Fitzjohn’s Avenue, NW3

Prepared for the London Borough of Camden

Sustainability and Energy Statement - Design and construction

A detailed planning application, submitted on behalf of PegasusLife to provide specialist living accommodation for older people

PegasusLife

Max Fordham LLP
42/43 Gloucester Crescent
London
NW1 7PE

T +44 (0)20 7267 5161
F +44 (0)20 7482 0329

maxfordham.com

ISSUE HISTORY

Issue	Date	Description
D	17/12/14	Final Planning Issue
C	12/12/14	Final Planning Issue
B	24/11/14	Issued for planning- Final Draft issue
A	13/10/14	Issued as part of draft report

MAX FORDHAM LLP TEAM CONTRIBUTORS

Engineer	Role
BD	Project Engineer
KC	Engineer
MPN	Senior Partner
BD	BREEAM Assessor

MAX FORDHAM

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1.0 EXECUTIVE SUMMARY

This Sustainability and Energy Statement concerns the planning policies and regulations that apply to Pegasus Life's redevelopment of a site in order to provide Fitzjohn's Avenue with a specialist accommodation for older people facility. The relevant planning policy targets are noted and we show how the proposed sustainability & energy strategy will comply with them. There are a number of documents that we must adhere to including parts L1A and L2A of the building regulations, and Camden Planning Guidance: Sustainability.

Throughout the design process we have applied the energy hierarchy from the Camden CPG3 ('Be Lean', 'Be Clean' and then 'Be Green') in order to reduce carbon emissions. The percentage reductions in carbon emissions are shown in tables and graphs for each stage of the energy hierarchy.

1.1 Sustainability Assessments

This statement explains our strategy for achieving the sustainability targets set out by the planning policy. The targets relating to sustainability assessments are described in the following paragraphs.

BREEAM Multi-residential 'Excellent'
This scheme is expected to include a substantial proportion of communal facilities, so we expect it would be assessed under the "BREEAM Multi-Residential" scheme. In line with CPG3 we expect the building to achieve 'Excellent' rating.

Achieving 60% of BREEAM credits for energy & water
In line with CPG3, and Development Policy DP22; supplementary to the 'Excellent' target, the council requests 60% of the energy credits & 60% of the water credits & 40% of the material credits to be achieved. We expect to meet the energy and water targets. However as the site is a tight sloping site, and because we are maximising facilities provision whilst keeping the massing to a minimum, this requires a stepped-back form and multiple basement levels. This type of form demands a concrete frame, which is not favourably assessed by the Materials credits in BREEAM. For these reasons we do not expect to be able to achieve the 40% materials credits.

Final applicability of assessment scheme
At this early stage the project is in development, so the internal area proportions are naturally in flux. The final scheme may provide communal areas which add up to less than 10% of total area. In this case, in the eyes of CPG3 and the BRE, it will be applicable for the Code for sustainable Homes assessment. In this case we will assess the scheme under the Code, to achieve the required level 4. In this event, the supplementary targets of 60% of the energy credits & 60% of the water credits will also be achieved. The 40% materials credits are not expected to be achievable, for the reasons outlined above.

1.2 Energy and Carbon Targets

This Statement describes how the following targets from the CPG3 and London Plan shall be achieved:

- 40% improvement on Building Regulations Part L (2013) notional building CO2 emissions
- 20% reduction in carbon emissions through use of on-site renewable energy generation
- On-site communal heating installation

The Energy Hierarchy
The Energy Hierarchy, as laid out in the CPG3, has been strictly adhered to during the design process in order to reduce energy use and carbon emissions and meet the above targets. The carbon saving measures proposed at each stage are summarised below, and fully described within this Sustainability and Energy Statement. The principles outlined in the Hierarchy will be referred to and upheld throughout the design process as it continues.

- **Passive measures.** We propose to reduce carbon emissions using passive measures such as increasing the insulation (to reduce heating demand), optimising daylighting (to reduce electrical lighting demand) and providing openable windows (to reduce cooling demand).
- **Clean energy**. We have proposed the introduction of mechanical ventilation with heat recovery to provide energy efficient ventilation.
- **Renewable energy- communal systems** We propose to provide the on-site heating and cooling using a communal installation of highly efficient air source heat pumps. Domestic hot water shall be provided by communal boilers.
- **Renewable energy- on-site generation**. We propose to further reduce carbon emissions by providing on-site renewable energy generation using photovoltaic panels.

1.3 Carbon Dioxide Emissions

The following tables and graphs on this page and overleaf demonstrate the modelled reductions in baseline CO_2 emissions at each stage of the energy hierarchy. The baseline carbon emissions and subsequent improvements have been calculated as follows: The living areas of the development have been assessed using SAP 2012 software in order to calculate their expected carbon emissions rate. The non-domestic communal areas have been assessed using a benchmark CO2 analysis based on the functions of each area.

Once all measures are in place, the following shall be achieved:

- CO_2 Savings over baseline: 40%
- Reduction in carbon emissions through use of on-site renewable energy generation: >20%
- BREEAM energy credits:10/15

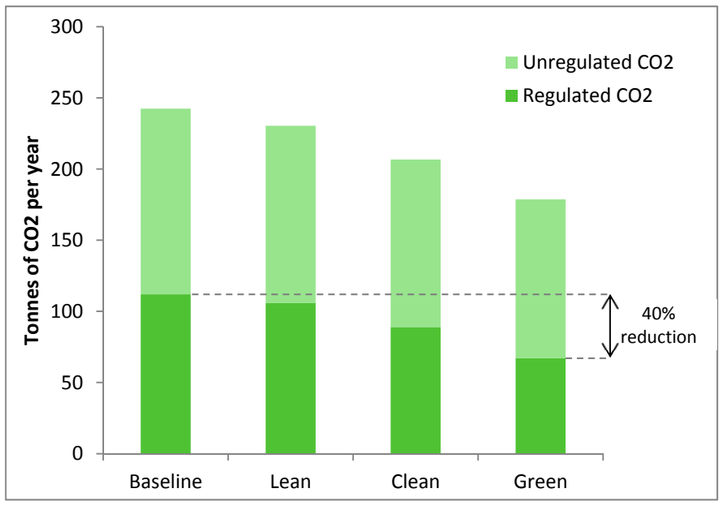
These figures illustrate that the targets set out by CPG3 are expected to be achieved. Note that an alternative servicing option is described in Appendix 5, this will also achieve all the targets set out above.

	Whole development CO_2 emissions (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Building Regulations 2013 **Part L** Compliance **('Baseline')**	112	130
After energy demand reduction **('Lean')**	106	125
After energy efficient systems **('Clean')**	89	118
After renewable energy **('Green')**	67	112

Table – Carbon Dioxide Emissions after each stage of the energy hierarchy

	Whole development Regulated Carbon Dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Savings from energy demand reduction **('Lean')**	6	5.5
Savings from energy efficient systems **('Clean')**	17	16
Savings from renewable energy **('Green')**	22	24.5
Total Cumulative Savings	45	40

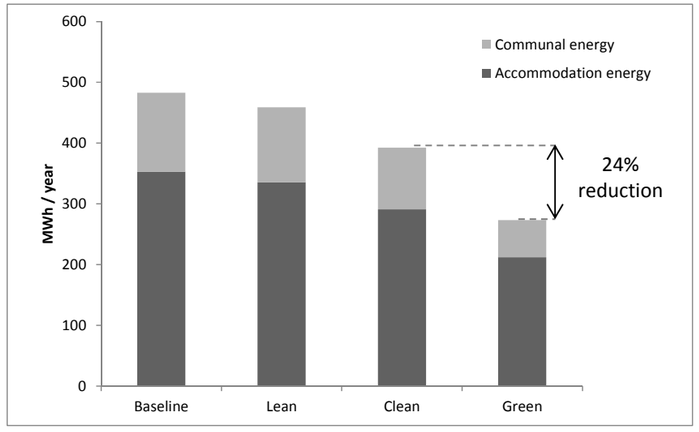
Table – Regulated carbon dioxide savings from each stage of the energy hierarchy



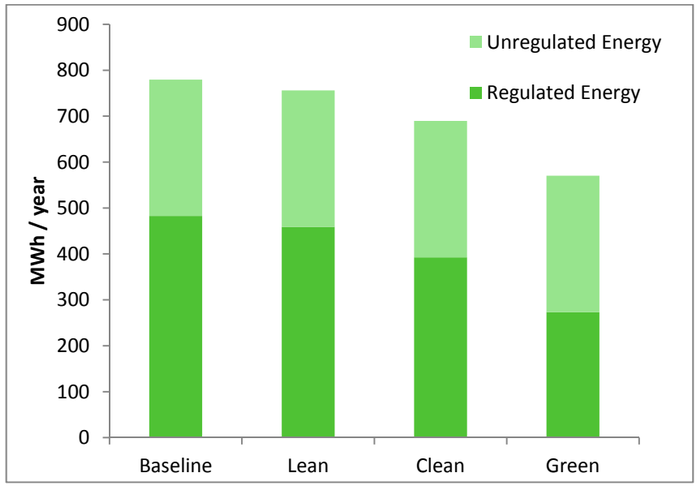
Graph – Regulated and unregulated CO_2 emissions at each stage of the Energy hierarchy

1.4 **Energy use**

The below graph illustrates the predicted energy use for the new development. The building energy use has been calculated as follows: The living areas of the development have been assessed using SAP 2012 software. The non-domestic communal areas have been assessed using a benchmark energy analysis based on the functions of each area.



Graph – Regulated CO_2 emissions for the specialist accommodation and communal areas at each stage of the energy hierarchy



Graph – Regulated and unregulated energy use at each stage of the energy hierarchy

2.0 INTRODUCTION

2.1 Description of the Development

The project is the demolition of the existing building on site and the construction of a new specialist accommodation for older people facility. The facility comprises a mix of specialist accommodation for older people, and communal facilities, including a restaurant/ cafe, a health and wellbeing facility, communal lounge/ library, guest suite and associated staff facilities. The development will also include basement level car storage, cycle and mobility scooter parking for residents, visitors and staff, and a communal garden.

2.2 Relevant Guidance and Regulations

There are a number of requirements that are applicable to this development and will affect the nature of the building services to be installed. These requirements are:

- The Building Regulations - Part L1A - Conservation of Fuel and Power in New Dwellings (2013 edition) (applicable to the living areas)
- The Building Regulations - Part L2A - Conservation of Fuel and Power in New Buildings other than Dwellings (2013 edition) (applicable to the communal areas)
- Camden Planning Guidance: Sustainability CPG3 (November 2013)
- BREEAM Multi-residential

The 2013 version of Parts L1A and L2A came into effect on the 6th April and hence should be the legal regulations against which Arthur West House will be measured. The Building Research Establishment Environmental Assessment Method (BREEAM) has recently been updated such that they can now be compared to the 2013 Building Regulations. The Standard Assessment Procedure (SAP) is used to calculate energy ratings and the carbon emissions of dwellings. These calculations are used to demonstrate that a building complies with the Part L1A of the Building Regulations, BREEAM Multi-residential and the CPG3.

A benchmark analysis of the communal areas has been carried out in order to analyse their carbon emissions and energy efficiency and demonstrate their compliance with Part L2A of the Building Regulations, BREEAM Multi-residential and the CPG3.

Fitzjohn's Avenue site location, boundary shown in red

3.0 PLANNING POLICY

The Arthur West House proposal has been developed within the context of national, regional and local planning policy that seeks to address the challenges of climate change. The policies outline how the Government and Camden Council are setting out to improve the sustainability, energy use and resource consumption of new developments.

3.1 National Policy

Under the Climate Change Act 2008, the government put in place legally-binding carbon reduction targets of 35% by 2020 and 80% by 2050 compared to 1990 levels.

Planning legislation seeks to mitigate the impacts of new construction to minimise carbon emissions and assist in meeting the over-arching national target.

The National Planning Policy Framework (NPPF) was published in March 2012; this replaces all national planning policy statements and guidance. The document advocates a presumption in favour of sustainable development.

The NPPF states that the purpose of planning is to help achieve sustainable development. There are three dimensions to sustainable development: economic, social and environmental. These should not be undertaken in isolation because they are mutually dependent. In order to achieve sustainable development - economic, social and environmental gains should be sought jointly and simultaneously through the planning system. The NPPF sets out that there should be a presumption in favour of sustainable development.

The NPPF states that planning plays a key role in helping to shape places - securing radical reductions in greenhouse gas emissions; minimising vulnerability to and providing resilience against the impacts of climate change; supporting the delivery of renewable, low carbon energy and its associated infrastructure. Local Planning authorities should adopt proactive strategies to mitigate and adapt to climate change, in determining planning applications, local authorities should expect new development to:

- Comply with adopted local plan policies on local requirements for decentralised energy supply, unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

3.2 Regional Policy –The London Plan

The London Plan (July 2011) is a document that sets out the overall strategic plan for London. It describes a fully integrated economic, environmental, transport and social framework for the development of the capital to the year 2031.

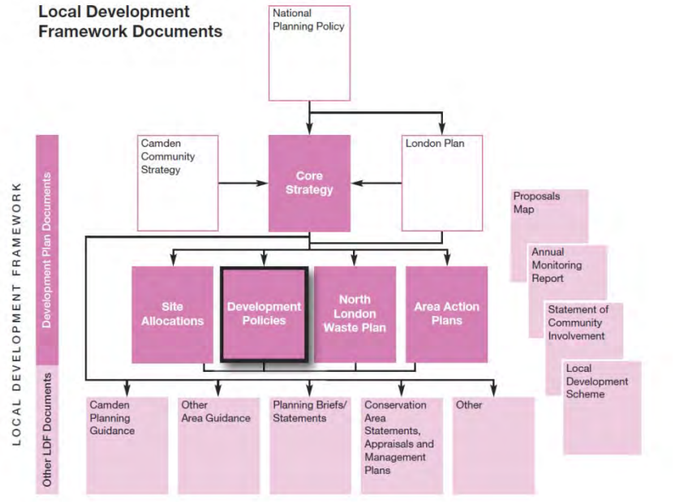
On 11th October 2013 the Mayor published Revised Early Minor Alterations (REMA) to the London Plan, and on 15th January 2014 the Mayor published draft Further Alterations to the London Plan (FALP).

3.3 Local Policy

This project sits within Camden borough and hence is subject to Camden Local Development Framework. The documents that are most relevant to Arthur West House are the following:

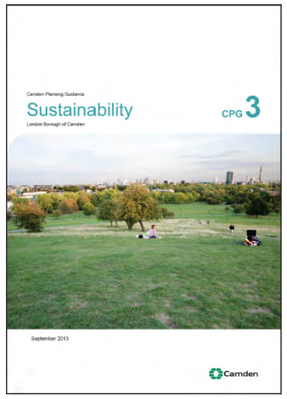
- Camden Core Strategy 2010-2025
- Camden Development Policies 2010-2025
- Camden Planning Guidance: Design
- Camden Planning Guidance: Housing
- Camden Planning Guidance: Sustainability

Camden Local Development Framework: All the documents related to the framework were reviewed and taken into consideration throughout the design of Arthur West House.



Camden Local Development Framework contains all the policies and documents that are relevant when making planning applications in Camden

3.4 Camden Planning Guidance



As mentioned above all documents that are related to the Camden Local Development Framework were taken into consideration. The two policies that affected the design of the building services the most can be found in the Camden Planning Guidance: Sustainability and are briefly summarised here:

- Decentralised energy networks and combined heat and power:

  "Key messages

  Decentralised energy could provide 20% of Camden's heating demand by 2020.

  Combined heat and power plants can reduce carbon dioxide emissions by 30-40% compared to a conventional boiler.

  Where feasible and viable your development will be required to connect to a decentralised energy network or include CHP."

- Best practice energy efficiency

  A carbon dioxide reduction target of 40% improvement on the 2013 Building regulations notional building is required.

  "Developments will be expected to achieve 60% of the un-weighted credits in the Energy category of their BREEAM assessment.
  Developments should achieve 50% of the un-weighted credits in the Energy category [for Code for Sustainable Homes]"

- Renewable energy:

  "There are a variety of renewable energy technologies that can be installed to supplement a development's energy needs.

  Developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies."

The Camden Planning Guidance is in line with the London Plan for the carbon reduction targets.

4.0 ENERGY, CARBON AND BREEAM TARGETS

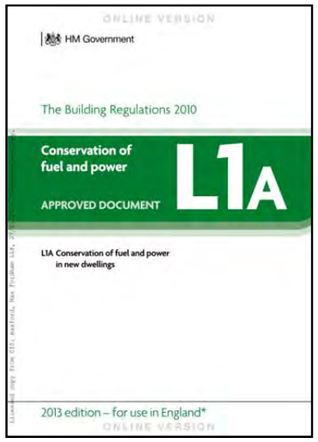
4.1 Requirements

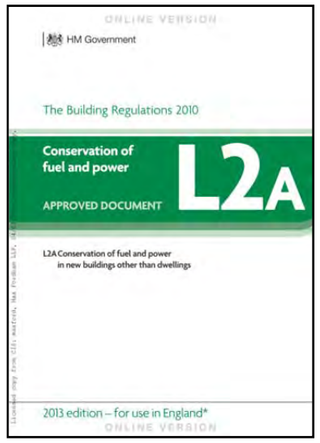
There are a number of requirements that are applicable to this development and will affect the nature of the building services to be installed. These requirements are:

- The Building Regulations - Part L1A - Conservation of Fuel and Power in New Dwellings (2013 edition)
- The Building Regulations - Part L2A - Conservation of Fuel and Power in New Buildings other than Dwellings (2013 edition)
- BREEAM Multi-residential (Excellent – 2014 edition)
- Camden Core Strategy 2010-2025
- Camden Development Policies 2010-2025
- Camden Planning Guidance (September 2013)
- The London Plan

The requirements are described and summarised in below.

4.2 Building Regulations





Part L1A
Part L1A is the building regulations document concerning the conservation of fuel and power in new dwellings. This document regulates the construction methods and the mechanical and electrical services installed within the building in order to minimise the energy usage.

The document states that the CO_2 emission rate must be calculated for the dwelling (Dwelling Emissions Rate, DER) and that this must be equal to, or more energy efficient than, the Target Emission Rate (TER) for a 'notional' dwelling of that size. The notional building is defined as being the same size and shape as the actual dwelling but constructed to a specification determined within the building regulations. The living areas of this building will be measured relative to Part L1A.

Targets set by the Code for Sustainable Homes and the CPG3 are measured relative to the 2013 edition of Part L1A.

The 2013 document aims to deliver on average 6% carbon dioxide savings relative to the previous 2010 version. It achieves this by improving the specifications of the notional dwelling against which new dwellings will be tested.

Furthermore, in the new edition there is now a mandatory target for fabric energy efficiency (TFEE). This works very similarly to the DER-TER relationship in that the Dwelling Fabric Energy Efficiency (DFEE) must not exceed the TFEE. The TFEE is found by calculating the FEE (Fabric Energy Efficiency) for a 'notional' building (of same shape and size as actual dwelling) and multiplying that by a factor of 1.15.

Part L2A
Part L2A concerns the conservation of fuel and power in new buildings other than dwellings. The 2013 version of this document seeks to achieve and average 9% reduction relative to the 2010 edition. Demonstrating compliance with this document is much the same as for Part L1A in that is must be shown the Building Emissions Rate (BER) is equal to or less than the TER. The BER is analogous to the DER. There is no TFEE for this document but the buildings must still at least equal or better the minimum U-values listed in the document.

The ground floor and basement communal areas of the development will be subject to Part L2A.

4.3 BREEAM

As described in the executive summary:

- This scheme is expected to include a substantial proportion of communal facilities, as such we expect it to be assessed under the "BREEAM Multi-Residential" scheme. In line with CPG3 we expect the building to achieve 'Excellent' rating.
- In line with CPG3, and Development Policy DP22; supplementary to the 'Excellent' target, the council requests 60% of the energy credits & 60% of the water credits & 40% of the material credits to be achieved. We expect to meet the energy and water targets. However as the site is a tight sloping site, and because we are maximising facilities provision whilst keeping the massing to a minimum, this requires a stepped-back form and multiple basement levels. This type of form demands a concrete frame, which is not favourably assessed by the Materials credits in BREEAM. For these reasons we do not expect to be able to achieve the 40% materials credits.
- At this early stage the project is in development, so the internal area proportions are naturally in flux. The final scheme may provide communal areas which add up to less than 10% of total area. In this case, in the eyes of CPG3 and the BRE, it will be applicable for Code for sustainable homes assessment. In this case we will assess the scheme under the Code, to achieve the required level 4. The supplementary targets of 60% of the energy credits & 60% of the water credits will also be achieved. The 40% materials credits are not expected to be achievable, for the reasons outlined above.
- BREEAM pre-assessment assessment for the whole building is included in the appendix.
- Code for sustainable homes pre assessment for the specialist accommodation portion only is included in the appendix.

The Building Research Establishment Environmental Assessment Method for New Construction 2014 (BREEAM New Construction 2014) helps Clients and Local Authorities to set environmental targets and demonstrate environmental performance for new and refurbished buildings. To date over 200,000 buildings have been certified under BREEAM worldwide since it was first launched in 1990. Figure 1 below illustrates countries in which BREEAM assessments have taken or are currently taking place.

Figure 1: Countries in which BREEAM is present

BREEAM New Construction 2014 incorporates the following categories:

- Management
- Health and Wellbeing
- Energy
- Transport
- Water
- Materials
- Waste
- Land use and Ecology
- Pollution

- Innovation (Exemplary Performance)

There is also an Innovation Category, where additional Credits can be awarded for any innovative features of the building project that are not assessed as standard and that the design team feel are worth credit. An application for these additional Credits has to be made to BRE for approval. As the new Priority Schools design develops, areas of the design will be assessed for eligibility for Innovation Credits.

Credits are allocated under each category and an environmental weighting is applied to determine an overall building score. The building will be allocated a rating of Pass, Good, Very Good, Excellent, or Outstanding as follows:

A challenging score of Excellent has been targeted for this development, which demonstrates Pegasus' commitment to sustainability.

Calculation Method
BREEAM currently expects an assessment of the building under the Part L 2013 methodology.

For Part L1 compliance, the Standard Assessment Procedure (SAP) 2012 has been used to calculate the TER, BER, TFEE and DFEE for the notional and proposed buildings as set out in Appendix 4.

For the communal areas, a benchmark approach has been used to estimate the energy demand.

Unlike BREEAM 2010, there is no mandatory requirement under Ene1 for reductions in CO2 emissions when compared to the TER; however the Camden Panning Guidance defines a target for this (see next section).

There is a mandatory requirement within BREEAM Ene 04 for renewable energy installations to contribute at least 5% of overall building demand and/or CO_2 emissions in order to ensure 'non-trivial' contributions. The Camden Planning Guidance sets out a more challenging target for this (see next section).

The results of the calculations are summarised in section 9 of this report.

BREEAM RATING	% SCORE
Outstanding	≥85
Excellent	≥70
Very Good	≥55
Good	≥45
Pass	≥30
Unclassified	<30

Summary of Targets

This project will comply with the targets in the table below. With this we will meet the targets set by the CPG3 and BREEAM Excellent.

Document	Target
Part L1A	DER must not exceed TER (L1A 2O13)
Part L1A	DFEE must not exceed TFEE (L1A 2013)
Part L2A	DER must not exceed TER (L1A 2013)
BREEAM Multi-residential	Excellent
Camden Council CPG3	On-site communal heating installation. 40% improvement on Part L notional building CO2 emissions Achievement of 60% of BREEAM energy credits (or 50% for CfSH) 20% reduction in carbon emissions through use of on-site renewable energy generation

Targets to be considered for the Fitzjohn's Avenue Development

5.0 OUR APPROACH

1.1 Design Hierarchy

Our aim is to maintain a comfortable internal environment throughout the development whilst using the least amount of energy necessary. Our approach to this is driven by the following design hierarchy:

1. **Be Lean - Passive Measures** - minimise building energy usage by considering building form and construction in order to avoid or minimise the need for mechanical and electrical services.
2. **Be Clean - Efficient M&E Systems** - minimise plant energy use by selecting the most appropriate engineering systems and optimising system performance.
3. **Be Green - Renewable Energy** - the use of appropriate on-site renewable/low carbon energy technologies.

Given this approach our design is therefore driven by preferential investment in firstly reducing the inherent baseline energy demand. Only after that has been achieved will we consider the application of renewable energy technologies at the outset. We also appreciate that investment in good building design and fabric specification often has a better lifetime advantage when compared with high technology mechanical and electrical systems.

The ethos of the design will continue throughout both the living and communal areas. The relevant elements of BREEAM will be carried into the communal areas. Both areas will be CPG3 compliant and hence will contain similar passive measures, efficient M&E systems and renewable energy supplies.

Our approach to integrating the lean, green, clean strategy into the design is outlined in the following sections.

POLICY 5.2
MINIMISING CARBON DIOXIDE EMISSIONS

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

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

6.0 BE LEAN – PASSIVE, ENERGY SAVING MEASURES

Building form plays a very important part in defining the internal environment. This reduces the need for energy-intensive intervention to maintain appropriate internal conditions. We must use appropriate building design and 'passive engineering' before we consider any dynamic (active) systems to further control the internal environment. Investment in good building design and fabric specification usually has a better lifetime energy savings/cost advantage when compared with high-technology mechanical and electrical systems.

6.1 Massing, Orientation and Internal Space Planning

The massing and location of the building and the internal arrangement of the apartments have been designed to reduce energy use in the following key ways:

- Most living areas have external façades with openable windows aiding natural ventilation when required.
- Bathrooms and kitchens have been located centrally, with occupied spaces (living room and bedroom) located close to the façade to get the best use of the available daylight
- The floor-to-ceiling heights have been optimised to provide good daylight penetration into the back of the perimeter rooms.

6.2 Building Envelope Thermal Performance

Insulation
The building fabric will have high levels of thermal insulation in order to reduce the heat loss during winter. This is particularly important as the homeowners will be older than average and therefore more sensitive to extreme temperatures. It will also aid in reducing heating bills and keeping carbon emissions down.

Our proposal is to insulate the entirety (living and communal areas) of the buildings to U-values that are significantly better than those specified for the notional building in Part L1A 2013. These are tougher standards than in Part L2A 2013 and we are still surpassing them comfortably. The relevant U-value standards and those that we will use are shown in the tables below.

Building Fabric Parameter	Maximum Permissible Part L1A 2013 values	Notional Building Part L1A 2013 values	**Proposed values**
Wall U-value (W/m^2K)	0.30	0.18	**0.15**
Window U-value (W/m^2K)	2.0	1.4	**1.27**
Ground Floor U-value (W/m^2K)	0.25	0.13	**0.11**
Roof U-value (W/m^2K)	0.20	0.13	**0.11**
Air Permeability $m^3/hr.m^2$	10	5	**2**
Thermal bridging y-value	0.15	0.08	**0.04**

Relevant U-values for Part L1A - Conservation of fuel and power (new dwellings)

Building Fabric Parameter	Maximum Permissible Part L2A 2013 values	Notional Building Part L2A 2013 values	**Proposed values**
Wall U-value (W/m^2K)	0.35	0.26	**0.15**
Window U-value (W/m^2K)	2.2	1.6	**1.27**
Ground Floor U-value (W/m^2K)	0.25	0.22	**0.11**
Roof U-value (W/m^2K)	0.25	0.18	**0.11**
Air Permeability $m^3/hr.m^2$	10	3	**2**
Thermal bridging y-value	0.15	0.08	**0.04**

Relevant U-values for Part L2A - Conservation of fuel and power (new buildings other than dwellings)

Air Infiltration
With modern well insulated buildings significant amounts of heat loss is typically caused by unwanted air infiltration through the fabric, and in particular through the points where different building elements meet. This requires good attention to detailing through design and monitoring of the construction process and workmanship on site.

The finished building will be tested for air leakage in accordance with CIBSE TM23, "Testing Buildings for Air Leakage"

The building will achieve an air-permeability of a maximum of 2 $m^3/hr/m^2$ (at an applied pressure of 50Pa). This vastly exceeds the current building regulations' minimum requirement of 10 $m^3/hr/m^2$.

Thermal Bridges
Thermal bridges occur at junctions between building elements and are significant sources of heat loss. Reducing the energy demand of a dwelling is strongly dependent on eliminating thermal bridges. Furthermore, heat loss via thermal bridges becomes a much more significant proportion of energy use the better the rest of the fabric performs. Similarly to air infiltration, minimising thermal bridging requires good detailing. Thermal bridges will be designed in accordance with the 'Enhanced Construction Details' (www.energysavingstrust.org.uk) on Arthur West House to achieve minimal heat loss through thermal bridges.

Improvements from using passive measures
Improving the building fabric to the proposed specification results in an improvement in the development's Fabric Energy Efficiency (FEE). SAP was used to model this improvement over the Target Energy Efficiency (TFEE), which is the FEE required to meet the Building Regulations.

6.3 Overheating

Modern apartment buildings, if poorly designed, have a propensity for overheating. Due to the high average age of the occupants it is especially important to perform checks to see whether the apartments are overheating. The London Plan also seeks to avoid overheating within new buildings.

Elderly people are more susceptible to extremes in temperature, such as very hot weather. Due to the elderly nature of the residents who will live at the new development it has been deemed necessary to provide cooling. The background noise levels mean that to provide enhanced adequate natural ventilation for the residents while maintaining internal noise requirements would not be viable on all facades.

Although mechanical cooling is being provided, all apartments will be provided with openable windows. This will ensure that thermal comfort requirements can be met in the event that the cooling system fails or is being maintained. It also gives the residents the option to have natural ventilation if they prefer.

<u>Requirements for the prevention of overheating</u>

Camden Planning Guidance 3 (Sustainability) requires that a full model of the building should be carried out to ensure the building design optimises solar gain and daylight without resulting in overheating for developments comprising 5 dwellings or more or 500sq m or more of any floorspace.

This guidance means that the specialist accommodation for older people should be modelled, as there are more than 5 apartments.

The communal areas, which are to be assessed separately, contain an occupied* area of circa $400m^2$, and so a full model is not required. For these areas, we will analyse the expected solar gain to ensure that the requirements of Building Regulations Part L2A (Criterion 3) are met. This is summarised below.

*An occupied space is defined as a space that is intended to be occupied by the same person for a substantial part of the day. This excludes circulation

space and other areas of transient occupancy such as toilets, as well as spaces that are not intended for occupation. (Building Regs Part L2A 2013)

BREEAM 2014 credit Hea 3 requires that operative summer and winter temperature ranges of occupied spaces in air conditioned buildings are in accordance with the criteria set out in CIBSE Guide A Environmental design. At the next stage we shall carry out dynamic thermal modelling to demonstrate that this requirement is met.

Measures taken to prevent overheating

This development will be mechanically cooled, which means that overheating will not be a risk. However, it is still important to mitigate the summer heat gains to the development in order to reduce the cooling energy demand.

In order to reduce the mechanical cooling demand, we have introduced openable windows and movable external blinds. Openable windows to each apartment will have a free area of at least 1/20th of the apartment floor area, which will allow flats to be purge ventilated for rapid cooling or for scenarios where increased ventilation is required such as painting. The apartments are dual aspect, which allows cross ventilation provided internal doors are left open. The movable external shading can be used to block out solar gains. The blinds can be partially or fully shut to the desired level.

Green/brown roofs on the development will contribute to cooling by naturally cooling the environment, and the improved insulation and air tightness of the building will reduce summer gains.

The mechanical cooling has been specified on FJA to provide a stable environment for the residents. Although the cooling requires energy, it is supplied via Air Source Heat Pumps (ASHP) which are a low-carbon energy source. These are the same ASHPs which are used for heating in Winter, so no additional cooling plant is required.

Overheating analysis – SAP modelling

As there are more than 5 apartments, we have carried out SAP modelling to show that overheating is not a risk as required by Camden Planning Guidance. This is summarised in the table below.

	Blinds open 50%
Flat type	SAP risk of overheating
1	Slight
2	Slight
3	Slight
4	Slight
5	Medium
6	Slight

Table – Overheating risk for sample flats

Overheating is only likely to be a risk at times when there are the largest solar gains. In these cases the most likely scenario would be that the blinds are partially closed, reducing the solar gains whilst still providing adequate daylighting. Therefore this is the scenario that has been modelled.

The table shows that, during summer, while blinds are 50% open there is either a 'slight' or 'medium' risk of overheating, which passes building regulations.

Overheating analysis – Limiting solar gains

The area of occupied spaces within the communal areas does not exceed 500m^2 so these are not required to be fully modelled, however we have analysed the solar gain to ensure that the requirements set out in Part L2A are met.

The limits on solar gains are laid out in part L 2A, criterion 3. It is required that no room shall have solar gains greater than that of a specific reference case.

The reference case states the maximum solar gains allowable in a reference room. The reference room has east facing windows, one meter in height, along the length of the room. These windows have a g-value of 0.68 and a frame factor of 0.1.

The windows on the new development have been generously sized for architectural intention and to provide good daylight and views out of the building, so it is important to ensure that the solar gains are within the specified limits. The worst-case communal rooms have been modelled: all south and west-facing rooms on the ground floor. There are no communal areas exposed to the sun on higher stories of the building. The model was carried out for the blinds-half-closed scenario, which was deemed most likely during summer. The below table presents the results:

		Double height lounge	Café lounge	SW kitchen
Reference	Maximum acceptable solar gain (kWh)	5079	1632	1921
Proposed Windows	Actual solar gain (kWh)	2516	845	423
	Meets Part L2A requirements?	yes	yes	yes

Table – Part L2A compliance for solar gains

The table shows that the Part L2A requirements are met for all of the worst-case communal rooms, and therefore on communal areas across the whole development.

Overheating analysis for BREEAM

At the next stage we will carry out dynamic modelling to satisfy the BREEAM Hea 04 requirement, and demonstrate that temperature limits set out in CIBSE A guide are not exceeded.

Conclusion

Mechanical cooling on Arthur West House will prevent the risk of overheating. External blinds and natural ventilation via openable windows will then reduce the energy required for cooling. Modelling has been carried out to show that the specialist accommodation and communal parts of the building comply with the Camden Planning Guidance and Building Regulations Part L2A with regards to overheating risk, and dynamic modelling will be carried out an the next stage to demonstrate compliance with BREEAM Hea 04.

7.0 BE CLEAN - USE ENERGY EFFICIENT SERVICES

7.1 Energy Efficiency Services

Having reduced the building's energy demand using passive measures the next step in meeting the demand is by designing energy efficient active engineering systems.

A number of energy efficiency strategies are proposed for the development including:

Mechanical Ventilation
Mechanical ventilation will be used throughout the apartments. A Mechanical Ventilation with Heat Recovery (MVHR) will be specified as it reduces the heating demand significantly during winter and thus reduces the carbon emissions of the building. The system specified will have a very low specific fan power (SFP) to minimise electrical consumption and a high heat recovery efficiency to maximise heat recovery. A summer-time bypass will also be specified to make use of free cooling during summer and minimise the risk of overheating.

Communal areas will generally be mechanically ventilated. Air flow-rates will be sized on the fresh air load only, with heating and cooling done locally via the VRF system. The air supply & extract will be variable volume with CO_2 sensors controlling the required ventilation rate to each space.

In addition to the mechanical systems, which will offer significant heat recovery savings during winter, the communal spaces will be designed with openable windows to enable natural ventilation when the outside conditions permit, enabling savings in electrical fan power.

This mixed-mode solution will offer significant energy savings when compared to a conventional air conditioned space.

Lighting
Light levels will be modelled to ensure that they are appropriate to the space and chosen to minimise over-illumination and unnecessary energy use. High efficiency light sources will be used throughout. All communal area lighting will be under the control of both presence detecting passive infra reds (PIRs) and daylight dimming to ensure that the areas are only lit when occupied and during daylight hours appropriate lux levels will be maintained.

Power
White and general goods installed as part of the base build will be selected for their energy efficiency. Users will be educated in order to ensure that power is used efficiently. Devices will be switched off when they are not required.

Energy meters will be installed for all major energy uses including water consumption. The meters will allow benchmarking of the building and will enable the building managers to target energy saving through user education.

Pumps
Circulation pumps for the building systems will be equipped with variable speed drives to reduce pumping power.

Central Controls
A building management system (BMS) in the communal areas and on central systems will enable the heating, cooling and domestic hot water systems to respond to the demand dynamically and run more efficiently.

Appropriate control set points will be specified in the communal spaces to achieve the target conditions for human comfort and the preservation of materials without unnecessary energy use.

User Controls
Efficient and user friendly controls will be specified throughout the apartments. The controls will be kept as simple and as intuitive as possible to ensure that they are used.

7.2 Heating

As described in Section 6, the building fabric is high-performance, which will lower the space heating demand.

Heating and cooling will be provided within the living areas by an electric air-source heat pump system located on the roofs of both towers. The reason for the selection of electric space heating over gas heating is explained below.

Comparing the carbon efficiency of electrical (ASHP) and gas space heating
More than twice as much CO_2 is released by the production of electricity as it is for gas, as shown:

Generation of 1kWh of natural gas produces: 0.184 $kgCO_2$

Generation of 1kWh of grid electricity produces: 0.445 $kgCO_2$

As a result, electrical heating has to be at least twice as efficient as gas heating in order to be more carbon efficient. The expected efficiencies of boilers and ASHPs on FJA are shown below:

Quoted efficiency of gas boiler: 95%

Quoted efficiency of VRF heating: 290% (Source: Daikin unit, -5°C external, 22°C room – worst case)

Therefore the carbon emitted by each heating type when delivering 1kW of heating to a property is as follows:

1kW of gas heating produces: 0.19 $kgCO_2$

1kW of electrical heating produces: 0.15 $kgCO_2$

These values show that electrical heating via ASHPs is more carbon efficient than gas heating, therefore electrical heating via ASHP has been selected for Arthur West House.

Fan coil units will be used to heat the apartments and communal areas. A Variable Refrigerant Flow (VRF) air source heat pump system will circulate refrigerant through the building to provide space heating through the fan coil units. This is an advantageous system as it can provide both heating and cooling, thus minimising cost/materials. It is also a low carbon technology which is discussed in Section 8.

Domestic hot water
The hot water demand will be met by high-efficiency low-NOx condensing gas boilers with high seasonal efficiencies. This will be a centralised system with the boilers located in a plant room common to all of the living areas. A soft spot will be built into the basement wall and pipe routes will be designated to allow for easy connection into a district heating network at a later date.

7.3 Cooling

Due to the elderly nature of the residents who will live at Arthur West House it has been deemed necessary to provide cooling. The following measures (listed in order of preference/importance) have been taken to prevent overheating within the apartments:

- External movable shading (roller blinds) have been provided on windows
- Efficient mechanical equipment (light fittings, fans, etc.) will be specified to minimise internal gains
- Openable windows will be provided to allow natural ventilation
- Solar control glazing will be selected if necessary to reduce solar gains through the windows
- MVHR with summer time bypass will be installed to provide fresh air and make use of any free cooling when external temperatures permit.

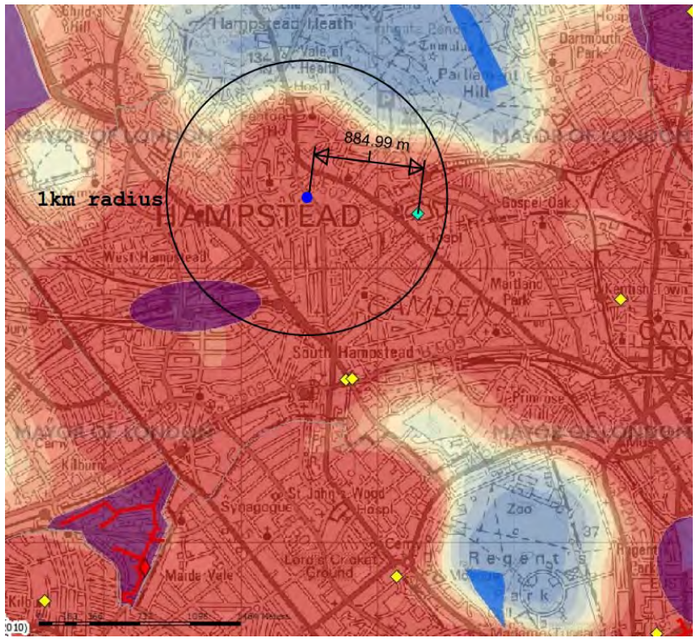
Even with all of the above measures taken it was still considered necessary to provide cooling due to the vulnerability of the residents to hot temperatures. However, this has been implemented in an energy efficient way by using low carbon air-source heat pumps. This system utilises the same equipment as the space heating system and hence also saves on embodied carbon.

7.4 District Heating

The location of Arthur West House is not currently close enough to any existing district heating network to allow for a feasible connection.

It is situated within 1 km of the Royal Free Hospital which is central to the Gospel Oak CHP Scheme. The scheme will provide half the heating to 1500 homes across six estates in the Gospel Oak area, utilising surplus heat generated by the Royal Free Hospital, as shown in the image.

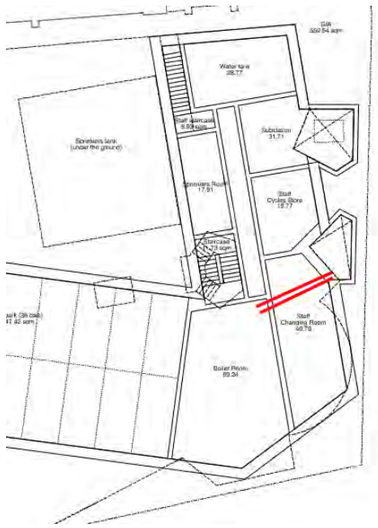
Contact was made with Camden council and the Gospel Oak CHP scheme administrators to request connection of Arthur West House to the network. However the scheme's capacity was not currently large enough to accommodate Arthur West House. A copy of the relevant correspondence with the scheme administrators can be found in Appendix 6.



London Heat Map showing existing district heating networks in read, Royal Free Hospital in cyan, West Hampstead potential development site in purple and the site location in dark blue

West Hampstead has been identified by the Major of London as an area with potential for the development of district heating, which may mean that future schemes are developed to which Arthur West House could be connected. There are currently no schemes proposed in this area to our knowledge.

The domestic hot water system in the proposed development is designed to take advantage of a possible connection to a district heating scheme in the future. The domestic hot water is fed from centralised gas boilers. The system could be connected into a district heating network through a nominated penetration in the basement wall.



Indicative plan showing flow & return pipe connections between boiler room and Arthur West House, ready for a future connection to district heating

Whilst the domestic hot water is provided by boilers, the building heating benefits from the low-carbon Air Source Heat Pump (ASHP) system. This hybrid system leaves us perfectly poised to take advantage of a new district heating connection in future, whilst obtaining energy benefits from the heat pump from the outset.

As previously stated, we are considering an alternative option: supplying the building's domestic hot water from the same ASHP system as the heating, rather than boilers. If this option were chosen, connection to district heating in the future would require an additional water-source heat pump to feed heat into the system when required.

The location of the Fitzjohn's Avenue development is not currently close enough to any existing district heating network to allow for a feasible connection, as illustrated by the below image clip from the London Heat Map.

7.5 Combined Heat and Power (CHP)

CHP units are suitable for developments which have a constant base demand for heat. When this is the case, then the CHP can be used to supply this base load, with the electricity being used on the development or exported to the grid for sale. No RHI subsidy is available for gas CHP.

Arthur West House is a relatively small development with gas Domestic Hot Water (DHW) heating. The base load for Arthur West House is estimated at 15kW. The CHP is selected to meet the thermal base load. The addition of CHP at such a small scale would add complications to the heating system such that it would be unlikely to perform efficiently alongside the main DHW generation plant and will increase the cost of maintaining the system. CHP technology also involves a large initial capital cost, despite only supplying a small proportion of the site's energy. At this scale of CHP the maintenance cost outweighs the benefits gained from the generation of heat and electricity.

A simple payback calculation was carried out for CHP on this project. It was determined that CHP would take 12 years to pay for itself. This is a long enough time period that CHP is not considered worthwhile when coupled with the drawbacks explained previously. Building regulations Part L2B (2014) states that LZC improvements to buildings are only considered economically feasible if they achieve a simple payback of 7 years. The use of CHP on Arthur West house is not economically feasible by this definition.

In conclusion, the additional complexity and cost imposed by CHP, alongside potential increased bills for residents, are not considered to be worth the energy savings that it may bring.

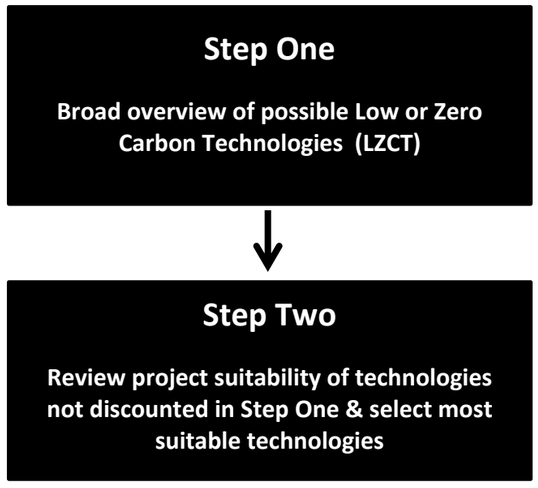
8.0 BE GREEN - USE RENEWABLE AND LOW CARBON ENERGY SOURCES

8.1 Background Information

Once both passive and active energy efficiency measures have been considered, renewable energy options should be investigated as a way to further reduce carbon emissions. Carbon dioxide emissions and energy bills can be dramatically reduced through the use of on-site renewable energy.

A study was undertaken to investigate which renewable technologies were best suited to Arthur West House.

There are many possible low and zero carbon technologies (LZCT) available for use. The following flowchart describes how the available LZCT were assessed and reduced down to a list of the most viable options.



Steps in LZCT Feasibility Study

This assessment concluded that the most appropriate and effective way to deliver the renewable energy target on this development would be through the air-source heat pump technology supplemented with photovoltaic panels.

8.2 Step One – Broad Overview of LZCTs

The following table shows which low or zero carbon technologies were discounted, and if so, why. The criteria used to determine the suitability of these technologies included:

- London planning guidance
- Camden planning criteria (incl. land use, noise, practical feasibility and pollution)

LZCT	Suitable
Anaerobic Digestion	**No** There are no waste streams available to "feed" an anaerobic digester. Anaerobic digestion plant requires high level of maintenance to keep it running smoothly. The development is predominantly specialist accommodation and to ensure sustainable future operation routine maintenance needs to be minimised.
Biomass	**No** The site is within the centre of London and an air quality management zone. Fuel would need to be sourced at a great distance from the site and delivered to site by HGV. Biomass combustion and the road transport required to transport fuel to site will likely result in an increase in local air pollution through the increase production and emission of particulates and NO_x gases.
Combined Heat and Power with local district heating	**No** The base heat load is too small to implement CHP at a scale where the increased complexity and large initial capital cost would be worthwhile (see section 7.5)
Connection to existing offsite district heating system	**No** There are no existing district heating systems in the vicinity of the site (see Figure 2).
Heat Pump – Air Source	**Yes**
Heat Pump – Ground/water source	**Yes**
Heat recovery from DCN central plant	**No** None of the plant being used on this project would produce enough waste heat to make this option feasible.
Photovoltaic (PV)	**Yes**
Solar Thermal	**Yes**
Connection to existing offsite waste energy source	**No** There are no existing waste energy streams available in the vicinity of the proposed site.
Wind	**No** Micro turbines have been assessed as inefficient and there is insufficient space on the dense inner-city site for the installation of a medium or large scale wind turbine.

LZCT Feasibility Assessment -Step 1

8.3 Step Two – Project Suitability for Selected LZCTs

The summary table on the following page sets out the advantages, disadvantages and project suitability of the LZCT deemed suitable from step one.

This section is set out in a matrix to make comparisons of technologies easier. The technologies deemed suitable in step two went on to be analysed in more detail in step three.

TECHNOLOGY	 **AIR SOURCE HEAT PUMP (ASHP) VRF SYSTEM**	 **GROUND SOURCE HEAT PUMP (GSHP)**	 **PHOTOVOLTAIC (PV) PANELS**	 **SOLAR THERMAL PANELS**
LOCATION	Rooftop	Ground /Basement Levels	Rooftop	Rooftop
LOAD	Takes heat from air to heat refrigerant, used to heat water in building (35 to 65 °C)	Generates hot water for heating (35 to 65 °C)	Generates on-site electricity	Generates domestic hot water (DHW)
POTENTIAL ENERGY SAVINGS	Up to 120 mWh/yr over Part L 2010 notional building	Insufficient information currently available to determine this. Expected to save at least as much energy as ASHP.	Up to 38 kWhe /yr over Part L 2010 notional building	Up to 60 kWhth /yr over Part L 2010 notional building
POTENTIAL CO2 SAVINGS	Annual CO2 saving: 24 tCO2/yr over Part L 2010 notional building CO_2 % Reduction: up to 33%	Insufficient information currently available to determine this. Expected to save at least as much CO2 as ASHP.	Array size: Up to 300m^2 Annual CO2 saving: 20 tonnes CO2/yr over Part L 2010 notional building CO_2 % reduction: up to 28%	Array size: up to 300m2 Annual CO2 saving: 11 tonnes CO2/yr over Part L 2010 notional building CO_2 % reduction: up to 15%
ADVANTAGES	• Heat is extracted from the air to heat the building and the hot water • No boreholes required which reduces capital cost • Heat recovery systems can provide heating and cooling simultaneously • No basement heating plant required	• Heat is extracted from the ground to heat the building and hot water • Higher COPs can be achieved than with ASHP, high COP can be maintained in winter • Can be installed in internal plantrooms without access to large volumes of fresh air	• Easy to install • Light weight, low plant space requirement • Low maintenance • Zero carbon electricity • Easy “bolt on” renewable technology	• Zero carbon domestic hot water produced • Light weight
DISADVANTAGES	• Efficiency is low if the heating system is not weather compensated • Systems are much less efficient when generating DHW than space heat • Not as efficient as a ground source heat pump, the initial capital cost will not be paid back in energy savings when compared to a gas boiler as running cost likely to be equal or higher • Roof plant may be visible from street level	• Performance dependent on geological conditions • High capital cost • Capacity of installation limited by size of ground array which can be installed - minimum distances required between energy piles to achieve optimum efficiency • COP drops at higher generation temperatures • May not be able to run all year around due to risk of excessively lowering ground temperature	• Lower efficiency compared than solar thermal • High capital cost • Large area of panel required to generate a meaningful amount of electricity • Requires direct sunshine to function efficiently	• Relatively low temperature hot water produced • Requires extensive hot water storage and separate district heating networks to distribute and store the lower temperature heat to produce domestic hot water • Very high capital costs • Requires more maintenance than a PV system • Surplus energy can’t be exported
AVAILABLE GRANTS & INCENTIVES	There is an incentive available for large commercial renewable heat installations of 100 kWth and above Tariff = 3.6 p/kWh	There is an incentive available for large commercial renewable heat installations of 100 kWth and above Tariff = 3.6 p/kWh	Feed in tariff available for installations with a peak capacity >10kW & <50kW Generation tariff = 12.13 p/kW Export tariff = 4.77 p/kWh	There is a non-domestic renewable heat incentive (RHI) available for solar thermal installations up to 200kW of 10p/kWh
PROJECT SUITABILITY	• Roof space is available for plant of this size • Cooling is required to flats, which can be provided by this system without need for separate heating and cooling plant • New technology is unfamiliar and increases project risk • ASHP is suitable for this project for heating and cooling. Suitability of DHW generation will be investigated.	• GSHP would contribute to meeting the base load, but is likely to be able to run all year round. • GSHP could be used along with ASHP. • Use of GSHP for heating may not be compatible with Pegasus preferred strategy, working better with backup boilers than ASHP • Additional energy efficiency provided by GSHP is not required as ASHPs are being used.	• Suitable due to ease of installation, low maintenance requirements and silent, vibration free operation • Communal spaces and elderly residents who are often home will utilise generated electricity during peak generation times • PV has been selected ahead of solar thermal panels for installation on the remaining available roof space	• Solar thermal and PV panels would compete for the same available installation space on the developments roofs • Due to prohibitively expensive capital costs compared to PV and inferior carbon reduction to PV, solar thermal has not been selected for use in the scheme
STEP THREE – Suitable/proposed	**Yes/ Yes**	**Yes/ No**	**Yes/ Yes**	**Yes/ No**

LZCT Review of project suitability -Step 2

8.4 Air-Source Heat Pumps/VRF System

One of the key technologies integral to our strategy is the use of air-source heat pumps for space heating and cooling for the apartments.

An air source heat pump installation involves extracting heat from the ambient air to provide efficient space heating to a building. Air temperatures in the UK are reasonably stable, fluctuating from 5 - 25 °C throughout most of the year. This relatively high temperature can be taken advantage of as a heat source by using a heat pump to 'pump up' the extracted heat to a useful temperature for space heating.

Heat pumps operate on electricity and at current carbon conversion rates it is a more efficient technology than gas boilers over the course of the heating season (see section 7.3).

A high Coefficient Of Performance (COP) VRF system is proposed and will be integrated with the building's hydraulic systems so that the heat rejected from comfort cooled areas can be transferred to the building's heating system resulting in a high efficiency integrated solution. The outdoor units will be located on both roofs of the development. A meter shall be installed on to the system for monitoring in order to comply with Camden Planning Guidance.

The entire space heating and cooling demand will be met by air-source heat pumps.

COPs are expected to be between 4 and 4.5, meaning the use of ASHP as a LZCT is estimated to result in a 10% reduction of the CO_2 emissions, resulting in a 40% improvement over building regulations Part L with the addition of PV panels.

The ability to locate these units on the roof frees up more of the building saleable area. This benefit coupled with the energy efficiency and capability of the units to provide heating and cooling makes ASHP ideal for this project.

Acoustic enclosures will be provided for the external units to mitigate noise from the units to an acceptable level. These are described in the Max Fordham Noise Assessment.

Carbon efficiency of VRF space heating (electrical) vs. gas heating
Where heat pump heating is proposed it is a requirement of LBC and CPG3 to demonstrate that it is more efficient than gas.

Generation of 1kWh of natural gas produces: 0.184 $kgCO_2$

Generation of 1kWh of grid electricity produces: 0.445 $kgCO_2$

More than twice as much CO_2 is released by the production of electricity as it is for gas. As a result, electrical heating has to be at least twice as efficient as gas heating in order to be more carbon efficient.

Quoted efficiency of gas boiler: 95%

Quoted efficiency of VRF heating: 290% (Source: Daikin unit, -5°C external, 22°C room – worst case)

Therefore the carbon produced to deliver 1kW of heating to a property is as follows:

1kW of gas heating produces: 0.19 $kgCO_2$

1kW of electrical heating produces: 0.15 $kgCO_2$

These values show that electrical heating via ASHPs is more carbon efficient than gas heating.

8.5 Solar Photovoltaic (PV) Panels

PVs convert energy from sunlight directly into electricity. The main advantage, particularly over solar thermal, is that the generated electricity can be used for a wider range of applications than hot water and can also be exported to the National Grid. Further, electricity can be considered a more valuable energy source than heat in terms of CO_2 emissions. For these reasons, PVs can be easily integrated into most schemes.

Arthur West House will have a large roof area. Some of this will be taken up by the Air Source Heat Pumps (ASHP), however there is still enough remaining space to provide a large PV array. The PV array will be located on the Green roofs area, which is a common arrangement.

The East building on the proposed development is the better location for PV as it is taller, while the Prince Arthur Road building will be partially shaded from the east. It is proposed that PV be located on both roofs, but the majority should be located on the Fitzjohn's Avenue building in order to fully utilise the solar gain.

PV module	Sharp ND-R225A5
Module efficiency	13.7%
Array size	**102 panels**
Panel aperture area	1.5 m2
Array space requirement	200 m2
kWp (peak)	**23 kWp**
Yearly irradiation for site	1000 kWh/m2.y
Uncorrected annual output	20682 kWh/y
(K) Correction factor for dust & temperat	0.9
(L) Loss factor from DC to AC	0.8
(E)Corrected Annual output	**14891 kWh/year**
Annual carbon emission savings	**7743 kgCO2/year**

Table – Proposed PV type and array size

Table – Proposed ASHP and PV rooftop layout

An area of around 200m^2 is expected to be required to meet the sustainability targets, for the first services option. This is a large array and will need to be co-ordinated with the other roof services and functions. A meter shall be installed on to the system for monitoring in order to comply with Camden Planning Guidance. The array details are shown on the table opposite.

As a potential CO_2 saving this equates to an 18% reduction after passive and energy efficiency measures and ASHPs have been taken into account.

8.6 LZCT Summary

Both ASHPs and PV panels are proposed to supply energy for Arthur West House. The table below illustrates the contribution from each source to reducing the annual carbon emissions. The reduction in carbon by these LZCTs far exceeds the CPG3 target of 20% reduction.

	ASHP	PV	Combined
Tonnes CO_2 saved annually	7	9	16
% improvement on baseline CO_2 emissions	10%	13%	23%

Table - Carbon savings by LZCTs

9.0 CARBON EMISSIONS ASSESSMENT

A full carbon analysis has been carried out to assess the development's baseline emissions and the subsequent carbon savings that can be achieved at each stage of the energy hierarchy.

9.1 Calculation method

The calculations were carried out as follows: The living areas (specialist accommodation) of the development have been assessed using SAP 2012 software in order to calculate their expected carbon emissions rate. The non-domestic communal areas have been assessed using a benchmark CO2 analysis. These assessments were then combined to provide overall carbon emissions values for the development.

9.2 Compliance models

Specialist Accommodation
The baseline scenario for the specialist accommodation areas is based on the Building Regulations Part L (2013) compliant building. The Part L compliant building, known as the 'notional building', uses standard operating conditions.

In order to demonstrate compliance and subsequent improvements on Part L, the actual building load is compared with the Target Emission Rate (TER) from the notional building. Compliance is achieved by demonstrating that the actual building carbon emissions are lower than those for the notional building.

Building Regulations only assesses regulated energy usage such as lighting, heating and hot water. 'Plug-in' energy demand such as cooking, IT, and electrical appliances, also known as unregulated loads, are not assessed by building regulations.

We have assessed the unregulated load for the Fitzjohn's Avenue development using the SAP (2012) recommended procedure for comparison with the regulated load.

Communal
The communal areas have been assessed using a benchmark analysis, looking at typical modern efficient levels of emissions for each of the area types. Benchmark values were used to assess both the regulated and unregulated loads.

We propose to carry out a full dynamic modelling of the building at the next stage to demonstrate Part L compliance.

9.3 Carbon emissions

The results of the carbon analysis are presented in the following tables and graphs. Key outcomes are as follows:

- CO_2 Savings over baseline: 40%
- Reduction in carbon emissions through use of on-site renewable energy generation: >20%
- BREEAM energy credits:10/15

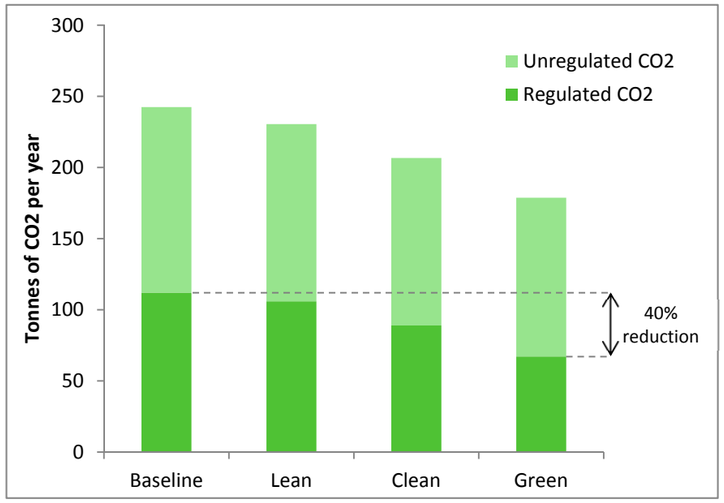
Note that an alternative servicing option is described in Appendix 5; this will also achieve all the targets set out above.

	Whole development CO_2 emissions (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Building Regulations 2013 **Part L** Compliance **('Baseline')**	112	130
After energy demand reduction **('Lean')**	106	125
After energy efficient systems **('Clean')**	89	118
After renewable energy **('Green')**	67	112

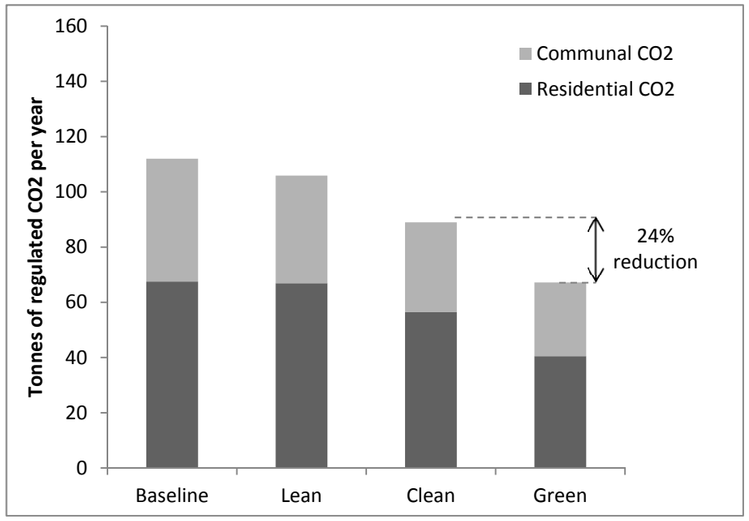
Table – Carbon Dioxide Emissions after each stage of the energy hierarchy

	Whole development Regulated Carbon Dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Savings from energy demand reduction **('Lean')**	6	5.5%
Savings from energy efficient systems **('Clean')**	17	16%
Savings from renewable energy **('Green')**	22	24.5%
Total Cumulative Savings	45	40%

Table – Regulated carbon dioxide savings from each stage of the energy hierarchy



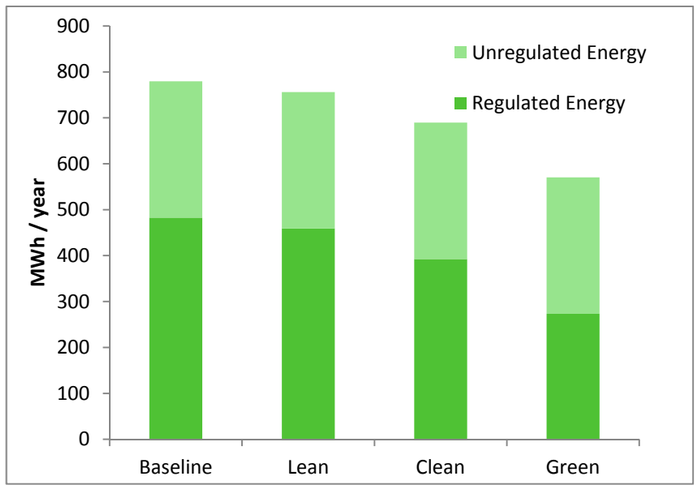
Graph – Regulated and unregulated CO_2 emissions at each stage of the Energy hierarchy



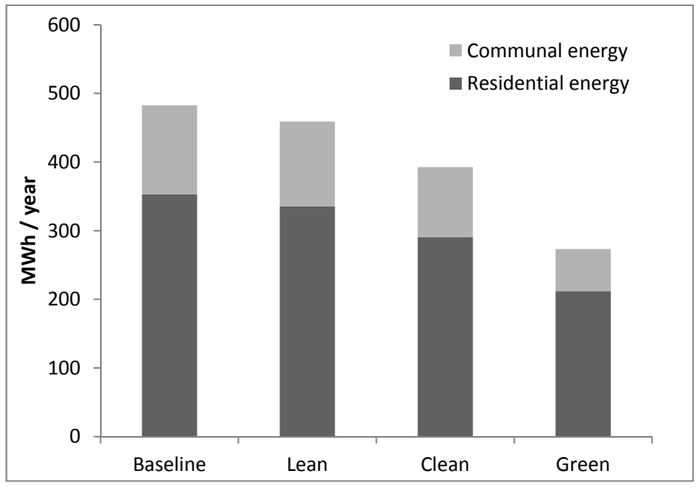
Graph – Communal and specialist accommodation contributions to carbon emissions from regulated energy use at each stage of the energy hierarchy

9.4 Energy

Regulated and unregulated energy for the new development has also been assessed via the same methods used for the carbon analysis. The following graphs demonstrate the regulated and unregulated energy for the development at each stage of the energy hierarchy, and the relative contributions from the specialist accommodation and communal areas.



Graph – Development energy use at each stage of the energy hierarchy



Graph - Communal and specialist accommodation regulated energy use at each stage of the energy hierarchy

10.0 ECOLOGY, DRAINAGE AND WATER CONSERVATION

10.1 **Ecology**

An ecologist has been employed to undertake a habitat survey of the existing site and make recommendations for the proposed landscape design.

Targeted BREEAM credits can be found in Appendix 1 and further detailed information can be found in the Landscape Architect's proposals.

10.2 **Sustainable Urban Drainage**

It is currently proposed that Sustainable Drainage Systems are incorporated within the scheme and will include green roofs and below ground surface water attenuation tanks. Drainage design is by others so is not described in this report.

The areas of impermeable surface are in fact being reduced from existing to proposed scheme. So, the effect on flooding will be reduced.

The Site Investigation has confirmed that infiltration into the subsoil is not feasible on this site due to the underlying impermeable clay strata.

More detailed information can be provided by the Structural Engineer.

10.3 **Water Conservation**

A number of water conservation techniques are to be adopted, with 6 of the 9 BREEAM water credits being targeted.

The showers, taps and WCs will be selected to be low-flow to reduce water consumption by 25% in the living areas.

Water use to individual apartments, the café and the wellness areas will be separately metered.

A leak detection system will be installed on the incoming main.

Solenoid shut-off valves will be installed on communal WC areas, linked to presence detectors.

A rainwater harvesting system is expected to be provided to reduce the amount of mains water used for irrigation of the planted areas.

11.0 BREEAM ASSESSMENT

11.1 Executive Summary

The development will be assessed under BREEAM New Construction 2011 V3.4 – Multi-Residential, and is on track to achieve a **BREEAM Excellent** rating. A current score of **74.73%** is thought to be achievable for the development, where BREEAM Excellent is 70%+.

It should be noted that the project is still at an early stage in the design and therefore changes are likely to occur that may impact on the overall BREEAM score. Credits in the assessment may become unfeasible due to design changes or for costs reasons. It is therefore recommended that projects have a contingency of **5 %** above the minimum to ensure the desired rating is achieved. This allows for any design developments or changes that may have an adverse effect on the rating.

The current score provides a margin of **4.73%** above the minimum required for an 'Excellent' rating. This buffer score is not sufficient and therefore a couple of additional credits are being investigated to ensure a safe journey to an excellent rating. A number of additional credits are highlighted in the pre-assessment for this reason. Should any of the current targeted credits become unfeasible, there will be a commitment from the design team to target alternatives in their place.

The graphs opposite illustrate the score and how the project is expected to perform in each of the ten categories.

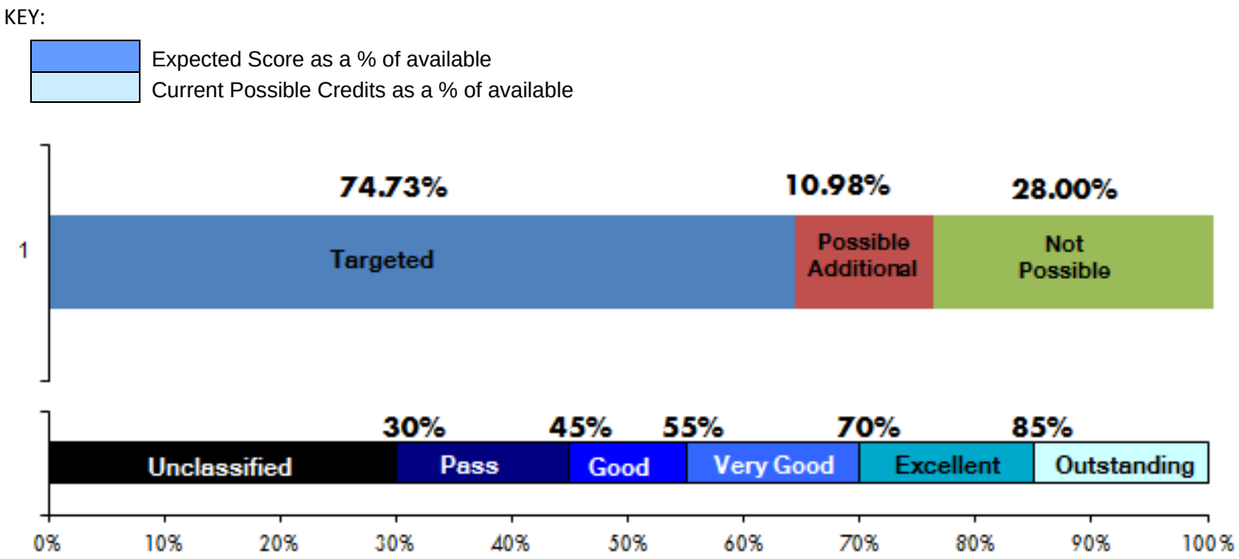
LBC CPG 3 Achieving 60% of BREEAM credits for energy & water

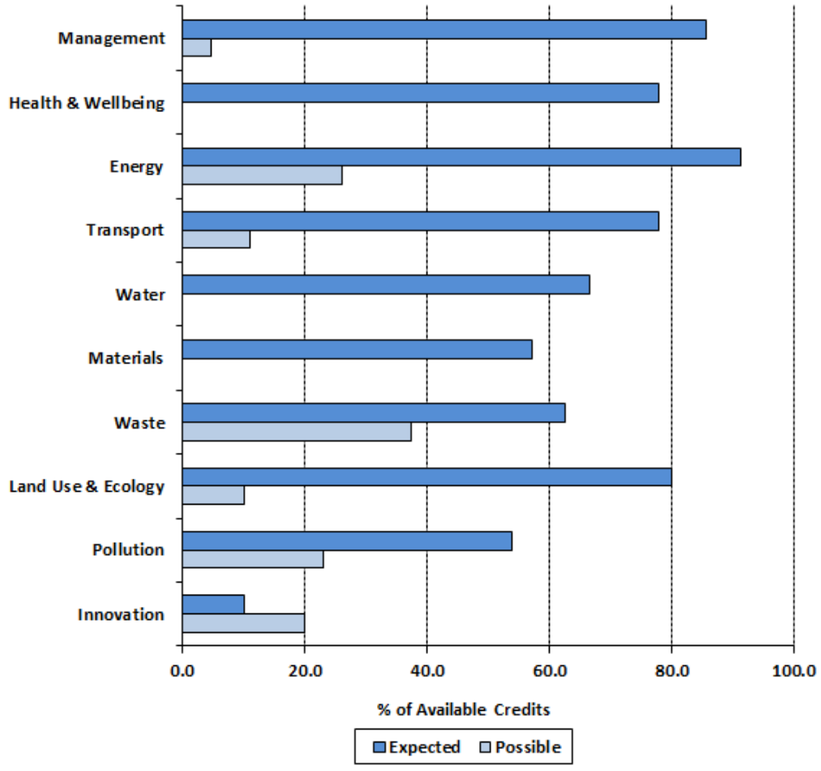
In line with CPG3, and Development Policy DP22; supplementary to the 'Excellent' target, the council requests:

60% of the energy credits to be achieved. 13.7% is achieved of 15% available, which is 91% of energy targets achieved.

60% of the water credits to be achieved: 4.67% is achieved of 7% available, which is 67% of water targets achieved.

40% of the material credits to be achieved: 7.71% is achieved of 13% available, which is 57% of material targets achieved. Although this is currently being achieved, it includes a number of high risk credits which are at risk of being lost, so we are unable to guarantee that the 40% target is achieved. As the site is a tight sloping site, and because we are maximising facilities provision whilst keeping the massing to a minimum, this requires a stepped-back form and multiple basement levels. This type of form demands a concrete frame, which is not favourably assessed by the Materials credits in BREEAM. For these reasons we do not expect to be able to achieve the 40% materials credits.





11.2 About BREEAM New Construction 2011

The Building Research Establishment Environmental Assessment Method for New Construction 2011 (BREEAM New Construction 2011) helps Clients and Local Authorities to set environmental targets and demonstrate environmental performance for new and refurbished buildings. To date over 200,000 buildings have been certified under BREEAM worldwide since it was first launched in 1990. Figure 1 below illustrates countries in which BREEAM assessments have taken or are currently taking place.

Figure 1: Countries in which BREEAM is present

BREEAM New Construction 2011 incorporates the following categories:

- Management
- Health and Wellbeing
- Energy
- Transport
- Water
- Materials
- Waste
- Land use and Ecology
- Pollution
- Innovation (Exemplary Performance)

There is also an Innovation Category, where additional Credits can be awarded for any innovative features of the building project that are not assessed as standard and that the design team feel are worth credit. An application for these additional Credits has to be made to BRE for approval. As the new design develops, areas of the design will be assessed for eligibility for Innovation Credits.

11.3 Scoring Process

Credits are allocated under each category and an environmental weighting is applied to determine an overall building score. The building will be allocated a rating of Pass, Good, Very Good, Excellent, or Outstanding as follows:

BREEAM RATING	% SCORE
Outstanding	85
Excellent	70
Very Good	55
Good	45
Pass	30
Unclassified	<30

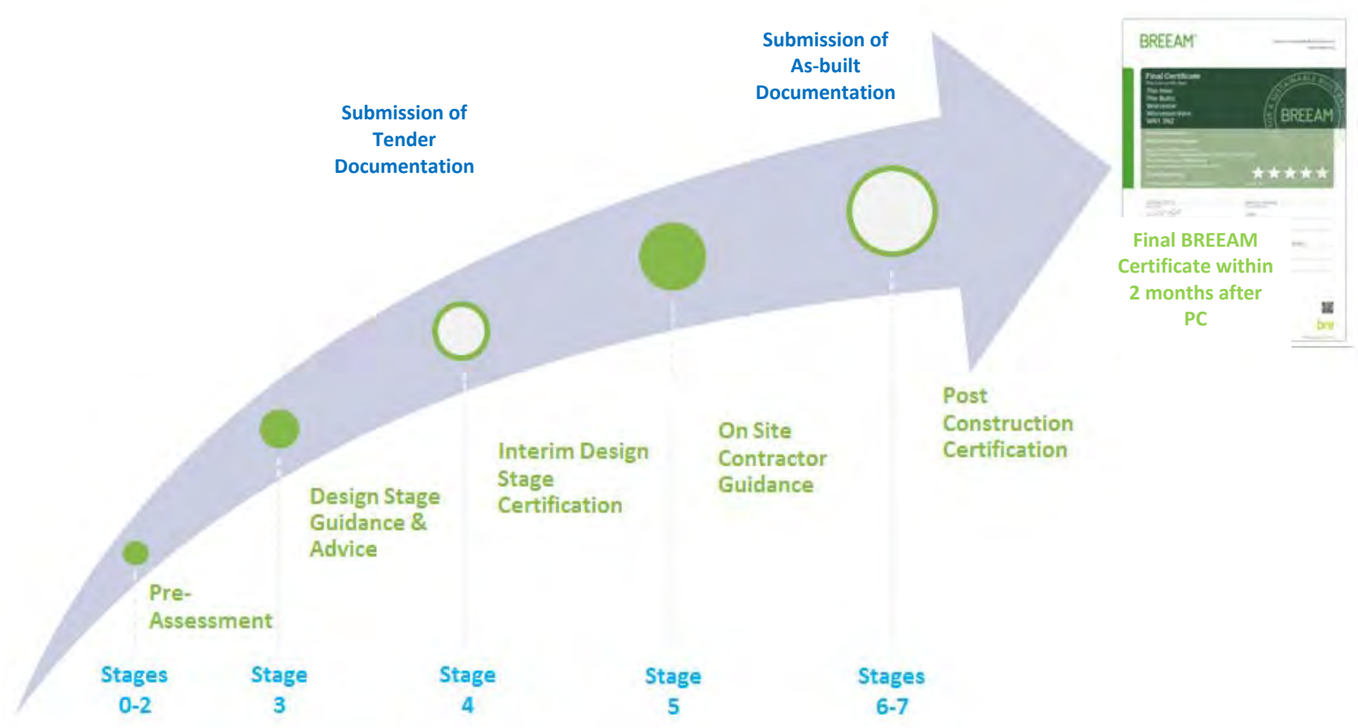
For those familiar with past BREEAM versions (2006 & 2008), it should be noted that a number of changes have been introduced in the latest scheme (BREEAM New Construction 2011), including more stringent requirements, significant credit consolidation, and new requirements under a number a credits.

11.4 Assessment Process

As part of the assessment scheme, two formal assessments will be required. The first assessment is to take place during design stages following the appointment of the contractor (Interim or Design Stage Certification). Design-based evidence and commitments from the team for various items to be included in the final product are required as evidence at this stage.

The final assessment will take place following Practical Completion (Post Construction Certification). A second batch of As-built information will be required that will confirm that the design stage information is valid. This will be carried out by a combination of on-site assessor auditing, and additional as-built drawings / records. The general BREEAM process is outlined in ***Figure 2*** below.

In BREEAM New Construction 2011, there are minimum standards required for Very Good and Excellent ratings. These are summarised in Section 3.0 on the following page. The current status for the proposed East Wick project confirms that all mandatory requirements are being addressed and are on track to be achieved.



11.5 Mandatory Minimum Requirements for Excellent

The issues below in Table 1 contain **mandatory minimum** requirements for achieving a BREEAM Excellent rating. The requirements specific to excellent are noted for each issue. The development is currently expected to achieve all of the minimum mandatory requirements.

CREDIT	RIBA STAGE	REQUIREMENT	OWNER
Man 01: Sustainable Procurement	B/C	For BREEAM Very Good, project must achieve at least one credit in this issue. Credits are available for team collaboration, appointing a BREEAM Accredited Professional, thermographic surveying, commissioning and aftercare.	Client, Design Team, Contractor
Man 02: Responsible construction practices	C	Contractor achieves 'compliance' with Considerate Constructors Scheme by achieving a score between 25-34.	Contractor
Man 04: Stakeholder Participation	K/L	Building User Guides are provided and are appropriate to general building users, staff, and non-technical facilities managers.	Contractor
Hea 01: Visual Comfort. Pre-requisite.	D	Pre-requisite (un-credited) All fluorescent and compact fluorescent lamps must be fitted with high frequency ballasts.	Services Engineer
Hea 04: Water Quality	D	All water systems must be designed in compliance with measures outlined in the Health and Safety Executive's "Legionnaires' Disease – The Control of Legionella Bacteria in Water Systems. Where humidification is required, a failsafe humidification system is provided.	Services Engineer
Ene 01: Reduction of CO2 emissions	D	Design achieves a minimum Energy Performance Ratio on a scale of 0.05 to 0.90 (1 - 15 credits available). Minimum 6 credits required for Excellent (25% improvement on TER).	Services Engineer
Ene 02: Energy Monitoring	D	Energy monitoring using BMS or separate accessible energy sub-meters with pulsed output.	Services Engineer
Ene 04: LZC technologies	C	1 credit required: e.g. LZC feasibility study or renewable energy supply contract OR free cooling.	Services Engineer
Wat 01: Water Consumption	D	Achieve at least a 12.5% reduction of water usage as compared to a notional baseline performance.	Services Engineer, Architect
Wat 02: Water Monitoring	D	Water meter on mains water supply to each building.	Services Engineer
Mat 03: Responsible Sourcing of Materials	F	All timber must be sourced in accordance with the UK Government's Timber Procurement Policy.	Architect, Contractor
Wst 03: Operational waste	D	Where dedicated, accessible and properly sized storage space is provided for recycling. Where consistent generation in large volumes of waste or compostable materials are generated, compactors, balers, and/or composting vessels or facilities with water outlet must be provided.	Architect
LE 03: Mitigating Ecological Impacts	F	Minimal negative change to ecological value of site, or a positive change.	Landscape Architect, Ecologist

Table 1: mandatory requirements for excellent

11.6 Current Pre-assessment Score

The score matrix in the appendix lists all credits which are being targeted as part of the 'Excellent' strategy.

11.7 Team commitment required to achieve the target rating

Achieving an 'Excellent' rating will require a strong commitment from all design team members. Also, the cost implications of certain credits need to be evaluated in order to ensure they can be achieved.

Please note that all of these credit requirements are to be read in conjunction with the full BREEAM 2011 manual. The detailed requirements will be communicated by the Assessor as the project enters the detailed design stages.

11.8 Early Stage Credits

The design team has been working through a number of items which require action at an early stage of the design. The aim is to be able to secure as many early stage credits as possible so that the process toward certification runs smoothly, and potentially at a lower cost.

Man 01 Roles and Responsibilities

Guidance has been sent to the project manager to ensure that from RIBA Stage B, all team members are involved in the decision making process for the project.

Man 04 Consultation

The requirements of the consultation credit have been reviewed by an external consultant who will carry out the work. It has been confirmed that a compliant consultation plan will be developed.

Man 04 Design & Access Statement

Guidance has been sent to the team on how to produce a BREEAM compliant Design & Access Statement.

Man 05 Life Cycle Costing

All three credits for Life Cycle Costing have been targeted and it has therefore been agreed that this analysis will be completed early enough to inform important design decisions.

12.0 APPENDIX 1 – BREEAM PRE-ASSESSMENT

Fitzjohn Avenue, Hampstead

BREEAM Pre-Assessment Strategy

Targeted Score for an 'Excellent' Rating (70) 74.73%

MAX FORDHAM

Project Stage: Pre-assessment

Assessment Scheme BREEAM NC 2014 V1

Credit & Description			Requirement	Min. Credits		Credit	Available		Targeted ...		Possible Additional Score		Risk	Owner	Contributor	Key Points/Reason for not targeting
(Full Credit Compliance Requirements & Schedule of Information Required Set out by section in the BRE Assessment Manual)				VG	EX	value	Credits	Score	Credits	Score	Credits	Score	H/M/L			
MANAGEMENT SECTION		Credit														
Man 01 Project Brief and Design	MUST OCCUR NO LATER THAN RIBA STAGE 2	# 1	Prior to completion of the Concept Design, all team members involved in decision making process for the project. Roles and responsibilities must be specifically outlined and a schedule of training must be identified for building occupiers.	1	1	0.57	1	0.57 %	1	0.57 %			M	Project Manager	All	The process should be repeated at subsequent project stages. Example info sent
	MUST OCCUR NO LATER THAN RIBA STAGE 2	# 2	During design brief preparation, all relevant parties and bodies are identified and consulted with by the design team - evidence must be gathered that these consultations were incorporated into the design. Consultation plan must be prepared that includes timescale and method of consultation.			0.57	1	0.57 %	1	0.57 %			M	Keeble Brown	Project Manager	
	MUST OCCUR NO LATER THAN RIBA STAGE 1	# 3	No later than early RIBA Stage 1, Sustainability Champion is appointed to facilitate setting of BREEAM performance targets. BREEAM target must be contractually agreed between client and project team no later than RIBA Stage 2. Project must undergo Design Stage Certification assessment.			0.57	1	0.57 %					M	MF Sustainability Champion	Project manager	Stage 1 had already expired by the appointment time, also requires cost item of extra BREEAM AP appointment
		# 4	Credit #3 has been achieved. Sustainability Champion is appointed to monitor progress against the agreed BREEAM performance targets throughout the design process and formally report progress to the client and design team. Sustainability Champion must attend key design team meetings and prepare regular written reports.			0.57	1	0.57 %					M	MF Sustainability Champion	Project manager	Requires above to be achieved
Man 02 Lifecycle Cost and Service Life Planning	MUST OCCUR NO LATER THAN RIBA STAGE 2	# 1	An elemental life cycle cost (LCC) analysis should be carried out, at RIBA Stage 2. The LCC analysis shows an outline plan based on the building's basic structure and envelope, appraising a range of options and based on multiple cash flow scenario's e.g. 20, 30, 50+ years and the fabric and servicing strategy for the project outlining services component and fit-out options (if applicable) over a 15-year period, in the form of an 'elemental LCC Plan'			0.57	2	1.14 %	2	1.14 %			M	Quantity Surveyor	M&E/AR/PM/SE	QS to carry out the LCC study.
	MUST OCCUR NO LATER THAN RIBA STAGE 4	# 2	A component level LCC plan has been developed by the end of RIBA Stage 4 and includes the following component types in line with PD 156865:2008 (where present): envelope, services, finishes, external spaces. Demonstrate how the component level LCC plan has been used to influence building and systems design/specification to minimise life cycle costs and maximise critical value			0.57	1	0.57 %			1	0.57 %	M	Quantity Surveyor	M&E/AR/PM/SE	QS to carry out the LCC study. Team must decide during stage C which design options to appraise
		# 3	Report the capital cost for the building in pounds per square metre (£/m²), via the BREEAM Assessment Scoring and Reporting tool, Assessment Issue Scoring tab, Management section.			0.57	1	0.57 %	1	0.57 %			M	Quantity Surveyor		This is a new credit introduced to help BRE understand the cost of applying BREEAM. If sought, report capital cost in BREEAM format
Man 03 Responsible Construction Practices		# 1	Principle contractor operates a compliant Environmental Management System concerning their main operations and implement best practice pollution prevention policies and procedures on site in accordance with Pollution Prevention Guidelines.			0.57	1	0.57 %	1	0.57 %			L	Project Manager	Contractor	To be included in the Contractor's Prelims. Assessor provided some example information (29/09/14)
		# 2	Sustainability Champion is appointed to monitor the project to ensure ongoing compliance with the relevant sustainability performance/process criteria and BREEAM targets throughout the Construction, Handover and Close out stages and formally report progress to the client and design team. Sustainability Champion must attend key design team meetings and submit a final post construction stage assessment report.			0.57	1	0.57 %	1	0.57 %			L	Project Manager	Contractor	Contractor's BREEAM AP should be appointed to prepare required documentation.
		# 3	Contractor achieves compliance with 'Considerate Constructors Scheme' by achieving a score between 25 34.		1	0.57	1	0.57 %	1	0.57 %			L	Project Manager	Contractor	To be included in the Contractor's Prelims.
		# 4	Contractor achieves compliance with 'Considerate Constructors Scheme' AND surpasses it by achieving a score of 35 or above in Considerate Constructors Scheme (at least a score of 7 in each category is required, regardless of final total score).			0.57	1	0.57 %	1	0.57 %			L	Project Manager	Contractor	To be included in the Contractor's Prelims.
		# 5	Responsibility has been assigned to an individual(s) for monitoring, recording and reporting energy use and water consumption resulting from all on-site construction processes (and dedicated off-site monitoring) throughout the build programme.			0.57	1	0.57 %	1	0.57 %			M	Project Manager	Contractor	To be included in the Contractor's Prelims.
		# 6	Responsibility has been assigned to an individual for monitoring, recording, and reporting data on transport movements and impacts resulting from delivery of the majority of construction materials to site and construction waste from site.			0.57	1	0.57 %	1	0.57 %			M	Project Manager	Contractor	To be included in the Contractor's Prelims.
Man 04 Commissioning and Handover	MUST OCCUR NO LATER THAN RIBA STAGE 4	# 1	Project team member appointed to monitor and programme pre-commissioning, commissioning, and where necessary, re-commissioning. Main contractor accounts for commissioning programme, responsibilities, and criteria within main programme of works.			0.57	1	0.57 %	1	0.57 %			M	M&E; Project manager	Contractor	All requirements to be accounted for in commissioning specification as part of contractor's appointment A separate appointment is required for a commissioning monitor, typically appointed by contractor
		# 2	Specialist Commissioning Manager must be appointed during design stage (by either client or contractor) for complex systems in order to give design input.			0.57	1	0.57 %	1	0.57 %			M	Project Manager	Contractor	Appointment of specialist commissioning manager must occur in design stage.
		# 3	Credit #1 has been achieved. The integrity of the building fabric is quality assured through completion of post construction testing and inspection. Dependent on building type this can be demonstrated through the completion of a thermographic survey as well as as airtightness test and inspection by a qualified professional. Any defects must be rectified prior to building handover/close out.			0.57	1	0.57 %	1	0.57 %			M	Project Manager	Contractor	To be included in the Contractor's Prelims.
		# 4	Building User Guide is developed for distribution to the building occupiers and premises managers. A training schedule is prepared for building occupiers/premises managers containing the building's design intent, aftercare provision, introduction/demonstration of installed systems and key features, introduction to the Building User Guide, maintenance requirements.		1	0.57	1	0.57 %	1	0.57 %			M	Project Manager	Contractor	A Building User Guide (BUG) is to be developed prior to handover for distribution to the building occupiers. Client meeting stated contractor would be asked to do this. Thus, should be included in contractor's prelims. All consultants should supply text in their stage reports for BUG
Man 05 Aftercare		# 1	Energy and water consumption data is collected for at least 12 months after occupation and data is analysed. A contract is in place for building aftercare support.			0.57	1	0.57 %	1	0.57 %			M	Client/project manager	Contractor	Client/Facilities management team are currently expected to fulfil this role.
		# 2	Seasonal Commissioning over a 12 month period once building becomes occupied.		1	0.57	1	0.57 %	1	0.57 %			M	Contractor	M&E	To be included in the Contractor's Prelims.
		# 3	Client makes commitment to carry out a Post Occupancy Evaluation (POE) one year after building occupation to gain building performance feedback. It should be carried out by an independent third part			0.57	1	0.57 %	1	0.57 %			H	Client	Project manager	Client has indicated desire to pursue. Client must formally agree to appoint a 3rd party to carry a POE.

Management totals:					0.57	21	12.00 %	10.29%	10.29 %	0.57%	0.57 %				
HEALTH & WELL-BEING															
Hea 01 **Visual Comfort**		# 1	Potential for disabling glare has been designed out of all relevant building areas using a glare control strategy. The glare control strategy avoids increasing lighting energy consumption and use or location of shading does not conflict with the operation of lighting control systems.		0.83	1	0.83 %	1	0.83 %			M	Architect	M&E	Blinds/other systems to be installed for disabling glare in all occupied spaces.
	Space planning- occurs before RIBA Stage 2 **Daylighting criteria should be met using either 2a OR 2b**	#2a	2% Daylight factor in 80% in occupied areas with EITHER (a) OR (c)} a- uniformity ratio of at least 0.3; c- The room depth criterion d/w +d/HW < 2/(1-RB) is satisfied. Where: d = room depth, w = room width, HW = window head height from floor level, RB = average reflectance of surfaces in the rear half of the room		0.83	1	0.83 %					H	M&E	Architect	Unclear whether design will comply. Modelling is required to confirm the credits
	Daylighting criteria should be met using either 2a OR 2b	# 2b	100% of kitchen / living rooms, dining rooms, studies (including home office) area with Average daylight luminance at least 100 lux for 3450 hours per year or more and Minimum daylight illuminance at worst lit point at least 30 lux for 3450 hours per year or more. 80% of communal occupied spaces area needs at least 200 lux for 2650 hours per year or more with minimum daylight illuminance at 60 lux for 2650 hours		0.83		0.00 %					H	M&E		Another way of achieving daylight credit.
	Space planning- occurs before RIBA Stage 2	#3	95% of the floor area in relevant building areas is within 5m of a wall which has a window or permanent opening that provides an adequate view out. The window/opening must be ≥ 20% of the surrounding wall area where the room depth is greater than 5m. In addition all positions with relevant areas must be within 5m of an opening with a view that should be >20% of surrounding wall area		0.83	1	0.83 %	1	0.83 %			M	Architect		Multi res requirements: Living rooms – (self contained flats), communal lounges, individual bedrooms and bedsits – (sheltered housing) All positions within relevant areas are to be within 5m of a wall which has a window or permanent opening providing an adequate view out. The window/opening must be ≥ 20% of the surrounding wall area. Areas that will require a view out: all offices, classrooms etc. Architect to check requirements
		# 4	Internal and External lighting provides luminance levels in accordance with the SLL Code for Lighting 2012. For areas where computer screens are regularly used, the lighting design complies with CIBSE Lighting Guide 72 sections 3.3, 4.6, 4.7, 4.8 and 4.9. External lighting provided is specified in accordance with BS 5489-1:2013 Lighting of roads and public amenity areas.		0.83	1	0.83 %	1	0.83 %			L	M&E		Internal & external Lighting design to comply with requirements.
Hea 02 **Indoor Air Quality**		# 1	Indoor air quality plan (IAQ) produced.		0.83	1	0.83 %	1	0.83 %			M	Contractor	M&E	Criterion 1, the Indoor Air Quality Plan must be produced in order for other credits in this issue to be achieved. BREEAM AP to provide the IAQ template.
	Space planning- occurs before RIBA Stage 2	# 2	Building has been designed to minimise the concentration and recirculation of pollutants in the building.		0.83	1	0.83 %					M	M&E		It highly unlikely/impossible that all natural ventilation openings can be positioned over 10m from sources of pollution, and mechanical inlets 20m away.
		# 3	VOC levels for all paints and varnishes, and at least 5 of the 7 remaining listed product categories of BREEAM table 18 have been met.		0.83	1	0.83 %	1	0.83 %			M	Architect		Internal finishes will need to meet VOC level requirements. BREEAM AP to provide guidance and specification clauses.
		#4	Formaldehyde and VOC concentration levels are tested post-construction. High levels must be remediated in accordance with the IAQ plan.		0.83	1	0.83 %	1	0.83 %			H	Contractor		Very difficult to achieve and high risk credit as the contractor is required to test VOC level prior to occupation to ensure levels are low enough. Needs to be factored into programme.
		# 5	The building ventilation strategy is designed to be flexible and adaptable to potential building occupant needs and climatic scenarios..		0.83	1	0.83 %					M	M&E	Architect	Not sought because all spaces need to be naturally ventilated.
Hea 03 **Safe Containment in Laboratories**	**MUST OCCUR NO LATER THAN RIBA STAGE 3**	# 1	An objective risk assessment of the proposed laboratory facilities has been carried out prior to completion of the RIBA Stage 3 to ensure potential risks are considered in the design of the laboratory. Where containment devices such as fume cupboards are specified their manufacture and installation meet best practice safety and performance requirements and objectives, demonstrated through compliance with the relevant standards.		0.83	0	0.00 %					M	M&E		
		# 2	Where containment level 2 & 3 laboratory facilities are specified they must meet best practice safety and performance criteria and objectives. The design team demonstrate that the individual fume cupboard location and stack heights have been considered in accordance with HMIP Technical Guidance Note (Dispersion) D1		0.83	0	0.00 %					M	M&E		
Hea 04 **Thermal Comfort**		# 1	Thermal modelling carried out and ensures design achieves criteria set out in CIBSE Guide A Environmental Design.		0.83	1	0.83 %	1	0.83 %			M	M&E		Thermal modelling expected to meet requirements. This credit is a pre-cursor to Ene04. Assessor provided example letter 29/09/14
		# 2	Credit #1 has been achieved and demonstrates a projected climate change scenario. Project team to demonstrate how the building has been adapted, or designed to be easily adapted in future using passive design solutions.		0.83	1	0.83 %	1	0.83 %			M	M&E		Study should demonstrate compliance by using probabilistic TRY weather data files to establish the projected climate change environment against which the design is evaluated
		# 3	Credit #1 has been achieved. Thermal modelling informs the temperature control strategy in terms of zoning, amount of occupant control, how systems will interact with each other, and need for an accessible building user actuated manual override for any automatic systems.		0.83	1	0.83 %	1	0.83 %			M	M&E		Thermal model to inform the design of controls and thermal zoning accordingly.
Hea 05 Acoustic Performance			**One credit** - Sound insulation values are 3 dB or higher and sound insulation values are 3dB lower than standards in the relevant Building Regulation Standards **Three credits** - Sound insulation values are 5 dB or higher and sound insulation values are 5dB lower than standards in the relevant Building Regulation Standards **Four credits** - Sound insulation values are 8 dB or higher and sound insulation values are 8dB lower than standards in the relevant Building Regulation Standards Programme precompletion test is done based on BRS OR Use of construction has been registered and assessed by Robust Details Limited. Testing should be done on multiple floors. See also CN3 and CN8		0.83	4	3.33 %	3	2.50 %			M	Acoustician		Indoor ambient noise levels likely to meet the required standards. Discuss roof materials to meet acoustic standards.

Hea 06 Safety & Security	**Site planning- occurs before RIBA Stage 2**	# 1	Proper cycle lanes, footpaths, pedestrian lighting. Delivery areas not directly accessed through general parking areas and have their own vehicle manoeuvring areas.			0.83	1	0.83 %	1	0.83 %			H	Architect		Check kitchen delivery routes & pedestrican routes
	MUST OCCUR NO LATER THAN RIBA STAGE 2	# 2	Consultation with ALO no later than RIBA Stage C. Final design must incorporate suggestions from ALO and must conform to either Secured by Design and/or Safer Parking Scheme (actual certification not required).			0.83	1	0.83 %	1	0.83 %			L	Architect		Confirm whether an ALO has been consultant for the project? Recommendations to be incorporated into security strategy.
Health & Wellbeing totals						0.83	18	15.00 %	11.67%	11.67 %	0.00%	0.00 %				
ENERGY																
Ene 01 Reduction of Energy Use and Carbon Emissions			Design achieves a minimum Energy Performance Ratio on a scale of 0.075 to 0.90 (1 - 12 credits available). Minimum 5 credits required for Excellent. Minimum 8 credits required for Outstanding		5	0.65	12	7.83 %	10	6.52 %	2	1.30 %	M	M&E		Part L model and initial BRUKL to be run- may not be possible before planning submission. 10 credits expected from initial calcs. 7 are required to meet LBC's 50% energy credits target. To achieve this a challenging 40% improvement over part L2013 and 10% improvement in primary energy and heat demand gives required. Large PV array on roof required.
Ene 02 Energy Monitoring		# 1	Energy metering systems are installed that enable at least 90% of the estimated annual energy consumption of each fuel to be assigned at various end-use categories of energy consuming systems. The energy consuming systems in buildings with a total useful floor area greater than 1,000m2. are metered using an appropriate energy monitoring and management system.	1	1	0.65	1	0.65 %	1	0.65 %			L	M&E		To be included in BMS /M&E specification and locations of meters to be shown on drawings.
		# 2	An accessible energy monitoring and management system or separate accessible energy sub-meters with pulsed or other open protocol communication outputs to enable future connection to an energy monitoring and management system are provided, covering a significant majority of the energy supply to tenanted areas or, in the case of single occupancy buildings, relevant function areas or departments within the building/unit.			0.65		0.00 %					L	M&E		
Ene 03 External Lighting			The building has been designed to operate without the need for external lighting. OR The average initial luminous efficacy of the external light fittings within the construction zone is not less than 60 luminaire lumens per circuit watt. All external light fittings are automatically controlled for prevention of operation during daylight hours and presence detection in areas of intermittent pedestrian traffic.			0.65	1	0.65 %	1	0.65 %			L	M&E		To be included in the specification.
Ene 04 Low Carbon Design	**MUST OCCUR NO LATER THAN RIBA STAGE 2**	# 1	First Credit from BREEAM Issue Hea 04 Thermal Comfort has been achieved. Design team has carried out analysis of the proposed building design/development to influence decisions made during Concept Design stage and identify opportunities for the implementation of passive design solutions. The building uses passive design measures to reduce total energy demand of the building.			0.65	1	0.65 %	1	0.65 %			M	M&E		First Credit from BREEAM Issue Hea 04 Thermal Comfort will need to be achieved. What passive design measures are included to reduce total energy demand of the building and how these will be implemented?
		# 2	Credit #1 has been achieved. The passive design analysis also includes an analysis of free cooling and identifies opportunities for the implementation of free cooling solutions. The building uses ANY of the free cooling strategies (night-time cooling, ground water cooling, displacement ventilation, ground coupled air cooling, surface water cooling, evaporative cooling, desiccant dehumidification and evaporative cooling using waste heat, absorption cooling using waste heat, or building does not require any form of cooling).ALL occupied spaces should use the free cooling strategy			0.65	1	0.65 %			1	0.65 %	M	M&E		VRF cooling specd so free cooling not possible
	MUST OCCUR NO LATER THAN RIBA STAGE 2	# 3	LZC feasibility study carried out no later than RIBA Stage 2. A local LZC technology/technologies has/have been specified for the building/development in line with the recommendations of this feasibility study and results in at least 5% of overall building energy demand and/or CO2 emissions.			0.65	1	0.65 %	1	0.65 %			M	M&E		Feasibility study being produced, PVs expected to be specified.
Ene 06 Energy Efficient Transportation Systems		# 1	Analysis for transportation demand and energy consumption for lifts, escalators, or moving walkways takes place. Strategy with lowest energy consumption is specified.			0.65	1	0.65 %	1	0.65 %			L	M&E		A Transport Pattern Study is to be carried out to determine a fit for purpose lift based on expected usage. Lift manufacturer can usually provide this study & specify compliant lift.
		# 2	# 1 is achieved. Lifts use three of the following: operate on a standby-by condition on off-peak periods, energy-efficient lighting, drive controller capable of variable speed, variable voltage, variable frequency of drive motor, and has regenerative drive unit.			0.65	2	1.30 %	2	1.30 %			L	M&E		To be included in specification. Not seen as any additional cost
Ene 07 Energy efficient laboratory systems	MUST OCCUR NO LATER THAN RIBA STAGE 1	#1	Criterion 1 within issue Hea 03 Safe containment in laboratories has been achieved. Client consultation required during the preparation of the initial project brief to determine occupant requirements and define laboratory performance criteria. The design team demonstrates that the energy demand of the laboratory facilities has been minimised as a result of achieving the defined design performance criteria.			0.65		0.00 %			1	0.65 %	M	M&E		
		#2	Up to an additional two credits where the laboratory area accounts for at least 10% (but less than 25%) of the total building floor area. Laboratory plant and systems are designed, specified and installed to promote energy efficiency, demonstrated through compliance with items B to L in Table - 27 of BREEAM 2014 Manual.			0.65		0.00 %					M	M&E		
		#3	Up to an additional four credits where the laboratory area accounts for 25% or more of the total building floor area Laboratory plant and systems are designed, specified and installed to promote energy efficiency, demonstrated through compliance with items B to L in Table - 27 of BREEAM 2014 Manual.			0.65		0.00 %					M	M&E		
Ene 08 Energy Efficient Equipment			Energy efficient equipment specified for small power and plug-in equipment, swimming pools, laundry, kitchen, IT intensive areas, etc. Requires an analysis showing the total annual unregulated energy demand of the development and its operation and ways to reduce consumption. Check ref C and F and also CN3, CN4, CN6 and CN8			0.65	2	1.30 %	2	1.30 %			M	M&E	Client/Project manager	Applies to fit-out of building where relevant, i.e. office equipment and white goods etc. BREEAM AP has provided supplementary guidance information (29/09/14)

					0.65	23	15.00 %	13.70%	13.70 %	3.91%	3.91 %				
TRANSPORT															
Tra 01 **Public Transport Accessibility**			Credits awarded on a sliding scale based on the proximity of the buildings' accessibility to the public transport network. An Accessibility Index (AI) is determined by the Tra 01 Calculator Tool. AI must be ≥ 2 to achieve AI credit. 3 credits awarded for an AI ≥ 8. Development with a low AI score can achieve 1 credit if the building has a dedicated bus service or shuttle. For multi-res, default hours of operation is 08.00-19.00			1.00	3	3.00 %	3	3.00 %			L	Transport consultant	Assessor	Central london site expected to do well. TFL report generates AI of 14.1- three credits
Tra 02 **Proximity to Amenities**			Building located in close proximity to local amenities which are likely to be frequently required and used by building occupants and where building type is indicated to have core amenities at least two of them must be provided as part of the total number required as per Table 31 of the BREEAM manual			1.00	2	2.00 %	2	2.00 %			L	Assessor	Transport consultant	Central london site expected to do well. Initial review of google maps confirms this.
Tra 03 **Cyclist facilities**	**Space planning- occurs at RIBA stage 2**		Compliant cycle storage spaces that meet the minimum levels set out in Table 32 of the BREEAM manual. #1 is achieved. Provide two of the four options: 1) showers, 2) changing facilities, 3) lockers, 4) drying space for clothes. Showers, 1 for every 10 cycle storage spaces, subject to a minimum provision of one shower. Changing facilities, same number of cycle storage spaces or showers provided. Lockers, at least equal to the number of cycle spaces required. A dedicated drying space for the drying of wet clothes.			1.00	1	1.00 %	1	1.00 %			H	Architect		Architect to include in space plan; space is a premium so high risk; Cycle storage require 1 cycle per 2 residents, plus 1 cycle per 10 staff- SB confirm adequate room size
Tra 04 **Maximum Car Parking Capacity**			The car parking capacity benchmarks for compliance (parking spaces per building users) can be found in table - 33. The Accessability Index must be determined prior to assessing this issue.			1.00	2	2.00 %			1	1.00 %	H	Architect		Unlikely to be achieved- Architect to review
Tra 05 **Travel Plan**			A travel plan is developed specifically for the site as part of the feasibility and design stages which considers all types of travel relevant to the building type and users. Travel plan must include a package of measures that have been used to steer the design of the development in order to meet the travel plan objectives and minimise car-based travel patterns.			1.00	1	1.00 %	1	1.00 %			L	Transport consultant	Client/Project manager	A compliant Travel Plan is required to be developed, from early stage D. This can be a site wide travel plan that is updated to reflect the new proposed building.
Transport totals:						1.00	9	9.00 %	7.00%	7.00 %	1.00%	1.00 %				
WATER															
Wat 01 **Water Consumption**			Credits awarded on a sliding scale based on the percentage improvement in water usage over a baseline notional building. Must use the Wat 01 calculator to determine final number of credits awarded. Minimum for one credit is 12.5% improvement, 5 credits awarded for 55% improvement or better. The following domestic scale water consuming components are included: WCs, urinals, taps, showers, baths, dishwashers, washing machines. Grey water and rainwater collection systems are taken into account in the calculator tool.	1	1	0.78	5	3.89 %	2	1.56 %			M	Architect- Woods baggot	M&E	Woods baggot to provide sanitary ware schedule Low flow taps, showers and low flush volume WC's to be specified. High volume showers if required may jeapordise this credit hence medium risk 2 credits is 25% percentage improvement over baseline building water consumption
Wat 02 **Water Monitoring**			Where a water meter with a pulsed output will be installed on the mains supply to each building/unit. Water-consuming plant or building areas that consume 10% or more of the building's total water demand must be fitted with sub meters or have water monitoring equipment with pulsed output enabling it to connect to a BMS system. If the site has an existing BMS belonging to the same owner as the new development, the meters must be connected to this system.	1	1	0.78	1	0.78 %	1	0.78 %			M	M&E		Water meters to be included in specification and shown on drawings
Wat 03 **Water Leak Detection**		# 1	Leak detection system capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities water meter.			0.78	1	0.78 %	1	0.78 %			L	M&E		Assumed a leak detection system will be in place.
		# 2	One of the following types of flow control devices is fitted to each WC area/facility to ensure water only supplied when needed: time controller, programmed time controller, volume controller, presence detector, or central control unit. Criteria does not apply to single WC - in these instances, shut-off could be provided via the same switch that controls the lighting.			0.78	1	0.78 %	1	0.78 %			L	M&E		Flow control devices will be fitted to each WC area/facility.
Wat 04 **Water Efficient Equipment**	*Where no planting is specified in the development, this issue is not assessed.*		Design team has identified all unregulated water demands that could be realistically mitigated or reduced. Systems or processes have been identified to reduce the unregulated water demand, and demonstrate, through either good practice design or specification, a meaningful reduction in the total water demand of the building.	L		0.78	1	0.78 %	1	0.78 %			L	Architect	Landscape architect	If no irrigation, achieved by default. RW harvesting for irrigation achieves this credit.
Water totals:						0.78	9	7.00 %	4.67%	4.67 %	0.00%	0.00 %				

MATERIALS																
Mat 01 **Life Cycle Impacts**			Credits are determined by the Green Guide to Specification for the major building/finishing elements and the Mat 01 Calculator Tool. For Multi-residential, this includes external walls, windows, roof, upper floor slabs, internal walls, floor finishes/covers. Green Guide ratings are based on a score of E to A+, where more points are gained with A+.			0.96	6	5.79 %	2	1.93 %			M	Architect	Structural Engineer	Materials TBC, however, 2 Credits are required to be achieved as a minimum.
Mat 02 **Hard Landscaping and Boundary Protection**			At least 80% of the external hard landscaping and boundary protection (combined) achieves A or A+ rating, as defined by the Green Guide to Specification			0.96	1	0.96 %	1	0.96 %			M	Architect	Landscape architect	Materials TBC, easy credit to achieve if the specification of materials for boundary protection and external hard surfaces have A/A+ green guide rating.
Mat 03 **Responsible Sourcing of Materials**	***Criterion 1 (timber based products are 'legally harvested and traded timber') is a minimum requirement, though it does not gain a credit alone.***	#1,2	**Pre-requisite** **All timber and timber based products used on the project is 'Legally harvested and traded timber'.** The principal contractor sources materials for the project in accordance with a sustainable procurement plan.			0.96	1	0.96 %	1	0.96 %			M	Architect	SE/Contractor	
		#3	Up to 3 credits can be awarded where the applicable building materials (refer to Table - 43 of BREEAM 2014 Manual) are responsibly sourced in accordance with the BREEAM 2014 methodology.			0.96	3	2.89 %	1	0.96 %			H	Architect	SE/Contractor	Materials in key building elements to have required certification. BREEAM AP to provide specification clauses. Credits are very difficult to achieve - requires careful specification and procurement.
Mat 04 **Insulation**			All new insulation specified for external walls, ground floor, roof, and building services must be assessed. The Insulation Index for the building insulation is > 2.5, as determined by the Mat 04 Calculator Tool.			0.96	1	0.96 %	1	0.96 %			L	Architect	M&E	Applies to services & fabric insulation
Mat 05 **Designing for Durability and Resilience**			Areas of the building identified, both internal and external, where vehicular, trolley, and pedestrian movement occur. Design must incorporate suitable durability and protection measures to prevent damage to vulnerable parts of the building.			0.96	1	0.96 %	1	0.96 %			M	Architect		Building to include suitable durability and protection measures or designed features/solutions to prevent damage to vulnerable parts of the internal and external building and landscaping elements. And select materials that protect building from degradation. Some guidance has been provided by Asssesor (29/09/14) for first part of credit.
Mat 06 Material Efficiency	**MUST OCCUR AT RIBA STAGES 1, 2, 3 & 4**		Design/Construction team must identify, investigate and implement measures to optimise material use at all stages of the project.			0.96	1	0.96 %	1	0.96 %			H	Architect	Structural Engineer, M&E	This new credit focuses on rewarding refurbishment and fit out projects that have identified actions to optimise material efficiency throughout the scope of the project. Riba stage 2:Stage C workshop meeting was held and minutes taken.
Materials totals:						0.96	14	13.50 %	7.71%	7.71 %	0.00%	0.00 %				
WASTE																
Wst 01 **Construction Waste Management**		# 1	There is a compliant Resource Management Plan. Where demolition must occur, a compliant pre-demolition audit must take place. Non-hazardous construction waste (excluding demolition and excavation waste) generated by the building's design and construction meets or exceeds resource efficiency benchmarks as set out in the BREEAM 4014 Manual. The less waste generated by area or weight earns more credits.			1.06	3	3.19 %	2	2.13 %	1	1.06 %	M	Contractor		Possible score will depend on the construction method. For one credit, amount of waste generated per 100m2 should be less than 13.3 m3 or 11.1 tonnes. For two credits, less than 7.5m3 or 6.5tonnes. To be included in the Contractor's Prelims.
		# 2	The following percentages, at a minimum, of non-demolition and demolition waste (where applicable) generated by the project have been diverted from landfill: Non-demolition - 70% by volume or 80% by weight. Demolition - 80% by volume or 90% by weight.			1.06	1	1.06 %	1	1.06 %			M	Contractor		
Wst 02 **Recycled Aggregates**			The percentage of high grade aggregate that is recycled or secondary aggregate, specified in each application (present) must meet the following minimum % levels (by weight or volume) to contribute to significant use of (25% or more) secondary or recycled aggregates in high-grade building aggregate uses. High grade uses include structural frame, floor slabs, base for paved areas, pipe bedding, gravel landscaping, etc. Aggregates must be either obtained on site, obtained from a waste processing centre within a 30km radius of site, or obtained from a non-construction post-consumer or post-industrial by-product (i.e. fly ash or slag).			1.06	1	1.06 %			1	1.06 %	H	Structural Engineer	Contractor	Could be considered if required, however seen as difficult to achieve.
Wst 03 **Operational Waste**	**Space planning- occurs at RIBA stage 2**		Where dedicated, accessible, and properly sized storage space is provided for recycling. Where consistent generation in large volumes of waste or compostable materials are generated, compactors, balers, and/or composting vessels or facilities with water outlet must be provided.		1	1.06	1	1.06 %	1	1.06 %			L	Architect	Client	The following guide for minimum storage space provision should be used: 1.At least 2m2 per 1000m2 of net floor area for buildings < 5000m2 2.A minimum of 10m2 for buildings ≥ 5000m2 3.An additional 2m2 per 1000m2 of net floor area where catering is provided (with an additional minimum of 10m2 for buildings ≥ 5000m2). Composting or organic waste collection included? proposed location?
Wst 05 Adaptation to Climate Change	**MUST OCCUR NO LATER THAN RIBA STAGE 2**		Conduct a climate change adaptation to climate change strategy appraisal for structural and fabric resilience by the end of Concept Design by carrying out a systematic risk assessment to identify and evaluate the impact on the building over its projected life cycle from expected extreme weather conditions arising from climate change.			1.06	1	1.06 %			1	1.06 %	H	Structural Engineer	AR/M&E	This is potentially a significant piece of work, requiring feedin from many design team members in a very short space of time. If undertaken, the assessment should cover the following stages: 1. Hazard identification 2. Hazard assessment 3. Risk estimation 4. Risk evaluation 5. Risk management

Wst 06 Functional Adaptability	**MUST OCCUR NO LATER THAN RIBA STAGE 2**		Client and design team to undertake a building-specific functional adaptation strategy study by Concept Design which includes recommendations for measures in to be incorporated to facilitate future adaptation.			1.06	1	1.06 %	1	1.06 %			M	Architect	Strutural/M&E/Client/ project manager	Assessor has circulated report structure. The study should consider: 1.The potential for major refurbishment, including replacing the façade. 2.Design aspects that facilitate the replacement of all major plant within the life of the building e.g. panels in floors/walls that can be removed without affecting the structure, providing lifting beams and hoists. 3.The degree of adaptability of the internal environment to accommodate changes in working practices. 4.The degree of adaptability of the internal physical space and external shell to accommodate change in-use. 5.The extent of accessibility to local services, such as local power, data infrastructure etc.
Waste totals:						1.06	8	8.50 %	5.31%	5.31 %	3.19%	3.19 %				
LAND USE & ECOLOGY																
LE 01 **Site Selection**		# 1	At least 75% of the proposed footprint is on ab area of land which has previously been occupied by industrial, commercial or domestic buildings or fixed surface infrastructure.			1.00	1	1.00 %	1	1.00 %			L	Architect		Architect; quick calc
		# 2	Site is deemed to be significantly contaminated as confirmed by a contaminated land specialist's site investigation, risk assessment, and appraisal. Client must confirm that remediation has occurred in accordance with the remediation strategy set out by the contaminated land specialist.			1.00	1	1.00 %					L	Structural Engineer		Credit not sought because it is currently expected that the site is not contaminated.
LE 02 **Ecological Value of Site and Protection of Ecol. Features**	**Survey to occur before any demolition**	# 1	Land within the Construction Zone is defined as being of Low Ecological Value (by using the BREEAM checklist, or by a Suitable Qualified Ecologist).			1.00	1	1.00 %	1	1.00 %			M	Porject manager: Ecologist	Architect	Ecologist has been appointed. Site has been defined as low ecological value. Ecologist has provided information in the template format
		# 2	All existing features of ecological value will be retained and protected during construction.			1.00	1	1.00 %			1	1.00 %	M	Porject manager: Ecologist	Architect, Landscape,	Ecologist cofirmed that there are areas of ecological value, which can be preserved through project programming; "clearance of vegetation must be avoided between March and August. " If programming is not possible, a clearance proceudre has been described whcih may take several weeks. If the works are not able to be programmed as such, and teh clearance programme is not followed for any protectted specieis discovered on site, this credit will not be achieved. Protection of trees- a method is proposed invloving protection zones. Requirements to be addedd to contractors prelims
LE 03 **Minimising Impact on Existing Site Ecology**		# 1	Two credits awarded where the change in ecological value of the site is equal to or greater than zero, i.e. no negative change. Must be proven by either using the LE 03/LE 04 Calculator Tool, or by a Suitably Qualified Ecologist.	1	1	1.00	2	2.00 %	2	2.00 %			M	Porject manager: Ecologist	Architect, Landscape,	Ecologist has confirmed,. Given 150m2 green roof plus 8 species /hectare landscaping will likely give an increase from 0.77 to 3.93= an increase of 3.16 taxon richness. Two credits can be achieeved if recommendations are written into the landscape spec.
		# 2	One credit awarded where change in ecological value of site is less than zero but equal to or greater than minus 9, i.e. a minimal change. Must be proven by either using the LE 03/LE 04 Calculator Tool, or by a Suitably Qualified Ecologist (SQE).			1.00		0.00 %					M			n/a as full two credits have been achieved above
LE 04 **Enhancing Site Ecology**	**MUST OCCUR NO LATER THAN RIBA STAGE 1**	# 1	Suitable Qualified Ecologist (SQE) is appointed no later than RIBA Stage 1 to report on enhancing and protecting the ecology of the site. SQE must provide an Ecology Report based on a site visit. General recommendations made by SQE must be implemented.			1.00	1	1.00 %	1	1.00 %			M	Porject manager: Ecologist	Architect, Landscape, M&E	Ecologist has given requirements which must be included in Prelims for contractor, and in external lighting design, and in landscaping proposals.
	MUST OCCUR NO LATER THAN RIBA STAGE 1	# 2	#1 is achieved. Recommendations of the Ecology Report for enhancement and protection have been implemented, and the SQE confirms that this will result in an increased ecological value of the site of greater than 6 plant species. LE 03/LE 04 Calculator Tool has been used using actual plant species numbers.			1.00	1	1.00 %	1	1.00 %			M	Ecologist	Architect, Landscape,	Ecologist has confirmed that increase in species will occur from 7 to 44= and increase of 37 plant types. Thi qualifies for one credit. Proposals to be included in landscape scheme
LE 05 **Long Term Impact on Biodiversity**			Suitable Qualified Ecologist (SQE) is appointed prior to commencement of activities on site. SQE confirms compliance with all UK/EU legislation relating to protection and enhancement of ecology, and a 5year landscape/management plan is produced and the Client and the Contractor carry out a number of actions to minimise the longer term impact of the site. Number of applicable actions (from the list of potential actions in the BREEAM Technical Guide p. 346) determines the number of credits achievable in this issue.			1.00	2	2.00 %	2	2.00 %			H	Ecologist	Contractor/AR, project manager, Client	Ecologist has confirmed which speciies are presnet that require protection. A landscape/management plan has been produced. Confirm in wiriting that this is adopted by the client. Protection of trees- a method is proposed invloving protection zones whcih should be accpeted by contractor/client Protected species- a construction program and clearance procedure have been defined by the ecologist and should be accpeted by contractor/client Additional measures in table 55 also need to be addressed.
Land use & Ecology totals:						1.00	10	10.00 %	8.00%	8.00 %	1.00%	1.00 %				
POLLUTION																
Pol 01 **Impact of Refrigerants**			Building does not require refrigerants (3 credits), or All systems (with electric compressors) must comply with the requirements of BS EN 378:2008 and have a Direct Effect Life Cycle CO_2 of ≤ 100kgCO_{2e}/kW (2 credits) or ≤ 1000kgCO_{2e}/kW cooling capacity (1 credit). Another credit cab be awarded where a permanent automated refrigerant leak detection system or an in-built automated diagnostic procedure for detecting leakage has been installed.			0.77	3	2.31 %	1	0.77 %	2	1.54 %	M	M&E		To review with heat pump supplier
Pol 02 **NOx Emissions**			Plant installed to meet delivered heating has a low dry NO_x emission level (≤ 40 mg/kWh to ≤ 100 mg/kWh)			0.77	3	2.31 %					L	M&E		VRF heating prevents this credit
		# 1	Site is Low Flood Risk which is confirmed by a site-specific Flood Risk Assessment (2 credits), or if site is medium or high flood risk and not in a Functional Floodplain, and ground level of building and access to building and site are at least 600mm above the design flood level - must be confirmed by Flood Risk Assessment.			0.77	2	1.54 %	2	1.54 %			L	Structural Engineer		Appropriate consultant needs to be appointed to carry out a site specific FRA. What is the flood risk of the site?
		# 2	Appropriate consultant appointed to carry out the following analysis: Peak run-off from site to watercourses is no greater for developed site than it was for pre-developed site - calcs should include allowance for climate change.			0.77	1	0.77 %	1	0.77 %			M	Structural Engineer		Calculations to be performed to confirm, but currently expected to be achieved.
Pol 03 **Surface Water Run-off**		# 3	Appropriate consultant appointed to carry out the following analysis: Flooding will not occur in event of local drainage system failure and either: post development run-off volume, over development lifetime, is no greater than it would have been prior to development - any additional predicted volume for the 100yr 6hr event must be prevented from leaving the site. OR, justification from the consultant that the first option is not achievable and post-development run-off rate is reduced to a limiting discharge. Calcs should include allowance for climate change.			0.77	1	0.77 %	1	0.77 %			M	Structural Engineer		Calculations to be performed to confirm, but currently expected to be achieved.
		# 4	Appropriate consultant appointed to carry out the following analysis: no discharge from developed site for rainfall up to 5mm. All delivery areas designed in compliance with current best practice planning guidance. If project does not include any areas that are sources of pollution, credit achieved by default.			0.77	1	0.77 %			1	0.77 %	M	Structural Engineer		Calculations to be performed to confirm, but currently not expected to be achieved due to london clays precluding soakway.

Pol 04 Reduction of Night Time Light Pollution		Where the external lighting design is compliant with ILE guidance for the reduction of night time pollution and is automatically switched off between 2300 and 0700.		0.77	1	0.77 %	1	0.77 %			L	M&E		To be included in the M&E Spec.
Pol 05 Reduction of Noise Pollution		Noise sources from development do not exceed ambient noise levels. Noise impact assessment to be BS 4142 compliant. Credit achieved by default where there are no noise sensitive areas or buildings within 800m radius of development.		0.77	1	0.77 %	1	0.77 %			M	Acoustician		A noise impact assessment to be undertaken in compliance with BS 7445.
Pollution totals:				0.77	13	10.00 %	5.38%	5.38 %	2.31%	2.31 %				
INNOVATION														
Man 03	Responsible Construction Practices	Achieve Considerate Constructors score of 40 or above.		1.00	1	1.00 %	1	1.00 %			M	Contractor		Unclear whether this can be achieved however if sought then requirements to be included in the Contractor's Prelims.
Man 05	Aftercare	Collection of occupant survey, energy consumption and water consumption data at quarterly intervals for the first three years of building occupancy		1.00	1	1.00 %			1	1.00 %	L	Client		Client's commitment to provide annual energy and water consumption and occupant satisfaction data for 3 years.
Hea 01	Visual Comfort	Achieve daylight factor of 3% in 80% of spaces.		1.00	1	1.00 %								Not sought
Hea 02	Indoor Air Quality	Products listed in Table - 18 under A) meets the testing requirements and emission levels criteria for Volatile Organic Compound (VOC) emissions. and products under B) to F) the formaldehyde emission levels have been measured and found to be less than or equal to 0.06mg/m3 air for 1 credit or equal to 0.01mg/m3 air for 2 credits in accordance with the approved testing standards.		1.00	2	2.00 %								Not sought
Ene 01	Reduction of Energy Use and Carbon Emissions	Carbon negative building (5pts), or large offset of unregulated energy demand by a carbon-neutral source (up to 4pts)		1.00	5	5.00 %								Not sought
Wat 01	Water Consumption	Achieve a 65% potable water use consumption reduction for sanitary use via water efficient components and water recycling systems.		1.00	1	1.00 %								Not sought
Mat 01	Life Cycle Impacts	Score 16 or higher using the Mat01 Calculator - requires almost exclusive use of A+ rated materials Or Use compliant Life Cycle Assessment software		1.00	3	3.00 %								Not sought
Mat 03	Responsible Sourcing of Materials	Using the Mat03 Calculator, 70% of the total points available are achieved (i.e. extremely responsible sourcing of materials).		1.00	1	1.00 %								Not sought
Wst 01	Construction Site Waste Management	Low amount of waste generated per 100m^2 of gross internal floor area (≤1.6 m^3 by volume or ≤1.9 tonnes by weight), high amount of diverting waste from landfill (non-demo waste: 85% by volume or 90% by weight, demo waste: 85% by volume, 95% by weight)		1.00	1	1.00 %			1	1.00 %				Not sought
Wst 02	Recycled Aggregates	Total amount of recycled and/or secondary aggregate is greater than 35% (by weight or volume) of the total high-grade aggregate specified for the project AND the percentage of high-grade aggregate per application that is recycled and/or secondary meets the corresponding exemplary requirement (by weight or volume) as defined in the BREEAM New Construction 2011 manual.		1.00	1	1.00 %								Not sought
Wst 05	Adaptation to Climate Change	An exemplary credit is awarded where a number of BREEAM issues such as Hea 04, ene 01, ene 04, wat 01, mat 05 and pol 03 aim to encourage and support efforts to mitigate the future impacts of climate change on the building by considering a number of relevant factors during the design stages.		1.00	1	1.00 %								Not sought
Innovation totals:				10.00	18	10.00 %	1.00%	1.00 %	2.00%	2.00 %				
OVERALL TOTAL					143	110.00 %	74.73%	74.73 %	13.98%	13.98 %				
Minimum requirement for an 'Excellent' rating = 70%					**Targeted Score**			**74.73 %**						
Minimum requirement for a 'Very Good' rating = 55%					**Possible Additional Score**			**88.71 %**						

13.0 APPENDIX 2 - CODE FOR SUSTAINABLE HOMES PRE-ASSESSMENT

Code for Sustainable Homes
PRE ASSESSMENT ESTIMATOR TOOL

breglobal

Results

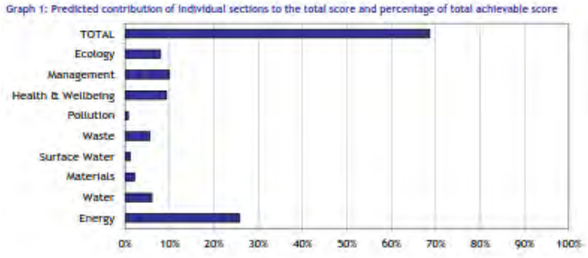
Development Name:	4901 FitzJohn Avenue
Dwelling Description:	Typical apartment
Name of Company:	Maxfordham
Code Assessor's Name:	B Dixon
Company Address:	42/43 Gloucester crescent, London NW1 7PE
Notes/Comments:	Stage C pre-assessment for review

PREDICTED RATING - CODE LEVEL: 4

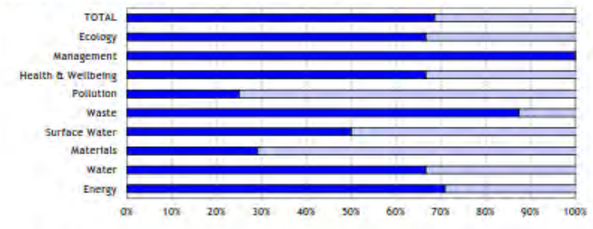
Mandatory Requirements: **All Levels**

% Points:	68.66%	- Code Level: 4
Breakdown:	Energy	- Code Level: 4
	Water	- Code Level: 4

Graph 1: Predicted contribution of individual sections to the total score and percentage of total achievable score



Graph 2: Predicted percentage of credits achievable: Total and by Category



NOTE: The rating obtained by using this Pre-Assessment Estimator is for guidance only. Predicted ratings may differ from those obtained through a formal assessment, which must be carried out by a licensed Code assessor.

CATEGORY 1 ENERGY	Overall Level: 4	Overall Score	58.66	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 70.96		Credits	Level		
Contribution to Overall % Score: 25.83 points		22.0 of 31 Credits	Level 4		
Ene 1 Dwelling Emission Rate	Credits are awarded based on the percentage improvement of the Dwelling Emission Rate (DER) over the Target Emission Rate (TER) as calculated using SAP 2009. Minimum standards for each Code level apply. The Code energy calculator can be used to calculate a predicted score. Enter the predicted score What is the predicted number of credits? 4.0 OR Are zero net CO_2 emissions achieved?	4.0 of 10 Credits	Level 4	Building fabric spec described in stage C report, plus Gas boilers for DHW, VRF for heating and cooling, large PV array sized to achieve 6 credits.	
Ene 2 Fabric Energy Efficiency	Credits are awarded based on the Fabric Energy Efficiency (kWh/m²/yr) of the dwelling. Minimum standards apply at Code levels 5 and 6. The Code energy calculator can be used to calculate a predicted score. Select whether the ECO monitors electricity and/or fuel OR End terrace, Semi and Detached OR Staggered Mid terrace What is the predicted number of credits? 9.0	9.0 of 9 Credits	Level 6	Expected FEE 23.96, this scores full 9 credits	
Ene 3 Energy Display Devices	Credits are awarded where a correctly specified Energy Display Device is installed monitoring electricity and/or primary heating fuel consumption. Will drying space meeting the criteria be provided? None Specified Primary Heating only OR Electricity only OR Electricity and primary heating fuel	1 of 2 Credits	-	MF TO SPEC- NO AFFORDABLE PRODUCT AVAILABLE ON MARKET FOR THE SECOND CREDIT	

Issue		Credits	Level	Assumptions Made	Evidence Required
Ene 4 Drying Space	One credit is awarded for the provision of either internal or external secure drying space with posts and fittings or fixings capable of holding 4m+ of drying line for 1-2 bed dwellings and 6m+ for dwellings with 3 bedrooms or greater. Yes	1 of 1 Credits	-	Internal drying cupboard SB to spec	
Ene 5 Energy Labelled White Goods	Credits are awarded where each dwelling is provided with either information about the EU Energy Labeling Scheme, White Goods with ratings ranging from A+ to B or a combination of the previous according to the technical guide. Dual lamp luminaires EU Energy labelling information only A+ rated appliances A+, A and B rated appliances Combination of compliant rated white goods with EU Energy Labelling Scheme	1 of 2 Credits	-	No white goods to be provided, provide info only	
Ene 6 External Lighting	Credits are awarded based on the provision of space lighting* with dedicated energy efficient fittings and security lighting fittings with appropriate control gear.. None provided OR Non Code compliant lighting OR Code compliant lighting None provided OR Non Code compliant lighting OR Code compliant lighting and controls Will there be provision for a Home Office? Compliant with both above criteria * Statutory safety lighting is not covered by this requirement	2 of 2 Credits	-	MF TO SPEC	

Issue		Credits	Level	Assumptions Made	Evidence Required
Ene 7 Low or Zero Carbon Technologies	Credits are awarded where there is a 10% or 15% reduction in CO_2 emissions resulting from the use of low or zero carbon technologies. Less than 10% of demand OR 10% of demand or greater OR 15% of demand or greater	1 of 2 Credits	-	IN RESERVE IF NEEDED 200m2 of roof available mf to check	
Ene 8 Cycle Storage	Credits are awarded where adequate, safe, secure and weather proof cycle storage is provided according to the Code requirements. Number of bedrooms: 3 Number of cycles stored per dwelling* 2.0 * If you have storage for 1 cycle per two dwellings insert 0.5 in number of cycles stored per dwelling	2 of 2 Credits	-	SB to allow space for 2 bikes per flat	
Ene 9 Home Office	A credit is awarded for the provision of a home office. The location, space and services provided must meet the Code requirements. Yes OR No	1 of 1 Credits	-		

CATEGORY 2 WATER	Overall Level: 4	Overall Score	68.66	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 66.66		Credits	Level		
Contribution to Overall Score: 6.00 points		4 of 6 Credits	Level 4		
Wat 1 Indoor Water Use	Credits are awarded based on the predicted average household water consumption, calculated using the Code Water Calculator Tool. Minimum standards for each code level apply. Select the predicted water use / Mandatory Requirement greater than 120 litres/ person/ day ○ OR ≤ less than 120 litres/ person/ day ○ OR ≤ less than 110 litres/ person/ day ○ OR ≤ less than 105 litres/ person/ day ◉ OR ≤ less than 90 litres/ person/ day ○ OR ≤ less than 80 litres/ person/ day ○	3 of 5 Credits	Level 3 AND Level 4	this is minimum mandatory level- Woods boggot to provide sanitaryware schedule	
Wat 2 External Water Use	A credit is awarded where a compliant system is specified for collecting rainwater for external irrigation purposes. Where no outdoor space is provided the credit can be achieved by default. Select the scenario that applies No internal or communal outdoor space ○ OR Outdoor space with collection system ◉ OR Outdoor space without collection system ○	1 of 1 Credits	-	Required for BREEAM- review if required here	

CATEGORY 3 MATERIALS — Overall Level: 4 — Overall Score 68.66 % of Section Credits Predicted: 29.16 — Credits: 7 of 24 Credits Contribution to Overall Score: 2.10 points — Level: All Levels				Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
Mat 1 Environmental Impact of Materials	Mandatory Requirement: At least three of the five key building elements must achieve a Green Guide 2008 Rating of A+ to D. Tradable Credits: Points are awarded on a scale based on the Green Guide Rating of the specifications. The Code Materials Calculator can be used to predict a potential score. Mandatory Requirement Enter the predicted score Will the mandatory requirement be met? Enter the predicted number of credits? 3	5 of 15 Credits	All Levels	This may be difficult to achieve high score with RC frame. SB & structural engineer to review construction materials against Green guide.	
Mat 2 Responsible Sourcing of Materials - Basic Building Elements	Credits are awarded where materials used in the basic building elements are responsibly sourced. The Code Materials Calculator can be used to predict a potential score. Enter the predicted Score What is the predicted number of credits? 1	1 of 6 Credits	-	FSc timber throughout should achieve 1 credit	
Mat 3 Responsible Sourcing of Materials - Finishing Elements	Credits are awarded where materials used in the finishing elements are responsibly sourced. The Code Materials Calculator can be used to predict a potential score. What is the predicted number of credits? 1	1 of 3 Credits	-	FSc timber throughout should achieve 1 credit	

CATEGORY 4 SURFACE WATER RUN-OFF — Overall Level: 4 — Overall Score 68.66 % of Section Credits Predicted: 50.00% — Credits: 2 of 4 Credits Contribution to Overall Score: 1.10 points — Level: All Levels				Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
Sur 1 Management of Surface Water Run-off from developments	Mandatory Requirement: Peak rate of run-off into watercourses is no greater for the developed site than it was for the pre-development site and that the additional predicted volume of rainwater discharge caused by the new development is entirely reduced as far as possible in accordance with the assessment criteria. Desiging the drainage system to be able to cope with local drainage system failure. Tradable Credits: Where SUDS are used to improve water quality of the rainwater discharged or for protecting the quality of the receiving waters. Mandatory Requirement Select the appropriate option ☑ ☐ Will the mandatory requirement be met? ☐ No SUDS No runoff into watercourses for the first 5 mm of rainfall Select the appropriate option(s) Runoff treated to receive an appropriate level of treatment ○ ○	0 of 2 Credits	All Levels	Mandatory- Symmetrys to review	
Sur 2 Flood Risk	Credits are awarded where developments are located in areas of low flood risk or where in areas of medium or high flood risk appropriate measures are taken to prevent damage to the property and its contents in accordance with the Code criteria in the technical guide. Zone 1 - Low OR Zone 2 - Medium OR Zone 3 - High Low risk of flooding from FRA** All measures of protection are demonstrated in FRA Ground floor level and access routes are 600 mm above design flood level * Planning Policy Statement 25 - Planning and Flood Risk ** FRA - Flood Risk Assessment	2 of 2 Credits	-	Expected low flood risk- Symmetrys to review	

CATEGORY 3 WASTE	Overall Level: 4	Overall Score	68.66	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 87.00%		Credits	Level		
Contribution to Overall Score: 5.60 points		7 of 8 Credits	All Levels		
Was 1 Storage of non-recyclable waste and recyclable household waste	Mandatory Requirement: The space provided for waste storage should be sized to hold the larger of either all external containers provided by the Local Authority or the min capacity ~~Mandatory Requirement: 1 - Yes/No - Evidence~~ Credits are awarded for adequate internal and/ or external recycling facilities. ☑ Internal Recyclable household waste storage Will the minimum space be provider and be accessible to disabled people? ☐ Local Authority collection Scheme Where there is no external recyclable waste storage and no Local Authority collection scheme ☑ Internal storage (capacity 60 litres) ☐ External Storage, no Local Authority collection scheme ☐ Post Collection sorting Internal storage (capacity 30 litres) ☐ Pre-collection sorting Internal storage (3 separate bins capacity 30 litres) ☐ 3 separate internal storage bins (capacity 30 litres) AND SWMP details ~~Houses~~ External Storage(capacity 180 litres) ○ Flats ○ Private recycling operator ○ 3 or greater types of waste collected ◉	0 of 2 Credits 4 of 4 Credits 0 of 4 Credits	All Levels	SB to allow adequate space for bins and recyling	

Issue		Credits	Level	Assumptions Made	Evidence Required
Wst 2 Construction Site Waste Management	A credit is awarded where a compliant SWMP is provided with targets and procedures to minimise construction waste. Credits are available where the SWMP include procedures and commitments for diverting either 50% or 85% of waste generated from landfill. Select the most appropriate option Does the SWMP include: + No SWMP + SWMP with targets and procedures to minimise waste? + SWMP with procedures to divert 50% of waste + SWMP with procedures to divert 85% of waste	3 of 3 Credits		Contractor prelims	
Wst 3 Composting	A credit is awarded where individual home composting facilities are provided, or where a community/ communal composting service, either run by the Local Authority or overseen by a management plan is in operation. No composting facilities Individual composting facilities OR Communal/ community composting*? Local Authority OR Private with management plan * including if an automated waste collection system is in place	0 of 1 Credit	-	Will not be achieved	

CATEGORY 6 POLLUTION	Overall Level: 4	Overall Score	68.66	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 25.00%		Credits	Level		
Contribution to Overall Score: 0.70 points		1 of 4 Credits	All Levels		
Pol 1 Global Warming Potential (GWP) of Insulants	A credit is awarded where all insulating materials only use (on) that have a GWP of less than 5. Select the most appropriate option All insulants have a GWP less than 5 OR Some insulants have a GWP of less than 5 OR No insulants have a GWP of less than 5	1 of 1 Credits	-	Expected to be achieved	
Pol 2 NOx Emissions	Credits are awarded on the basis of NOx emissions arising from the operation of the space and water heating system within the dwelling. Greater than 100 mg/kWh OR Less than 100 mg/kWh OR Less than 70 mg/kWh OR Less than 40 mg/kWh OR Class 4 boiler OR Class 5 boiler OR All space and hot water energy requirements are met by systems who do not produce NOx emissions	0 of 3 Credits	-	Will not be achieved due to VRF	

CATEGORY 7 HEALTH & WELLBEING — Overall Level: 4		Overall Score	68.66	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 66.00%		Credits	Level		
Contribution to Overall Score: 9.33 points		8 of 12 Credits	No level		
Hea 1 Daylighting	Credits are awarded for ensuring key rooms in the dwelling have high daylight factors (DF) and a view of the sky. Room Kitchen: Avg DF of at least 2% Living Room*: Avg DF of at least 1.5% Dining Room*: Avg DF of at least 1.5% Study*: Avg DF of at least 1.5% 80% of working plane in all above rooms receive direct light from the sky? Select a type of property Any room used for the Home Office must also achieve a min DF of 1.5%.	0 of 3 Credits	-	Not expected to be achieved as layouts not yet provided, & heavy overshading	
Hea 2 Sound Insulation	Credits are awarded where performance standards exceed those required in Building Regulations Part E. This can be demonstrated by carrying out pre-completion testing or through the use of Robust Details Limited. Select a performance standard Detached Property Attached Properties: - Separating walls and floors only exist between non habitable spaces - Separating walls and floors exist between habitable spaces Will a private/ semi-private space be provided? Performance standard not sought Airborne: 3db higher; Impact: 3dB lower OR Airborne: 5db higher; Impact: 5dB lower OR Airborne: 8db higher; Impact: 8dB lower	3 of 4 Credits	-	Allow 300mm in party walls. SB to review stage C acoustic report.	

Issue	Mandatory Requirement	Credits	Level	Assumptions Made	Evidence Required
Hea 3 Private Space	A credit is awarded for the provision of an outdoor space that is at least partially private. The space must allow easy access to all occupants. Lifetime Homes Compliance Yes, private/semi-private space will be provided OR No private/semi-private space	1 of 1 Credits	-	loggias of at least 3m2 for all	
Hea 4 Lifetime Homes	Mandatory Requirement: Lifetime Homes is mandatory when a dwelling is to achieve Code Level 6. Tradable credits: Credits are awarded where the developer has implemented all of the principles of the Lifetime Homes scheme. Dwelling to achieve Code Level 6? All Lifetime Homes criteria will be met OR Exemption from LTH criteria 2/3 applied Credit not sought	4 of 4 Credits	No level	Full LTH to be achieved- planning requirement? SB to review & respond	

CATEGORY 8 MANAGEMENT	Overall Level: 4	Overall Score	68.66	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 100.00%		Credits	Level		
Contribution to Overall Score: 10.00 points		9 of 9 Credits	All Levels		
Man 1 Home User Guide	Credits are awarded where a simple guide is provided to each dwelling covering information relevant to the 'non-technical' home occupier, in accordance with the Code requirements. Operational issues? Site and Surroundings? Is available in alternative formats?	3 of 3 Credits	-	Include in contractor prelims	
Man 2 Considerate Constructors Scheme	Credits are awarded where there is a commitment to comply with best practice site management principles using either the Considerate Constructors Scheme or an alternative locally/ nationally recognised scheme. Select the appropriate scheme and score No scheme used Considerate Constructors OR Best Practice: Score between 24 and 31.5 OR Best Practice+: Score between 32 and 40 Alternative Scheme* OR Mandatory + 50% optional requirements OR Mandatory + 80% optional requirements Tick the impacts that will be addressed * In the first instance, contact a Code Service Provider if you are considering to use an alternative scheme.	2 of 2 Credits	-	Include in contractor prelims	
Man 3 Construction Site Impacts	Credits are awarded where there is a commitment and strategy to operate site management procedures on site as following: Monitor, report and set targets, where applicable, for: - CO_2/ energy use from site activities - CO_2/ energy use from site related transport - water consumption from site activities Secured by Design Compliance Adopt best practice policies in respect of: - air (dust) pollution from site activities - water (ground and surface) pollution on site 80% of site timber is reclaimed, re-used or responsibly sourced	2 of 2 Credits	-	Include in contractor prelims	

Issue		Credits	Level	Assumptions Made	Evidence Required
Man 4 Security	Credits are awarded for complying with Section 2 - Physical Security from Secured by Design - New Homes. An Architectural Liaison Officer (ALO), or alternative, needs to be appointed early in the design process and their recommendations incorporated. Credit not sought OR Secured by Design Section 2 Compliance	2 of 2 Credits	-	Sb to contact ALO before stage C	

CATEGORY 9 ECOLOGY	Overall Level: 4	Overall Score	68.66	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 66.00%		Credits	Level		
Contribution to Overall Score: 8.00 points		6 of 9 Credits	All Levels		
Eco 1 Ecological Value of Site	One credit is awarded for developing land of inherently low value. Select as appropriate (one) Credit not sought OR Land has ecological value OR Land has low / insignificant ecological value* * Low ecological value is determined either a) by using Checklist Eco 1 across the whole development site; or b) where an suitably qualified ecologist is appointed to produce an independent ecological report of the site, that the construction zone is of low / insignificant value; AND the rest of the development site will remain undisturbed by the works.	0 of 1 Credits	-	Ecologist is appointed, survey to be done	
Eco 2 Ecological Enhancement	A credit is awarded where there is a commitment to enhance the ecological value of the development site. Type and protection of existing features Will a Suitably Qualified Ecologist be appointed to recommend appropriate ecological features? AND Will all key recommendations be adopted? AND 30% of other recommendations be adopted?	1 of 1 Credits	-	Ecologist to advise	
Eco 3 Protection of Ecological Features	A credit is awarded where there is a commitment to maintain and adequately protect features of ecological value. Site with features of ecological value? OR Site of low ecological value (as Eco 1)? Change in Ecological Value AND All* existing features potentially affected by site works are maintained and adequately protected? *If a suitably qualified ecologist has confirmed that a feature can be removed [illegible], as long all the rest have been protected, then this box can be ticked.	1 of 1 Credits	-	Ecologist to advise	

Issue		Credits	Level	Assumptions Made	Evidence Required
Eco 4 Change of Ecological Value of Site	Credits are awarded where the change in ecological value has been calculated in accordance with the Code requirements and is calculated to be: Major negative change: fewer than -9 Minor negative change: between -9 and -3 OR Neutral: between -3 and +3 Minor enhancement: between +3 and +9 Major enhancement: greater than 9	2 of 4 Credits	-	Ecologist to advise	
Eco 5 Building Footprint	Credits are awarded where the ratio of combined floor area of all dwellings on the site to their footprint is: Credit Not Sought OR Houses: 2.5:1 OR Flats: 3:1 OR Houses: 3:1 OR Flats: 4:1 OR Houses & Flats Weighted (2.5:1 & 3:1) OR Houses & Flats Weighted (3:1 & 4:1)	2 of 2 Credits		5-6 storeys- 2 credits expected to be achieved	

14.0 APPENDIX 3 – EXAMPLE SAP DER WORKSHEET

15.0 APPENDIX 4 – COMMUNAL AREAS BENCHMARK CARBON ANALYSIS

15.1 General strategy

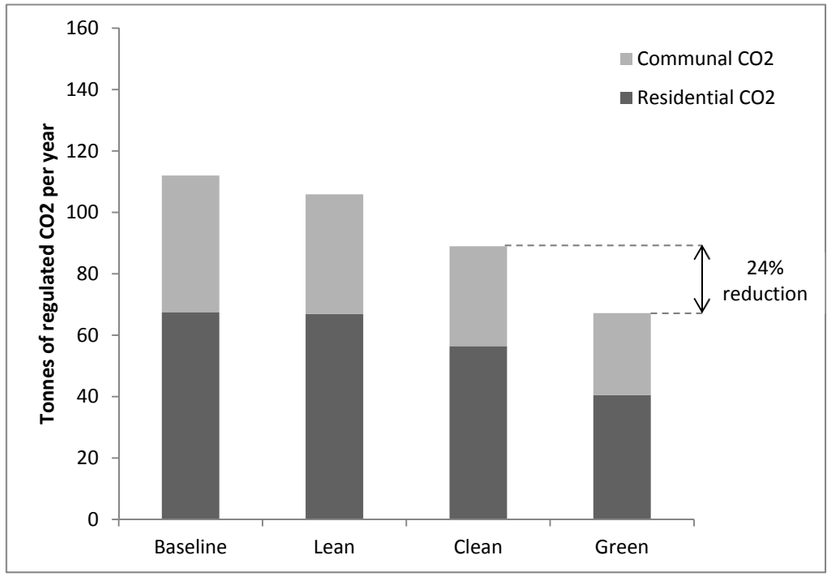
The communal areas will generally be serviced by the same or similar systems to the specialist accommodation for older people. Heating and cooling will be provided by Air Source heat Pumps (ASHP) as part of a Variable Refrigerant Flow (VRF) system. This heat/cooling will be supplied via warm air Fan Coil Units (FCUs). For the water supply low-flow fittings will be installed throughout.

Ventilation will be provided by heat recovery Air handling Units (AHUs). Low energy lighting will be used throughout and power will be provided to electrically sub-meterd zones. Controls will be via BMS with manual interfaces.

15.2 Benchmark Carbon Analysis

A benchmark carbon analysis of the communal areas has been carried out in order to analyse their carbon emissions and energy efficiency, and demonstrate their compliance with Part L2A of the Building Regulations, BREEAM Multi-residential and the CPG3. The specialist accommodation areas were modelled using the Standard Accredited Procedure (SAP).

The benchmark data for the analysis was obtained from carbon data from Bartram's Convent, a similar and recent Pegasus Life project with a combination of specialist accommodation for older people and communal facilities. The data from the Bartram's Convent model was utilised to estimate the baseline carbon emissions for Arthur West House. Once the baseline has been established, it was assumed that the communal emissions would improve at the same rate as the specialist accommodation emissions because the same benefits were added at each stage. The graph below shows the proportions of carbon emissions from the specialist accommodation and communal areas at each stage of the energy hierarchy.



Graph – Regulated CO_2 emissions for the specialist accommodation and communal areas at each stage of the energy hierarchy

This benchmark analysis will be followed up by a full model of the communal areas at the next stage.

16.0 APPENDIX 5 – ALTERNATIVE SERVICES STRATEGY

16.1 Alternative Strategy Description

An alternative services strategy to the one described in this statement is also being considered. The alternative strategy is a full electric system: Air Source Heat Pumps (ASHP) would be used to provide the heating, cooling and domestic hot water using a whole-building Variable Refrigerant Flow (VRF) system.

The Domestic Hot Water (DHW) and heating would be decentralised, with one refrigerant-to-water 'Hydrobox' unit and DHW cylinder per flat. No hot water circulation is required, and individual Hydroboxes provide improved control to each flat.

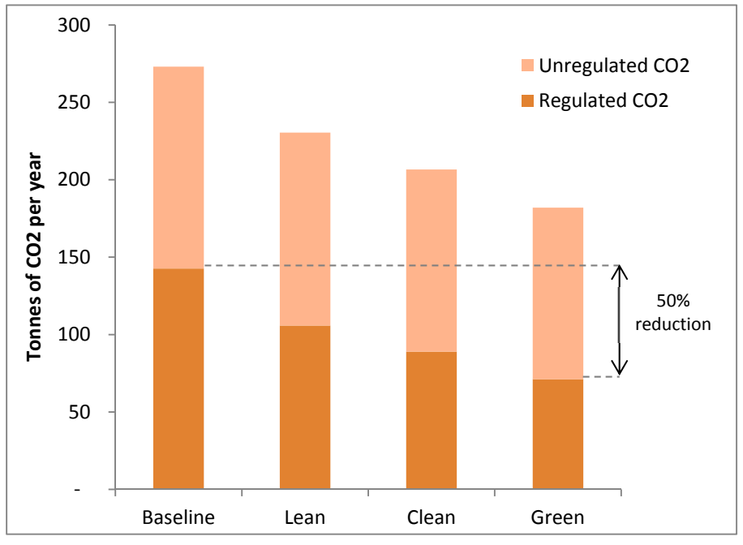
This arrangement would remove the need for any gas-fuelled space or water heating. This changes the building type as seen by the SAP software, which improves the score.

16.2 Carbon Analysis for alternative strategy

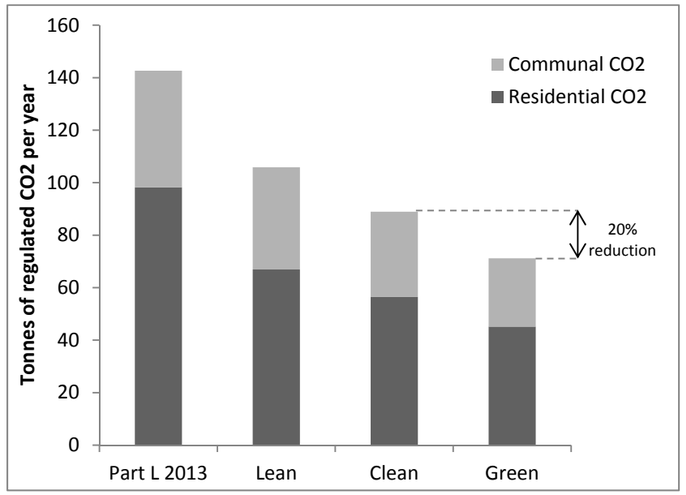
A carbon analysis for this alternative option was run alongside the main carbon analysis. The methods described in Section 9 were used to assess the emissions. The results are presented in the following graphs.

The key values for the analysis of this option are as follows:

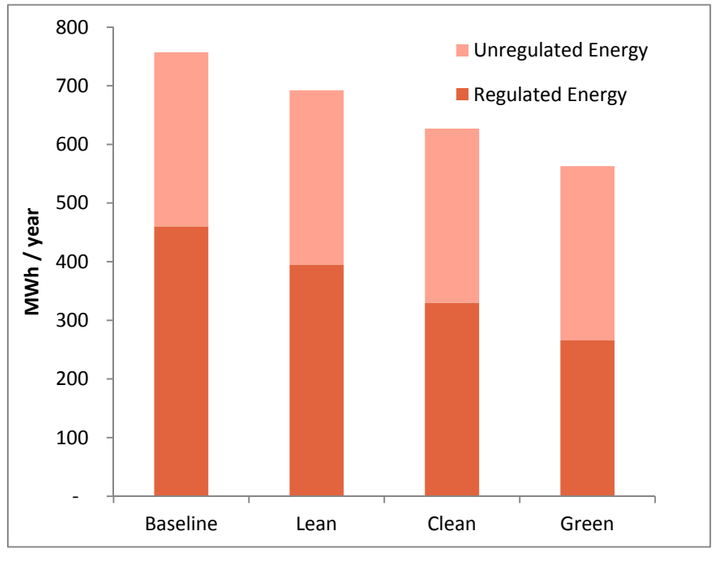
- CO_2 Savings over baseline: 50%
- Reduction in carbon emissions through use of on-site renewable energy generation: 20%
- BREEAM energy credits:10/15



*Graph – Regulated and unregulated **CO2 emissions** at each stage of the Energy hierarchy for alternative option*



*Graph – Residential and communal contributions to **regulated CO2** at each stage of the Energy hierarchy for alternative option*



*Graph – Regulated and unregulated **Energy demand** at each stage of the Energy hierarchy for alternative option*

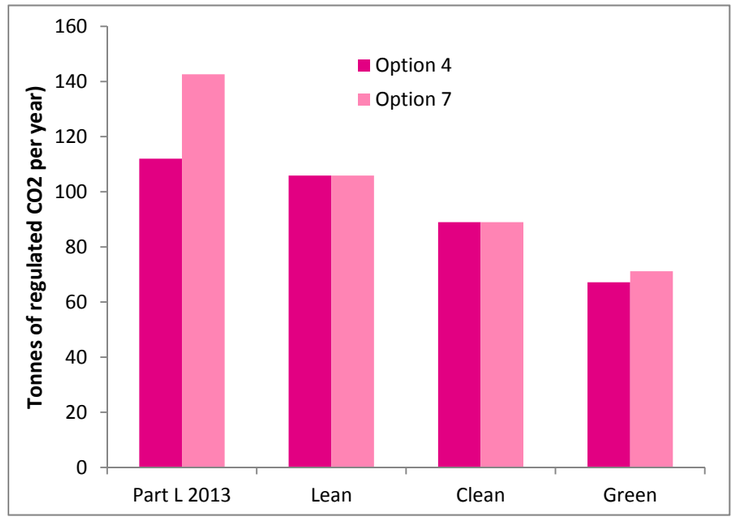
16.3 Comparison

Both of these options meet the targets set out in the planning policy.

Option A is the main strategy set out in this document. It consists of heating and cooling provided by ASHPs on a building-wide VRF system. DX Fan coil units are used to emit heat and cooling. Heating and cooling can be provided simultaneously, and heat recovery canbe used across the system to save energy. DHW is provided by communal gas boilers on a centralised system, circulating Low Temperature Hot Water (LTHW) to Hydraulic Interface Units (HIUs) in flats where it is used to heat water for domestic use. All other aspects of the scheme are the same between the two options.

Option B is as described in section 16.1, with heating, cooling and DHW supplied by the air source heat pumps. On this system simulaltaneous heating and cooing cannot occur within flats, and heat recovery can not be used. The Part L improvement increases due to a higher baseline, and better performance for all-electric systems.

Regulated carbon emissions for both options are compared in the table below. It can be seen that overall Option B leads to fewer carbon emissions. Both options meet the Planning policy targets.



*Graph – Comparison of **regulated CO2 emissions** for the two service strategy options*

17.0 APPENDIX 6 – DISTRICT HEAT NETWORKS

The following email demonstrates that the scheme does not currently have the option to connect to an existing heat network.

Incoming Email

"MacRae, Vhairi" <Vhairi.MacRae@camden.gov.uk>

10/12/2013 09:34

Create Mail Reply

File Ref 1 Local Authority Camden
File Ref 2 None
File Ref 3 None

To: 'P.Almpouras@maxfordham.com' <P.Almpouras@maxfordham.com>
Subject: Gospel Oak CHP information request

Associated Documents

"MacRae, Vhairi" 10-Dec-13

Dear Panos,

Thank you for the email. I have asked around the person who deals with the CHP project is Susana Espino, Sustainability Officer. Her contact details are:
Susana.espino@camden.gov.uk
Telephone: 020 7974 6563

The works have been completed but new schemes cannot connect until we have another energy source available that can provide the additional capacity built into the network.

This approach is to protect the savings we have estimated for residents, which forms the basis of the business case for this project. Also, the hospital at this time cannot provide more heat that the amount agreed under the contract and therefore an alternative energy source would be required.

I hope this helps but let me know if you need further information.

Regards

Vhairi MacRae
Community Planning and Engagement Officer
Placeshaping
Culture and Environment
London Borough of Camden

Telephone: 020 7974 7407
Mobile: 075 5719 1375
Web: camden.gov.uk

Argyle Street
London WC1H 8EQ

Please consider the environment before printing this email.

From: P.Almpouras@maxfordham.com [mailto:P.Almpouras@maxfordham.com]
Sent: 03 December 2013 17:28
To: MacRae, Vhairi
Subject: Gospel Oak CHP information request

Dear Vhairi

Max Fordham is a building design company. At the moment one of our projects is a large residential project next to the Royal Free Hospital. While doing an online research I ran into the Gospel Oak Regeneration Project.
Can you please provide me answers to the following questions?

1) When is the project due to be completed? (It was supposed to be completed already but a member of the Gospel Oak Regeneration Team told me that the main work has not started yet)
2) Is it possible to connect our project to that network? (Approximately 70 dwellings in total)
3) Could we have the technical specifications of the project or contact details to obtain the required technical information?
4) Assuming that our dwellings are connected to the CHP network, who is the responsible party that we need to get an agreement with?

Looking forward to your response.

Kind regards
Panos Almpouras