of a Ground Investigation (G.I.) and associated loads that could be harnessed. Energy metering will be installed throughout and is a key part of UCL's FM team to monitor the use of the building and asses the building's performance and look to reduce energy where possible.

9.2.4 Transport

TRANSPORT			
% of credits achieved	100%	Contribution to score	8.00%

A maximum score is targeted for transportation credits. However, as the category of transport is weighted relatively low is the assessment method, only a modest contribution to the final score is given. Issues relating to public transport and local amenities score well for the proposed Bloomsbury Research Institute due to the location of the site. In addition, the lack of provision of car-parking also contributes to a good score. Cyclist facilities will be provided and the London Borough of Camden's requirement will be addressed first, which is in excess of that required by BREEAM. BREEAM compliant cyclist facilities are therefore targeted here.

9.2.5 Water

WATER			
% of credits achieved	66.67%	Contribution to score	4.00%

Water is weighted relatively low in a BREEAM assessment compared to other criteria. In addition, the design team expected water consumption to be particularly high in the building, therefore targeting only two out of five credits for water consumption (Wat 01). The combination of this is a low contribution to the final score from water credits. Despite this, low water use fittings will be applied throughout, and other requirements relating to metering, leak detection and sanitary shut off are all targeted. Landscaping will be developed with the appointment of an Ecologist to ensure the species specified do not have irrigation requirements.

9.2.6 Materials

MATERIALS			
% of credits achieved	76.92%	Contribution to score	9.62%

The Bloomsbury Research Institute scores reasonably well in the material category. However, the design team felt the targets relating to responsible sourcing and low lifecycle impacts of material were particularly onerous, so a more modest score has been identified. A concrete frame will look to be developed in the scheme, however the local sourcing of recycled aggregate will be key and local sites where the volumes of material can be procured will be identified as the design develops. Materials workshops will play a key part in the development of the structural design.

9.2.7 Waste

WASTE			
% of credits achieved	83.33%	Contribution to score	6.25%

During the construction process, a Site Waste Management Plan will be required. Three credits are associated with the detail of this and meeting targets set by WRAP. This can however be a particularly onerous set of credits; particularly as the volume and type of waste is not accurately known at this time. Two of three credits are therefore targeted. In addition, use of recycled aggregate may be challenging for this project, so has been highlighted for monitoring. Reuse of the existing structure will be explored as this reduces the number of waste collections during the construction phase. Storage of this waste will be an issue due to the constrained site and therefore discussions with the Contractor will be key in finding a balance between materials saved versus not disrupting works onsite. Overall, a score of 5 of 6 credits are targeted for this category.

9.2.8 Land use and ecology

LAND USE AND ECOLOGY			
% of credits achieved	90.00%	Contribution to score	9.00%

An “Extended Phase I Habitat Survey” has been completed by London Conservation services in June 2013 (refer to section 10.7). Whilst the site of the Bloomsbury Research Institute has no significant ecological value, it offers some reduced scope for improvement, so scores a reasonable rating against this criterion. A small area of bio-diverse roof is proposed. This has allows 2 of 2 credits to be scored for LE03. However, for ‘enhancement of site ecology’ (LE04), one credit of the three available is likely to be lost due to the loss of external space caused by the proposed atrium. A further credit has been gained in this section from the previous stage as it has been identified that the land is suitably contaminated and as such the contaminants will be remediated before works start onsite.

9.2.9 Pollution

POLLUTION			
% of credits achieved	76.92%	Contribution to score	7.69%

Credits relating to pollution from refrigerant use in cooling systems are challenging to achieve due to the need for lab cooling. However, credits relating to flood risk, watercourse pollution and light pollution have been targeted. In addition, low NOx boilers bellow 70mg/kWh are required to achieve credit against the heating system. This will be challenging to achieve if a CHP system is proposed. The appointment of an acoustician will ensure that the proposed building use will not have a significant noise impact on the neighbouring buildings.

9.2.10 Innovation

INNOVATION			
% of credits achieved	10.00%	Contribution to score	1.00%

Innovation credits are deliberately challenging to achieve by definition. One credit is targeted for additional energy/water metering for a three year period after construction. An increased score under the considerate contractor’s scheme and a higher proportion of recycled aggregate may be targeted.

TOTAL SCORE	**81.30%** **EXCELLENT**

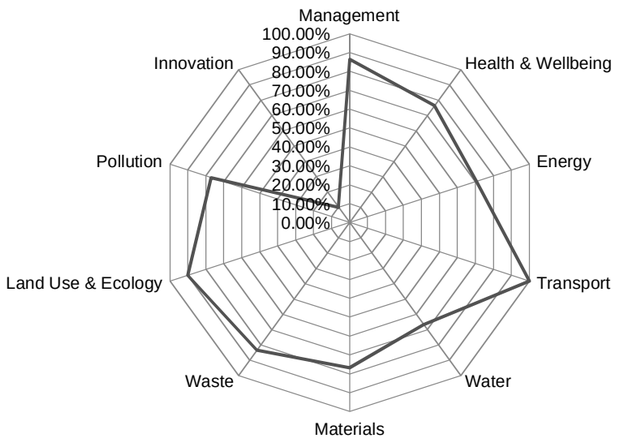

Figure 9-1 Percentage of credits achieved in each category

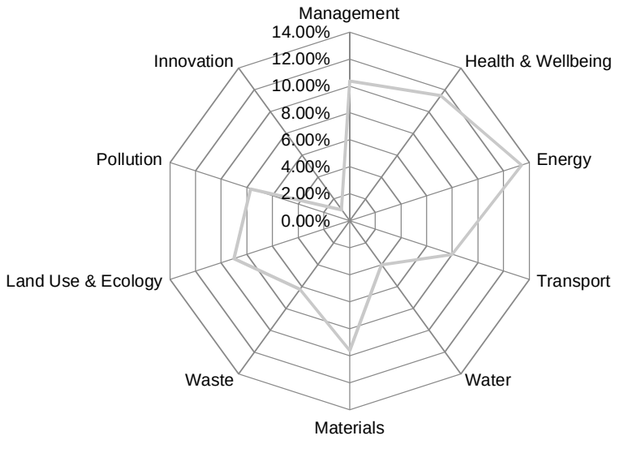

Figure 9-2 Contribution of each category towards total score

Note: difference between "percentage of credits achieved" and "contribution to total score" is due to the varying weighting of the categories in the BREEAM process.

9.3 BREEAM Technical Risks and Cost Implications

To ensure the BREEAM rating is maintained throughout the design and construction process, the design team are aware of the associated technical and cost risks associated with compliance with BREEAM. Credits are being monitored and priced accordingly, so during the latter design stages these credits are not lost for technical or financial reasons.

Technical:

- → **High** Potentially achievable, but design development required to confirm if it can be incorporated into design.
- → **Medium** Technically feasible, may have some practical implications
- → **Low** Technically and practically feasible

Cost:

- → **High** > £100,000
- → **Medium** £10,000-£100,000
- → **Low** >£10,000

Table 9-1 Credits identified as having significant technical and cost implications for the project

CREDIT	DESCRIPTION	TECHNICAL RISK	COST IMPACT
Hea 05 – Acoustic Performance	The design team must appoint an acoustician to ensure the building meets the required acoustic standards. Specific lab equipment may be sensitive to noise and vibration may and as such there may be significant structural costs required to meet the ratings.	Medium	Medium
Ene 01 – Reduction of CO_2 Emissions	The scheme is currently targeting 6 credits (Excellent Rating). This is equates to a 25% reduction in CO_2 and dependent renewable technologies including ground source heating/cooling and PV's. The current assessment indicates as many as 10 out of 15 credits may be achievable, however 6 are assumed for caution.	High	High
Ene 02 – Energy Monitoring	Sub-metering of substantial energy uses, for a building such as the BRI with a large number of complex systems that need to be monitored will be significant. As such the metering requirements for this building will be over and above a typical installation and the costs and technicalities of individually metering by system and areas should be closely monitored. A metering strategy in-line with UCL's requirements would be advised here.	Medium	Medium
Ene 04 – Low and Zero Carbon Technologies	The scheme is currently targeting at least 10% reduction in Energy due to the GSHP and PV. This again is dependent the ground being suitable for extracting heating and cooling.	High	High
Mat 01 – Life Cycle Impacts	Materials selection will be a key design consideration for this project. As such materials not only need to be selected based on thermal performance and aesthetic, but additionally their environmental credentials. As such to achieve the credits materials may need to be procured from a more expensive supply chain and should be monitored.	Low	Medium
Wst 02 – Recycle Aggregates	At least 25% of the total aggregate specified must be obtained from recycled sources, either produced onsite or from a processing plant within a 30km radius of the site. Asset value and materials transformation will be maximised during design through detailed demolition and salvage planning. The ICE Demolition Protocol will be applied.	High	Medium
Le 01 – Site Selection	The degree of contamination and remedial measures require are unknown at this stage and once a soil investigation has determined the source and extent of pollution the costs can be more easily assessed. However the risks and costs involved are dependent on the degree of contamination.	Medium	Medium

10 CPG3 SUSTAINABILITY OBJECTIVES

The following sections are in response to the wider sustainability objectives outlined by Camden in CPG3. This should be read in conjunction with the previous BREEAM section and the Design and Assess Statement Submitted separately.

10.1 SUSTAINABILITY ASSESSMENT TOOLS

A BREEAM pre-assessment has been completed by a registered BREEAM AP assessor and the design is lodged with the BRE. As outlined in Section 9, the proposal meets an **Excellent** rating with a score of 81.30%. This meets Camden's overall requirement.

In addition, in accordance with CPG3 and Development Policy DP22 - Promoting sustainable design and construction, the following BREEAM related targets have also been achieved.

Table 10-1 Achievement of BREEAM sub-categories

BREEAM CATEGORY	MINIMUM STANDARD FOR CATEGORIES (% OF UN-WEIGHTED CREDITS)	BREEAM SCORE ACHIEVED	
Energy	60%	70.59%	✓
Water	60%	66.67%	✓
Materials	40%	76.92%	✓

10.2 WATER

Low water use fittings will be applied throughout the development and other objectives relating to metering, leak detection and sanitary shut off are all targeted. Landscaping will be developed with the appointment of an Ecologist to ensure the species specified do not have irrigation requirements.

- Low flow fittings will be used: Low flush WCs - 4 Litre/ use; Low flow showers - 8.7 Litre/min; Taps - 4 Litre / min and Spray taps
- Water meter to be installed with a pulsed output to enable connection to a Building Management System
- An audible leak detection system which is capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities water meter will be used.
- Solenoid values and presence detection will be fitted in each toilet area
- Landscaping will not require irrigation.
- A bio-diverse roof is proposed (refer to design and access statement). Use of rain water harvesting is currently not targeted due to lack of space for collection tank.

10.3 MATERIALS AND WASTE

Camden requires use of the waste hierarchy to prioritise reduction, re-use and recycling of materials. Materials should be sourced responsibly and ensure they are safe to health.

- Design proposal includes only Green Guide A+ or A rated materials for all major building elements and hard landscaping. Only exceptions are flooring elements.
- BREEAM requirements will be followed for sourcing all the construction products responsibly. Contractor will be responsible for providing all the necessary documentation.
- Site Waste Management Plan will be completed to reduce the construction waste. Target will be set < 7.5 m3 or <6.5 tonnes of construction waste for every 100 Sq.m area
- The building shall be designed in such a manner way that it is possible to achieve a total occupancy waste production figure of less than 80 kg per person per year.
- The WRAP Net Waste toolkit shall be used to generate construction waste forecasts and identify opportunities to reduce waste and increase recycled content of materials.

10.4 BROWN AND GREEN ROOFS

Camden requires that all developments should incorporate green and brown roofs.

The current design includes significant areas of green roofs and hanging planting. Reference should be made to the Design and Access Statement.

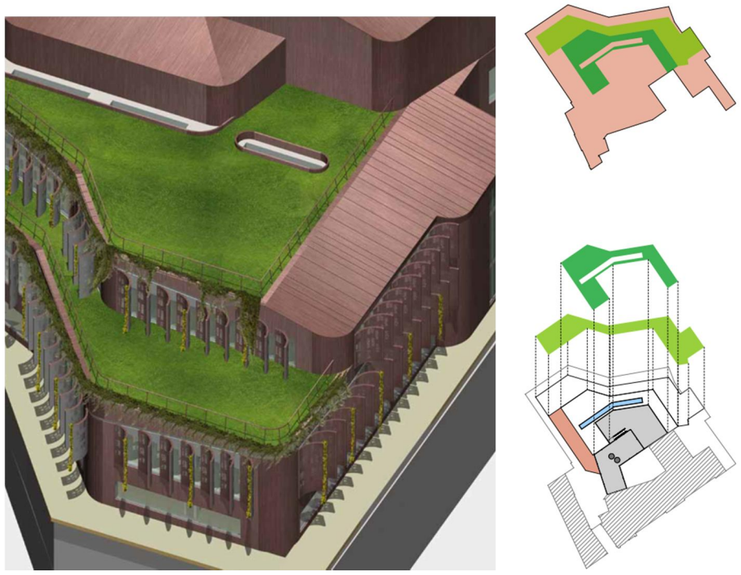

Figure 10-1 Proposed Green Roof (BMJ Architects)

10.5 FLOODING

Camden requires that all developments prevent or mitigate against flooding. All developments are expected to manage drainage and surface water.

- Drainage measures will ensure that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater for the developed site than it was for the pre-development site.
- It is proposed that the Green roof installation will be the primary source of rain water attenuation.

10.6 CLIMATE CHANGE

Camden requires that all development should consider how it can be occupied in the future when the weather will be different due to climate change. The following features are included:

- Mixed mode ventilation which will be able to change operational profiles to match changing climate conditions
- Significant green roofs and planting to aid evaporation and cooling effect
- Solar shading to limit high intensity solar heat gains
- High insulation U-values to limit conduction heat gains
- Use of ground cooling via GSHP that will retain high efficiency in warmer air temperatures
- Use of rain water attenuation in Green Roof
- Selection of drought resistant planning to both limit water needs and cope with drier summers
- Use of low water flow fittings

10.7 BIODIVERSITY

Camden requires that proposals should demonstrate how biodiversity considerations have been incorporated into the development, what mitigation measures will be included and what positive measures for enhancing biodiversity are planned

A detailed 'Extended Phase 1 Habitat Survey Report' has been completed by London Conservation Services in June 2013. The following points summarise the primary findings for the survey report:

- The courtyard, created in 2010, consisted of numerous raised wooden planters supporting a variety of exotic perennials, ferns, shrubs and young trees. A sparse ruderal flora was present in a few areas, mainly growing in the pebble substrate, with a few in the planters. Given the limited area of habitat, the site is unlikely to support rare species, diverse assemblages or large populations of species. The site was therefore judged to be of low ecological value.
- No statutory or non-statutory nature conservation designations apply to the site. The nearest statutory designated site for nature conservation is Camley Street Nature Park.
- The buildings had limited features with bat roosting potential, however, it is recommended that an internal and external building inspection is undertaken on the buildings to be demolished. This will provide a more detailed assessment to ascertain the presence/absence of bats.
- If bat roosting features are confirmed to be present by the internal and external building inspections, emergence/activity bat surveys will be required. Such surveys can only be undertaken May – September (the optimal season is from May to August). If bats are confirmed present a European Protected Species Mitigation Licence may be required. These may impose significant timing and methodological restrictions on works.
- The few young trees planted on the site have limited potential to support nesting bird species, given their immaturity. The only potential nesting habitat is provided by a climber located at the junction of the warehouse and brick building and a planter of bamboo. The site is of negligible potential to support any other protected species.
- Where the scope of works requires the removal of habitats suitable for breeding birds, any vegetation clearance (cutting to 150 mm above ground) and building alterations/demolition should be carried out outside of the main bird nesting season (March to August inclusive) to avoid any potential offences relating to nesting birds.
- Where this is not possible, a search for any nesting birds prior to vegetation clearance and building alterations/demolition must be undertaken by an experienced ecologist and, if any are found, the nests are to be protected until such time as the young have fledged and left the nest. If any nesting birds are found at any time during clearance works, work should stop immediately and an ecologist consulted. All nesting birds are protected under the Wildlife and Countryside Act 1981 (as amended).
- If any unexpected discoveries of other protected species are made on site during site clearance or other works, then all activities in the immediate vicinity should be halted and further advice sought from a suitably qualified ecologist.
- The Ecologist has concluded that if the recommendations of the Phase 1 Habitat Survey Report are followed, the current design may score 7 credits out of a possible 8 for BREEAM 2011 (LE02 to LE05). This is summarised as:
  - LE 02 – Ecological Value of the Site and Protection of Ecological Features (1 of1 credit available);
  - LE 03 – Mitigating Ecological Impact (2 of 2 credits available);
  - LE 04 – Enhancing Site Ecology (2 of 3 credits available);
  - LE 05 – Long-term impact on Biodiversity (2 of 2 credits available)

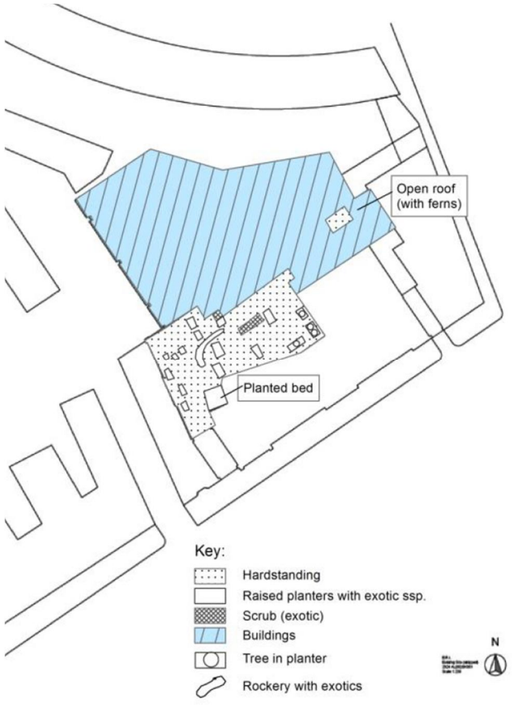

Figure 10-2 Extract from Extended Phase 1 Habitat Survey Report by London Conservation Services

10.8 FOOD GROWING

Camden requires that development proposals should consider the opportunities for food growing. Given the nature of the building and limited public access to site, food growing is not deemed appropriate.

Appendix A

BREEAM TRACKER DOCUMENT

UCL Bloomsbury Research Institute

BREEAM 2011 Pre-Assessment and Sustainability Summary

Issue	Date	Description	Prepared	Checked	Note
1.0	15/05/2013	For information	David Perris	David Williams	Initial issue
2.0	12/06/2013	For information	David Williams	-	Draft issue only - UCL SDS intergrated
3.0	02/08/2013	RIBA B Issue	David Perris	David Williams	UCL Sustainability objectives added
4.0	27/11/2014	Riba C Issue	Andrew Coles	David Williams	Score Updated
5.0	24/04/2015	Riba D Issue	Andrew Coles	David Williams	Score Updated

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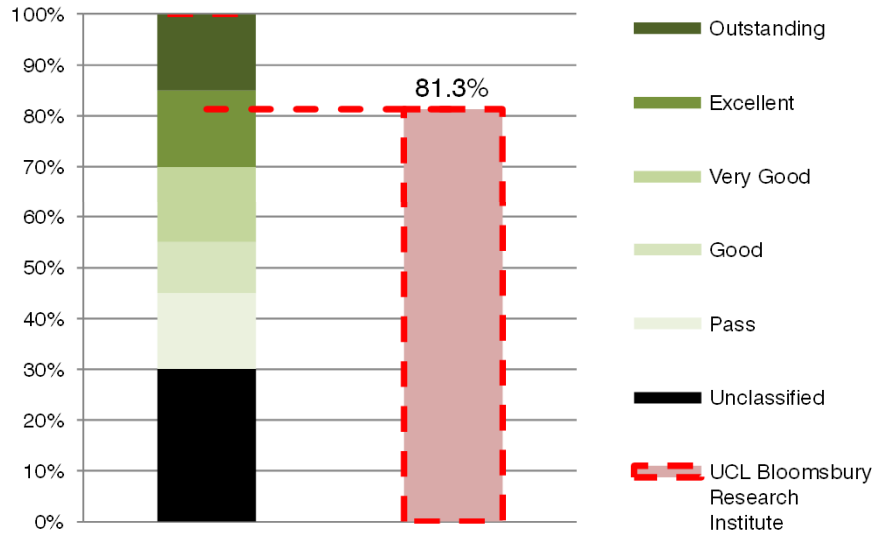
Introduction

This report summarises the BREEAM 2011 pre-assessment completed for the UCL Bloomsbury Research Institute. The BREEAM workshop was completed on the 9th May 2013 by Parsons Brickerhoff and the rest of the design team.

The pre-assessment has reviewed the current scheme against the BREEAM criteria and recorded the targeted ratings. The BREEAM rating bands and the current pre-assessment rating are shown bellow. An overall rating of **EXCELLENT** has been targeted.

The project has been registered with the BRE and given the following reference

BREEAM Rating	% Score
Outstanding	85
Excellent	70
Very Good	55
Good	45
Pass	30
Unclassified	<30



In addition to requiring achievement of credit percentages to reach a particular banding, the assessment also includes 'minimum standards' or prerequisite credits. The following table highlights these requirements, and shows the level achieved on this pre-assessment (blue outline).

BREEAM issue	Pass	Good	Very Good	Excellent	Outstanding
Man 01 - Sustainable Procurement	One	One	One	One	Two
Man 02 - Responsible Construction Practices	None	None	None	One	Two
Man 04 - Stakeholder Participation	None	None	None	One	One
Hea 01 - Visual Comfort	Criterion 1	Criterion 1	Criterion 1	Criterion 1	Criterion 1
Hea 04 - Water Quality	Criterion 1	Criterion 1	Criterion 1	Criterion 1	Criterion 1
Ene 01 - Reduction of CO2 Emissions	None	None	None	Six	Ten
Ene 02 - Energy Monitoring	None	None	One	One	One
Ene 04 - Low and Zero Carbon Technologies	None	None	None	One	One
Wat 01 - Water Consumption	None	One	One	One	Two
Wat 02 - Water Monitoring	None	Criterion 1	Criterion 1	Criterion 1	Criterion 1
Mat 03 - Responsible Sourcing of Materials	Criterion 3	Criterion 3	Criterion 3	Criterion 3	Criterion 3
Wst 01 - Construction Waste Management	None	None	None	None	One
Wst 03 - Operational Waste	None	None	None	One	One
LE 03 - Mitigating Ecological Impact	None	None	One	One	One

Clearly the level required to reach outstanding has been achieved, thereby achieving excellent as default.

The following pages outline the detail of each credit, along with the design stage evidence required to demonstrate compliance.

Credits outlined in **Red** are flagged up for particular attention during RIBA Stage A/B. This is generally because they are particularly onerous, or require action at this stage.

Those outlined in **Green** are additional credits that may be targeted to take the project to an outstanding level. They are however, not generally targeted for achievement at this stage.

UCL Sustainable Design Specification Response

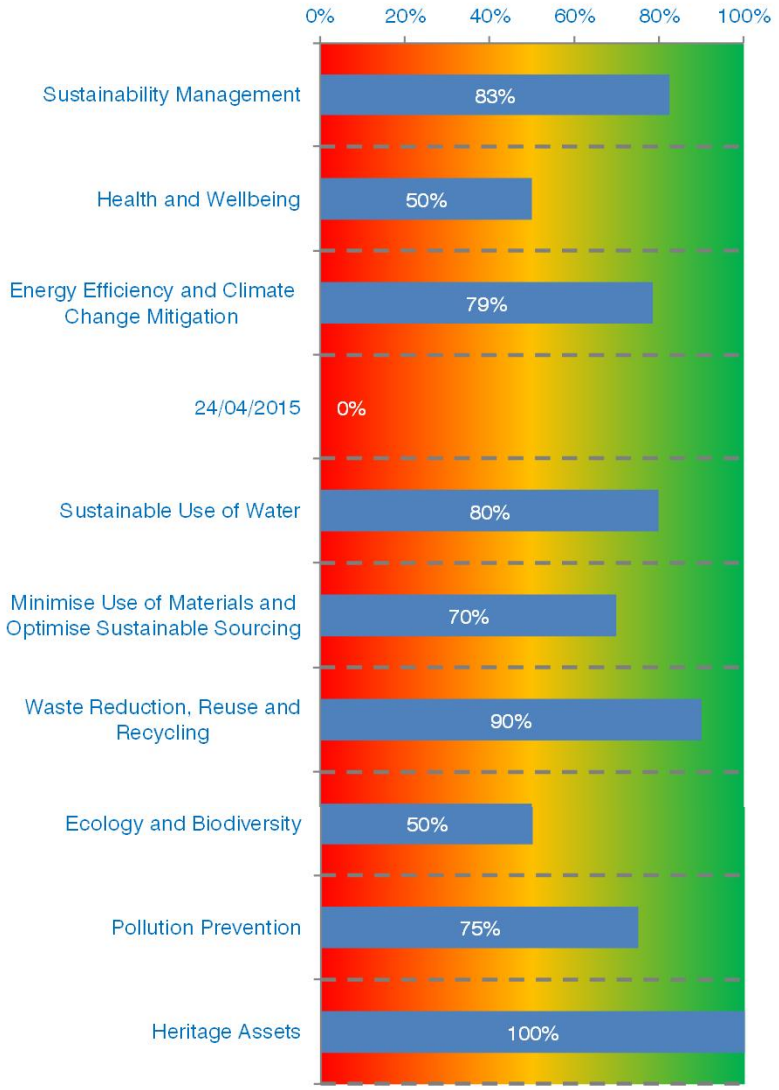
In addition to the BREEAM pre-assessment, a review of the design has also been completed against the UCL Sustainable Building Design Specification produced by the UCL Environmental Sustainability Team. The specification is an extension to the BREEAM process and includes challenging targets for carbon / energy performance and other environmental issues. In addition, the specification also includes areas of particular importance to UCL including stakeholder engagement and protection of heritage assets that are not well covered in BREEAM.

To assess compliance against this specification, we have completed an initially qualitative review where we have broken the specification down into separate criteria and aligned them with the primary BREEAM sections. This is simply to allow ease of comparison between standards. We have then added key 'credit gatekeepers' and highlighted the 'Headline' (or primary) issues, and stated whether the issue is considered in the design (D), construction (C) or operational phases (O).

To add a degree of quantitative review, and allow high level benchmarking of the project, we have developed a simple rating system. This is based on the level of certainty concerning achievement of the criteria. This is expressed with a Red, Amber, Green rating, which returns a score of 0%, 50% or 100% accordingly. To allow aggregation of the ratings, we have added a subjective weighting to each criteria. It is noted that this is an area of development that we are keen to explore with the UCL Environmental Sustainability Team.

The output of the review is a multi-criteria breakdown of performance expressed as a percentage score. We have taken the step not to further aggregate results to give a single 'end-point' rating, so that resolution of data is retained in the results. The criteria reviewed in this process are listed below. Final score is shown adjacent, and a complete breakdown, including weightings is provided in the main body of this document.

Sustainability Management
Health and Wellbeing
Energy Efficiency and Climate Change Mitigation
Enhancing Connectivity and Sustainable Transport
Sustainable Use of Water
Minimise Use of Materials and Optimise Sustainable Sourcing
Waste Reduction, Reuse and Recycling
Ecology and Biodiversity
Pollution Prevention
Heritage Assets



BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1	2	3	Weighting	Adjusted (%age)

Management (12%)									1	2	3
Man 1	Sustainable Procurement	Role responsibilities and training schedule be defined in accordance with BREEAM	1	1	1	Prelims document	Documents showing collaboration, meeting minutes, responsibility schedule & training schedule	Involvement of stakeholders in preparing project brief & design (Please use exact text as in BREEAM document) 1. Involvement of stakeholders from Stage B 2. Roles and responsibilities outlined 3. Schedule of training identified for relevant building occupiers (Please refer to the text in BREEAM document Page 28)			3
		BREEAM AP at Stage A/B	1	0	0	UCL	AP appointment letter Meeting Minutes AP progress reports	Agreement on BREEAM targets at early stages and appointment of BREEAM AP at stage A/B (Please refer to the text in BREEAM document Page 29)					
		BREEAM AP at Stage B-E	1	0	0	BREEAM AP	Meeting Minutes AP progress reports	BREEAM AP at stages A to E (Please refer to the text in BREEAM document Page 29)					
		BREEAM AP at Stage F-L	1	0	0	BREEAM AP	Meeting Minutes AP progress reports	BREEAM AP involvement from Stage F to completion (Please refer to the text in BREEAM document Page 29)					
		Thermographic Survey & Remedial work to any defects identified	1	1	1	Prelims document	Project Budget Programme of works Spec clause confirming thromographic survey	Thermographic survey will be carried out and any necessary remedial work will be completed before handover. This should be include in the prelims document or evidence to be submitted confirming that the necessary procedure will be completed prior occupation. (Please refer to the text in BREEAM document Page 29 & 30)		2	
		Compliant commissioning of Services	1	1	1	MEP	Commissioning responsibilities schedule	Evidence required confirming that the commissioning manager will be appointed and all the work to be completed according to BREEAM requirements (Please refer to the text in BREEAM document Page 30)			3
		Compliant seasonal commissioning of Services	1	1	1	MEP	Appointment letter or commissioning responsibilities schedule	Seasonal commissioning programme will be prepared outlining four commissioning at three months interval. Seasonal commissioning will include - Testing under full & partial load conditions - Interviews with building occupants - Re-commissioning of systems (Please refer to the text in BREEAM document Page 30)		2	
		24/04/2015	Riba D Issue	1	1	MEP	1. Evidence of either existing procedures or commitment to record compare and analyse relevant data 2. Commitment to make suitable adjustments where required 3. Commitment to provide aftercare support & training	This will include - collecting and comparing energy use for 12 months post-occupation - contracted team to provided aftercare, FM training and telephone support Please include this in specification document of prelims document. (Please refer to the text in BREEAM document Page 30)		2	
Man 2	Responsible Construction Practice	CCS Score	2	2	2	Prelims document UCL	Specification clause or formal letter confirming commitment to achieve a CCS score equal to above 32	Note that under the new CCP, a minimum score of 35 must be achieved, with a minimum score of 7 in any category.			3
Man 3	Construction Site	Site energy consumption metered/ monitored	1	1	1	Prelims document	Specification clause or formal letter confirming commitment to the BRE requirement	Contractor to monitor , record and display energy usage throughout the construction period. This aims at reducing energy use for construction activities.		2	

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level
UCL	UCL-wide target	Standard to be achieved			Headline issue?	Design team gatekeeper	Project design stage D C O	Design team comment	Certainty level 1 2 3 / Weighting / Adjusted (%age)
Man 3	Impacts	Site water consumption metered/ monitored	1	1	1	Prelims document	Specification clause or formal letter confirming commitment to the BRE requirement	Contractor to monitor , record and display water usage throughout the construction period. This aims at reducing water use for construction activities.	2
Man 3	Construction Site Impacts	Transport of construction material and waste measured/ monitored	1	1	1	Prelims document	Specification clause or formal letter confirming commitment to the BRE requirement	Contractor to monitor , record and display transportation energy usage throughout the construction period. This aims at reducing energy use for construction activities.	3
		Timber Procurement	1	1	1	Prelims document	Specification clause or formal letter confirming commitment to the BRE requirement	Confirmation that all site timber used on the project is sourced in accordance with the UK Government's Timber Procurement Policy.	1
		Principal contractor to operate Environmental Management System Contractor to adopt best practice pollution prevention policies & procedures	1	1	1	Prelims document	Specification clause or formal letter confirming commitment to the BRE requirement	Contractor should operate an Environmental management system (ISO14001 or equivalent system) Contractor is required to comply with and to adopt best practice in prevention of pollution. This includes - Water pollution - Dust pollution Evidence is required for all the above items.	3
Man 4	Stakeholder Participation	Appropriate level of consultation	1	1	1	Architects/ UCL	Specification clause or formal letter confirming commitment to the BRE requirement	Design team will carryout consultation with key stakeholders - During preparation of brief - Consultation programme will be prepared - Consolation feedback will be communicated to the stakeholders - Design amendments will be communicated to the stakeholders (Please refer to the text in BREEAM document Page 50-57)	2
		Inclusive and Accessible Design	1	1	1	Architects	Design and Access statement with compliance to BREEAM requirement	Access to the building & within the building will meet DDA requirements. Access strategy will be based on CABE recommendations on inclusive design. (Please refer to the text in BREEAM document Page 50-57)	3
		Building User Guide	1	1	1	Prelims document Contractor	Written commitment to produce Building User Guide with details of individual section as listed in BREEAM document	Easy to Use Building user guide will be produced covering all the headings listed under BREEAM SD5073 Document. (Please refer to the text in BREEAM document Page 50-57)	2
		Post occupancy evaluation and information disseminated	1	1	1	Prelims document Contractor	Specification clause or formal letter confirming commitment to the BRE requirement	Post occupancy evaluation will be carried out after 12 month period which will review sustainability performance, design performance and internal environment Also this information will be communicated to end users. (Please refer to the text in BREEAM document Page 50-57)	2

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
Man 5	Life Cycle cost and Service life planning		3	3	3	QS/ MEP	1. Feasibility stage LCC analysis 2. Details of alternative options considered and benefits of selected options. 3. Maintenance strategy has been developed, informed by the LCC analysis.	1. A Life Cycle Cost (LCC) analysis has been carried out based on the proposals developed during RIBA Work Stages C/D 2. The Life Cycle Cost analysis is: a. Conducted in accordance with the process outlined in PD156865:2008 19 (a supplement to BS ISO 15686-5:2008) b. Based on the concept design/design development proposals c. Completed for the following stages and uses a study period of 60 years, shown in real and discounted cash flow terms: i. Construction ii. Operation - includes as a minimum, utilities, cleaning, management costs iii. Maintenance - includes as a minimum, planned maintenance, replacements and repairs costs A critical appraisal has been completed at the feasibility stage of building procurement, covering the service life estimations and maintenance implications for different design options.	1		
	Total Score		21	19	19				2.25		

UCL Objectives

Sustainability Management											
Deliver high performing buildings and infrastructure using intelligent design to influence sustainable behaviours	All new build achieves BREEAM (New Construction) Excellent, or equivalent bespoke	The design team project manager shall implement an auditable systematic approach to ensure sustainability is addressed throughout the design and development process (from inception to post-occupancy review), including establishing baseline, use of benchmarks, reviewing progress and safeguarding agreed non-negotiable requirements against value engineering or cost reduction exercises during design, construction, commissioning and post occupancy (see CIBSE Guide L Sustainability).	yes	Design team and sustainability consultant	D	C		The design team to specify a building that meets the UCL Sustainability Guidelines. The prelims to specify actions for the principle contractor to take to help achieve the targets.	3	15%	15%
Considerate Construction		The Contractor shall register with the Considerate Constructors scheme (at least 6 weeks prior to start on site) and achieve the desired outcome against the 2013 code and checklist as defined by the Sustainability Assessment Scheme for the construction phase of the works. Achieve minimum 36 points under Considerate Constructors Scheme (2013)	yes	Prelims	D	C		Design team to specify registration with the Considerate Constructors Scheme and provide a target.	3	10%	10%
Whole Life Costing		The design of the new building elements (incl. M&E) and materials selected shall use Whole Life Costing methods (BSRIA) and Carbon Abatement Methodology (UCL). The project value including OpEx energy and water costs and not solely the CapEx cost will be used to evaluate project investment decisions.	yes	Cost consultant	D			To be completed during RIBA C. The team is committed to completing this going forward.	2	10%	5%
Design Quality Indicators		A Design Quality Indicator system or equivalent stakeholder review & evaluation process shall be used to evaluate the design and delivery.	yes	UCL/Architect	D			Design team to undertake consultation process with stakeholders. Several internal stakeholders have been consulted, and a list of external stakeholders has been compiled by planning consultant.	2	5%	3%
Site management		Monitor energy and water use during construction	yes	Prelims	D	C		Preliminaries to include requirements for monitoring of energy and water consumption by the site during construction.	2	5%	3%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
Design for long life, low maintenance, energy efficiency and climate change adaptability		• Design a flexible space, that is simple to maintain and adaptable to the effects of climate change (wind, temp & rainfall) • Design for future de-construction • Engage with end users to ensure maintainability and operability, especially cleaning at height. • Design out H&S risk through choice of materials and design	yes	All	D			To be reflected in design	2	15%	8%
Adaptation to Climate Change		The development must be designed and constructed so that it is adaptable to the effects of climate change (including heating, cooling, ventilation, soft landscaping and biodiversity).	yes	All	D			To be reflected in design - may adversly impact cooling load	2		
Environmental Management System (EMS)	UCL to achieve EcoCampus Platinum standard by mid-2014 & ISO 14001 by 2014	• Implement an environmental management system throughout design and construction. Incl. establishing benchmarks and targets, progress reviews, safeguarding of 'non-negotiable' sustainability measures • Identify non-negotiable measures early in design		UCL	D	C		UCL to advise additional measures	3	10%	10%
Design, plan and deliver accessible, functional and inclusive spaces in consultation with current and future users and other stakeholders		• Identify and consult with relevant stakeholders during the design process, using an appropriate and documented methodology • Provide consultation feedback to stakeholders • Track how the consultation process has influenced design and use	yes	UCL/Architect	D			Design team to undertake consultation process with stakeholders Initial consultation completed. Further consultation during RIBA C	3	15%	15%
Create highly accessible and navigable spaces, applying the principles of inclusive design		Apply principles of Inclusive Design • Design spaces that are DDA compliant and accessible by all potential users • The Access Statement addresses access to and throughout the development for all users, including disabled users, people of different age groups, gender, fitness etc. • Use learning from NSC	yes	Architect	D			Design to be DDA compliant. UCL to advise NSC learning.	3	15%	15%
								Average Risk	2.5	100%	83%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level
UCL	UCL-wide target	Standard to be achieved		Headline issue?	Design team gatekeeper	Project design stage D C O		Design team comment	Certainty level 1 2 3 / Weighting / Adjusted (%age)
Health and Wellbeing (15%)									1 2 3
Hea 01	Visual comfort	High frequency ballast for fluorescent lamps	Prerequisite			MEP	Design drawings or specification clause	All fluorescent lamps within the building will be fitted with high frequency ballast	
		appropriate daylight factor	2	0	0	MEP	Daylight calculation	First Credit: Higher education-Occupied spaces: 2% Daylight Factor over 60% of the room area Second Credit: Higher education-Occupied spaces: 2% Daylight Factor over 80% of the room area It will be difficult to achieve the credit due to the two basement levels.	
		Provide adequate glare control and view out for building users	1	0	0	Architects	Drawings showing occupant controlled blinds & View out from work areas.		
		Internal/external lights to be specified in accordance with CIBSE / British standards	1	1	1	MEP	Design drawings or specification clause (Conformation to CIBSE requirements)	Lighting will be designed according to - CIBSE Code for Lighting 2009 - CIBSE Lighting Guide 7 sections 3.3, 4.6, 4.7, 4.8 and 4.9 - External lighting will be designed according to BS5489-1:2003+A2:2008 Lighting of roads and public amenity areas - Zoning of light control in office areas	3
Hea 02	Indoor air quality	Produce air quality plan + Minimise source of internal pollution	1	0	1	MEP	This can be in the form of drawings or report and should cover the items in the next column	Air quality plan will be produced at early design stage. Reports and should cover the following. a. Removal of contaminant sources b. Dilution and control of contaminant sources c. Procedures for pre-occupancy flush out d. 3rd party testing and analysis. Air quality plan required to get other HEA02 credits. Unlikely to achieve as difficult to avoid external pollution.	outstanding only
		specification of Low VOC products	1	1	1	Prelims document Architects	Air quality plan report should contain spreadsheet showing details of the materials with low VOC	Specification will include low VOC products for at lest 5 elements listed on SD5073 document	3
		Formaldehyde and total VOC level to be measured post construction	1	1	1	Prelims document Architects	Air quality plan report should contain commitment to carry out necessary testing post construction.	Contractor will be required to comply with items listed below - Formaldehyde concentration level is measured post construction (but pre-occupancy) to make sure it is less than or equal to 100µg/m3 averaged over 30 minutes - The total volatile organic compound (TVOC) concentration is measured post construction (but pre-occupancy) and to make sure it is less than 300µg/m3 over 8 hours, in line with the Building Regulation requirements - If the reading is high then remedial work must be carried out to meet above standards.	3
		Building design to provide potential to natural ventilation	1	1	1	MEP	Relevant section/clauses of the building specification or contract	The design team will provide evidence for the item listed below. Either natural ventilation strategy provides adequate cross flow of air to maintain required thermal comfort conditions and ventilation rates. This is demonstrated using ventilation design tool types recommended by CIBSE AM10	2
		Fume cupboards to be manufactured and installed to appropriate standards	1	1	1	MEP	Specification	Fume cupboards to be manufactured and installed to BS EN 14175-2:2003, BS 7989:2001, and BS EN 12469:2000. Discharge velocity of exhaust stack to be more than 10 m/s.	3
		Level 2 and Level 3 labs to be to appropriate standards.	1	1	1	MEP	Specification	- Ventilation systems to be in accordance with ACDP Guidance -. Filters located outside main lab space for ease of cleaning. - Emergency button in each Level 2 & Level 3 lab. - Fume cupboard locations and stack heights in accordance with HMIP Tech Guidance Note D1 (Dispersion)	3

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level
UCL	UCL-wide target	Standard to be achieved			Headline issue?	Design team gatekeeper	Project design stage D / C / O	Design team comment	Certainty level 1 / 2 / 3 — Weighting — Adjusted (%age)
Hea 03	Thermal Comfort	Thermal modelling of the design	1	1	1	MEP	Relevant section/clauses of the building specification or contract or a formal letter from the design team	Design team will provide evidence to confirm that thermal comfort can be achieved in all occupied areas. Thermal modelling will been carried out using software in accordance with CIBSE AM11 Building Energy and Environmental Modelling.	3
Hea 03	Thermal Comfort	Modelling to inform development of a thermal zoning and control strategy	1	1	1	MEP	Thermal comfort strategy highlighting the points that have been considered and decisions taken accordingly	The thermal modelling analysis will be used for designing the temperature control strategy for the building and it's users.	3
Hea 04	Water Quality	Risk of water contamination in building services to be minimised. Provide fresh clean drinking water.	1	1	1	MEP	Relevant section/clauses of the building specification or contract Design drawings showing drinking water points and details of the occupancy of the building	Design will specify - water systems in the building in compliance with the control of legionella bacteria - Where humidification is required, a failsafe humidification system is provided - Chilled, mains-fed point-of-use water supply is provided in each staff kitchenette, or in a suitable location on each floor level	3
Hea 05	Acoustic Performance	Acoustic performance, including sound insulation, to meet appropriate standards for the purpose.	2	2	2	Acoustician (To be appointed in early stages)	Report /study from an acoustician Letter of appointment at appropriate stage Formal letter from design team regarding commitment and pre-completion testing	A suitably qualified acoustician (see Relevant definitions) is appointed by the client at pre-bid/briefing stage of the project to provide early design advice	2
		Safe access for pedestrians and cyclists	1	1	1		Drawings and specification details.	Dedicated cycle lanes are provided and have been designed and constructed in accordance with either: a. Local Transport Note 2/08 Cycle Infrastructure Design, Department of Transport, 2008. b. The National Cycle Network Guidelines and Practical Details – issue 2, Sustrans and the relevant parts of Appendix VI NCN Design and Construction Checklist 5	2

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
Hea 06	Safety & Security	Qualified security consultant to produce recommendations	1	1	1	Architects	Correspondence and a copy of the report/feedback from the ALO/CPDA/Security consultant Drawings and/or specifications confirming steps taken to implement the recommendations	Secure by Design standards are to be met with Architectural Liaison Officer or CPDA to advice on the design proposal. This advice should be considered while developing the design. Evidence is required against all the above stages.	3		
	Total Score		17	13	14				2.75		
UCL Objectives											
Health and Wellbeing											
Optimise daylight, temperature, natural ventilation acoustics and views		to be confirmed	yes	Architect/MEP	D			Design team to meet criteria where possible. Limitations of the site may make this awkward. Also surrounding building may be impacted by atrium. To be monitored	2	50%	25%
Promote healthy life-styles through design		• Create social networking spaces through design. • Embed landscaping and biodiversity (see UCL BAP) in to the design and maintenance to promote appreciation of nature. • Explore 'Living Lab' opportunities such as growing areas,	No	Architect	D			Limited opportunity for landscaping. Sustainable materials to be specified. Living lab to be explored, but likely to be limited	2	50%	25%
								Average Risk	2	100%	50%
Energy (19%)									1 2 3		
Ene 01	Reduction of CO2 Emissions	Minimise operation energy demand, consumption and CO2 emissions.	15	6	6	MEP Energy Consultants	A copy of the building regulations output document from the approved software A copy of the results from the BREEAM New construction 2011 Ene01 compliance checker website containing the ID number and EPRs	Design team is targeting a score of 10. However our target include the following - BREEAM Excellent level: Requires a CO2 parameter for the EPRNC calculation of 0.60. This is equivalent to a 40% improvement on the TER. However it is not clear as to how many credits can be achieved at this stage. This is to be updated as we progress through the design.	2		
Ene 02	Energy Monitoring	BMS or sub meter to monitor energy use from major building services system	1	1	1	MEP	Relevant section/clauses of the building specification or contract & design drawings	The following major energy consuming systems (where present) are monitored using either a Building Energy Management System (BEMS) a. Space Heating b. Domestic Hot Water c. Humidification d. Cooling e. Fans (major) f. Lighting g. Small Power h. Other major power usage	3		

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level
UCL	UCL-wide target	Standard to be achieved			Headline issue?	Design team gatekeeper	Project design stage D / C / O	Design team comment	Certainty level 1 / 2 / 3 — Weighting — Adjusted (%age)
		BMS or sub meter to monitor energy use from tenant/ building functions area	1	1	1	MEP	Relevant section/clauses of the building specification or contract & design drawings	An accessible BEMS sub-meters are provided covering the energy supply to relevant departments within the building/unit. Evidence required in the form of drawings/ specification clauses.	3
Ene 03	External Lighting	Energy-efficient light fittings for external lighting.	1	1	1	MEP	Relevant section/clauses of the building specification or contract & design drawings	All external light fittings for the building, access ways and pathways have a luminous efficacy within the range specified by SD 5073 document (Page 153)	3
Ene 04	Low & Zero Carbon technology	Feasibility study	2	2	2	Energy Consultants	Feasibility study report with relevant sections of specifications and drawings	A compliant feasibility study must be carried out by an energy specialist to establish the most appropriate local (on-site or near-site) low or zero carbon (LZC) energy source for the building/development.	3
		Target percentage net reduction in Operational stage CO2 emissions	2	1	2	Energy Consultants	Report, calculations/outputs from the manufacturers, suppliers, engineer or approved model software confirming the carbon savings A copy of the LCA study report/ findings	Design team is targeting 20% of the energy demand will be generated from renewable sources. However, this is likely to be particularly challenging, so 10% is currently indicated	2
		Free Cooling	1	1	1	MEP Energy Consultants	Formal letter from the design engineer confirming the free cooling strategy	Design team to confirm if any of the following cooling strategy is being used in the proposed scheme. a. Night-time cooling (requires fabric to have a high thermal mass) b. Ground coupled air cooling c. Displacement ventilation d. Ground water cooling e. Surface water cooling f. Evaporative cooling, direct or indirect g. Desiccant dehumidification and evaporative cooling, using waste heat h. Absorption cooling, using waste heat. i. The building does not require any form of cooling (i.e. naturally ventilated)	2
Ene 05	Energy Efficient Cold Storage	Energy efficient refrigeration systems.	2	2	2	MEP	Specification. Calculation of indirect CO2 emissions saved relative to baseline.	Refrigeration system components are on ECA ETPL. System is properly commissioned. Indirect CO2 savings are calculated.	3
Ene 06	Energy Efficient Transport system		2	2	2	MEP	Professional study/report of transportation analysis. Relevant sections of specification regarding appropriate lift system	Lift traffic analysis and design should recommend energy efficient lift system (Please see BREEAM document Page 172 for more details)	3

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)

Ene 07	Energy Efficient Laboratory System	Compliant fume cupboards	1	1	1	MEP	Specification.	Fume cupboards meet HEA 02. Fume cupboard design air flow rate is less than 160 l/s/m (if appropriate).	3		
		Energy-saving features	4	4	4	Full team	Specification/drawings.	Implement energy-saving features. Features must have at least 2% reduction or greater in energy use. Safety of occupants must not be compromised. - Energy -efficient fans - Further hood flow rate reductions - Grouping of similar activities - Energy recovery - heating and cooling - Free cooling - System matches load - Particle monitoring	3		
Ene 08	Energy Efficient Equipment		2	2	2	MEP	Relevant section/clauses of the building specification or contract & manufacturers details.	List below shows the functions/equipment that are or will be present within the assessed building. Of those highlighted functions will be responsible for the significant majority of unregulated energy consumption in the building. 1. Small power, plug in equipment - Energy Star rating 2. IT-intensive operating areas - Uses a natural ventilation and cooling strategy as standard, with forced ventilation only to be used when the internal temperature exceeds 20oC and active cooling only when the internal temperature exceeds 22oC.	2		
Ene 09	Drying Space		N/A	N/A	N/A						
	Total Score		34	24	25				2.67		

UCL Objectives

Energy Efficiency and Climate Change Mitigation											
Increase in-use energy efficiency and so minimise energy related carbon emissions	Contribute to achieving an absolute reduction in carbon emissions for buildings of 34% by 2020 (2006 baseline)	Total CO2 emissions (as total modelled operational) shall be reported as kg CO2/m²/year at project inception	yes	MEP	D		O	Design team to design building with as low carbon emissions as feasible. Part L model to be completed during RIBA C	3	10%	10%
		Detailed In-Use Energy report shall be produced at RIBA C.	yes	Energy consultant	D			To be completed	3	5%	5%
		The project shall achieve at least 6 CO2 credits under BREEAM Education 2008 or BREEAM(R), and at least 12 CO2 credits under BREEAM(NC)	yes	MEP/Energy	D			10 credits currently targeted. Further credits possible, but challenging. This will be closely monitored. Noted that UCL target is 12 credits. Achivment of this is likley to be problimatic, but will be monitored.	2	20%	10%
		The buildings shall be designed to adapt to future climates.	yes	MEP/UCL	D			Design conditions to be suitable for future climates. MEP to review with UCL regarding future time frame and risk	3	5%	5%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
CO2 Emission Target		Minimise in-use carbon emissions and energy demand through design a) for minor refurbishment through the selection of energy efficient systems. b) for major refurbishment so as to achieve a building emissions rating of at least a 25% improvement on the target emissions rating, excluding any benefit from CHP, as calculated under 2010 Building Regulations Part L c) for new build/part new build so as to achieve 40% improvement on the target emissions rating excluding any benefit from CHP, as calculated under 2010 Building Regulations Part L. This shall be expressed as kg/CO2/m3/year		MEP/Energy	D			10 BREEAM credits, aligns with and EPR(NC) [Energy Performance Ratio - New Construction] of 0.60 and a 405 reduction in CO2 emissions (2010 standard). Credit to be monitored	2	10%	5%
Reduce the final carbon footprint of the structure including its embodied energy		Undertake LCA for primary materials. Identify and prioritise material components and apply LCA to select the most sustainable option. (Adopt methodology evolving from framework suppliers sustainability group & NSC to prioritise materials)		Cost consultant/Energy	D			Primary materials to be identified during RIBA C.	2	2%	1%
Efficient Lighting		Energy Efficient lighting shall be specified from the criteria detailed on the Lighting Technology List	yes	MEP	D			To form part of MEP specification	3	2%	2%
Heat Recovery		Opportunities to maximise heat exchange potential and building operational efficiency shall be taken.		MEP	D			Large air volumes in labs make heat recovery appropriate. This must however be reviewed against cross-contamination risk.	2	2%	1%
Building Orientation		The design must demonstrate optimisation of the available site to enhance day lighting and natural ventilation potential for building users, whilst accommodating acoustic issues.		Architect/MEP	D			Constrained by size of site and 'right for light' envelope. Building zoning to optimise nat vent and daylight opertunities	2	2%	1%
Insulation		In order to maintain low values for heat loss low U value components must be used wherever remodelling of building elements takes place. The use of cavity construction shall be minimised where possible.		Architect/Energy consultant	D			To form part of architectural specification	3	2%	2%
High Thermal Mass		Use is to be made of the internal exposed high thermal mass of building structures to absorb heat energy. This high thermal mass is to be taken into account in the design of any heating / cooling and ventilating systems to reduce plant and system size.		MEP/Architect	D			Cooling method still to be agreed. Thermal mass unlikely to be appropriate in labs	2	2%	1%
Air Leakage		The amount of air leakage shall be minimised to reduce the building heating / cooling loads as per best practice in CIBSE TM23.		Architect	D	C		To form part of architectural specification	3	2%	2%
Energy Consumption of Appliances and Electric Motors		All electrical appliances and fixtures must be energy efficient and rated at a minimum A+. Electric motors for fans and pumps etc. above 1.0 kW shall be of the high efficiency and variable speed with separate individual inverter controls. All systems and fittings shall be from the Energy Technology List.		UCL/Architect/MEP	D			To form part of MEP specification	3	2%	2%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
Ventilation Efficiency		The type of ventilation used will (subject to production of a thermal model for major refurbishments or new build projects), aim to achieve the best system in terms of comfort and low energy consumption. If thermal modelling indicates the need for heating and cooling, mixed mode mechanical ventilation using the building mass is the preferred option. Efficient air to air heat recovery methods shall be used with a minimum efficiency of > 85%. Where natural passive ventilation is utilised, cross ventilation low or stack ventilation shall be used as the highest priority; taking into account location and winter operation to ensure no cold draughts are introduced into occupied spaces. In consideration of winter conditions supply and extract air ventilation systems shall incorporate high efficiency air to air heat recovery methods through both passive and mechanical means such as thermal wheels of phase change applications. Opportunities to avoid Direct Expansion cooling are to be sought for office or comfort type applications.		MEP	D			Natural ventilation inappropriate for Labs. Scheme seeks to exploit building features (e.g. narrow plan depth) to improve ventilation effectiveness and reduce cooling needs	2	5%	3%
Plant Energy Usage		Modular plant and equipment such as boilers, pumps etc. shall be sized to operate at maximum efficiency and installed to enable plant to be turned down to match building loads in and out of season.		MEP	D			To form part of MEP specification	3	2%	2%
Site Renewables		The designer shall actively investigate renewable energy technologies such as, solar thermal for domestic hot water heating etc. Installations using biofuel oil derived from crops are unacceptable.		Energy/UCL/Architect/MEP	D			Feasibility report to be completed during RIBA C. Local connection to district heat and/or CHP to be prioritised. Investigation of local schemes underway (including Cartwight Gardens and Bloomsbury Heat and Power network).	3	2%	2%
Natural Day Lighting		Window and glazing design is to be such that maximum day lighting is provided to the occupied areas whilst solar gain is reduced by shadowing and natural shading forms of solar shading, external blinds (brise soleil) and solar control glazing with heat reflective properties and/or internal mid pane blinds. Light tubes, light wells winter gardens etc. shall be provided to provide daylight in building interiors, corridors, wc's etc., within building constraints imposed by heritage listing where appropriate. Daylight factors of 5% (minimum of 2%) are to be achieved with due respect to life cycle costing.		Architect	D			Options limited due to site constrraints. Options being investigated. Circular lightwell proposed to take light from atrium area down to basement level.	3	6%	6%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
Artificial Lighting		Internal lighting designs shall minimise energy usage and shall use dedicated energy efficient fittings (minimum T5 and LED) selected from the ECA Energy Technology List with automatic (timed, daylight and presence) lighting controls in all areas. Off switches shall be provided to all individual rooms. Lighting controls shall ensure that excess artificial lighting is eliminated through design. External space lighting shall only use energy efficient fittings selected from the ECA Energy Technology List. Security lights shall be LED or approved energy equivalent and fitted with PIR and daylight sensors. All other external lights shall use energy efficient fittings with appropriate daylight shut off devices. Consideration of ACPO Secured by Design shall be incorporated into external lighting to enhance personal and building security. External light pollution shall be minimised by design.		MEP	D			To form part of MEP specification	3	2%	2%
Building Management System		If appropriate for the works being undertaken, a fully tested and commissioned Building Management System (BMS) shall be provided to ensure that building systems can be closely controlled and monitored. Systems will be commissioned in both the heating and cooling seasons and on an annual basis to further improve performance. Zones shall be generally based on a floor-by-floor basis (or by department as appropriate) If installed, the BMS shall be connected/integrated into the UCL building management network. There shall be adequate space temperature sensors installed to cover all elevations of the building (a minimum of two per zone) to give an accurate space temperature for each of the associated zones. Variable temperature circuits will be compensated to outside air temperature.		MEP	D			To form part of MEP specification	3	2%	2%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
Metering		Each floor shall have its own set of utility meters. Where there is zone control each zone will have a meter including heat meters. Electricity meters shall meter lighting and power for each floor and each zone. Newly installed large plant items shall be metered separately. Monitoring shall be 24 hours a day 365 days a year. All meters shall have a volt free pulse output (or equivalent technology). This output is to be directly compatible with the UCL BMS system digital inputs and (either safeguarded or) transferred to the BMS energy dashboard. All meters shall have a plotting channel set up to record the meter pulses. Where installed, all space, flow, return and outside air temperature sensors shall be set up to record historical temperatures within the BMS.		MEP	D			To form part of MEP specification	3	2%	2%
User Controls		The building shall allow for non-transient building users to have some control over their internal environment. This may be via opening windows in summer, or user controls on chilled air units. Users shall in general be able to control their internal environment as set out below. [a] Temperature: +/- 2 oC either side of the BMS set point [b] Ventilation/air quality +/- 10% either side of the BMS set point.		MEP	D			To form part of MEP specification	3	2%	2%
Plant Efficiencies and Zoning		Plant equipment and engineering systems must be specified and designed to operate efficiently under part loads. Typically plant and equipment must operate at an average efficiency of no less than 87% when at 25% of full load capacity. Where appropriate, zoning of the environmental building systems is to be maximised such that small areas of the building can operate efficiently independently.		MEP	D			To form part of MEP specification	3	2%	2%
Internal Design Conditions		From 31 May to 30 September and from 0900 to 1700, Monday to Friday, there should be no more than 120 hours when the internal air temperature in the building rises above 28oC. Note: this may be challenged depending on the design or use.		Energy/MEP	D			This analysis is appropriate to naturally ventilated spaces only.	3	5%	5%
External Design Conditions		CIBSE degree day data for Region to be used in design.		MEP/Energy	D			Only appropriate for high level calculations. CIBSE Test Reference Years and Design Summer Years to be used in thermal modelling	3	2%	2%
Plant Selection and Design		The design and choice of equipment shall be selected to maximise the possibility of external funding/discounts. Grant funding may be available during the course of development, design and construction from such sources as Enhanced Capital Allowances, Carbon Trust, DETR, HEFCE etc. The project team shall provide information and submissions to support the application process.		MEP	D	C		Opportunities to be investigated during design development. To form part of MEP specification	3	2%	2%
								Average Risk	2.72	100%	79%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1	2	3	Weighting	Adjusted (%age)

Transport (8%)													
									1	2	3		
Tra 01	Public Transport Accessibility		5	5	5	BREEAM Assessor	No additional evidence is required.	Site has very good public transport links.			3		
Tra 02	Proximity to amenities		1	1	1	Architect	Drawing showing following facilities and the walking distance from the main entrance.	Drawing showing following facilities and the walking distance from the main entrance. - Library - Food/ Grocery shop - Post Box - Cash machine - Student Union (Other available options are Leisure/ Sport centre and GP surgery)			3		
Tra 03	Cyclist Facilities	Cycle storage	1	1	1	Architect	Drawings & Specification clauses	Dedicated cycle storage is provided with compliant cycle racks (10 no) Required no of compliant cycle store will depend on the number of students and staff. Current student and staff number is approximately 1100. 1-500 users @ 1 space per 10 users = 50 spaces 501 – 1000 @ 1 space per 15 users = 34 spaces 1001 – @ 1 space per 20 users = 5 spaces		2			
		Cyclists facilities	1	1	1	Architect		This credit can be targeted only if the first credit is awarded.		2			
Tra 04	Maximum Car Parking Capacity		2	2	2	Architect / UCL	Letter confirming occupancy of the building and number of parking spaces provided. Site plan showing parking available parking spaces	Parking to be calculated as one space for every 25 users to achieve one credit and one space for every 30 users to achieve two credits. No car parking to be provided.			3		
Tra 05	Travel Plan		1	1	1	UCL	Copy of the travel plan Copy of the site specific transport survey/ assessment Design drawings showing examples of the measures taken	Site specific travel plan will be prepared as outlined in SD5073 document. Site Specific Travel plan has to be prepared covering all the items listed in BREEAM document.			3		
	Total Score		11	11	11						2.67		

UCL Objectives

Enhancing Connectivity and Sustainable Transport													
Reducing the Need for Travel		Ensure video conferencing facilities are incorporated into the design. Ensure broadband provision & Wi-Fi is made available throughout the development		MEP/Architect	D			To form part of MEP specification. Architect to provide suitable space			3	10%	10%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
Walking Routes		The design should promote low risk, safe and secure access to and use of the building. All walking surfaces shall be non-slip with a rating of R11 or greater (DIN 51130). All walking routes associated with the building shall be well lit, footpaths should be lit to at least 10 Lux average and footpaths adjacent to roads should be lit to at least 20 Lux average, whilst minimising light pollution. Solar powered 'Help stations' may be provided in external areas to provide a direct link to security. CCTV must cover all footpaths.		Architect/MEP	D			To form part of Architect and MEP specification.	3	30%	30%
Cycling Routes and Facilities		Clear signage for cycle parking facilities shall be provided Showers with changing areas shall be provided for the use of cyclists and walkers. Secure long stay cycle storage shall be either incorporated into the development or addressed through the UCL-wide cycle park strategy, in line with best practice.		Architect	D			Cycle storage and facilities currently proposed but may be difficult to achive BREEAM standards.	1	10%	0%
DDA / Parking		The design should be DDA compliant and provide parking close to the building for disabled building users.		Architect	D			Building will be DDA compliant. No parking provided on site.	2	10%	5%
Provide connectivity that promotes walking, cycling and the use of public transport	UCL Green Travel Plan 2013	Project design in line with UCL Travel Plan. • Consider requirements of the UCL Travel Plan (2013) in the design • Use technology to provide information for cyclists and public transport users, such info hubs on availability of Barclays Bike Hire, Train and tube times etc. • Ensure cycling connectivity with other areas by considering opportunities beyond the development boundary (e.g. installation of cycle racks at key access routes)		UCL/architect	D			architect to review travel plan with UCL. Potential for remote cycle storage to be reviewed	2	20%	10%
Minimise deliveries during construction and use	10% reduction in delivery vehicles on campus by 2014 (based on 2011 baseline)	Use Construction Consolidation Logistics Centres • Optimise design and engage with supply chain to take account of (potential) use of construction consolidation logistics centres (e.g. off-site prefabrication, reverse logistics, Just-In-Time deliveries)		Architect/UCL	D	C		Likely to be inappropriate as building is off main campus. Just in time and modular construction may be appropriate (and beneficial due to restricted site area)	2	20%	10%
								Average Risk	2.17	100%	65%

Water (6%)	1 2 3

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level
UCL	UCL-wide target	Standard to be achieved			Headline issue?	Design team gatekeeper	Project design stage D / C / O	Design team comment	Certainty level 1 / 2 / 3 — Weighting — Adjusted (%age)
Wat 01	Water Consumption	Baseline Level to Level 5+	5	2	3	Architect	Completed WAT01 calculator Relevant section/ clauses of the specification document Technical info/ drawings showing details of the sanitary components and any rain water or grey water system proposed	Low flush WCs - 4 Litre/ use Low flow showers - 8.7 Litre/min Taps - 4 Litre / min and Spray taps	3
Wat 02	Water Monitoring		1	1	1	MEP	Relevant clauses/ sections of the building specification Design drawings	Water meter to be installed for every building at all sites. Also Each meter has a pulsed output to enable connection to a Building Management System	3
Wat 03	Water Leak Detection and prevention	Mains water leak detection system	1	1	1	MEP	Relevant clauses/ sections of the building specification Design drawings Manufacturers details	An audible leak detection system which is capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities water meter.	3
		Flow control devices installed in each sanitary area/ facility	1	1	1	MEP	Relevant clauses/ sections of the building specification Design drawings Manufacturers details	Solenoid values and presence detection will be fitted in each toilet area	3
Wat 04	Water Efficient Equipments		1	1	1	MEP	Specification	Landscaping will not require irrigation.	3
	Total Score		9	6	7				3

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1	2	3	Weighting	Adjusted (%age)
UCL Objectives													
Sustainable Use of Water													
Improving Water Efficiency	contribute to achieving an absolute reduction in water consumption of 10% (2010 baseline)	In context of the water reduction target of 10%, the total water use for the building shall be aligned to HEEPI best practice for building type (<4m3/person/year for offices/teaching facilities/dry labs and <9m3/person/year for wet labs). This is to be achieved through the use of dual flush WCs, low flow taps, automatic flow regulators, the design of systems and/or the use of waterless and low water consuming technologies and laboratory equipment. Products from the ECA Water Technology List shall be used. When procuring specialist equipment not listed on the WTL, water and energy efficiency shall be considered in determining the best product solution. Generally water storage shall be minimised to ensure compliance with HSC Approved Code of Practice L8 (Legionella)	yes	MEP/Architect	D			To be reflected in Architect and MEP specification.			3	50%	50%
Rainwater Harvesting & Grey water Recycling		The development shall consider roof rain water harvesting or grey water recycling for grey water uses such as the flushing of WCs, with due respect to life cycle costing.		MEP	D			Water recycling will not be provided.	1			10%	0%
Flood Risk from Surface Runoff		The development shall avoid surface run off through the use of sustainable drainage principles (SUDS) in the design of all surface water storage and discharges.		MEP/Civil	D			Existing systems to be reused		2		20%	10%
Flood Risk from Water Courses		The development must avoid increasing the risk of flooding from water courses and minimise the risk of surface and ground water pollution.		Civil	D			Low risk due to location			3	20%	20%
								Average Risk		2.25		100%	80%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1	2	3	Weighting	Adjusted (%age)

Materials (12.5%)									1	2	3
Mat 01	Life Cycle Impacts		6	5	5	Architect	1. Spreadsheet providing specification with detailed description of each material and quantities of each element. 2. Design drawings 3. Output from BREEAM Mat 01 calculator including Green Guide rating and element numbers	Design proposal includes only Green Guide A+ or A rated materials for all major building elements. Only exceptions are flooring elements. Preliminary investigation has indicated that 5 credits can be achieved in this section.		2	
Mat 02	Hard Landscaping and Boundary Protection		1	1	1	Architect	1. Spreadsheet providing specification with detailed description of each material and quantities of each element. 2. Design drawings	Design proposal should include Green Guide A+ or A rated materials (at least 80% of all hard landscaping and boundary protection)			3
Mat 03	Responsible Sourcing		3	1	1	QS - Prelims document	1. Design plans and specification confirming building elements and details of materials 2. Output from BREEAM Mat 03 Calculator	Contract clause to be included as part of the tender documents requiring to source all the construction products responsibly. Contractor will be responsible for providing all the necessary documentation.		2	
Mat 04	Insulation	Building targeting insulating index of 2 or more	1	1	1	Architect MEP	1. Spreadsheet providing specification and quantities of insulation. This should include both building insulation and for services. 2. Design drawings 3. Output from BREEAM Mat 06 calculator including Green Guide rating and element numbers	Green guide A rated insulation material must be specified.			3
		Insulating material to be responsibly sourced	1	1	1	MEP		At least 80% of insulation materials must have BES 6001 certification, or have an EMS covering key process and supply chain extraction process, e.g. manufacture and principal polymer production,			3
Mat 05	Designing for Robustness		1	1	1	Architect	Design drawings & specification along with a note or letter explaining how vulnerable areas have been protected in the design.	Design team will specify finishes and boundary protection in vulnerable areas.		2	
	Total Score		13	10	10						2.5

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
UCL Objectives											
Minimise Use of Materials and Optimise Sustainable Sourcing											
Impact of Materials	Achieve Level 5 in the Sustainable Procurement Flexible Framework by 2014	All main building elements shall obtain a minimum A rating from the BRE Green Guide to Specification (www.greenbooklive.com). In addition low or zero formaldehyde products shall be specified; PVC products shall be avoided where suitable alternatives exist.		Architect	D			To form part of Architect's specification	2	20%	10%
Minimising the Use of materials		All developments shall demonstrate the steps taken to reduce the quantity of materials used in the design and construction of the buildings. WRAP Design out Waste Principles must be applied to the design. A Site Waste Management Plan must be produced during the design stage and shall include reduce/reuse/recycling targets that incorporate best practice.		Architect	D	C		SWMP to be produced	3	20%	20%
Recycled Content		The project shall consider the use of WRAP Net Waste toolkit for assessing the recycled content of the development. A value of 40% recycled content by value is desirable.		Architect / prelims doc	D	C		To be reflected in architects and structural specification, as well as prelims document	2	15%	8%
Sourcing Materials produced locally		Where feasible, the development shall source at least 40% of its building materials from local suppliers. All contractors/suppliers shall minimise emissions from transport when sourcing materials. Contractors shall keep a comprehensive and detailed record of where all materials are source, and provide this data to UCL as required so at to enable the calculation of scope 3 emissions associated with construction (water, waste, procurement, and transport). HEFCE guidance on data capture is available.		Architect / prelims doc	D	C		To be reflected in Prelims Document	2	5%	3%
Environmental Impact of Materials		All new main building elements (where relevant) must achieve an A rating from the BRE Green Guide to Specification, including. • Roofs • External walls • Internal walls and partitions • Floors • Windows • External surfacing • Boundary protection In addition low or zero formaldehyde products shall be specified; PVC products shall be avoided where suitable alternatives exist.		Architect	D			Design team to specify sustainable materials.	2	15%	8%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
Sourcing of Basic Building Elements		The majority of materials in the following basic building elements (where relevant) must be responsibly sourced and hold an appropriate accreditation e.g. FSC/PEFC for timber, BES 6001. • Ground floor • Upper floors • Roof • External walls • Internal walls • Staircases		Architect	D	C		Design team to specify responsibly sourced materials where possible.	3	10%	10%
Sourcing of Secondary Building and Finishing Elements		The majority of materials in the secondary building and finishing elements (where relevant) shall be responsibly sourced and hold an appropriate accreditation e.g. FSC/PEFC for timber, BES 600; and shall not require the use of chemical products or harsh practices for cleaning and maintenance. In addition low or zero formaldehyde products shall be specified; PVC products shall be avoided where suitable alternatives exist. These include: • Stairs and associated ancillaries • Windows and associated ancillaries • External and internal doors and sub frames • Skirtings • Panelling • Fitted Furniture • Facias • Any other significant use		Architect	D	C		Design team to specify responsibly sourced materials where possible.	3	10%	10%
Designing for End of Building Life		The design of the development must take into account 'end of life' so that the building may be easily refurbished / adapted /decommissioned /demolished and the materials reused (see CIRIA Design for Deconstruction)		Architect/MEP	D			To be considered during design development	2	5%	3%
								Average Risk	2.375	100%	70%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1	2	3	Weighting	Adjusted (%age)

Waste (7.5%)														1	2	3
Wst 01	Construction Waste Management	SWMP	3	2	2	QS - Prelims document	1. Compliant Site Waste Management Plan 2. Pre demolition audit 3. Relevant specification clause or contract documentation	Contract clause to be included as part of the tender documents requiring to reduce the construction waste. Target will be set as below - Construction waste generated for every 100 Sq.m area - < 7.5 m3 or <6.5 tonnes			3		
		Diversion of resources from landfill	1	1	1	QS - Prelims document	1. Compliant Site Waste Management Plan 2. Pre demolition audit 3. Relevant specification clause or contract documentation	Non-demolition waste: At least 70% by volume or 80% by weight is diverted from landfill Demolition waste: At least 80% by volume or 90% by weight is diverted from landfill. Exemplary credit not available unless construction waste generated is less than 1.9 t/100 m2.			3		
Wst 02	Recycled Aggregates		1	1	1	QS - Prelims document/ Structures	Relevant specification clause or contract documentation Design team calculations showing total requirement and percentage of the recycled aggregates	Contract clause to be included as part of the tender documents. At least 25% of the total aggregate required must be obtained from recycled sources.			2		
Wst 03	Operational Waste		1	1	1	UCL	Provide drawings showing dedicated recycling area. Include calculation of area based on BREEAM requirement.	Suitable space provided for recycling (approx 2 m2 per 1000 m2 net floor area). Suitable hazardous waste disposal. Waste compactor to be provided.			3		
Wst 04	Speculative Floor & Ceiling Finishes		N/A		0								
	Total Score		6	5	5						2.75		

UCL Objectives

Waste Reduction, Reuse and Recycling													
Reducing Waste Creation	85% recycling of operational wastes by 2015	All new fixtures, fittings and internal contents shall be latest models with no foreseeable reason for upgrading. All new building contents shall be predicted to have at least a 25 year life span. 'Design out Waste' Principles shall be included in the design process and captured at RIBA B.		Architect/UCL	D		O	To be reflected in specification	3			20%	20%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)
Total Waste Production		The building shall be designed in such a manner way that it is possible to achieve a total occupancy waste production figure of less than 80 kg per person per year. The WRAP Net Waste toolkit shall be used to generate construction waste forecasts and identify opportunities to reduce waste and increase recycled content of materials.		Architect/UCL	D		O	Design team to provide suitable recycling facilities. Building User Guide to be provided to help promote recycling.	2	20%	10%
Diverting Waste from Landfill		The building shall be designed so the following can be achieved: • The recycling infrastructure shall allow at least 90% of occupancy waste to be easily diverted from disposal • Provision of space for waste storage and recycling areas shall be included within the design, enabling ease of access for cleaning and waste logistics. • No individual office bins shall be supplied. • All outside bin storage facilities shall enable waste segregation, be secure and provide adequate access for waste collection vehicles • High velocity energy efficient hand dryers (without heating coils and with energy consumption <8A and standby power at <3W) shall be supplied to washroom and toilet areas. No paper towel systems shall be supplied to these areas. Options for paper towel alternatives should be explored for kitchen areas.		Architect/UCL	D		O	Design team to provide suitable recycling facilities. Building User Guide to be provided to help promote recycling.	3	20%	20%
Re-Using Recycled Materials		The designer shall utilise the WRAP Net Waste Toolkit achieve at least 40% by value recycled products (desirable determined by products to be procured as part of the refurbishment).		Architect	D			To form part of Architect's specification and completed during design development	3	20%	20%
Site Waste Management Plan		SWMP completed during construction		Prelims document		C		To form part of Prelims Document	3	20%	20%
								Average Risk	2.8	100%	90%

Land Use and Ecology (10%)									1 2 3
LE 01	Site Selection	Previously developed land	1	1	1	Architect	Existing and proposed drawings with calculations of areas demonstrating 75% of the building footprint was previously developed land	Building is on existing site. Therefore this credit can be awarded. As evidence please provide existing and proposed floor plans & elevation drawings to demonstrate compliance.	3
		Land contamination and remedial work	1	1	1	Architect	Soil investigation report.	A degree of contamination has been found and remedial actions will be taken to remove the contamination risk.	2

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1 2 3	Weighting	Adjusted (%age)

LE 02	Ecological Value of Site and Protection of Ecological Features		1	1	1	Ecologist	Completed table 30 from the design team OR A suitably qualified ecologist's appraisal	Ecologist confirmed site of low ecological value. This is however subject to bat, bird and protected species survey prior to work on site	2	
LE 03	Mitigating Ecological Impact		2	2	2	Ecologist	Calculation of ecological impact using LE03/LE04 calculator	Either a site evaluation by design team is carried out using BREEAM LE03/LE04 calculator OR a suitably qualified ecologist will be appointed to carryout site specific recommendations. Ecologist has advised 2 of 2 can be achieved here	3	
LE 04	Enhancing Site Ecology		3	2	2	Ecologist	Ecologists recommendations to enhance the site wide ecology.	Ecologist has advised that 2 credits are achievable. Third credit not possible if Atrium is constructed, due to loss of external space	2	
LE 05	Long-term Impact on Biodiversity		2	2	2	Ecologist/ Contractor	Ecologist, specification clauses.	Ecologist develops landscape management plan, confirms that all relevant UK & EU legislation will be complied with. A number of additional measures are taken (depends how many apply), including site actions by principal contractor to minimise habitat disturbance, provision of a new habitat, etc. Ecologist has advised both credits are achievable.	2	
	Total Score		10	9	9				2.333333333	

UCL Objectives

Ecology and Biodiversity											
Integrate and enhance biodiversity through design, operation and maintenance	Introduce at least 50m2 of new, biodiverse urban space by 2014	• Incorporate opportunities to enhance biodiversity and improve well-being through green spaces, within the development. • Ensure that the design aligns with the UCL Biodiversity Action Plan (in development – phase 1 survey available)		Ecological	D			Limited opportunity given the site, but any provision will improve on the current provision. Recommendations will be in line with UCL Biodiversity action plan and learning from project glimmer. Ecologist apointed to provide phase 1 survey report.	2	100%	50%
								Average Risk	2	100%	50%

Pollution (10%)									1 2 3		
Pol 01	Impact of Refrigerants	No refrigerant proposed or refrigerant with GWP <10	2	1	1	MEP	Formal letter from the design team confirming absence of refrigerant	Systems using refrigerants will have low leakage losses.	2		
		Refrigerant leak detection system	1	0	0	MEP	Formal letter from the design team confirming specification of leak detection system or absence of refrigerant	Unlikely that systems will have refrigerant leak detection and automatic pump down.			
Pol 02	NOx Emissions		3	2	2	MEP	As evidence please provide NOx emission details of proposed boilers with calculations	Two credits can be awarded provided boiler (space heating) has a NOx emission of <70 mg/kwh. Note that heat pumps usually use 'dirty' mains power. CHP calcs allow for CO2 displaced from the grid.	2		

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level
UCL	UCL-wide target	Standard to be achieved			Headline issue?	Design team gatekeeper	Project design stage D / C / O	Design team comment	Certainty level 1 / 2 / 3 — Weighting — Adjusted (%age)
Pol 03	Surface Water Run off	Flood risk (low to High) Compliant Flood risk assessment	2	2	2	Environmental	Short (One page) flood risk assessment Flood zone maps from environmental agency	Site specific assessment is required along with environmental agency maps. Site is probably in low risk area. Therefore two credits can be awarded.	3
		Surface water run off	1	1	1	Civil/PH	1. Statement from appropriate consultant confirming that they are qualified in line with BREEAM requirements 2. Consultants report demonstrating compliance with BREEAM requirements	An appropriate consultant to produce drainage measures to ensure that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater for the developed site than it was for the pre-development site. This should comply at the 1 year and 100 year return period events. (Please refer to text on BREEAM document Page 383)	3
			1	1	1	Civil/PH	1. Statement from appropriate consultant confirming that they are qualified in line with BREEAM requirements 2. Consultants report demonstrating compliance with BREEAM requirements	Where flooding of property will not occur in the event of local drainage system failure (caused either by extreme rainfall or a lack of maintenance), the post development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development	3
Pol 03	Surface Water Run off	Site designed to minimise watercourse pollution in accordance with BREEAM criteria	1	1	1	Civil/PH	1. Consultants report detailing the design specifications, calculations and drawings to support the 5mm rainfall discharge criteria 2. Design drawings, specification clauses 3. Letter from the design team confirming the compliance with the BREEAM requirements	Specification of Sustainable Drainage Systems (SUDs) or source control systems such as permeable surfaces or infiltration trenches where run-off drains are in areas with a relatively low risk source of watercourse pollution. Specification of oil/petrol separators (or equivalent system) in surface water drainage systems, where there is a high risk of contamination or spillage of substances such as petrol and oil All water pollution prevention systems have been designed and detailed in accordance with the recommendations of Pollution Prevention Guideline 3 and where applicable the SUDS manual. No discharge from site for rainfall up to 5 mm.	2

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1	2	3	Weighting	Adjusted (%age)
Pol 04	Reduction of Night Time Light Pollution		1	MEP	Design drawings, specification clauses and/ or external lighting design calculations			The external lighting strategy has been designed in compliance with Table 1 (and its accompanying notes) of the ILE Guidance notes for the reduction of obtrusive light, 2005 All external lighting (except for safety and security lighting) can be automatically switched off between 2300hrs and 0700hrs Safety or security lighting is provided and will be used between 2300hrs and 0700hrs, this part of the lighting system complies with the lower levels of lighting recommended during these hours in Table 1 of the ILE's Guidance notes			3		
Pol 05	Noise Attenuation		1	Acoustician	1. Design drawings 2. Acousticians report, qualifications and professional status 3. Acousticians recommendations.			Noise-sensitive areas or buildings within 800m radius of the assessed development will be included in the noise impact assessment in compliance with BS 7445:1991. Where the noise source(s) from the proposed site/building is greater than the levels described in criterion 4, measures will be taken to attenuate the noise at its source			2		
	Total Score		13	10	10						2.50		
Total Score			134	107	110								

UCL Objectives

Pollution Prevention												
Control both the quantity and quality of surface water run off		Prevent water pollution • Control both the quantity and quality of surface water run-off through sustainable drainage, where appropriate. • Provide and maintain oil interception, where appropriate.		MEP/Structural	D			To be reflected in MEP / below ground drainage specification	3		30%	30%
Control emissions to air		Introduce leakage alarms onto refrigerant lines		MEP	D			To be reflected in MEP specification	2		50%	25%
Light Pollution		Ensure lights are automatically controlled for the presence of daylight or occupancy to minimise light pollution.		MEP	D			To be reflected in MEP specification	3		20%	20%
								Average Risk	2.67		100%	75%

Heritage Assets												
Protect and enhance heritage assets adjacent to the development		• Ensure that the design and engineering solutions are sympathetic to and enhance the heritage assets adjacent to and in the vicinity of the development. • Seek advice from a Historic Buildings Advisor to approve direct interfaces, including the effect of the new structure on the natural air and moisture circulation through the adjacent buildings; and the direct attachment of fixtures/plant to the original architectural facades • Where 'making good' is required, use original materials e.g. lime render and reclaimed London brick stock		Architect	D	C		Not significant heritage site, but in conservation area. To be reviewed during planning	3		100%	100%
								Average Risk	3		100%	100%

BREEAM	Credit	Sub Credits	Total available Credits	Design Stage Target	Additional credit to take to 'outstanding' level	Responsible design team	Evidence Required at Design Stage	Design Team Actions	Achievement certainty level

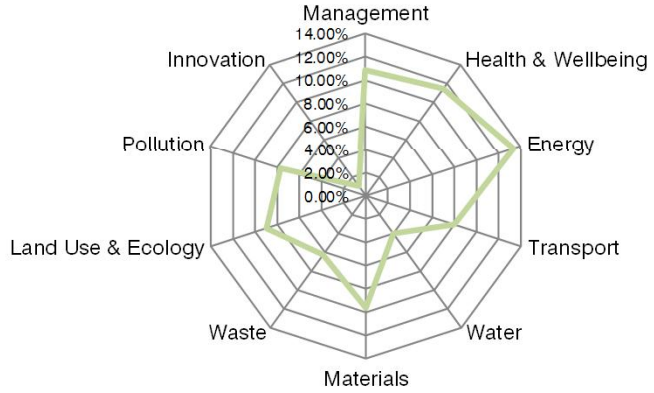
UCL	UCL-wide target	Standard to be achieved	Headline issue?	Design team gatekeeper	Project design stage D	C	O	Design team comment	Certainty level 1	2	3	Weighting	Adjusted (%age)

Innovation Credits			Credits	Design Stage Target				Action	1	2	3
Man 01	Sustainable procurement	Water/energy consumption to be recorded and reported for 3 years (Innovation Credit)	1	1	1				1		
Man 02	Responsible construction practice		1	0	1			Score 40 or more under CCP.	1		
Hea 01	Visual Comfort		1	0	0						
Ene 01	Reduction of Co2 Emissions		1	0	0						
Ene 04	Low or zero carbon technologies		1	0	0						
Ene 05	Cold storage		1	0	0						
Wat 01	Water consumption		1	0	0						
Mat 01	Life cycle impacts		1	0	0						
Mat 03	Responsible sourcing of materials		1	0	0						
Wst 01	Construction site waste management		1	0	0						
Wst 02	Recycled aggregates		1	0	1			Recycled/secondary aggregate is more than 50% of high-grade aggregate.	1		
Total Score			10	1	3				1		

Scoring Summary and Result

	No. credits available	No. credits Achieved	Percentage of credits achieved	Section Weighting	Contribution toward total score	*No. credits Achieved (if seeking outstanding)*	*Contribution toward total score (if seeking outstanding)*
Management	21	19	90.48%	12.0%	10.86%	*19*	*10.86%*
Health & Wellbeing	17	13	76.47%	15.0%	11.47%	*14*	*12.35%*
Energy	34	24	70.59%	19.0%	13.41%	*25*	*13.97%*
Transport	11	11	100.00%	8.0%	8.00%	*11*	*8.00%*
Water	9	6	66.67%	6.0%	4.00%	*7*	*4.67%*
Materials	13	10	76.92%	12.5%	9.62%	*10*	*9.62%*
Waste	6	5	83.33%	7.5%	6.25%	*5*	*6.25%*
Land Use & Ecology	10	9	90.00%	10.0%	9.00%	*9*	*9.00%*
Pollution	13	10	76.92%	10.0%	7.69%	*10*	*7.69%*
Innovation	10	1	10.00%	10.0%	1.00%	*3*	*3.00%*
Total Score					81.30%		*85.40%*

Percentage of credit achieved



Contribution toward total score

UCL Sustainable Design Specification Response

The table below summarises the response of the design to the UCL Sustainable Design Specification. It should be noted that the criteria in each of the main categories listed below have been weighted to give an overall rating. This process is inherently subjective and should be confirmed with the UCL Environmental Sustainability team.